CATALONIA

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New territoriality: fertile cities, creative fields

A ‘twentist’ reflection between globalization and sustainability

Generalitat de Catalunya
Departament de Territori i Sostenibilitat

Catalonia, a Green Future
Conclusions and papers of the cycle

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Departament de Territori i Sostenibilitat

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Presentation

This publication contains the presentations, conclusions and supplementary material from *Catalunya Futur Verd*, the second cycle of strategic conferences that the Ministry of Territory and Sustainability organised a few years ago. The first one, *GlobalCat,* addressed the territorial conditions for the internationalisation of Catalonia and its economy.

On this particular occasion, the reason for the conferences was to try to determine the foundations for the new economic growth of the country, this being understood as indivisible from the sustainable development of the region and the wellbeing of the citizens of Catalonia, regardless of whether they live in an urban or rural setting.

The impoverishment of rural areas of Catalonia by aesthetically inconsequential urban developments of arguable purpose are the result of old-fashioned models of regional development. The time has come to achieve a new relationship between urban and rural settings, with the realisation that indiscriminate urban development must never encroach upon the rural environment in an attempt to replicate metropolitan patterns that are completely alien to this kind of setting.

To this end, information and communication technologies (ICT) can be of great assistance, in many cases obviating a physical presence. In this way, the rural world can broaden the scope of its activities which, thanks to ICT, can cover the whole world. The countryside has become the place of choice for a new creative class, and it has proved ineffective to replicate urban models in these environments.

Meanwhile, the network of Catalan towns and cities retain their economic competitiveness, but it may be advisable to improve their quality of life, and a key process for achieving this is the renaturing of urban spaces.

The aim is thus to integrate the values of both urban and rural settings, taking the best of each of them to instil in the other. Or, to take this even further, making the distinction between the two areas irrelevant: both of them should strive for maximum creativity and environmental sustainability (both socially and economically).

The fact that the conferences were held at a historic moment in time can also help to instil a successful experience of fully regenerative economic development, rooting and binding the population to their territory. Catalonia is at a key moment in its history as a country, and we must take on the challenge of recovering from the economic crisis of recent years and its very serious social repercussions. Taking advantage of this fact, we note that both reasons demand that we put our knowledge and innovation skills at the service of growth models

that include the environmental factor in their activities and which, at the same time, allow for increased social cohesion and territorial balance.
The ravages of the recent crisis have shown us how important it is for economic activity to respect natural and social boundaries. It would be good for environmental and social factors to be integrated into economic activities as another asset in the corporate balance sheet.
The climate crisis demands a clear turnaround in the economic policies followed so far. These must become more quantitative than qualitative, more systematic than complementary, based more on obligations than incentives, more focused on large-scale actions than large-scale plans and, ultimately, more aimed at transforming the economic model than at stepping up proactive action.
We must set about a real Green Agenda in Catalonia as the country's main sustainable economic development strategy, looking to 2030. An ambitious transforming agenda to modernise the country, that serves as an effective framework for implementing the Sustainable Development Goals in Catalonia, taking the approach of the European Green Deal as a model.
A Green Agenda demands that we engage in actions to guarantee our territory's response capacity: fortunately, the mosaic that forms our country should ensure that the environmental impacts that will undoubtedly come about will be spatially restricted, but that does not imply that we should miss any opportunity to increase our territorial resilience (and leading on from this, our human and economic resilience).
It is precisely in this increase of our territorial capacities that the human factor plays such a key role. Citizens who are committed to the local issues of its immediate environment and feels a bond with their territory are citizens who will contribute to global environmental improvement.
Finally, we believe that the Public Administration should improve its decision-making processes and start acting in a timely manner. It must become a proactive agent that implements new environmental policies right from the start.
For this reason, we believe that the *Catalunya Futur Verd* conferences have provided us with valuable material to reconnect the different constituent concepts of this new territoriality (circularity, attachment, resilience, boundaries, etc.) in our governance and in our policies.
Given the broad scope of the subject matter to be explored, the seminars were divided into three sessions that addressed cultural issues (social and economic), biophysical elements (territorial and environmental) and political matters (governance, education, etc.), all of which will need to underpin the new territorial model being advocated.
We also believe that the scientific rigour and academic category of the speakers invited to the *Catalunya Futur Verd* conferences will have helped to strengthen the conceptual foundations of this new country model to which we aspire.

Damià Calvet i Valera,
Minister of Territory and Sustainability

Introduction

Catalonia is diverse but its resources are limited, and therefore the ability to tend towards economic models based on environmental efficiency becomes imperative. In fact, it must be understood that without said efficiency any economic growth Catalonia may achieve will be flawed in its origin. This is why we think it is desirable to propose new models of land occupancy and use in which respect for available resources, trying to achieve their circularity, takes full prominence.

At the same time, the prosperity and well-being of the Catalan population must be ensured, and consequently the strengthening of people's attachment to their territories should be sought without losing sight of the opportunities offered by globalising economic trends.

All of this revolves around a new way of conceiving territory which should, on the one hand, help the country overcome the havoc of the economic crisis and, on the other, place the new Catalonia on a sound basis, considering that, after all, the most important aspects of the new country will be its inhabitants and the territories that constitute it. Without the first and the latter there is no viable country.

The new territoriality we invoke has to tend towards efficiency, necessarily, respecting the limits set by the scarcity of resources in Catalonia and the global environmental trends in full swing. Also, once and for all, economic activity will have to internalise the environmental and social costs in its accounts. Environmental issues will have to be considered when formulating and implementing public policies. Finally, in order to ensure the balance of territory and the well-being of its inhabitants, the renewal of relationship patterns between the population and their spatial settings will be indispensable, trying to promote the attachment of people to the territory that accommodates them.

Facing these challenges, the cycle of sessions *Catalunya Futur Verd* aimed to rework and update the concept of sustainability, taking as a starting point three discussion threads, due to the cross-cutting nature of the work that lay ahead and its extent. These discussion threads covered the three kinds of bases on which the new territoriality will have to be built. Namely:

At the first working day (22 March 2017) the cultural bases of a renewed commitment to territory were discussed: how should the new forms of territorial occupation be organised?; how can the country become (re)balanced?; how can we promote the feeling of belonging to each one's spatial surroundings?; how can the space be rethought for nature and culture to reunite and to stop excluding each other?

At the second working day (26 April 2017) the biophysical bases of the new territoriality were addressed: what are the limiting factors (water, energy, waste...) to be taken into account in the new ways of doing things in our country?; what are the vulnerabilities and risks threatening our territory, and how can we face them?; what must be done in order to carry out a successful energy transition?
At the third working day (18 May 2017) the political bases that should enable the attainment of the expected goals were discussed: which educational model should be implemented in order to increase awareness of environmental issues among younger generations?; what role can companies lay in the transition towards a fully regenerative economy?; what are the public policies that must be implemented in order to achieve the proposed goals?; how can citizens become empowered and take part in the sustainability we call for?; how do digital technologies affect the relationship between people and their territory, and which new forms of occupancy do they enable?
Much the same way that some Catalan intellectuals in the early 20th century tried to put culture at the service of the creation of an imagery for a better country following the ideological movement of noucentisme (the style named after the century, the 1900s, from Catalan nou-cents, nine hundred), we believe that a century later it is necessary, again, to put science and knowledge at the service of new growth models ensuring both the territorial and human sustainability of our country, for it to overcome the challenges it faces.
Taking the parallel a bit further, we think that such new territorial models could perfectly be referred to as “twentist”.

Ferran Falcó i Isern,
Secretary-General of the Ministry of Territory and Sustainability, Government of Catalonia

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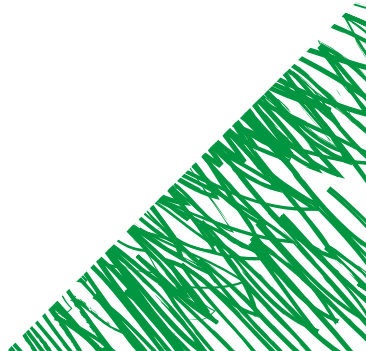


Conclusions.
The ‘twentist’ hypothesis

Today we live in an **‘**intermediate landscape**’**, in hybrid territories where artificialization decreases from the center of the densest cities to the least inhabited mountain areas –which combine the advantages and the inconveniences of both the city and the countryside in a contradictory manner. The proclamation by Ildefons Cerdà (1859) that “the countryside must be urbanized, the city must be ruralized”, belonging to the Romanticist age of the first industrialization, could be followed by the **‘**twentist**’** epic, in favor of a new territoriality based on the regeneration and ruralization of cities, once the countryside has already been urbanized or **‘**periurbanized**’** to a great extent. The ruralization of cities does not refer to the renaturalization projects or the mere increase in urban greenery: it proposes fertile cities and a creative countryside; it would like to transform the urban neighborhoods into villages with their own identity, making the citizen feel more attached to the place they inhabit or where they work. We could imagine new urban landscaping practices, city-planning transformed into landscape architecture. At the same time, the ‘twentist’ hypothesis would like to promote the cosmopolitan vocation and the creativity of villages. A so conceived **‘**twentist**’** perspective would somehow update the utopian vision defined in *Theory of Urbanization* by Ildefons Cerdà (1859). And would also acknowledge the vision of a **‘**Catalonia-city**’** that Gabriel Alomar (1907) proposed before the *noucentisme* movement emerged. For Alomar and other futurists from his generation the transition from region to nation was nothing but the initial stage towards the construction of the city as the ideal of cosmopolitan civilization, of well-structured territory and of a cohesive society based on a shared civic culture. Rather than homeland, they used to invoke the concept of philia.

Economic globalization and the spreading of new virtual communication technologies feature an individualist vocation: they put into relation what is personal, even private, with what is global, thus shaping **‘**global villages**’**, as McLuhan put it. Locality has a nuance of community, more supportive of social, ecological and cultural links between individuals and towards the communities they belong to. Communities are more than the sum of individuals they comprise: they are also the memory treasured by territory, culture and language, as well as future expectations. Transit spaces have traditionally been represented by cities, by specialization and homogenization dynamics, whereas the rural world is often tightly related to a close environment, to a place, to a different way of doing, to rather slow inertias and to a holistic vision on the world. The new territoriality aims to overcome the dichotomous and exclusionary relation between urban and rural phenomena, in order to reach a new relation based on the exchange of values, through a proposal for **‘**rururbanization**’**.

No matter what the views on the future might be (creative cities, slow cities, smart cities, eco-regions, knowledge and talent cities, cities in transition, resilient cities, etc. are some of the proposed models), they will continue to have an explicit territorial dimension, despite the highest degree of de-materialization the economy could end up reaching; this also implies the acknowledgement of boundaries and of territorial jurisdictions where political power expresses itself, that can both unite and divide us, and that rather than barriers should become filters, non-traumatic transitions. The **‘twentist’** vision takes as starting points the biophysical bases of territory (the material ones), along with its social and cultural bases (the immaterial, intangible ones), in order to define more efficient, project-oriented and networked management and intervention units capable of overcoming historical territorial delimitations and divisions, that turn out to be deficient because of the sectored structure of the public administration and the unbalanced allotment of resources and jurisdictions between the different administrative levels.

The **‘twentist’** vision aims to avoid social segregation and excessive territorial specialization, and to promote the participation of citizens in the improvement of urban quality. Public space and public facilities are the main asset of European cities, to which most citizenship rights are linked. The **‘ruralization’** of cities should go beyond renaturalization projects and **‘ecological luxury’** criteria: beyond these, energy, water, materials and waste circularity, as well as food security and the use of our own resources constitute the pillars that help build the **‘twentist’** vision on development. New smart technologies and the encouragement of better-informed and awareness of the impacts of activities on health and coexistence are both necessary elements.

The theory of urban **‘ruralization’** (or **‘rururbanization’**) would adopt a critical position in relation to the technological transformation of cities. On the one hand, new technologies do enable a healthier mobility, as well as collaborative work options that are compatible with residence; but on the other hand, they can limit the freedom of individuals and put their privacy at risk. Rather than the extension of the city following iterative, banal patterns, the regeneration of both the countryside and the city should be promoted, emphasizing their diversity and ensuring not only territorial balance but also the equal access to public services of general interest, and space-related justice.

Among the many communities and identities we belong to –of a virtual kind in many instances–, the community attached to the place where we live and work is essential for socialization. The recovery of public space in cities must also allow the recovery of close relationships: children should be able to go out on the street to play with their neighbors or to go to school, all by themselves; citizens should be more aware of the city surroundings: where the water and energy they use come from, where the goods and food they consume are produced –by the way, more of them should be produced in the vicinity of cities. Self-sufficiency implies following the same principles of self-organization used by

natural systems in order to reach durability in time with the least possible energy consumption.

As information and communication technologies allow us to develop our global and cosmopolitan vocation from almost anywhere, and as they de-materialize relationships, they can also help us, paradoxically, to recover a higher degree of attachment to places, re-creating the cultural landscape of villages and cities. The highest-quality cities are also the healthiest, the freest, the most diverse, the ones offering more opportunities for everyone, and the ones where children and senior citizens feel best. The highest-quality villages are those which, while retaining those values of coexistence, remain open to the world and are more creative. These environments also provide us with most of the energy or water we need, but not only: they go beyond, they have always been spaces that produce tangible and high-quality goods; and lately, in addition, prestigious and reputable services.

The **'**twentist**'** movement advocates social liberalism and communitarianism: individuals and human communities must be granted a minimum well-being and development conditions ensuring the dignity of every person and every group, as well as respect for cultural diversity; at the same time, public policies should focus on the gradual reduction of social inequality between individuals and communities. Only if everyone can enjoy full well-being will we be able to enjoy it, too; only if everyone is free will we be free, too.

In relation with the 'twentist' vision introduced above, the contributions of the lecturers can be concretized and summarized in the strategies proposed below:

1. Renovating the feeling of attachment and belonging to a given place

We live in a globalized world, a world of migrations, de-localizations and mass tourism. We inhabit transition spaces that are run through by growing flows of information, energy and resources. We have become transit passengers, which can lead to a traumatic loss of our feeling of belonging to a place, and to an uprooting from places we used to feel ours. According to **Àngel Castiñeira,** we have become a de-territorialized society. We are disconnected from our surroundings. We are witnessing a change in our perceptions on attachment to territory, and we do not want to be deprived of such attachment.

For this reason, if we act globally, we need to think locally: this should attach us to territory without losing sight of the global reality around us. This feeling generates all sorts of political responses, some of a reactive character –the utmost conservative protectionism, the strengthening of borders, etc.– and some others of a more proactive kind –cosmopolitism, collaborative economy, environmentalism, etc.–. Territory is now comprehended and understood through the multidisciplinarity of factors and actors operating in it, with changing rhythms and tempos, as **Carme Miralles-Guasch** points out.

Moreover, the new cultural conception of distance, the new political and economic bases, and the new technological means, have helped turn us into **'territoriants'** between places, **Francesc Muñoz** affirms: we inhabit territory while also inhabiting the networks, which gives way to continuous hybridizations of the functions and uses of space, which vary.

As a result of these processes, as Joan Nogué highlights, a new ruralism emerges: a new look on territory, on natural spaces and on the social environments around us.

2. Promoting global vocation and cosmopolitan values

Whereas a part of the adult population tends to conservative reactions when facing globalization, especially in predominantly rural environments, generations younger than 20 or 30 years old are more prone to a cosmopolitan awareness: they are more open to cultural diversity, both in urban and rural environments. Moreover, we also tend to be more aware of global issues –climate change, economic crises, armed conflicts, etc.– and, simultaneously, we are more engaged in local matters –right to housing and mobility, environmental and urban space quality, public neighborhood facilities, cultural landscape, etc.–. Promoting cosmopolitan values strengthens both the attachment to a given place and the appreciation of territorial diversity, and global vocation.

As **Ignasi Aldomà** points out, such is the case in the rural world, which has lost some of its traditional, characteristic expressions in order to gradually become a new urbanity where economic activity and social life follow more global and cosmopolitan patterns, but in most cases without losing its direct attachment to its most immediate territory.

3. Promoting models of local, open to the world production

New systems allow the customized mass-production of goods and services, reduce commercial intermediation and enable a more local production and consumption.

This is demonstrated by **Pep Salas** and his proposal to create neutral energy data operators capable of registering hourly curves of electric consumption, their historic values and other kinds of related information. Thus, said operators could become a necessary element for a closer, more local and user-oriented energy transition. Furthermore, consumers can also become producers of goods and services –renewable energy, mobility, shared residence, etc.–. As against more pessimistic visions that seem to point to a more significant centralization and control of production by large global companies, new initiatives emerge at a local scale, and a bigger de-centralization of production is possible. In this sense, as **Alba Cabañas** points out, the circular economy can enable a solid attachment of economic activity to a given territory, for it is based on a business model that closes production cycles and that searches for networked strategies in its closest surroundings. Thus, local development public policies take on a growing significance.

Also, industrial policies are of the utmost importance, according to **Sergi Ferrer-Salat:** companies must play an essential role in the transition to a fully regenerative, socially fair and functionally sustainable economy.

4. Strengthening the resilience of landscape

The management of vulnerability in general and of natural risks in particular must be a key factor in territorial policies and management in Catalonia, a country tightly conditioned by its Mediterranean climate, the seasonal occurrence of hardly foreseeable phenomena, the fragility of its ecosystems, and the high density of cities and strategic infrastructures, especially along its coastline. Mediterranean countries need to explicitly incorporate into territorial management the adaptation to climate change impacts –for instance, floods or long-lasting droughts– and their mitigation. They must also ensure the supply of water and of other resources essential to the well-being and health of people. This implies, in turn, the strengthening of the resilience of our agricultural activity, as highlighted by **Montserrat Viladrich:** thus, in order to boost the competitiveness of Catalan agriculture, we must opt for actions that increase the productivity of our agricultural sector and that improve the quality, efficiency and added value of our produce, while also trying to make it healthier.

5. Valorizing an anisotropic and diverse territory

The value of the Mediterranean landscape patchwork relies to a great extent on its capability of making compatible a great diversity of territorial activities and the conservation of environmental quality, all in a dense, relatively small and highly anisotropic space.

Territorial balance understood as a homogenization of uses and of urbanization patterns is no longer possible or desirable. As **Lourdes Viladomiu** points out, the rural world must remain alive and diverse by itself, without applying urban standards to it. Both worlds, urban and rural, should be diverse and should share bonds, which are the key to the resilience of Catalonia as a whole. We must overcome the *noucentisme* model and its balance between Catalan cities and counties (*comarques*) as an ideal of territorial policies: the Metropolitan Region of Barcelona is nowadays a global city that competes with London – South East, Paris – Île-de-France, the Randstad in the Netherlands or the region of Milan, and its scope reaches in fact most of the Catalan territory.

Moreover, new organizational models in society and in companies show us the high degree of dynamism of territory, which transforms the manner and the speed in which its uses develop, **Luis Falcón** states.

For his part, **Jordi Sunyer** mentions the need for the city to keep on transforming, changing its current dynamics and uses in favor of a car-free city with more green spaces. He affirms that a green city is beneficial both for health and well-being.

6. Creating sustainable processes

We must promote a cross-cutting knowledge capable of generating a new vision on circularity through the integration of sustainability and creativity. As **Manuel Gausa** affirms, no system can be sustainable without some degree of innovation and creativity. Rather than on the ability to reduce costs, economic competitiveness depends on the ability to create new opportunities and to globally valorize local advantages, as well as on the entrepreneurship, the sociability and the relational character: in other words, on the social capital of a given place.

Thus, there cannot be sustainability if there is no well-being regarding the environment around us: this could be the conceptual basis of the new territoriality.

In this vein, **Lluís Sala** presents water as an example: cutting edge research and innovative processes in the field of water treatment and management could make us lead the mitigation policies of impacts on water resources in the Mediterranean context. The same should happen in the case of energy, as **Montserrat Mata** points out, through the development of urban energy generation and consumption units which, associated with a balanced and controlled storage system, could enable territory to take part in the specific use of its own resources.

7. Managing beyond limits

Energy, water, food security, and materials and waste circularity are the pillars needed to build economic development, but they are, simultaneously, limiting factors. The analysis of the load capacity of a given territory –of its limits, its environmental quality and the risks it can assume– changes over time, depending on social values and the technologies available at a given time. We have exceeded the limits, in many cases, and now we are forced to manage territory beyond its limits. These, it should be noted, are not permanent, they vary, and sustainability should be reached through the reduction of loads and the increase of limits.

In this sense, there can only be growth if it is sustainable, as **Jordi Angusto** affirms. We cannot, by any means, refer to the decrease or to the lack of appreciation of the assets around us as if they were growth. Human ingenuity is capable of recreating new development cycles that modify current models and limits, and of adapting to them: for instance, technology has increased the number of recycling cycles of some products. Nonetheless, when its environmental impact is assessed, it turns out to be negative.

Thus, products and their associated processes will end up being considered good or bad based on the application we give them, **Pere Fullana** reflects. He also affirms that we must break some eggs in order to avoid some of the current environmental issues. The effective regulation of the limits to growth and the management of territory, oftentimes beyond its limits, become therefore a more difficult challenge for public administrations.

8. Reconciling natural and artificial dynamics

Natural capital and ecosystem services are key elements for the economy, and economic efficiency depends on the functionality of nature. The reverse is also true: natural dynamics depend on human activities and on technology. Natural and artificial are interdependent, from the human body to a whole city, and also at a planetary scale. In this mutual dependence, renaturalization does not mean letting natural dynamics transform territory without human interference: renaturalization implies, rather, the management of cities and territory in favor of natural dynamics.

As **Carles Ibáñez** highlights, the interrelation of elements such as water, energy, economy or population is governed by complex patterns that must be organized in order to become more functional: until now, the gratuitous, unpunished mistreatment of landscape and biodiversity unfolds as a symptom of our scarce comprehension and sensitivity towards nature.

Simultaneously, the tendency of population to cluster or to disperse is a significant element of territorial organization: some factors seem to promote clustering, some others favor dispersion, and they must be properly identified if we want to intervene on territory in an accurate manner, as **David Jou** points out.

9. Renaturalizing culture

Territory is no longer a patchwork of compact cities surrounded by non-urbanized agricultural and forest areas; it is a more hybrid space, showing diffuse urbanization, where the networks and flows connectivity can become a development factor more significant than geographical vicinity.

Today, in the 21st century, we can make territory more fertile and healthier (renaturalizing cities, i.e., the most densely populated areas), and also more creative (placing value on the least urbanized areas, on agricultural or forest spaces, and on those with a lower degree of urbanity). The challenge of correcting the social impact generated by the economic crisis is a great opportunity to think a new model of territorial development, a new conversational culture with the natural environment. **Brother Lluc Torcal** suggests that new science implies a new model of thought, a new way to understand the world through social and cultural models based on the comprehension of natural cycles and the inter-

action with them; these models should respect resources and their finiteness, as well as biodiversity; they should generate and ensure a renewed territorial model.

In parallel, a process of cultural renaturalization is also needed, **Jordi Pigem** underscores. This process is linked to the renaturalization of our perception on who we are and what our place in the world is; it is also related to the rediscovery of the places that host our existence, and to the acknowledgement of the biodiversity we live with; moreover, it implies paying less attention to things and more to relations, less attention to abstract, quantitative and mechanical aspects, and more attention to concrete, qualitative and lively aspects.

10. Promoting territorial governance

The policies aimed towards a sustainable and creative Catalonia must take as starting points the biophysical bases of territory, as well as the social and cultural ones. Paradoxically, in a more de-materialized economy, the visions on the future cannot be abstractly imagined: from smart cities and creative cities to slow cities and eco-regions, our visions on the future do have, today, an explicit territorial dimension. Therefore, we must define more efficient, project-oriented and networked units of management and action, overcoming current territorial organization and delimitations.

The deficient territorial organization of Catalonia, caused by the imbalanced resources and jurisdictions between different administrative levels, remains the main unsolved problem of territorial governance. Furthermore, as **Josep Enric Llebot** points out, the systematic separation within governments, with each ministry strictly focused on its affairs instead of on the global governmental action, is an outstanding problem not yet solved. Therefore, the corporative intelligence of public administrations should be improved, as should their ability to learn and to promote public debate, institutional cooperation and global influence processes.

Oftentimes, the reasonableness and the objectivity of public institutions are merely fictitious, and what really exists is an inertia in the individual manner of approaching every public policy, as **Pere Torres** suggests.

For these ways of doing to be corrected, some paramount elements are the dialogue between the involved parties, the collective work, the processes enabling society to understand and assume public policies, the search for common interest, the spaces for debate and negotiation, and the practice of innovation and experimentation, as highlighted by **Anna Ayuso.**

And, for his part, **Eduard Vallory** underscores that the complexity of the new challenges faced by our societies overcomes the traditional, detailed problem solving processes,

and demands new competencies: concept analysis and relation, creativity, comprehension of the world, and capability to collaborate, debate and act in order to generate positive change; all of the above will only be possible through an educational system that empowers citizens.

'Twentist' glossary

In a mostly urban world, 'twentist' views lead to the formulation of a 'theory of ruralization' that seeks to go beyond city renaturalization projects –according to a quite stereotypical 'ecological luxury'– and countryside 'civilization' in a banal manner –through 'urbanalization processes.

In this sense, the aim of the twentist perspective would rather be that of the eventual, utopic vision defined by Cerdà in his *Theory of Urbanization* (1859).

"The main cause of the discomfort afflicting modern societies lies in the fact that they are locked in big cities. For it is childish to waste time debating on the ideal limits of the city: the city will spread limitlessly, as long as the common services its inhabitants need can be provided." (Translation from the Spanish original.)

To the call to "urbanize the countryside and ruralize the city" made by Cerdà, suitable for the Romanticist times of the first industrialization, the 'twentist' call in favor of a "new territoriality: fertile cities, creative fields" could follow. This is precisely the subtitle of these sessions.

Since we would like to be the enablers of a new conceptualization of territory, we consider necessary to incorporate, as an appendix to the book of conclusions and lectures of the cycle Catalunya Futur Verd, a brief glossary containing the terminology associated with this new way of addressing the analysis of territorial issues. Most of the words presented have a common use, but in light of the 'twentist' view they can take on a new nuance.

In the definitions and explanations you will find below, the concepts are introduced in pairs or in threes: these groupings do not necessarily imply contradiction or mutual exclusion between their elements. They are proposed in this manner in order to enrich (with all the shades of grey) the perspective of the concepts that the 'twentist' territorial vision promotes, from the talks that have taken place throughout the reflection sessions. Some of the entries collected did not appear in the lectures themselves, but in the debates that followed each session, or had already made their appearance in our former strategic debate, Global Cat: therefore, we have deemed suitable to incorporate them too.

Furthermore, the entries of the glossary do not constitute self-contained compartments: they are tightly interlocked, and therefore many of the concepts imply or suggest others or point to them.

Adaptation – Mitigation

Climate change poses some challenges, both of adaptation to changes in existing environmental conditions and of mitigation of possible risks through the reduction of their known effects. The tension between adaptation and mitigation refers to the dilemma between favoring new behaviors and promoting certain social values, and/or accelerate the implementation of new technologies in order to make productive processes more efficient. Whereas new values and behaviors demand a cultural transformation –probably linked to a generational shift–, changes associated with the implementation of new technologies do not necessarily imply significant cultural and behavioral transformations –though they do in the field of research and innovation.

(See the talk from Carlos Ibáñez for some considerations on climate change and its impacts –pp. 173-180 of this work.)

Anisotropy – Isotropy

The anisotropy of a space or a medium implies the fact that they feature different physical properties in each direction; on the contrary, isotropy implies the uniformity of that medium or space, no matter which direction is considered.

Catalonia, for example, is highly anisotropic.

The value of the Mediterranean landscape patchwork relies to a great extent on its ability to make compatible a great diversity of activities and the preservation of environmental quality, all in a relatively small and dense space. Nowadays, the homogenization of uses and of urbanization patterns is neither possible nor desirable. The anisotropy in the differential distribution of diverse physical properties, such as landform, geology or climate, is a key characteristic of the biophysical matrix of Mediterranean countries. Anisotropic territories generate a feeling of attachment, for its diversity enables an immediate commitment to it through the shaping of sociologically different landscapes with which one can become identified. Another advantage of the anisotropy of Catalan territory is the resilience that this characteristic conveys to the whole: in the face of adverse events, only a few tesserae of the mosaic suffer.

Nonetheless, anisotropy also makes some demands: the territory is neither isotropic nor homogeneous, but the development opportunities and the level of social well-being must be, for reasons of space justice, of opportunities balance and of equity. Few things are more unfair than treating the different equally. Thus, though it may seem paradoxical, a differentiated management of Catalan territories is imperative.

(See the talk from Ramon Folch, pp. 333-337 of the book of conclusions and lectures of the cycle Global Cat, at https://territori.gencat.cat/web/.content/home/01_depar-

tament/actuacions_i_obres/actuacions_dr_d_i/jornades/jornades_global_cat/llibre/JORNADA_TERCERA.pdf)

Circularity – Sustainability

In a simplified manner, we could say that in a circular economy model, resources remain within the economic system for as long as possible, whereas waste is reduced to a minimum. This economy is sustainable over time, in comparison with traditional economic models, based on resources extraction, transformation, use and elimination. The circular economy model, thus, takes environmental principles as its guidelines. It implies reducing, reforming, recycling and renewing.

Furthermore, the circular economy tries to connect different social actors in a context of alliances (public, private or combined) that go beyond frontiers or political and administrative jurisdictions. In this sense, it can encompass a multitude of sectors in a vast typology of possible alliances that enable the completion of production and consumption economic cycles –not by themselves but searching for evolutionary and networked strategies.

These practices of collective efficiency, featuring different interconnected flows, are useful tools in order to achieve an economic (and territorial) 'twentist' growth. Nonetheless, we should never lose sight of the radius of the circle into which this economic modality is inscribed; within value chains that are becoming more international and global, it must be kept in mind what the real role of territories is: in that chain some links are essential, while some others are dispensable or replaceable.

From a strictly environmental point of view, circularity constitutes a good indicator of the sustainability of a product or an action: generically, the desired sustainability goals can be considered achieved if in the implementation of a given practice the natural cycles in resource extraction are respected; if eco-design techniques are applied; and if all the options for the recycling, recovery or revalorization of the generated waste are enabled.

(See also the talk from Alba Cabañas –pp. 207-216 of this work.)

City – Nation

The transition from the region to the nation is just the first stage in the construction of the city as an ideal of cosmopolitan civilization, of structured territory and of cohesive society, on the basis of a shared civic culture. This view on the "Catalonia-city" was the one proposed by Gabriel Alomar i Villalonga in *El Poble Català* (1907), before the noucentist movement was born, and is also the one that the **'**twentist**'** perspective wants to recover.

Translating from Catalan:

"The mere nation is a collectivity closed in itself, moving itself and exerting its influence on the circle of itself; and the city is the core irradiating its influence outwards; whereas in the nation there is conscious spirit, in the city there is thinking and reigning spirit; if in the nation there is sentiment, in the city there are thought and volition. National interests rely on the resistance to adapt to everything foreign; they are traditional, conservative of their movement and of their own law. The city interests are futuristic, since cities see their entire mission in things yet-to-come, in the future chances, in the fecundating and generating power of the ideas they launch, in the success of the endeavors they undertake. We could say: the region is moved, the nation moves, the city is the moving one; the region is inert, the nation is self-moving, the city is the motor."

(Refer to the article by Gabriel Alomar i Villalonga published in *El Poble Català* (1907) for further details.)

Cosmopolitism – Communitarianism

Generations born less than thirty years ago have a higher cosmopolitan awareness, are more open to cultural diversity, both in urban and in rural environments. In parallel, current society, no matter if urban or rural, tends to have a bigger sensitivity towards global issues (climate change, economic crises, armed conflicts, etc.), and also is more communitarian: individuals are more engaged in local matters and issues (right to housing, mobility, environmental and urban space quality, neighborhood facilities, cultural landscape, etc.). Cosmopolitan values strengthen global vocation and the internationalization of individuals and their activities; communitarian conceptions, by contrast, encourage the placing of value on territorial diversity, on the one hand, and the attachment to a given place, the feeling of belonging and the engagement on the other.

Cosmopolitism and communitarianism are, therefore, the two sides of the 'glocal' character of many current societies.

(For questions regarding social empowerment, see the talk from Anna Ayuso –pp. 245-251 of this work.)

Creative fields – Fertile cities

Today we can make the most densely urbanized spaces more fertile and healthier (renaturalizing cities); we can also make rural spaces become more creative (placing value on the least urbanized, on agricultural or forest environments, on those with a lesser degree of urbanity). To achieve these improvements in the territory as a whole, the promotion

of territorial renovation valuing territorial diversity and ensuring space justice is needed –rather than the extension of cities through iterative, banal patterns.

Moreover, and especially owing to the development of information and communication technologies, the knowledge economy is no longer an exclusive attribute of urban and metropolitan environments. The countryside and the rural world host creativity with economic significance, one of the main assets of which is the attachment to the locus. These activities always imply the production of high-quality, tangible goods –and also of prestigious services, lately.

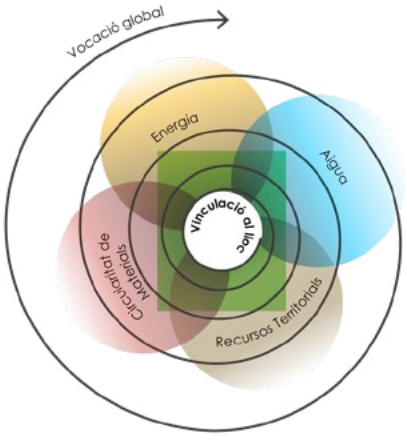
(See the talk from Ignasi Aldomà –pp. 51-63 of this work–. You can also refer to the work Aldomà, I. *Atles de la nova ruralitat*. Lleida: Fundació del Món Rural, 2015. On the economic competitiveness and creativity of our countryside, see the talk from Montserrat Viladrich, focused on technologies applied to agricultural activity, pp. 113-119 of the present work.)

Cycles – Limits

Water and energy circularity, along with the use of our own resources for the production of materials, products and services, and with the subsequent management of their waste, constitute the main building pillars of the 'twentist' vision on development (see the image below). These elements are also limiting factors. The load capacity of a given territory –of its limits, its environmental quality and the risks it can assume– changes over time, depending on social values and the technologies available at a given time. Sustainability is a dynamic concept that must be managed.

We are compelled to manage territory beyond its limits: these thresholds are not permanent but vary in an autopoietic manner (they create and reformulate themselves over time). Sustainability can be reached through the reduction of loads and/or the extension of limits. Human ingenuity is capable of adapting to current models and cycles, and of modifying them through the recreation of new development cycles.

As for limits, the scheme proposed by the so-called 'doughnut economics' (https://www.kateraworth.com/doughnut/) is becoming popular nowadays: limits can be both social and planetary. Among the first ones, we can find food, health, education, income and work, peace and justice, political participation, social equity, gender equality, housing, networks, energy, and water; among the planetary ones (maybe more tightly related to the main matters discussed in this cycle Catalonia a Green Future), we can find climate change, ocean acidification, chemical pollution, phosphorus and nitrogen loads, drinking water extraction, changes in land uses, biodiversity loss, air pollution, and the depletion of the ozone layer.



(From the center clockwise outwards: attachment to a place, energy, water, territorial resources, material circularity, global vocation)

The energy available at any given moment is the main limiting factor of the development processes that take place in any given place; other limiting factors are water and the biophysical resources, such as land use. Creativity, research and technological innovations, along with social and political organization, reinvent processes at all scales, and can also weaken or strengthen the flows and circularities that are key to efficiency and global sustainability.

Theoretically, taking into consideration all these limiting factors, a fair and safe space for mankind, as well as a redistributive and regenerative (i.e., sustainable) economy, could be reached.

See also the entry “Triple value of ‘twentism’: quality, cohesion and biodiversity as indicators”, in this glossary.

(For water as one of the main limiting factors, see the talk from Lluís Sala –pp. 127-133 of this work; for the environmental limits of farming and agricultural activities, see the talk from Montserrat Viladrich –pp. 113-119 of this work.)

Effectiveness – Efficiency – Efficacy

Effectiveness (usually called eficàcia in Catalan) means to reach the materialization of a given purpose, no matter the cost it could imply; efficiency (usually called eficiència in Catalan) consists in carrying out what is intended in accordance with the availability of tools and resources, but without a reflection on the suitability or the necessity of the goal that must be reached; efficacy (usually called efectivitat in Catalan) tries to combine effectiveness and efficiency: it implies establishing a clear goal and making it possible, while also ensuring that the goal is achieved through the best possible use of the available human, economic, conceptual, technological or administrative resources. For this precise reason the search for methods of measurement and characterization of the efficacy of public policies is of special interest, going beyond the mere consideration of efficiency –which is, unfortunately, the main parameter taken into account in policy evaluation.

(See the talk from Pere Torres –pp. 223-227 of this work.)

Global vocation – Local attachment

Globalization is a process of an increasing number of social and economic relationships on a planetary level. This process accelerated in the last decades thanks to the implementation of new information and communication technologies, as well as because of the opening of markets. The tension between the local and the global grows, and distances sometimes become subverted: geographically close activities can have fewer economic relationships with each other than geographically distant activities.

The new systems of production and of service supply enable the customized mass production and reduce commercial intermediation. At first sight they also could seem to affect the more local production and consumption. But against the most pessimistic views, which suggest a higher degree of concentration and a tighter control of production by big global companies, consumers themselves have become producers of goods and services: examples thereof are renewable energy sources, or some schemes of shared residence or mobility.

Thus, not only have new local scale initiatives emerged, radically decentralizing production, but, thanks to ICT, they can find their market anywhere in the world, too.

This is precisely the 'twentist' view on global vocation combined with local attachment, at a new scale (often called 'glocal') whose references are the whole world and, simultaneously, the everyday landscape, and in which the borders of the traditional nation state become less and less significant.

This 'glocalism' understood as a way of living is for example the one we can find in the new tourism modalities proposed by Copenhagen: the traveler is no longer an individual searching for the perfect picture, but rather looking for the authentic character and the emotional connection with the territory they visit. Differential elements become the key for territories and cities not to die overwhelmed by standardizing globalization; in opposition to the trivialization, for instance, implied by mass tourism, or by high streets around the world where only stores belonging to global franchises can be found, we witness the emergence of the unique experiences that the place can offer to the visitor as an added value factor that should be considered.

In the same 'glocalist' vein, we can mention the opportunities provided by ICT in order to make local products and services known to the whole world, and distribute them everywhere: these services or products (food for example) offer high quality, high added value and authenticity guarantee; they also help anchor the population in the rural world, in a non-trivial natural environment, in a countryside that has become creative and that generates wealth.

To achieve this, some erroneous conceptions of what cosmopolitism implies should be left behind. Be that as it may, cosmopolitism should not be a blind, uncritical imitation of foreign models.

(See for example the talk from Luis Falcón –pp. 217-222 of this work.)

Industrial ages and their stages of change

Processes of technological change are usually described as big waves implying deep transformations in people, organizations and capabilities, as some "sort of hurricane that breaks habits" –as described by economist Carlota Pérez, (http://www.carlotaperez.org). According to her theses, each new industrial age lasts some fifty years, and can be divided into five stages: a first stage of wild growth; a second stage of social disruption; a third stage of severe clash between the current age and the former one: a 'turning point' with deep economic, social and labor-related crises; a fourth stage of readjustment; and a fifth and last stage of widespread adoption.

(See the talk from Luis Falcón –pp. 217-222 of this work.)

Labor – Occupation – Fulfillment

Technological progress demands from society as a whole a higher degree of professional qualification in order to ensure employability in a labor market that demands new capabilities and knowledge.

Technological progress has also generated other modalities of work and new ways to organize it: hence for example the emergence of globally connected small and medium companies.

These advancements can cause a cultural gap between different generations and social groups with unequal levels of access to technology. An economic growth based on occupation understood solely as the active population in the labor market figures can have positive impacts in the short term, but it does not necessarily ensure a sufficient productivity or an increase in social well-being in the middle or long term.

The 'twentist' vision advocates work as a means of helping the worker achieve personal fulfillment, not only as an activity occupying some hours a day in exchange for an economic retribution. The remuneration of work should not exclusively be a monetary one. Furthermore, work should be a cooperative activity, linked to the positive impact it can have on other people, and tending to the strengthening of social cohesion, rather than being a competitive activity. Moreover, work should be a conscious activity within the framework of a concrete moment and place.

(See the talk from Sergi Ferrer-Salat –pp. 195-200 of this work– for a vision on labor that searches for benefits beyond the economic ones. You can also find some remarks on this subject in the talk from Jordi Angusto –pp. 65-68 of this work.)

Life cycle

The term 'life cycle' refers to all the stages in the life of a material or product, from the extraction of raw material through the intermediate stages of processing, fabrication and use, to the final stages of waste recycling or elimination.

Not every action of environmental protection leads to a clear benefit in the long term: for instance, the recycling of some kinds of waste can imply a more serious environmental damage and more consumption of resources than, let us say, a controlled incineration. Or, the use of plastic is often more sustainable than the use of other materials, for it can be reused.

In order to understand to what extent a given initiative really means an environmental improvement when compared to other options, some life cycle perspective must be applied; moreover, if the decision to be made could affect many people, a life cycle analysis must be carried out, with scientific and objective methodologies.

This is clearly stated by Art. 4.2 of the Directive 2008/98/EC: "When applying the waste hierarchy referred to in paragraph 1 [from more to less desirable: waste prevention, preparing for re-use, and recycling; other waste recovery methods; waste disposal], Member States shall take measures to encourage the options that deliver the best overall environmental outcome. This may require specific waste streams departing from the hierarchy where this is justified by life-cycle thinking on the overall impacts of the generation and management of such waste". Thus, the very waste hierarchy, which seemed set in stone, can be modified if a life cycle analysis so advises.

(See the talk from Pere Fullana i Palmer –pp. 121-126 of this work.)

Multilevel government – Trans-sectoral government

The 'twentist' vision takes as starting points both the biophysical (material) bases of territory and the social and cultural (immaterial, intangible) ones. No matter what the views on the future are (creative cities, slow cities, smart cities, eco-regions, etc.), or the degree of de-materialization achieved by the economy, all these views will still have an explicit material dimension. This also implies the recognition of frontiers and jurisdictions where political power expresses itself.

Nevertheless, the 'twentist' perspective does define more efficient, project-oriented and networked management and action units, capable of overcoming the traditional territorial demarcations which are usually deficient because of the sectored structure of the public administration and the unbalanced allotment of resources and jurisdictions between

the different administrative levels. In light of these governance issues, one of the "twentist' goals is the improvement of corporate intelligence and of administrative processes: public administrations must increase their learning capacity, promote true public debate activities, and establish effective mechanisms of institutional, trans-sectoral and multi-level cooperation on the basis of physical reality and natural reason and, secondarily, of political frontiers.

(For aspects regarding governance improvement, see the talks from Josep Enric Llebot –pp. 253-257 and Pere Torres –pp. 223-227 of this work.)

Multi-local – Multi-national

The main challenge faced by public administrations with static territorial jurisdictions is the transposition onto their spatial scope of global changes and the response they should be given. These changes usually adopt the form of networks.

The liberal inspiration of economic globalization is oriented to particular interest and aspires to global outreach, whereas the locality has a rather communitarian connotation that tends to favor a stronger social, ecological and cultural attachment between its individuals and to the communities (territorial or of other kinds) they belong to.

In spite of this, the social and economic reference framework is still, to a great extent, that of nation states, lacking both the global reference of cosmopolitism and the local reference of communitarianism. The governments of many nation states today face as their main challenge the preservation of their political legitimacy, since when it comes to managing new reference frameworks they prove more and more incapable: "too big for small problems, too small for big problems".

Needless to say, the economy is fully aware of the limitations of nation states, and for this reason companies tend to be multi-local rather than multi-national: this is the field in which urban axes of economic activity (true networks of interconnected towns and cities that go beyond borders) can find their role. Thus, furthermore, a new materialization of 'glocalism', cosmopolitism and communitarianism takes place, trying to respond to what territory is nowadays: a patchwork of coterminous areas and a web of overlapping networks, at all scales.

(See for example the talk from Josep Vicent Boira –pp. 288-296 of the book of conclusions and lectures of our former debate cycle (Global Cat)–, at https://territori.gencat.cat/web/.content/home/01_departament/actuacions_i_obres/actuacions_dr_d_i/jornades/jornades_global_cat/llibre/JORNADA_SEGONA.pdf Also, as an instance of individual and local empowerment regarding energy, refer to the talk from Pep Salas –pp. 135-143 of the present work.)

Neoruralism

The neoruralism emerging today is quite different from that of the 70s and 80s. Cities being left behind by some sectors of the population (especially the youth) is currently characterized by a countryside/city opposition far blurrier than it used to be 30 or 40 years ago.

Nowadays, neorural individuals do not radically cut their ties with the city they left; in fact, they still belong to it somehow. This is possible thanks to the advancements in transportation and ICT.

Furthermore, whereas former neoruralism was mostly a reaction to a social model that could not be accepted, current neoruralism, though still reactive to some extent, also aspires to offer an alternative to certain conceptions of nature, resources and landscape. Besides, some reasons for this change of territoriality, for this atypical migratory movement are relatively intangible: pleasant environments, unique landscapes, territorial identity, and exaltation of what is autochthonous and traditional.

Finally, it must be noted that neorurals nowadays are also characterized by their deep involvement in the (pre)existing territorial issues of their new living space, and by their desire to face them and solve them.

(See the talk from Joan Nogué –pp. 75-78 of this work.)

New business philanthropy

For their central role in the economy and society, companies must assume leadership in the fight against climate change and the advancement towards a fully green and sustainable future and a totally regenerative economy (which is, furthermore, the only one that can make companies competitive, and generate jobs and progress).

An example of this new philanthropy can be found in the open letter sent by 360 big North American companies to the President of their country, trying to make him reconsider the withdrawal of the United States from the Paris Agreement. The message was ignored, but at least the signatory companies were able to show their commitment to environmental matters, especially through the de-carbonization of the economy.

Also, it must be kept in mind that the main reason for many present geopolitical and armed conflicts (though disguised as sudden, supposedly ideological factors) is nothing but climate change and its consequences: social inequality, forced displacement of population, mass migrations, etc. which, in turn, can end up resulting in wars or in the emergence of populist movements that finally gain power.

In this context, and as long as simple greenwashing practices are overcome, the responsibility of companies becomes a key factor in ensuring the cohesion, justice and harmonious functioning of society. This equitable goal also especially implies the fight for an environmentally and economically sustainable future as the main factor that can prevent some of the aforementioned conflicts.

(See the talk from Sergi Ferrer-Salat –pp. 195-200 of this work.)

New territoriality

The new manner of occupying, understanding, perceiving and living territory has changed thanks to the advancements in mobility and, especially, in ICT. The frontiers of cities, the rural world and the natural environment have become blurred: former categories are no longer valid, limits must be redefined, and the different territorial typologies are now interlocked. The reason for this has not only been because cities are naturalized or that the countryside has become creative and capable of generating wealth: it is also due to the fact that we are now ' territoriants', citizens in transit, and mobility and opportunities to communicate have become an essential element in our daily lives.

(See the talks from Manuel Gausa –pp. 155-165–, Ignasi Aldomà –pp. 51-63–, Joan Nogué –pp. 75-78– and Carme Miralles-Guasch –pp. 69-73 of this work.)

'No-places' – Attachment to place

'No-places,' are flow spaces, anonymous, amorphous transition places lacking a clear delimitation. Taking it a step further, the example formulated by Torsten Hägerstrand (a Swedish geographer specialized in migration and cultural diffusion), who wrote that someone travelling on a plane "is imprisoned in a narrow time-space tube without openings and he does not therefore effectively exist in the geographic locations over which he is flying", we can note that also high-speed rail lines, highways, telephone lines and ICT networks turn us into mere 'passengers in transit', de-territorialize us, make us become 'inhabitants of nowhere' or 'territoriants'.

Flow spaces are traditionally constituted by cities, whereas the rural world is often tightly linked to a closer environment, a place, a memory, a way of doing, a holistic view on the world, and a rather slow inertia.

Nowadays, in a globalized world of migrations, mass tourism and relocations, we live continuously connected to a space of growing flows of information, energy and resources. This can lead us to the traumatic loss of our feeling of belonging, to our uprooting. The feeling of deprivation can generate reactive political responses (conservative protectionism, strengthening of frontiers, etc.) as well as proactive ones (cosmopolitism, environmentalism, communitarianism, social liberalism, etc.).

The 'twentist' movement, as introduced in this cycle of sessions of work and reflection, wants to be built upon the responses that those proactive trends can offer with regard to the feeling of deprivation.

(See the talk from Àngel Castiñeira –pp. 87-89 of this work.)

Pixels – Vectors – People

In this model of spatial analysis, 'pixels' refer to the constitutive (anatomic) elements of the territorial matrix when considered in an analogy to a picture or a map on which several variables and thematic layers characterizing said matrix can be superimposed (for instance, biological, geographic, environmental, landscape-related, infrastructural or land occupation variables).

We define 'vectors' as the territorial functional (physiological, so to say) interrelations, such as energy, the environmental role of the territorial matrix, networks, nodes, road and railway corridors, commercial routes of logistic chains, among others.

We talk about 'people' when referring to the actors (individuals, companies, institutions, etc.) capable of modifying the nature of pixels and of generating, through their decisions and needs, the aforementioned vectors.

(Refer to the section "Temes i metodologia d'estudi" on the website of the Global Cat cycle, at https://territori.gencat.cat/ca/01_departament/04_actuacions_i_obres/05_actuacions_dr_d_i/05_jornades/jornades_global_cat/temes_i_metodologia/. You can also see the talk from Miquel Rafa i Fornieles –pp. 181-191 of the book of conclusions and lectures of that cycle, at https://territori.gencat.cat/web/.content/home/01_departament/actuacions_i_obres/actuacions_dr_d_i/jornades/jornades_global_cat/llibre/JORNADA_SEGONA.pdf, for a concrete example: the 'green pixel'. For it being the founding work of this model of spatial analysis, we would like to mention the collective publication *People and Pixels – Linking Remote Sensing and Social Science*. Washington D.C.: National Academy Press, 1998.)

Ruralizing – Urbanizing

"The countryside must be urbanized, the city must be ruralized". The city has traditionally been associated with progress; it was the destination to be reached in order to achieve economic and social development. Also, traditionally, the contempt of the rural world led to the contempt of community and nature, and, therefore, to the denaturalization of culture.

Rural life was often associated with isolation and idiocy (in the sense of underdevelopment). But, paradoxically, the places where these traits can be found nowadays are some

digital spaces and many neighborhoods of the world's megacities. The city has generated hyper-urbanization, marginalization, concentrations of resources and activities in a scenario where congestion economies already outweigh urbanization and scale economies. Therefore, the European model in favor of a territory constituted by a fabric of well-connected small and medium-sized cities that shape decentralized urban regions is more efficient in environmental and economic terms, and the degree of social well-being it can provide is higher than the one massive, dispersed and fast-growing megacities ever could offer.

This polycentric model of connected and networked cities is the one that the 'twentist' movement wants to adopt, in order to materialize the utopian vision defined by Ildefons Cerdà in his Theory of Urbanization.

It must be noted that the ruralization of cities goes far beyond the mere (re)introduction of nature within the urban fabric, or the will to transition from a 'gray' city to a 'green' one: ruralization implies the assumption of an asymmetrical interdependence between the natural and the artificial and, therefore, it also implies the management of the city –and of the whole territory in fact– in favor of natural dynamics: 'twentism' considers nature as a reference model, natural capital lies at the basis of the community, and it must be addressed accordingly.

(See for example the talk from Jordi Pigem –pp. 91-97 of this work.)

Self-sufficiency – Interdependence

Self-sufficiency means following the principles of self-organization that characterize natural systems in order to achieve durability in time with the least possible energy consumption. In our ambit, it revolves around the beginning of a proactive process aimed at implementing eco-efficient structures that are also capable of generating energy surpluses, preferably from renewable energy sources, in every new development. Thus, the possibilities for territory to satisfy its own metabolic demands by itself must be maximized: each territory, each location, city, neighborhood or building must be able to make the most of existing resources, especially energy resources, and must also be able to adapt to specific local conditions.

Nevertheless, self-sufficiency today, though aspiring to verticality, still needs a connection to resource supply networks, as well as some degree of interdependence with their horizontal distribution: in fact, without such dependence, verticality features some vulnerability and implies some risk of isolation; on the other hand, interdependence enables a higher degree of energy resilience, though it can also imply economic losses or some conditioning of decision-making capacity.

Therefore, connections are multiple, simultaneous and complex; and interdependence (since it must exist), will perhaps take on the meaning of learning to depend in a balanced manner.

Interdependence leads to a sustained interaction of relation models showing different degrees of stability.

Exchange and interdependence characterize collaboration or competition relations. Frontiers are now open, and multiple actors are involved in networks.

(See also the talk from Montserrat Mata –pp. 145-153 of this work.)

Seventeen Sustainable Development Goals and New Urban Agenda Habitat III

The 17 Sustainable Development Goals (SDGs) adopted by the United Nations General Assembly in September 2015 are the new framework established by the international community in order to promote a new, more inclusive development model in the next fifteen years. These SDGs (also called the 2030 Agenda) are universal, despite the development challenges being expressed differently in every corner of the world. The concrete goals of the 2030 Agenda are: eradication of poverty; fight against hunger; access to health, access to a quality education; gender equality; access to clean water and sanitation; use of renewable energy sources; decent work; innovation and infrastructures; reduction of inequalities; sustainable cities and communities; responsible consumption; fight against climate change; protection of aquatic life; protection of life on land; justice and peace; and partnerships to reach the global goals.

Moreover, the 3rd United Nations Conference on Housing and Sustainable Urban Development, focused on human settlements (Habitat III) approved in 2016 the New Urban Agenda, implying the full incorporation of local authorities into the development agenda for an increasingly urbanized world.

In response to the 17 SDGs and the New Habitat III Agenda, Catalonia has formulated its own Urban Agenda, a call for institutions, administrations and private actors engaged in these issues to place the focus of political action on urban development, for it is the field where the battle for sustainable development will be won or lost.

(For further details on the engagement of local institutions in the 17 SDGs and the New Habitat III Agenda, see the talk from Anna Ayuso –pp. 245-251 of this work–. You can also access the Urban Agenda of Catalonia at http://agendaurbanacatalunya.cat/)

Social integration – Social exclusion

In recent years social inequalities have become greater and deeper, especially from the 2008 economic crisis onwards. Economic poverty, financial difficulties in many households, unemployment and underemployment, unaffordability or precariousness of housing, school dropouts, and material deprivation are the main exclusion factors in the socioeconomic sphere.

The 'twentist' vision aims at preventing social segregation and a poorly understood territorial specialization. It also aspires to promote the participation of citizens in the improvement of urban quality. In this sense, the specialization of territory must take into account the different scales, in order to achieve diversification instead of impoverishment.

Public space and public facilities are the main characteristic of European cities, to which most citizenship rights are linked. 'Twentism' is a strong proponent of social liberalism and of communitarianism: it believes that individuals and human communities must be granted a minimum well-being and development conditions ensuring the dignity of every person and group, as well as respect for cultural diversity. 'Twentism' also advocates public policies aimed at the gradual reduction of social inequality between individuals and communities.

(For social integration through education, see the talk from Eduard Vallory –pp. 201-205 of this work; for socially responsible corporate activity, see the talk from Sergi Ferrer-Salat –pp. 195-200 of this work.)

Sustainable growth – Stabilization – Degrowth

In the present context, the only reason why opting for conventional economic growth (historically understood in terms of GDP) is worse than degrowth is that it operates faster –for degrowth just prolongs the agony.

Sustainable growth must be advocated: if it is not sustainable it cannot be considered growth, either.

Thus, in what could almost constitute the economic definition of sustainability, we can say that the environmental and social costs of development and wealth creation must be internalized, and that they must be established as limits to growth. Degrowth is not necessary, but we need to opt for the non-consumption of non-reproducible resources, and for the consumption of reproducible resources below their reproduction rate.

This internalization should be accompanied by the preference for regeneration and circularity instead of expansion. Thus, growth (now sustainable by definition) will be understood as a succession of dynamic balances between order and repetition, which can degenerate into stagnation, and discordant growth, which can degenerate into chaos.

Therefore, it is necessary to maximize efficiency and stop considering that every growth or improvement must be expressible in monetary terms: in this sense, for instance, an increase in free time as a result of higher efficiency in the use of resources, or of the implementation of new technologies, is undoubtedly growth, too.

(See the talk from Jordi Angusto –pp. 65-68 of this work.)

Territorial efficiency – Environmental efficiency

Territorial efficiency highlights the optimized distribution of pixels: some examples of it could be the pooling of services between several municipalities, or the actions of urban transformation and of space recycling and re-use.

Environmental efficiency is defined by the optimization of vectors: for instance, the use of resources and the minimization of several impacts and footprints (such as water, energy or CO2 footprints).

(See, among others, the talk from Carles Ibáñez –pp. 173-180 of this work.)

'Territoriant'

A 'territoriant' is an individual that conceives public space and, in fact, the space of their life and their usual activity, beyond the location, be it rural or urban, to which they are native. The existence of this type of user of space has caused the recent emergence of certain territorial functionalities in places where they should not be present, where they used to be unexpected. As Francesc Muñoz says, individuals nowadays, apart from inhabiting a place, are also 'territoriants', that is, they visit other places. Mobility has become ingrained into the DNA of the postindustrial society, and there are more displacements, to go more times, for more reasons, to more places that are more distant, as Muñoz puts it. This new paradigm, where flows and vectors predominate over pixels (metaphorically, the static picture has become a film frame, a part of a sequence), can result in some cases in the loss of feeling of belonging to the place, in uprooting; in other cases, though, it can enable a higher degree of open-mindedness. It is not an intrinsically negative paradigm.

(See the talk from Carme Miralles-Guasch, regarding new approaches to mobility –pp. 65-68 of this work; you can also refer to the talk from Francesc Muñoz –pp. 229-243 of this work. For an in-depth vision on this concept, see Muñoz, F. *UrBANALización. Paisajes comunes, lugares globales*. Barcelona: Gustavo Gili, 2008.)

Transhumanism – New science – Limit awareness

As a result of stretching to the maximum the modern characteristics of the 20th century (especially in terms of artificialization and of rationalist excesses, born in fact in the 19th century), the new doctrine of transhumanism appears. It proposes ways of overcoming three of the main human limitations: longevity, mental agility, and elimination of suffering.

But is it really necessary to try to overcome what makes us human, simply as a result of our evolution and of our licit desire to improve ourselves? Many scientists actively work on achieving those goals (immortality de facto, infinite computing capacity and absence of pain); many disciplines, depending on the use made of them, can contribute to it (biological and molecular engineering, robotics, neurocognitive sciences, ICT, etc.). The artificialization (and, in the long term, the annihilation) of human life as we know it today could reach a point of no return within a few years. What transhumanism proposes, after all, is nothing but the perpetuation of our own will, the supremacy of the self-referential in each person, the self-deification of new beings (similar to robots, in fact) that consider that we are limited by what we are nowadays, and consequently want to distance themselves from it. It is not difficult to infer that if the new transhuman beings hate everything they used to be as humans, they will also hate all other beings, human or transhuman. Empathy will disappear, impassibility will appear, the world will become a hell populated by wolves, and no relationships will be feasible.

Against this scenario, which is an outcome of modern science (the one that emerged in the 19th and peaked in the 20th century) another one can be opposed (one that results from contemporary science, emerged in the 20th and that will peak in the 21st century): as opposed to determinist and mechanistic conceptions, physics has undertaken new paths where the most important is interaction (we can think, for instance, of quantum phenomena) and complexity. Also, biology is now open to these ideas and has put reductionism aside. The new parameters are of an interdisciplinary nature: elemental physics cannot explain all of the world's phenomena anymore, neither can biology, and the model has become one of interacting networks, where each area of knowledge receives enlightenment and feedback from all the others. Interrelation constitutes the basis of everything, and new methods aimed at understanding the links between local and global are proposed. The whole world becomes an organic subject of study.

'Twentism' is established precisely in this new science. It proposes a rethinking of our models in order to base them on networks, complexity and the different levels of reality. These models take as a starting point the deep understanding of nature and of natural cycles. Thus, being aware of limits and finiteness, they tend to ensure a renewed territorial balance, on a human scale, able to integrate everything society is made of. As suggested, in this new model interaction will be continuous, and there will be a constant transmission of goods: it will all result in cities becoming integrated in nature, and in a sustainable and environmentally friendly rural development.

(See the talk from Brother Lluc Torcal –pp. 99-105 of this work.)

Triple value of 'twentism': quality, cohesion and biodiversity as indicators

The triple value of 'twentism' comes from the fact that it wants to influence territorial and living quality, social cohesiveness, and biodiversity: firstly, the management of territory cannot be self-harmful; secondly, it cannot cause inequalities; and thirdly, it must take into account the fact that the human being is just one among the many inhabitants of our planet.

This triple value can be considered a measurement, an indicator of whether the pillars shaping the 'twentist' vision on development really exist, and of their degree of maturity. See, in this respect, the entry "Cycles – Limits" in this glossary.

(For a more detailed exposition, refer to the conclusions –pp. 13-21 of this work.)

'Twentism' – Noucentism

As we have pointed out in the introduction of this glossary, in the first decades of the 20th century the ideological corpus of noucentism was formulated. It was a class-biased, classical, Mediterranean and radically urban model. The events of the Tragic Week (1909) changed the noucentist vision on cities. Rather than the "Barcelonization of Catalonia"advocated by the 'Catalonia-city' model of Gabriel Alomar i Villalonga, the noucentist intellectuals proposed the "Catalanization of Barcelona": in comparison with the network of Catalan towns, Barcelona had become 'macrocephalous'. Moreover, due to the immigration the city had received –from the Catalan countryside as well as from Aragon, Valencia and Murcia– and to social inequalities, violent revolts took place. Noucentism aspired to impose order and equilibrium as an ideal of territorial policy.

Today we are living in a material and immaterial reality characterized by informational excess and superabundant symbolic mediations. Also, identities are defined by networks. Cultures have become de-territorialized. We manage time, relations and manners of belonging in a different way to the one of our parents and grandparents. Our shelves are full of books about countries that no longer exist, of manuals about machines that are no longer produced, of obsolete software programs. The attachment to a place and the global vocation, staying and moving, are today complementary rather than contradictory. 'Twentism' advocates the adoption of a new territorial project tending to sustainability. The key to sustainability resides in a territorial awareness and self-esteem that integrates both the urban and rural ideals. An essential condition for this new territoriality is that the global vocation of urban values must be accompanied by a strong local and territorial attachment. The 'twentist' strategy promotes a more efficient use of natural resources in order to generate a more equitable society.

(Refer to the article by Ramon Folch "El relleu del noucentisme" (2012), in *El Periódico de Catalunya*: you can access it at https://www.sostenible.cat/opinio/el-relleu-del-noucentisme.)

Urban extension – Urban regeneration

Whereas the extension of urbanization enables fast growth processes, reurbanization demands slower and more complex processes, which consume more information and energy and imply more difficult actions of institutional and popular participation, because the perimeter of the city remains the same. Local administrations with jurisdiction in urbanism and planning, usually with meager financial resources available, must face the challenge of avoiding hasty planning decisions (aimed at promoting the attraction of foreign economic activities or the growth of existing activities that could otherwise opt for relocation) which could limit the future development opportunities due to having assumed costs higher than those advisable in the management of public services.

Regeneration demands some political leadership capacity and high-quality public management skills –at the same level, for instance, as the ones shown by Catalan public administrations in the 80s as a response to the bad management practices of Francoism. Moreover, a further follow-up of the actions of urban regeneration is imperative, in order to ensure that the effects of the implemented policies are the wanted ones. For example, the Catalan Neighborhoods Act (Llei de barris) was aimed at increasing environmental sustainability, social cohesiveness, neighborhood social networks (through actions opposed to gentrification) and economic activity: it remains to be seen whether these goals have been achieved or, perhaps, some unwanted results exist, such as gentrification derived from property value gains in the areas where urban regeneration actions were implemented.

(For an exposition on new urban geographies, see the talk from Manuel Gausa –pp. 155-165 of this work.)

'Urbanalization'

'Urbanalization' (from *urban* + *banal*), understood as the loss of all the identity traits of a given place, is one of the undesirable outcomes of the 'territoriant' paradigm. In our country, 'urbanalization' unfolds, among others, as low-quality urbanization processes in rural areas which contribute nothing to the effective improvement of their surroundings.

(See Muñoz, F. *UrBANALización. Paisajes comunes, lugares globales*. Barcelona: Gustavo Gili, 2008.)

Vulnerability – Resilience

Resilience is an indicator of the recovery response of a given system when facing impacts of different types and natures. It is a measurement of the reaction capacity before diverse change factors and driving forces, be they biophysical, environmental, climate-related, economic, migration-related, social, or of any other kind. Vulnerability, in turn, is the lack of suitable response and recovery capacity of a given system when facing said driving forces.

Though the vulnerability degree of territory is determined not only by climate change, the fact is that at present the risks derived from this factor are, perhaps, the ones whose materialization has the highest degree of likeliness. They could be already taking place.

The management of vulnerability in general and of natural risks in particular is a key element of 'twentist' policies and management, due to the Mediterranean climate being characterized by seasonal phenomena showing some degree of unpredictability and, moreover, by the fragility of its ecosystems as well as by a high urban and infrastructural density, especially along the coastline. Nonetheless, when facing natural risks, a small advantage Catalonia can benefit from is its high degree of anisotropy, thanks to which impacts should be reduced and limited to a really concrete area in case of severe territorial events.

Be that as it may, our country needs to explicitly incorporate the adaptation and mitigation of climate change related impacts (floods, long-lasting droughts, pests, heatwaves or fires, for instance) into its territorial planning, as to ensure the supply of basic resources for the health, the well-being of citizens, and economic activity. This is true, especially, regarding water supply.

Vulnerability increases when the social value of everything that has already been built is high, and when certain modes of urbanization tend to degrade the natural services that the non-developed landscape can provide. Climate change is nothing but an aggravating factor of preexisting dangers.

Therefore, cities must be naturalized (or ruralized) in order to become as resilient as the countryside is in a natural way. An example thereof could be the implementation of soft infrastructure enabling the urban space to prevent flood occurrences.

(For a vision on the vulnerability of rural world and rural activities, see for example the talk from Lourdes Viladomiu –pp. 167-171 of this work; you can also find some notes on the diversification of rural activities as a resilience factor of that environment in the talk from Montserrat Viladrich –pp. 113-119 of this work.)

Zones – Networks

Territory is no longer a patchwork of compact cities surrounded by non-developed agricultural and forests areas. It has become hybrid: diffuse urbanization has multiplied on territory, and development factors related to the connectivity of networks and flows, to energy, resources and information transmission, have been implemented on it. The traditional methods of territorial governance are now inefficient in order to control the fluxes of people, goods or information.

As communities take on a more virtual character and become articulated around social networks, the landscape ceases to have a value of mere location and recovers its values of place and habitat, of cultural, ecological or biophysical environment. The 'twentist' vision promotes territories capable of combining two paces: slow –to take a stroll– and fast –to instantly transmit information–. In other words, simultaneously rural and urban territories.

(For an exposition on the diverse typology of hybrid zones, refer to the talk from Manuel Gausa –pp. 155-165 of this work; you will also find some thoughts on the new dynamics of zones and networks in the talk from Carme Miralles-Guasch –pp. 69-73 of this work; Moreover, the talk from David Jou about territorial organization offers some perspective on the factors that can influence the concentration or dispersion of population in different zones, which should be taken into account in space analysis –pp. 79-86 of this work.)

1st WORKING DAY

A ‘twentist’ commitment in search of a new territoriality

(Cultural bases)

Program

1st WORKING DAY

A ‘twentist’ commitment in search of a new territoriality (Cultural bases)

Date: March 22nd 2017

Place: La Pedrera
Passeig de Gràcia, 92 – Barcelona

Regarding territory, is the vision of the city as the only viable destination still valid, or can we expect a new, different territorial relationship between the prevailing urban phenomena and a new rurality, endowed with higher prestige, diversification and creativity? What is the current meaning of Cerdà’s call to “urbanize the countryside and ruralize the city”? Can cities be more fertile and healthier (ruralize the city), can the countryside be more creative? The key to sustainability relies on a territorial awareness and self-esteem that can integrate both urban and rural ideals: this is what we have wanted to describe as a ‘twentist’ strategy for a new territoriality. As an indispensable condition for this territoriality, the global vocation of urban values must be accompanied by a strong local and territorial attachment.

Inauguration
Josep Rull, Minister of Territory and Sustainability

Session 1: New territoriality

Making Catalonia rural?
Ignasi Aldomà Buixadé, geographer. Professor of the Geography and Sociology Department at University of Lleida (UdL)
Sustainable growth: an oxymoron?
Jordi Angusto, economist.
If the past of mobility allows for a dynamic thought, why do we keep seeing an immovable present?
Carme Miralles-Guasch, geographer. Professor of Urban Geography, Mobility and Transportation at Autonomous University of Barcelona (UAB)
Reencounter with place and new territoriality
Joan Nogué, Professor of Human Geography at the University of Girona (UdG)
Debate
Ferran Miralles (rapporteur/moderator), Director-General of Environmental Policies and Natural Environment (Ministry of Territory and Sustainability)

Session 2: 'Twentist' commitment

Three mathematical metaphors at the service of the analysis of territory and urban-rural tension
David Jou i Mirabent, physicist of the Department of Physics at Barcelona's Autonomous University (UAB). He is also a poet and the author of a vast literary, essayistic and scientific work
Rethinking space
Àngel Castiñeira, philosopher and educationalist, professor of Social Sciences at the ESADE Chair in Leaderships (Ramon Llull University)
Renaturalizing culture
Jordi Pigem, philosopher of science and writer
Physicist and philosopher, monk in Poblet Monastery and Secretary of the General Chapter of the Cistercian Order
Fra Lluc Torcal, physicist and philosopher, monk in Poblet Monastery and Secretary of the General Chapter of the Cistercian Order
Debate
Joan Manuel Tresserras (rapporteur/moderator), professor of the Department of Journalism and Communication Sciences at Autonomous University of Barcelona (UAB)

Work group

1st WORKING DAY

Ignasi Aldomà Buixadé
Geographer. Professor of the Geography and Sociology Department at University of Lleida (UdL)

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Making Catalonia rural?

Ignasi Aldomà Buixadé

Geographer. Professor of the Geography and Sociology Department at University of Lleida (UdL)

In the 70s of the 20th century, some theorists began to propose the idea that the countryside-city duality was coming to an end. From then heretofore we have not but witnessed the confirmation of such general proposal. The old rural world has lost a great deal of its characteristic expressions and has become blurry, becoming a new urbanity, or a new city. To define it, some rather forget the term 'rural' and talk about 'low-density areas', giving an answer to the uniqueness of their scarce human population, which determines their economic activity and social life. We could also talk about some kind of barely dense, sprawled city, with some imperfections regarding its services and urban-planning attributions. On one hand, it could be useful to get rid of the concept 'rural', due to it representing a reference to a past that no longer exists. On the other hand, though, the new concepts turn out to be too aseptical, and they do not thoroughly illustrate the state and the unique conditioning of those spaces in contrast with the city. Therefore, some prefer to talk about a 'new rurality', in spite of the fact that the 'new' will also be worn out in some time (I. Aldomà, 2009, 2015).

A 'new rurality'

In the last fifty years 'rurality' has been overturned by background changes that we cannot consider to be over yet and that would take a long time to enumerate. We can nevertheless highlight and synthesize the ones that appear more significant to us:

- Agricultural production is becoming industrial and is immersed in a process of firm concentration that seems unstoppable. Agriculture does not exist any longer, there are only food and agricultural industrial chains undergoing intense vertical and horizontal integration processes which increase the size of the actors, usually well beyond the local scale, be it a town or a county (comarca). Even the farming sector producing raw material is changing its scale.
- Services, in all of their different branches, have become the main source of occupation, both the ones generating wealth (tourism, e.g.) and the ones oriented to satisfy the needs of the local population. Services, especially the public ones, are also the sector that has best withstood the most recent crisis.[1]

1. Salaries in the public sector have certainly undergone a slight drop, but the occupation rate in public services (i.e., the subsectors qualified as non sales-oriented services) is the only one that has kept a positive growth in the last years, as can be seen in the Observatori del Treball statistics (I. Aldomà, 2015).

- Changes in work organization, along with opportunities in mobility, have taken the scale of everyday human relationship (due to work, study, leisure, etc.) to a vast territorial scale: county and region. The rural people, today, insert themselves into urban networks according to the scale of their interests.
- And changes in work organization and in mobility, along with the pervasiveness of telecommunications, have to a great extent made possible changes in social behavior, which has become equal with that of the city. New developments do not arrive late to the rural world anymore, and one could even imagine a 'rurality' that generates innovation.

Therefore, we would have rather avoid the concepts of 'rural' and 'rurality', which do not tell us much after all. We still use them, though, because at least some typological differences still stand; and mostly because said differences have a meaning in the interests of the comprehension and the governance of 'rurality' from the central metropolis. In the end, if we still consider the advisability of supporting the same 'rurality', we could say that it is probably no longer necessary. But negation is of little use, for it is the metropolis that has the last word.[2]

The urban economy of current 'rurality'

Once settled the matter of the name choice, the question now is how current 'rurality' is highlighted and asserted. With what does (or with what can) the 'new rurality' provide the metropolis? –we ask ourselves after confirming that the metropolis tentacles have engulfed the countryside.[3]

The first contribution, so to speak, comes from the very situation of dependence of the countryside: 'rurality' is just another element in the sphere of urban (city-county or city-region) consumption. From this point of view, 'rurality' appears to be the outer link of the large network through which goods, services and capitals move. The hub and the point of maximum intensity of transactions are situated in cities, especially in large ones, which act as big transmitter-receivers for the whole network. In a former article (I. Aldomà, 2016) we underlined the contributions of the city-metropolis to rural areas, highlighting the residential economies from three sources:

- Contributions derived from the consumption by temporal dwellers (tourism and second residence). Rural tourism has greatly benefited, in recent years, from the shrinking of

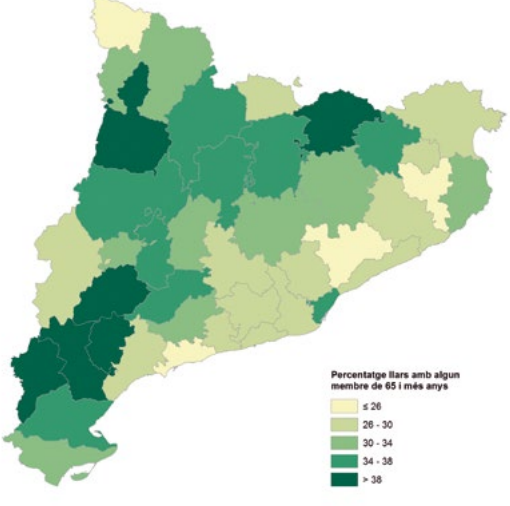
2 The Quebecois sociologist J. Bruno (*Territoires d'avenir. Pour une sociologie de la ruralité*. Quebec: Presses de l'Université de Québec, 1997) stated and defended, as a matter of fact, that the appeal of rural areas to urban dwellers (materialized in peri-urban residential units and in weekend trips) is what most justifies to maintain the concept 'rural', despite all the criticism it has earned; in this sense, Bruno aligned himself with the Toulousian geographer Bernard Kayser. The vicinity links established around the 'locality' would thus be some of the main aspects of the new 'rurality', heir to the older one, as well as the main factor advocating the validity of the concept 'rural'.

3 We must refer to studies and methodological works carried out in France by M. Talandier (2008).

long distance tourism. The frequency of use of second residences, too, has benefited from the same phenomenon –though no statistical confirmation exists thereof.

- Income derived from all kinds of pensions and allowances, ranging from the highest ones (retirement pensions) to many others (widow's pensions, state pensions or disability allowances). They have remained stable or on the rise, and make up the biggest part of such 'residential' income (up to 50% of its value). They are not an exclusive privilege of rural areas, but they do play an important role in them due to the ageing rate of their population (see Map 1).
- Salaries of rural residents that commute to the city daily. Work-related mobility may take place in every direction, but the one to the rural environment compares unfavorably with the one to the city, as more workers go to the nearest city than the other way around. Thus, we can say that 'rurality' clearly benefits from its residents' work-related mobility.

Obviously, all these flows, which seem to favor small villages, should be completed with a second set of data, the ones referred to the consumption flow of rural residents on which greatly rely the commerce and the services of the cities (market hubs and metropolis). We enter now a rather unknown field, in which we must return to the starting point: the interweaving of countryside and city has become so intense that it is difficult, and even not pertinent to some extent, to separate these two worlds–though some unique aspects can still be noted.



Map 1. Percentage of households with at least one 65 year-old (or older) person (2011)
Source: *Atles de la nova ruralitat* (2015; p. 21)

Contribution of the countryside to urban economy and society

Beyond the rural world on which the urban kraken has fed, there is still a unique 'rurality' containing the most notable aspects of its social and economic differentiation: we talk about the economically active 'rurality', the one providing the city with goods and services usually based on the resources and the land occupation that make the essence of the very definition of 'rurality': agriculture, forests, quarries, waters, etc. all of them indispensable to satisfy the basic needs of the urban dwellers. We cannot deny the fact that, as Western societies have solved their basic needs in the last decades, 'rurality' itself has lost a great deal of its value and importance. But nothing can be considered definitive, and the traditional contributions of 'rurality' have not disappeared, but rather have nowadays taken a new sense and offer new possibilities:

1) To begin with, 'rurality' supplies the energy needed for the big engine (the city) to work. It has historically been like this thanks to wood, charcoal, coal, hydroelectric or nuclear power production. And it is also the way it could be in the future thanks to biomass and to the different technologies involving solar energy harnessing. As usual, the active or passive role of 'rurality' in power generation will remain an outstanding issue, as the business owners and the final consumers of energy are mostly urban. What are the chances for small, rural companies to access power generation? Will the inhabitants of these areas get some compensation or benefit, in terms of taxes or jobs, for the implementation of industrial units?[4]

2) Water is the other main, indispensable resource 'rurality' provides us with, and poses questions quite similar to the ones we have just mentioned. The city could even abstain from the water it gets from rivers and aquifers in rural areas, connecting itself to desalination plants. But this would mean a higher price for water, and would also represent a displacement of the environmental issues, from the catching of a limited resource to the extraordinary power supply desalination demands and to its consequences. It does not seem to be the wisest of the choices when more harmonious solutions, based on territorial collaboration, can be found. These can benefit both parties, urban and rural: industry and services, and farmers.

3) Food comes from the countryside and is its traditional source of wealth, though this aspect is losing its weight in consumers' pockets. It should not be necessary

4 For some years now, a bright future for 'rurality' is being foreseen, thanks to the huge potential of renewable energies and to the new communications. But without a change in organizational models, 'rurality' is left with the inconvenience of artifacts, whereas economic return and jobs go away from it: ICT and computerization are in fact intended to relocate control and management. Alternative energies, and more precisely the renewable ones, along with other aspects (for instance, CO_2 capture), constitute a future strategic element for rural areas, but we will have to be vigilant not to reproduce former models of unsuccessful development, as hydroelectric power back in the day or more recently wind power.

to repeat that agriculture nurtures cities, for this is the way it has been since cities exist, and the role and the function of food should be updated. In a context where agricultural production loses weight and where the added value of the chain is collected by city-based parties, perhaps nowadays the stress should not be put on the amount of the supply (at the origin of some environmental malfunctions not to the taste of urban residents) but rather on a farmer able to reach the city directly with attractive, honest produce –emphasizing, thus, the produce-service, guarantee of health, cultural differentiation and high-end creativity. Catalonia as Barcelona's 'zero miles' area?

4) The countryside and the 'rurality' used to be, and are still now, the great recyclers of the waste generated by the city. This is another main service, and it can be either active or passive, according to the manner it is given. The countryside usually assumes in a passive way, generally with little compensation for the inconvenience caused, the tasks of processing and stocking the waste that the city does not want or cannot accommodate. Here a lost feedback, beneficial for everyone, could be invoked: urban waste becoming an input of agricultural production. One century ago farmers practically paid to get the refuse of the city, or to clean its cesspits: could the reutilization of metropolitan waste be proposed by an agricultural activity that currently must overwhelmingly resort to external sources of nutrients and fossil energies?

5) Finally, nothing seems to suggest that the service functions that nowadays constitute the main activity of 'rurality', as well as one of its greatest appeals, should not be strengthened and increased. It will be difficult to renew any feedback, or to create new ones, if the service function of 'rurality' is neither enhanced nor made visible to the metropolitan population. Service, but of what kind? –many may wonder. Well: ski, rafting services, golf courses... But also, and especially, non-packaged, non-encapsulated services: reuniting with the stones of times past, discovery of animal and vegetal species, forest strolls, almond trees blossoming, silence...5 The countryside must offer enough appeal of its own in order to attract urban residents to spend there a part, or all, of their life cycle.

The efforts to make the actions derived from the mentioned proposals become a reality are numerous. They are small initiatives scattered over the country, and nothing new must be invented. But many urban people are unaware, or partly unaware of them, and many farmers and rural residents are also ignorant of their details and possibilities. There is not

5 Also, to defend such associations, no resort to 'pro-ruralist' proclamations, like those by B. Farinelli (2008), is needed. Several medical studies bring to light the positive relation between 'rurality' and health, both in terms of perception on one own health, of health symptoms and of mortality. Focusing on the Netherlands, J. Maas et al. (2006) analyzed this phenomenon through the relationship between free spaces (cultures, forests, parks and such) and health: whereas they did not discover notable differences between age groups, they did discover a bigger sensitivity among the lowest income groups.

enough awareness of the interweaving of countryside and city, and of the many doors that it can open for all of us, which are probably of greater interest to urban than to rural residents, simply because the first ones are more numerous and they cannot find the solutions that 'rurality' has to offer right in their backyard, so to speak.

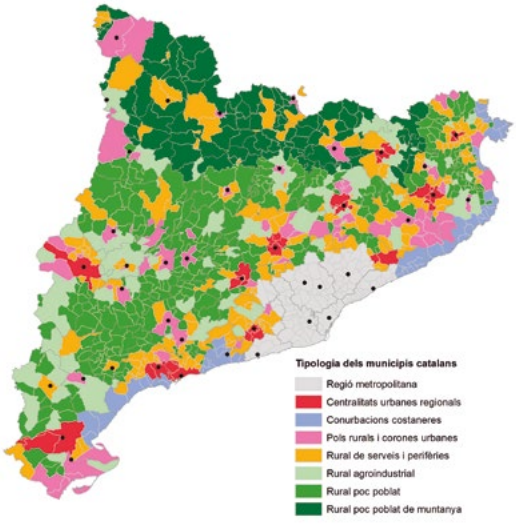
Rural-urban diversity

There is certainly a horizon of interweaving and collaboration between countryside and city, as well as one of divergence, much the same way some neighborhoods have a certain color or another. In the rural environment these color differences are inescapable, and even positive, for they mean there is a variety to choose from and to feel different: some have vineyards, some make an excellent olive oil, and some offer the chance to go skiing... Among the different possible typology exercises to depict that variety we find especially interesting the one based on the socio-demographic parameters that are most directly related to urban-rural contrast.6 The different typologies, ranging from the greatest concentration of population in the metropolitan areas to the least inhabited municipalities, have also quite a lot to do with historical economic dynamics (Map 2).

As we revealed back in the day with Atles de la nova ruralitat (2015), the contrast between rural and urban areas is alive in Catalonia today. In spite of a generally positive growth in the years of the big housing bubble (2001-2008), the subsequent crisis is still persistently felt in rural areas. Not only do rural municipalities lose population, but they lose jobs as well, in a more pronounced manner than cities do. There is also a significant contrast between the smallest rural municipalities and the rest, due to population losses more than to job loss. And those losses have to do with specific circumstances: since in the past those municipalities had already undergone an important depopulation process, their current population is older, and the demography drain on them occurs naturally.

Beyond the conventional image of 'rurality' disadvantaged by the lack of economic prospect, which has a huge territorial extent (Map 2), the reality in the counties (comarques) is more complex, because the dynamics of centralities at county and sub-county levels strongly influences the one of their surroundings. There is no doubt that the so-called 'rural poles' and other rural municipalities showing a more urban profile also undergo job losses related to the economic crisis, but their demographic behavior remain generally positive. If we transpose these contrasts to the final count of the comarques we find that their demographic situation is rather stable despite the general loss of jobs and, also, of income per capita that the summary economic indicators show. And from this point of view the contrasts between rural comarques and those with a more urban character are not really notable or conclusive, either.

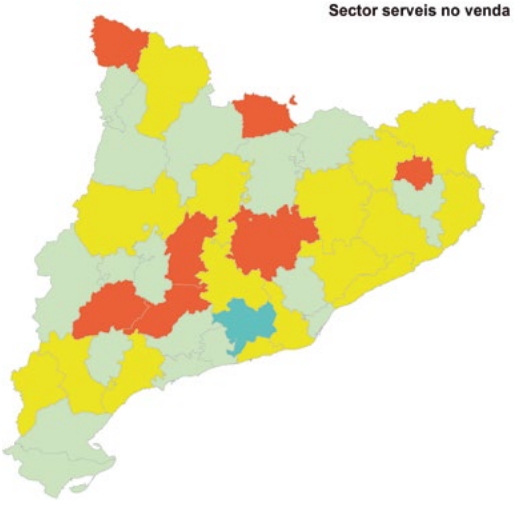
6 The method used for the municipal delimitation follows that of the Délégation à l'Aménagement du Territoire of France (Datar, 2012).



Map 2. Municipalities' characterization according to rural-urban dynamics (2014) (From top to bottom: Metropolitan region; Urban regional centralities; Coastal conurbations; Rural poles and urban rings; Service-based rural, and peripheries; Agri-food rural; Sparsely populated rural; Sparsely populated, mountainous rural) Source: *Atles de la nova ruralitat* (2015; p. 97)

To sum up, we could say that in the last years of crisis there has not been a 'rurality' characterized by contrasting behaviors, as far as we understand such 'rurality' as a world where small villages form a whole with their urban centers. Apart from specific circumstances related to local business initiative, the evolution of small municipalities should be linked rather to residential dynamics that result from the facts we have mentioned above –local housing supply, conservation of the existing housing stock, hosting and attraction of newcomers...– than to other reasons.

Remarkable or more concerning differences rather arise between sets of comarques or urban subsystems, and are tightly related to dynamics specific to each subset: degree of impact on local building sector, evolution of local industry, effects on agricultural subsectors, weight and evolution of tourist industry... As enough proof we can see the contrast between comarques in the dynamics of public-service related occupation, the so-called non sales-oriented services, which, strangely enough, have been the only ones that have experienced some growth in the last years (Map 3). Any kind of spatial logic is difficult to appreciate, it must be noted.



Map 3. Dynamics of the occupation in non sales-oriented services (2008-2014) Source: *Atles de la nova ruralitat* (2015; p. 57)

Countryside and city, two steps in one physical and life journey

Beyond the differences between comarques and their geostrategic features, we must insist on the deep relationship linking countryside and city, and on the potential that it represents for each of the areas, which, as stated, cannot be understood separately. It is not necessary to stress the interrelation that constitutes the daily life of both rural and urban communities, but it is certainly necessary to iterate the need to deepen such interrelation in order to develop projects and alternatives in the interest of both areas:[7]

- 'Rurality', especially the deepest one, or the one with the lowest population density, has its projection platform in its very cities-rural centers, the ones providing it with services, economic activity and connection to the external world. The basis of this interrelation is mobility: rural inhabitants that benefit from public and private services in the city and at the same time contribute to the payment of their upkeep, and city inhabitants that carry out some activities in the surrounding villages. It must be noted, though, that the relationship and the synergies between rural environments and their capitals do have also some friction point, especially from the institutional point of view, due to the dif-

7 Due to the insistence on the multi-relational, networked society, some authors (D. Behar, 2014) point out the rigidity of stock-based policies as opposed to a more real, flow-based one, avoiding measures aimed at the fixing to a certain territory and adapting more to elements of population mobility and its relation to the life cycle, paying attention not so much to the harnessing of local resources as to their projection into the external world and to the added value they can generate.

ficult collaboration between different local councils and the frequent clashes between the county council, or the county municipalities, and the council of the capital town
- Mobility, be it for work, education, shopping, leisure, holiday or family reasons, leads to a complementarity or a specialization in the use and the frequentation of rural spaces, rural centers, regional capitals and the metropolis. Young, adult and elderly people inhabiting villages or towns resort to one space or another according to their own needs and to the place appeal:8 nature leisure in villages and rural houses, sports or cultural leisure in the capital facilities, specialized restaurants in the first or the latter, specialized shopping in the capital...
- In addition to the multiple journeys in any given moment, there are also the many different journeys throughout life, for instance the ones taking a rural child to attend high school in the county capital and college in the regional university, and ending up in them working in the metropolitan Barcelona and their eventual return to the original village after retirement; or the children and grandchildren of rural families migrated to the city who return to the village to start a family; or young families from metropolitan neighborhoods in search for manual labor opportunities and for the calm of small villages...

The networks of rural mobility are not confined to the space of the county, but spread out into regional space and even further. These flows interlock each other, taking county and region capitals as nodes of a more global network. Even the most remote places within our territory keep a relationship with Barcelona, for example, in both directions: rural people use the specialized services of the capital, or even work there every day; and people from the big city who have a second residence in a village, or who go there for some work-related motive. Here, exactly, lies one of the most important reasons for the differentiation of our hinterland, of deep 'rurality': there is one that is able to attract a great number of urban hosts, and which shows sign of economic and social dynamism; and there is another that is unable to exert said attraction and ends up lagging behind.

All this universe of mobilities raises two critical issues about the role of 'rurality' and its relationship with the city: the first one lies in the lack of systematic knowledge about said relationship, which could allow a measure and an assessment of the real flows; the second one lies in the difficulty, or even impossibility, of that very knowledge, for borders and individual feelings of belonging have become blurry and local statistics reflect nothing but legal circumstances (the mere fact of being registered as a resident in a given village, for example) that have little to do with reality.

8 Several studies confirm this kind of displacement, showing a great variability of routes and typology, in places like France or Belgium, not so different from our own country (M. Drevelle, 2012; V. Hervouet, 2007).

The current value of the local

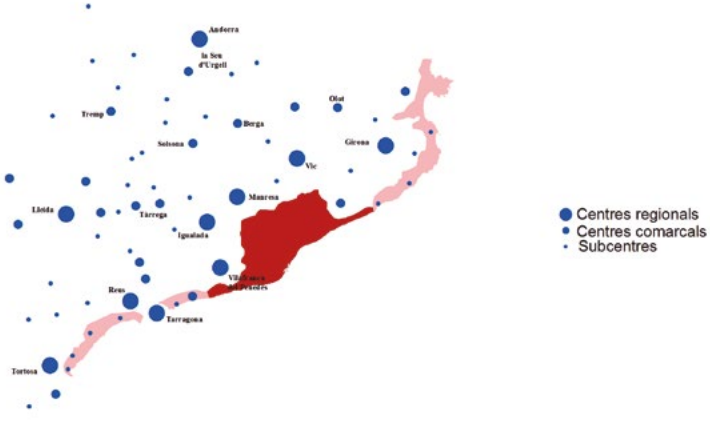
In spite of statistical downsides and of the fact that current 'rurality' appears to be deeply inserted in urban reality, we must rely on old schemes and make an effort to establish mobility in a given space and territory. We could imagine, in this respect, a night view of the country in which we could highlight:

- Some flows interconnecting our territory through the main mobility axes, whose thickness grows as we approach the metropolis, and which would result in a figure similar to Map 4 –though not on a strictly flat space.
- Some points of light concentration and flow intersection, which match cities and which also reflect, with their higher or lower light intensity, more or less powerful dynamics. Those would be the urban 'circles' on Map 5, which are smaller in inland areas.
- In more detail, we would also discover rural habitats, with diffuse, more or less intense light, which reflect demographic density maps. These habitats also have a two-way relation with the surrounding towns and flows: they benefit from the strength of the city, but they simultaneously feed it, from many years ago.

Besides, it cannot be ignored the fact that all of these local geographies are nowadays greatly blurred thanks to planetary geographies. At the time being, the metropolis does not pay attention to its ring of cities, let alone to its more or less remote 'rurality'; it lives absorbed in its planetary competition, in the materialization of the Mediterranean Corridor, in the knowledge exchanges with Shanghai or in its sports teams playing some European or global final. 'Rurality', on the other hand, does turn intently to the metropolis, though in some aspects does not differ much from the capital: swine genetics comes from the Netherlands or Denmark, and soya from Argentina, and in the end it all becomes meat to be exported to China. Having a presence in the world affects us all and is almost mandatory: thus, the farmer would rather stay on top of the evolution of the grain market at the Chicago Board Trade.

Nonetheless, the enlargement of the relational space should not equal losing sight of the topos, the local. Raw materials fix the exploitation of resources to the place. The accumulation of industries, services and people is also related to one place, though mobility makes it less steady and indispensable. The place is also the basis of personal relationships, as well as of the insertion and responsibility of men for nature, apart from other factors of enrichment. Surely, we will have to imagine other horizons, for when our lettuce comes directly from the lab or the virtual world makes the real one unnecessary. As for now, and for some years, we will have to go remind the urbanites of their 'rurality', and we will also be able to proclaim that Catalonia will be rural or will not be at all.

Map 4. Fabric of the current 'rurality': centralities and urban network (I). Flows between urban areas through the main corridors (From top to bottom: Metropolitan synergies; Interurban dependence; Inter-center relations) Source: *Atles de la nova ruralitat. L'actualitat del món rural* (2015)



Map 5. Fabric of the current 'rurality': centralities and urban network (II). Urban continua and territory structuring centralities (From top to bottom: Regional centers; County-scale centers; Sub-centers) Source: Font: *Atles de la nova ruralitat. L'actualitat del món rural* (2015)

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Sustainable growth: an oxymoron?

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Introduction

In stating that all economic growth is unsustainable, and in defending degrowth, some ecological movements shot themselves in the foot. Firstly, because behind the word *degrowth* one can see a black future, a worsening of things that no one wants. Secondly and more importantly, the matter is precisely the other way around, and there is no growth if it is unsustainable, i.e., the only way there can be growth is if it is sustainable.

We are obviously not saying that the current growth is sustainable. What we state is that such growth is false, a fallacy derived from our way of measuring our economic activity, which relies basically on the GDP, a gross domestic product that only measures the "value added and exchanged" by us humans, who use as means of exchange goods whose origins are not taken into account. No one pays the Earth for what they take from it, and since there seems to be no cost, it is ignored. In the economy, more than in any other sphere of human life, "man is the measure of all things".

The GDP rises if we use and burn oil, adding up the rent of the land owner, the wages of the workers who extract it, the benefits and salaries of oil refineries and gas stations... The same happens when we deforest lands or destroy sea bottoms: we add up the human activity, the effort of some, the profit others get from it, and we just ignore what we subtract from the planet, just as if we did not depend on it! In an arithmetical exercise where only sums exist, there is no wonder that the result is always positive.

In order to determine if we are really "growing", we should at least deduct what we take from the Earth. As an example, the agricultural and livestock industry assimilates the cost of reproduction, whereas the exploiters subtract it from their income: the conservation of a reproductive core, of a field, of a tree... But what is the worth of non-reproducible things? If it is infinite, any consumption would mean a subtraction bigger than the addition, and thus, currently, we are not growing but degrowing. In other words, we take as income things that really imply a squandering of assets; and the faster we squander them, the more we think we are earning.

In such an economic model, betting on degrowth only equals slowing down the pace of squandering, when the really necessary thing is to change the model so that it becomes sustainable. This, certainly, imposes some limits to growth, but does not imply a demand

for degrowth. Growth is, after all, a biological trait common to all living beings, having a reproduction rate higher than 1 and operating in an interdependence that makes the growth of some of them dependent upon, and limited by, that of the others. Thus, this limit, of a demographical nature, should be the first and the main one: our species cannot grow beyond the biological set –or, at least, beyond some concrete sub-set–, constricted as a whole by planetary limits consisting in the non-reproducible resources consumed, and in the metabolization of our waste. At least, as long as the plans to conquer other planets remain as chimeras.

All in all, a sustainable economic model would be defined by the non-consumption of non-reproducible resources, and by the consumption of the reproducible ones below their reproduction rate. Does this mean that there can be no economic growth? Not necessarily: if we can increase our efficiency and do the same with less effort, all within the aforementioned parameters, the freed up efforts will allow us to increase our leisure time, or to work on other things; if we do the latter, economic growth will have taken place.

Let us suppose a community that relies solely on solar energy and that consumes well below the reproduction rate: therefore, a sustainable community. Let us also suppose that, from one year to the next, that community manages to reduce by 10% the amount of working time needed to get their supplies: such community can now allow everyone to work fewer hours, or can free up 10% of its working force and make them provide services of any kind to the rest; if the case is the latter, the value of these services, added up to that of the previous supply, will mean an economic growth, in spite of material growth being nonexistent.

This is in fact the process that we have historically been applying: whereas two centuries ago almost all of the employed population worked in the obtaining and transformation of material goods, both agricultural and industrial, nowadays more than 80% of people have an occupation in the service sector (education, culture, health...).

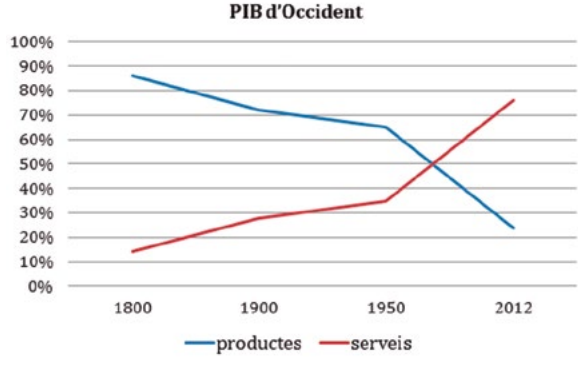

Figure 1

Thus, it is not a matter of degrowing, but of changing the model! Nonetheless, there is a field where growth must be stopped: population.

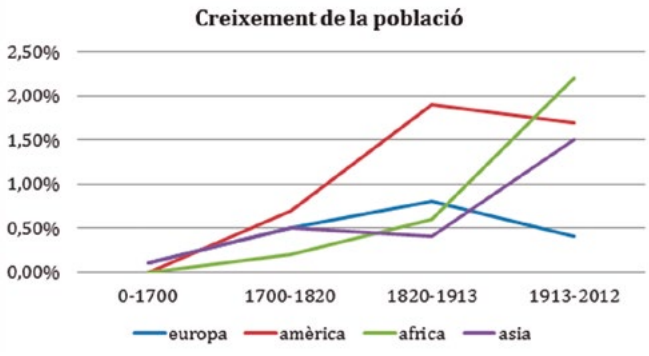

Figure 2

Both in Europe and the Americas the population has been curbed, and it is even decreasing. But in Asia and in Africa the demographic boom is far from stopping, and this poses a threat to global sustainability. Hopefully the same that happened here might happen there soon and having many children could no longer be seen as synonymous with a guarantee for the future.

Be that as it may, here or there, we are still far from reaching a sustainable energy consumption. In the EU, as little as 17% of the energy consumed came from renewable sources in 2016: this clearly speaks about the urgent need for a resolute stimulus to energy transition. Such demand is twice pressing if we take into account the fact that the consumption of energy from unsustainable sources is limited in time, as it is linked to the availability of reserves, as well as the climate alteration that it causes and that could make unsuitable for human life vast areas of the planet and, in not a much longer time, the planet as a whole.

What about Catalonia?

Catalonia has historically excelled in economic growth, though not equitable nor sustainable enough. If the average consumption of energy from renewable sources in the EU averages 17%, here it does not reach 10%. And environmental pollution, mostly a result of many years of favoring private vehicles against collective mobility, very often exceeds the recommended indices.

When it comes to underground waters, in some areas of the country an intensive livestock industry (mostly swine) has been favored: this truly constitutes an ecological disaster

because of the huge amounts of waste these activities generate. Meanwhile, some ill-advised ecological movements fight the rational exploitation of forests and let them grow too much and in wrong ways, which makes them vulnerable to fires at every summer drought.

Assuring a green future for Catalonia requires urgent, strong decisions regarding:

- The population that the territory can sustain, most probably lower than the one which could result from maintaining the current growth rate.
- The uses of the territory, with limitations for some unsustainable ones, e.g. tourism.
- The regulation of activities which require opposed solutions, e.g. swine industry, fisheries and forestry.
- The energy efficiency oriented reconversion of industry.
- The mobility of people and freight, which should use mainly collective, electrically propelled means of transportation.
- The generation and storage of energy from renewable sources.

None of the above means degrowth in economic terms, though it could in some physical units. The wine-related GDP of El Priorat county, as well as the income of the producers and transformers of wine, has risen thanks to the decrease in the amount of harvested grapes and to the increase in their quality and price. Similar actions should be carried out in other sectors: less quantity and higher prices. All in all, the GDP –and its derivatives, such as income per capita and production per worker– grows at the same rate as the result of the multiplication of quantity by price does: these two factors usually go in opposite directions, and some talent may be needed in order to overcompensate the decrease in the amount with the increase in the price. There is not any lack of such talent in Catalonia; there should not be at least.

To conclude, we can also mention a phenomenon related to urban planning that should be reconsidered: whereas it has been argued, until now, that urban concentration is more efficient and sustainable than urban sprawl, the recent technological revolutions (namely the digital and the energy ones) have put, or could put everything upside down. From concentration to network, from big cities to a system of well-connected towns, from nuclear power plants to photovoltaic panels everywhere... Catalonia, as a network of towns, makes today more sense than ever; a network with no fracture between its urban and rural realities, since the rural one must enter the cities to the same extent that cities must approach the rural world.

If the past of mobility allows for a dynamic thought, why do we keep seeing an immovable present?

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In the second half of the 19th century, when railway seemed to be at its peak, the French poet Victor Hugo wrote: "Ce qui mène et entraîne le monde, ce ne sont pas les locomotives, ce sont les idées."[1] Further on, in the 30s of the 20th century, Keynes said: "The ideas of economists and political philosophers, both when they are right and when they are wrong, are more powerful than is commonly understood. Indeed the world is ruled by little else."[2] Nonetheless, in the beginning of the 21st century, absorbed in an accelerated technological change that makes us follow the pace of an unprecedented social transformation, we seem to have forgotten about that. It is not technology, nor economy, that moves the world, but ideas: both now and more than one hundred years ago. There is no feasible project, there is no sustainable future without a set of ideas that suffices for us to progress as a collective. Today's ideas may take some time to prevail, but they will move tomorrow's world.

The value of this thought is now gaining relevance because we find ourselves in a moment of change of paradigm, in a time of transition in the cosmology of ideas. A paradigm is the means that allows us to visualize and interpret a multiplicity of concepts, schemes, values or behavioral models. From a paradigm, a set of ideas with a coherent form common to all of them can be formulated, and we can build up our own cosmogony in order to find help in the description of the current world and in the formulation of future scenarios within a long period of time, often well beyond one century. At times in history the world of ideas is perfectly sound and the paradigm in their basis is fully legitimized. But at other times ideas are constructed from a will to change the paradigm, and the old ideas become obsolete whereas the new ones have not become established yet. Those are moments of change of paradigm, of contradiction and reformulation; those times are confusing, conflicting and attractive, all at once: they are confusing and conflicting because the old world is not completely dead yet, whereas the new one is not fully born; and they are

1 HUGO, V. *Les Misérables* (1862); vol. IV, bk. VI, ch. 2.
2 KEYNES, J.M. *The General Theory of Employment, Interest and Money* (1936); ch. 24.

attractive because they allow for our own reformulation, for the creation of new ideas and the rethinking of the scale of values needed to examine them. The rebuilding of hegemonies, as Gramsci put it.

We are in an era of change of paradigm: we have abandoned modernity, which accompanied us throughout the 20th century, and in which the idea of limit, equaling finiteness, did not exist. Everything was limitless back then: through the idea that space was endless, low-density urban developments were possible; the atmosphere was considered infinite, and for this reason CO_2 could be endlessly poured into it; and fossil energies were deemed inexhaustible. And these are only a few examples thereof. Now Humanity cannot be thought without the idea of finiteness: everything has a limit, a capacity that cannot be exceeded. And it is from this point of view that the idea of sustainability, the one accompanying the 21st century, is formulated.

The old world is not completely dead yet; the new one is not fully born

The critical voices of the 60s and the 70s had already begun to sense that limitless growth could not be sustained in the long term. Thus, they timidly started to introduce some critical reasoning about the developmentalist model hegemonic back then. They focused their criticism mainly on the consequences of the consumption of non-renewable energies as well as on the interaction of economic development and natural elements. This line of thought had found its foundational document in the work *Silent Spring*, by Rachel Carson (1962), which cast doubts on the indiscriminate use of pesticides and its repercussions on the environment. Some authors, e.g. Voight (1969) and Wolman (1965), and even the very United Nations Conference held in Stockholm in 1972, demonstrated that our planet is a closed system and that any factor, be it local or regional, has global environmental effects. From a more urban perspective, Jane Jacobs, in her work *The Death and Life of Great American Cities* (1961), condemned, in the early 60s, the extensive, functional and fragmented urban model that was hegemonic at that time, and defended proximity, public space and neighborhood relationships in the city as urban values to be preserved. All of these authors, though they cannot be fully incorporated into the paradigm of sustainability yet, already point out the difficulties that modernity implies regarding the environment, both natural and urban; simultaneously, and well ahead of their time (and this is where their merit lies), they show the way the future will have to follow.

The paradigm of sustainability, not only as an academic issue but as a political goal in the European agenda, does not emerge in full force until the end of the 20th century. Starting with the Brundtland Report (1987) and the Rio Summit (1992), until the Treaty of Amsterdam (1999), sustainability appears as a new paradigm that changes the scale of values regarding the way of understanding natural, social and economic development. A paradigm, a set of coherent ideas, occupying a transversal position and affecting several spheres and human activities. Thus, the organization of cities and of metropolitan areas

–along with policies regarding mobility and transportation– is reinterpreted according to this new conceptual frame and approaches more sustainable scenarios in all of its three dimensions: environmental, economic and social.

The change of paradigm in the field of mobility, transportation and territory

The daily mobility of people is a growing, complex phenomenon which encompasses different analytical dimensions, and which is lately undergoing a deep methodological and conceptual revision affecting academic works as well as public policies regarding urban spaces.

The backbone of this transformation is the shift of the subject of study, from transport to the people using them; there has also been, though, some influence from the changes that the territorial and socioeconomic structure of the late 20th century has undergone, as well as from the introduction of the new paradigm of sustainability. Because of all of that, the social and environmental impacts of the means of transport are underlined: those impacts consist in the use of non-renewable energies (mainly from fossil sources), in noise and air pollution, and in the amplification of climate change. Throughout the 20th century, almost until its very end, the subject of analysis was limited to a means of transport, the private vehicle, which was perceived as the hegemonic one and, in some places, as the only one. For this reason, it all used to come down to an issue of traffic and road capacity. Those were times when cities like Detroit succeeded as urban and economic models, and in which functionalism constituted the conceptual basis of planning, both for cities and for metropolitan areas. Said functionalism proposed cities planned in terms of zoning, so that in each place only one activity could be located, and so that each activity could occupy only one place. Since people were compelled to travel from one activity to another by private vehicle, this planning needed a high-capacity road network. As a result of it all, great amounts of public funds were invested in the building of huge highway networks, conceived for the circulation of thousands of cars; downtowns were abandoned, whereas low-density, suburban peripheries, which eventually became the daily landscape of much of the population, appeared; finally, the environmental and social costs of mobility rose, especially in terms of time of displacement.

But at the end of the 20th century and, especially, at the beginning of the 21st century, the studies on transport undertake a process of theoretical renovation, through the inclusion of social sciences and of territorial and urban studies, which once again (re)conceptualize the displacements of the population. In this new frame, the subjects are the people who move, and the means of transportation become the instruments that allow an increase in the speeds of travel. Besides, along with the mechanical means of transportation, the active ones are also considered: for the first time, cycling and walking acquire the

analytical category of means of transportation which can be compared to the public and private means, i.e., to the mechanical ones.

Furthermore, the impacts generated by the mechanical means of transportation, especially by the private ones, become apparent. In the environmental sphere such impacts refer to the use of non-renewable energy sources (mainly the fossil ones), as well as to noise and air pollution, and to the factors that provoke climate change. On the other side, in the social sphere, the impacts are related to social exclusion as well as to time of displacement: exclusion refers to the levels of accessibility that the individuals enjoy regarding their ability to arrive to the places where their daily activities are located, an individual characteristic which relates to the proposal expressed by Henri Lefebvre in his work *Le droit à la ville* (1968). Regarding time of displacement, it is assessed as a social cost of mobility inasmuch daily time is a (really) finite social capital, and time spent in travelling must be subtracted from other activities.

Another change that has taken place in recent years has been the incorporation of a dialectical, congruent methodology that has replaced the more traditional, causal one. Since the 19th century, the analyses that tried to study transport infrastructures as territorial elements were accompanied by the paradigm of causality. This approach grew stronger from the 50s onwards, when social sciences adopted the neopositivist logic characterized by the will to formulate universal, empirically generalizable laws, through mathematical explanatory models that used, exclusively, the elements that allowed for an objective knowledge about reality. Scientific laws were formulated as mere empirical regularities, depending on a certain amount of observations, where causality was a natural relationship of factors. In this context the consequences of the implementation of transportation infrastructures on certain spaces were deemed mechanical (and, as such, repetitive and predictable) derivatives. Technology and cost were the variables that supported said causal relationship. Technological progress was also the explanation for urban structures, and the principle of least cost was the link connecting transportation and territory.

Nevertheless, in more recent years, the link between transportation and territory has been addressed from a more holistic, interactive perspective, focusing on the connections and relationships between their different parts. Nowadays, proposals exist for transportation to be analyzed within a socioeconomic frame which, when employed, makes them become efficient or inefficient according to the priorities and conflicts that arise. This theoretical approach also implies understanding the rhythm and the cadence which impose all dynamics taking place in territorial coordinates. For such reason, the territorial dimension of transportation cannot be understood without entering a process that deploys itself over time, even though in this case time does not have a linear sense, as in a series of sequences, one after the other, where new conditions just join the existing ones; on the contrary, now a set of processes, with unequal rhythms and with time mismatches, must

be analyzed. Therefore, a vast time frame must be considered, not to fragment dynamics which, stretching over time, make actually part of a single dialectical process.

In this context, the needed progress of the new culture of mobility must be based on the thorough knowledge of the characteristics of the citizens' displacements and, along with them, of the use of the means of transportation and of territorial dynamics, for daily travels have an individual dimension as well as, especially, a collective one. The daily displacements of the population have their roots in individual decisions, made according to the possibilities and capabilities every one of us has in our reach. These capabilities must be understood, following Martha Nussbaum's definition,[3] as the set of functioning ways that are feasible for a person, as long as they can choose, and that more often than not depend on the collective to whom each individual belongs. Thus, every person has the capability of choosing their daily displacement model –means of transportation, schedule, route, times...–, but said model is determined by the characteristics of the collectives where the person is placed: gender, age, income or cultural level, among others. Therefore, the possibilities are unequal when it comes to moving, and they depend both on the individual characteristics and on the ones of the collective where the individual dwells. These inequalities are the ones that determine the accessibility levels to reach the workplace, leisure activities or the shops, just to mention some of them; in the end, those inequalities also determine the capability for work and for leisure, as well as the purchasing capacity, of the citizens. Thus, it becomes essential to be able to know the daily mobility of the population according to the different groups that build up the social structure, collectives that follow different patterns as a result of the place they occupy in said structure.

3 NUSSBAUM, M. "Human Capabilities, Female Human Beings", in Nussbaum, M.; Glover, J. (ed.) *Women, Culture, and Development: A Study of Human Capabilities.* Oxford: Clarendon Press, 1996.

Reencounter with place and new territoriality

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In this first session of the series Catalunya Futur Verd, which Xavier Baulies has so skillfully and carefully designed, we are asked, among others, a really specific question: "Is the vision of the city as the only feasible fate still in force, or can we expect a new, different territorial relationship between the prevailing urban phenomenon and a new 'rurality' enjoying greater prestige, diversification and creativity?"

My answer to that question is categorically affirmative, not in reference to the future, but to the present. We are already in that new territoriality, which in the question seemed to be glimpsed only as a future project. It has not become widespread, it is not obviously noticeable, but we have plenty of proof, of symptoms that allow us to affirm that we are clearly on this track: we do not know whether the track is a short or a long one, but it is evident that we are already on it. The few minutes we have been granted will allow us to expound only one of those evidences. We are talking about the emergence of a new 'neo-ruralism' based, precisely, on the vindication of a new territoriality.

The context

But first allow us a previous, more general reflection. Said new territoriality expresses itself through a new look at territory, through a reencounter with place with the help of new, inventive ways... and this as a result of a change of paradigm led chiefly by civil society itself, for which it poses no problem recognizing the importance of linking emotions to places, to landscapes and, in general, to the management of public space.

The relationship between people and places is changing in a noticeable way, and this has been clearly perceived as a result of the systemic crisis (for it is not only economic) in which, in our opinion, we still dwell. A crisis that, as time goes by, further proves to be not only an economic one, but also a crisis of values, of model of society and of ways of living. In this context a reencounter, a rediscovery of place happens. In this process, the rural world is gaining a renewed role, much more active than the one it used to play in other times.

So, what exactly is happening? Why do we often get a feeling of 'end of stage', of 'end of cycle'? Why does it look like as if a certain way of understanding and managing our surroundings, of relating to them, were coming to an end? Why do we feel a renewed need for the reinvention and reinterpretation of places? Not by chance, nor randomly, such questions nowadays arise throughout the world, in fora of all kind and condition. This is the case, e.g., of the international seminar "Curare la terra. Luoghi, pratiche, esperienze" ("Healing the land. Places, practices, experiences"), recently organized by the Fondazione Benetton Studi Ricerche in Italy. The expression "Curare la terra" ("Healing the land", with 'terra' in lower case letters, thus meaning 'land' rather than 'Earth') was the main subject of the seminar, and it referred to the set of new practices, experiences and attitudes that show that the contemporary society has a renewed disposition of mind regarding places, not only in rural spaces, but in general. The organizers were overwhelmed by the success of the sessions. Shortly after, in Bordeaux (France) another international seminar was held, with a shorter title, but closely related to the former, named: "L'appartenir" ("The fact of belonging"). In Catalonia we could also find plenty of forums and reflection spaces following this very line, like the seminar that the Landscape Observatory of Catalonia organized not long ago regarding landscape as a common good ("El paisatge com a bé comú").

From our point of view, the main reason for the interest in this matter is merely the change of paradigm, in the broadest sense of the word, which is taking place. The traditional material and ideological structures, once deemed infallible, are cracking and losing their aura of soundness and consistency. The mainstays of the hegemonic production and consumption system show crevices, and the growth model, along with reigning social values such as the prevailing rivalry and self-interest, are challenged by new attitudes towards work, natural resources, daily life spaces, and landscape. There is a desire for a more senseful life in which individuals become owners of their own destiny and of their own time, in which they eat healthier and are happier. Something is going on, something is being put in motion in cultural, social and even ethical spheres. And this 'something', the aforementioned change of paradigm, is what primarily explains the new look (more comprehensive and cross-cutting) on places and territory. Enjoying referential, often archetypal landscapes on weekends and summer holidays is no longer enough for us. What we want, now, is to interact with the landscapes of our daily lives, every day, when we commute from home to work and from work to home.

Thus, no matter how we look at it, and even admitting that the form and the intensity of the described situation may vary from country to country, from region to region, we are undoubtedly in transition towards a new scene, also in the rural world, which is no longer a silent observer and has become another protagonist in said transition.

New ‘ruralities’, new landscapes

Next, we will briefly expound the only example the time available allows: the new ‘neo-ruralism’. A new ‘neo-ruralism’ is indeed emerging, and it goes much further than the well-known “neo-rural” phenomenon once so important in much of Europe in the 70s and the 80s of the 20th century. The ‘neo-rural’ phenomenon is usually understood as (mostly) young people leaving the city and settling in the countryside, in search for an alternative life project which can be as diverse as the activities to be carried out in the countryside. The phenomenon not only has not disappeared as such but is more alive than ever. There are, though, two aspects of it to be underlined: first, it has hugely diversified and spread, both from a geographical and a sociological point of view; second, the cultural, economic and social context of the first years of the 21st century is dramatically different from the one existing thirty or forty years ago: to begin with, because of the relationship between countryside and city, and even because of the very meanings of ‘countryside’ and ‘city’, more and more blurred and interlinked. In contrast to the original ‘neo-ruralism’, currently one does not perceive a truly marked opposition between the two poles. In fact, many of the new settlers simultaneously belong to both worlds, mentally, functionally and even when it comes to socialization. They have not abandoned the ugly, unpleasant city of the 70s, but one far more pleasant, with more facilities, and offering more opportunities. They freely leave in order to deploy their life project in a different environment, without completely severing their ties with the city.

Thus, we see a unique migratory movement, one that affects the rural world and that expresses a change of territoriality, i.e. a change in the relationship existing between individuals and their biosocial environment. An answer is given not only to a model of society abstractly, but to its prevailing conception of nature, of natural resources, of landscape. Therefore, the traditional conceptions of work, land and capital cannot be applied to them mechanically, because the meaning of those conceptions is no longer the one they used to have in a traditional rural society.

The social, economic and cultural context has greatly changed in comparison to that in which the first ‘neo-rurals’ lived. The pervasiveness of the use of the internet and of new communication technologies will now make possible networking and, more notably, teleworking. Besides, new mobility networks will allow reaching any point of the territory in very little time, which will make it easier for any person to settle in a rural environment keeping their connection to the city and to everything the city offers. Although the essence of the original ‘neo-ruralism’ remains, it has incorporated new ingredients and new reasoning: now, the main aspiration is to live in a pleasant environment, in a unique landscape, enjoying to the maximum all the ‘natural’ things, which are often synonymous with ‘autochthonous’: local produce, zero miles philosophy, biological agriculture, local handicraft recovery, etc. The phenomenon now points towards environmental and territorial identity issues, as well as towards the search for quality of life as a whole. The link

between local products, landscape and territorial identity is thus reinforced, and this has made the integration of new settlers into the local society easier. That reinforcement has often resulted in their profound involvement in the territorial conflicts of the place chosen to live in, and in the attempt to solve said conflicts even running for local office: something unheard of in the original 'neo-ruralism'.

As a conclusion

Since we do not want to exceed the time we have been granted, we cannot expand further. The expounded example is only one, among a host of others, in which the questions raised by the foreword of these sessions materialize: the issue of territorial self-esteem and the desirable integration of both urban and rural ideals. We could have talked about the multiplication of alternative production and consumption circuits, too, and about an emerging actor, the 'prosumer'; about the many experiences that, as strategies of economic revitalization and cultural change, aim to recover the original character of places; about the strengthening of marginal, uninhabited areas by means of high-quality cultural projects; about the emergence of new practices of territory management from the territory itself; about new local governance models, etc. And the question of territorial self-esteem and of the desirable integration of urban and rural ideals would appear in every one of these phenomena as well.

In the concrete case that we have chosen (the new 'neo-ruralism') we can witness an almost total blurring of the old conceptual and functional borderlines between the countryside and the city, from both a sociological and a functional point of view, as well as from the perspective of collective imagination. These borderlines no longer tell us much. It is not only a matter of information technologies and mobility networks making both worlds closer than ever: the collectives, the people –the new settlers– simultaneously belong to both worlds, mentally, functionally and in terms of socialization. We are undoubtedly facing a new panorama and a new paradigm, in which the concept of "common good" (applied to territory, to place, to landscape) becomes an essential one; and its importance will be ever greater in all experiences and strategies of recuperation and re-encounter with place: they are emerging everywhere, both in urban and in rural environments, and all of them permeated with the new territoriality we have referred to.

Three mathematical metaphors at the service of the analysis of territory and urban-rural tension

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Summary

Here we will consider some physical aspects regarding space and time that can contribute to reflecting on territory. In particular, we will address three situations: the tension between aggregation and dispersion in space structuration; the tension between output and power in time and energy management; and the tension between continuity and discontinuity in the predictability of the future.

Introduction

The mathematical modeling of different situations in natural sciences, medicine, engineering and human sciences contributes more nuances than a mere qualitative vision ever could and allows a bigger predictive capability and a better organization and management of relevant data. In human sciences, the modeling of situations of social interest has been gaining momentum after the modeling, already highly developed though with dubious results –especially regarding their contribution to common good–, of economic issues. Here, we do not intend to talk about mathematical models of rural and urban worlds proper, being those the matters of reflection of the second session of this series of conferences, but rather about mathematical metaphors. In other words, we will not try to approach the details of each particular issue, but to expound some situations that, though other than the ones in discussion, can spur by analogy the reflection on space and time, matters so rich in general and so crucial in territorial analysis. We will specifically address three situations: the tension between aggregation and dispersion in space structuration; the tension between output and power in time and energy management; and the tension between continuity and discontinuity in the predictability of the future.

Tension between aggregation and dispersion in space structuration

In physics, different ways to consider space exist: the dynamism of space in general relativity, the fluctuations of space-time in the primordial quantum vacuum, and the boundary

of space in black holes' event horizon are perhaps the most extreme situations, for their striking traits, which can be reached through physical research on something apparently so obvious and transparent as space is. We must keep in mind, for instance, that the dynamism of space is responsible for the expansion of the universe, for it is not galaxies that move in reference to a pre-existing space, but rather space itself, in its own expansion, drags galaxies, almost static in reference to space; or that the alleged fluctuations of quantum space-time –not witnessed yet– could play a key role in the generation of universes, according to quantum cosmology.

Apparently, the world of cosmology falls far from the world of territory, regarding both their space and time scales as well as their inhabitants and respective dynamics. Even so, the formation and the distribution of galaxies in space illustrate, in quite a suitable manner, the basic features of a *competition between structure and homogeneity.* From the point of view of basic physics, the main issue in the structuration of any system lies in the fact that the second principle states that isolated systems tend to maximum entropy, i.e., to maximum disorder and maximum degree of amalgamation, as well as to total homogeneity. That said, how is it possible for the universe to become structured in galaxies from a homogeneous primordial gas? How is it possible for living systems –an embryo, for example– to spontaneously become structured in distinct tissues and organs? The answer is that living systems are not balanced, their action produces outwards entropy higher than the decrease of inner entropy and, far from equilibrium, many systems tend to differentiation and structuration. In general, a *competition between a differentiating element and a homogenizing one* exists in these processes. When near equilibrium, the homogenizing element wins; when away from equilibrium, the structuring one does.

The formation process of galaxies from hydrogen and helium gases homogeneously distributed throughout space is one of the fundamental issues of classic cosmology. We can see in it, somehow, a metaphor for the evolution of a population, initially disseminated throughout a certain territory, towards their aggregation in several points (villages and towns) that become bigger and bigger. This analysis is drawn from the tension between two opposing factors: a *gravitational tendency towards aggregation* (the bigger the mass the stronger its pull) and a *thermal tendency towards dispersion* (the higher the density the higher the pressure and, therefore, dispersion towards lower pressure areas takes place). The compromise between said two tendencies determines the formation process of galaxies and their rate of growth, as well as the time in which galaxies begin to form.

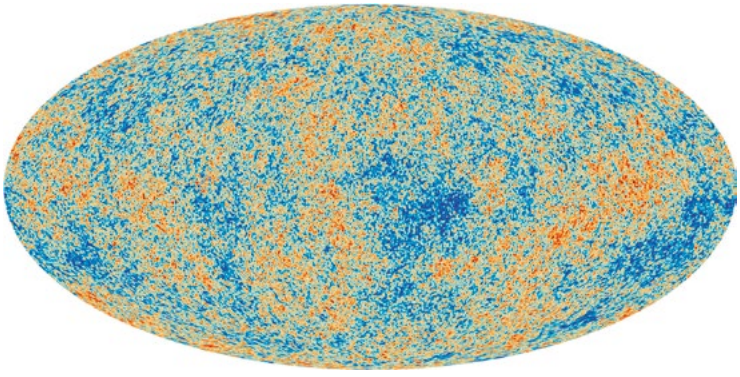

Figure 1. Appearance of the Universe at 400,000 years old. The yellowish dots are the seeds of galaxies, small areas whose density was higher than the average, around which hydrogen and helium gas progressively merged until primitive galaxies were built up; the blue areas had a low matter density, and no galaxies could be formed in them (Planck satellite, European Space Agency, 2012)

However, galaxies, like human cities, are not randomly scattered, nor regularly ordered, but rather spread along privileged lines, which in the case of cities would correspond to coastlines, rivers and major rail or road transport routes. Galaxies bind together in clusters, and in clusters of clusters, spreading along immense lines or surfaces, around large empty areas. The areas where galaxies cluster are related to the previous aggregation of dark matter, whose gravitational pull makes possible the formation of galaxies. In fact, said dark matter, which is approximately six times more abundant than ordinary matter, began aggregating in the very first minutes of existence of the universe, whereas ordinary matter could not aggregate for the first 400,000 years, because prior to that it was ionized and subject to the homogenizing pressure of electromagnetic radiation, to which dark matter is impervious.

Another instance of space structuration, though on a much lesser scale, is morphogenesis in biological development, i.e., the appearance of distinct areas, from a pool of initially identical cells, which end up building up body tissues and organs. A relatively simple modeling of such process was proposed by the renowned mathematician Alan Turing (especially notorious for his pioneering works on computers and for his contribution to decipher the secret codes of German submarines during World War II). Said modeling combines *diffusion* (transport of particles from high concentration to low concentration areas) *as a homogenization process,* and *autocatalysis* (reaction in which a particle transforms different particles into ones identical to itself) *as an aggregation process* (or one of inhomogeneity increase). As the embryo grows, different scales of organization and diverse organs occur.

Both in the cosmic and in the biological case the compromise between those two tendencies sets a certain threshold of concentrations below which homogeneity prevails and above which differentiation predominates.

The tendency of population to cluster or to scatter is an important factor in the organization of the territory. Some elements bolster the clustering, whereas others favor the scattering. Therefore, a proper identification of said factors is desirable when acting on the territory. The implementation of highways and efficient means of transport contributes to the dispersion of people, to homogeneity (at least along areas privileged with good transport routes): they can go and live far from town because they can easily access it. In contrast, the multiplicative rhythm of economy makes it grow faster in environments with a higher density of contacts and exchanges, because these elements contribute to clustering. The dream (often not fulfilled) of better work conditions or a more promising future makes people opt for migration to cities.

Tension between output and power in energy management

The time-related aspect of collective life has gradually become more preeminent as technology has progressively accelerated the rhythm of changes and increased the intensity of flows (be they of population, of goods, of information, of capital) between different territories. Daily and seasonal mobility is a concrete aspect, highly relevant for the analysis of human geography and for the management of territory and labor. The measurement of all these flows is nowadays more important than the one of classic, more static parameters, such as number of inhabitants, households, shops or factories...

The concept of sustainability is closely related to time. Indeed, any given situation is sustainable if its resource consumption is lower than the production of new resources. When consumption or expense is higher than production or profit, the stock, as well as the assets we can leave to future generations, progressively decreases. The time-related rhythm also has a direct impact on economic life: when production exceeds consumption, surpluses pile up and prices fall. The adjustment of rhythms is one of the main difficulties of biological evolution, for example the passage from prokaryotes to eukaryotes (a transition that might seem immediate but that took 1.2 billion years!), and from single-cell to multicellular organisms (a process that needed another billion years).

From the point of view of physics, an aspect of the analysis of time is the relationship between different time-based rhythms, and the consumption of energy and the production of waste each one of them implies. A straightforward illustration for it is offered by the simplified analysis of thermal machines, i.e., the ones that produce mechanical work or electricity from thermal energy. These machines have been thoroughly studied since the very beginning of the industrial revolution, in the last years of the 18th century, thanks to steam machines.

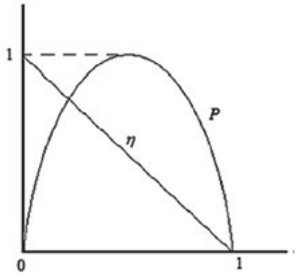

Figure 2. Output *h* and power *P* of a thermal machine (vertical axis) according to the rhythm of the cycle (horizontal axis), i.e., according to the inverse of the time the cycle takes. For really slow cycles, the output is high whereas the power is low. As the rhythm of the cycle hastens, the output decreases whereas the power increases, within a certain interval of rhythms. If the rhythm is too fast both output and power diminish

The maximum output of thermal machines is reached when their functioning is reversible (Carnot's output), but that implies zero power, for the process is very slow. In practice, finite power (i.e., the carrying out of some work in a concrete, finite time, not in an infinite one) is wanted. As we can see in Figure 2, the higher the rhythm of the machine is, the lower its output and the higher the power it produces, to a certain point (corresponding to the maximum of the P-curve in figure 2). Beyond such rhythm, the output continues to decrease, and the power diminishes again, because the loss in output exceeds the increase in velocity. If the rhythm of change is too fast, it is also negative in both output and power terms.

Thus, in the area in Figure 2 where power increases, there is *a compromise between a higher output* –a slower but more efficient functioning– *and a higher power* –a faster but less efficient functioning. The first situation makes a better use of resources and generates less waste but is slower; the second one makes a worse use of resources and generates more waste but is faster. In practice we will opt for the first or the latter depending on several factors. One of them is fuel price –if it is expensive, a better use of it will be made, with slower rhythms and higher outputs as priorities; if it is cheap, there will be a tendency to search for a higher amount of energy per unit of time, and power will be the priority. Another factor is the price at which we sell the produced work –if it is high, higher profits will be obtained if more work can be made per time unit, and therefore power will be the priority.

In fact, *nature uses both strategies* when it comes to the reproduction of species. Some species produce an abundant offspring with a poor output –few of the descendants survive–, whereas others produce a small offspring with a high output –most of the descend-

ants survive. Another instance of compromise between power and output can be found in oxidative phosphorylation, the basic process of cellular respiration, i.e., the stocking of the energy supplied by adenosine triphosphate (ATP) molecules, the energy exchange units on a molecular level. In the brown adipose tissue of hibernating animals, in winter there is no need for work, but for heat production to keep the animal within a sufficient temperature range. On the other hand, as spring arrives and the animal wakes up and returns to its usual life, no more heat will be needed, but more work, for the animal to be able to run, hunt, flee, mate, etc. This transition from maximum output to maximum power takes place thanks to some hormones that disrupt the oxidative phosphorylation process during winter. In the case of mitochondrial phosphorylation, an increase in power and a decrease in output can lead to the generation of free radicals, highly reactive molecules that attack other molecules or organelles important to cellular life. This degrades some aspects of the functioning of cells and causes them to senesce.

Tension between continuity and discontinuity in the predictability of the future

One of the difficulties in the prediction of the future is the fact that *the relations between cause and effect, besides being multifactorial, are not linear.* The dependence on several factors, some of which increase the effect whereas others reduce it, is quite a complex problem in itself. To this difficulty non-linearity is added. The latter means that the relation between cause and effect is not a straight line representing the proportionality between the increases in the cause and those in the effect, but rather curved lines that can grow in different ways in several areas, so that the relation between cause and effect varies according to the value of the cause –or of the effect. An especially complex case is that in which the curve shows discontinuities, for in such situation a small change in the cause can result in a sudden, dramatic change in the effect. This is especially remarkable when comparing the two curves in Figure 3.

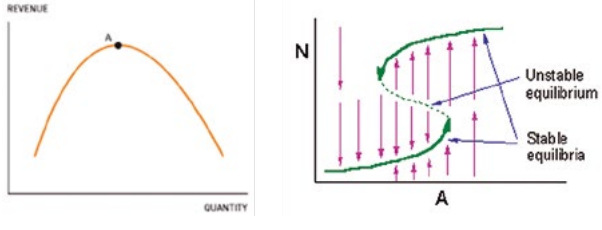

Figure 3. Some possible non-linear relations between cause (horizontal axis) and effect (vertical axis). In the curve on the left, small variations in the cause always result in small variations in the effect; on the other hand, in the curve on the right, there are some points in which a small variation in the cause results in a great and sudden change in the effect

In the curve on the left the variation is always continuous: if the cause changes little, so does the effect. If we want a function to increase but we observe that beyond a maximum it begins to decrease, we can reduce the cause and thus we obtain the maximum again. In contrast, in the second curve, a small variation in the cause in a given point causes the effect to grow suddenly. Indeed, as the cause gradually increases, so does the effect, until a certain value of the cause is reached: then a sudden increase of the effect takes place. We observe that in order to reduce the effect to a lesser value it is not enough to slightly reduce the cause, but a considerable reduction is needed, until the sudden drop of the effect takes place, as can be seen in Figure 3.

The increase of the unemployment rate according to the yearly deficit reduction imposed to the countries of the European Union could be considered a particular illustration of such behavior. The Union imposed the achievement of a less than 3% deficit in 6-7 years, instead of proposing this reduction to be achieved in 10-12 years. A slower reduction would have probably resulted in a relatively low increase of the unemployment rate; in contrast, when the yearly deficit reduction rate reached a certain value, the increase of the unemployment rate resulted much bigger.

Final comments

We have addressed two physical aspects of space and time, not widely known but relevant to the study of certain territorial issues: the first is the aggregation of elements formerly scattered throughout a given space that later cluster in a few points with abundant and dense population, leaving big, almost uninhabited areas in the initial space; the latter, related to time, implies that an increase in power necessarily results in a decrease in output. Regarding aggregation, not only has it taken place from rural to urban environments, but from poor to rich countries as well, thanks to demographic, economic and even war-related factors: in this case, the aggregation forces have been, rather than a veritable pull effect (as in the gravitational or autocatalytic factors considered in the examples in the first section of this article), a fleeing effect, i.e., a repelling one, whose dynamics are different from the ones merely related to attraction.

The time-related aspect is crucial for change. As we have stated, *sustainability is a matter of rhythms*: food, fuel or available capital consumption at the same rhythm as their respective replenishment, or slower. There are though other rhythm-related phenomena. One of them is the *fast rhythm of human migrations.* If the amount of deprived people arriving yearly to a given community is higher than the amount of people such community can reasonably accommodate (according to its housing, schooling, services and resources availability), situations of increasing tension may arise, whereas no such situations would take place if the arrival rhythm were slower.

Another de-stabilizing element is the *high rhythm of technological innovations and the social changes* they induce. If the rhythm is too high, many people can feel noticeably lost at the sight of a world that changes way faster than their capacity to comprehend and adapt. Such problem does not only affect the elderly: the youth, too, more seasoned in change, can find an intellectual and imaginative barrier that will make it difficult for them to understand and judge former times in an unbiased manner.

A way to establish an *environmental tax* based on thermodynamic theories could consist in placing a levy on the reduction of real output compared to maximum output. The second principle of thermodynamics states that such maximum output never reaches 100%, but is limited by Carnot's output, a mere 27% when working between 0 C and 100 C (the output can be enhanced if the temperature of the heat source is higher than 100 C). Thus, a levy could be placed on the output reduction compared to said value, but this would be unrealistic, for Carnot's output can be reached only when power equals zero. Taxing the output reduction compared to the output at maximum power would be a more realistic option. If we want to be stricter and favor high outputs, we can take as a reference output the mean value between Carnot's output and the output at maximum power, below which an environmental tax can be levied.

Sustainability also implies taking into consideration the natural heritage of future generations. Nonetheless environmental degradation is a common topic, whereas an uncommon one is the economic debt that our generation is leaving in order to afford not really essential installations and services which will not always be useful to future generations, the ones that will have to pay for them.

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Rethinking space

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The categories of time and space used to constitute, in their Kantian conception, the *a priori* aspects of external sensitiveness, i.e., the conditions of possibility for our sensitive perception or experience of the material world.

Nowadays, young millennials would say that the *a priori* aspects of sensitiveness are composed of a powerful geolocation system (GPS) and a 'chronolocation' system (an Apple smartwatch, let us say), both built-in in us, that help us set, position and materialize the things that we know.

Taking a look at recent philosophical literature, we could say that the interest in time dimension, the one that Kant identified also as the *a priori* aspect of internal sensitiveness, has overtaken the interest in space concerns. According to Kant this could be due to the fact that time constitutes the indispensable dimension for the perception of one's own psychical life and, as we know, the discovery of the subject and of its interior aspects has been the element that has characterized modernity. Let us mention just a few of the new works that you could find displayed in bookstore windows: Judy Wajcman, *Pressed for Time – The Acceleration of Life in Digital Capitalism*; Rüdiger Safranski, *Zeit: Was sie mit uns macht und was wir aus ihr machen*; Luciano Concheiro, *Contra el tiempo. Filosofía práctica del instante*; Graciela Speranza, *Cronografías. Arte y ficciones de un tiempo sin tiempo*; Byung-Chul Han, *Duft der Zeit. Ein philosophischer Essay zur Kunst des Verwailens*; Simon Garfield, *Timekeepers: How the World Became Obsessed with Time*.

We perhaps accept the predominance of time concerns, and it is probably justifiable. But we also realize that, if we accept the complexity of talking about space and its dialects, space concerns are on the rise, too. There are plenty of reasons for that.

Our geolocation system often fails in a world of delocations, forced displacements, migratory fluxes, fragmentation, discontinuity, unsteadiness and contexts where 'no-places', anonymous, amorphous spaces, limitless transitory places and flux spaces multiply. As Torsten Hägerstrand said, in 1970, someone travelling on a plane "is imprisoned in a narrow time-space tube without openings and he does not therefore effectively exist in the geographic locations over which he is flying". The same thought is today valid for high-speed rail lines, highways, telephone lines or networks for telematics. The prolifer-

ation of no-spaces turns us into “passengers in transit”, not into “inhabitants of places”, and we become a ‘deterritorialized’ society thanks to a new kind of space: cyberspace. ‘Deterritorialization’ is accompanied by another phenomenon, the depredation of time-space. Daniel Innerarity wrote that we are “squatters of the future” because, in order to satisfy our present consumerism, we have invaded a property belonging to future generations: the capacity of our planet to sustain and accommodate them; or that we are “colonizers of the future”: now that colonizing space is no longer possible the same way we Europeans did centuries ago mostly in American and African land, we colonize time to the point of recklessly despoiling, for our own profit, the possibility of a future life (Daniel Innerarity, *El futuro y sus enemigos: una defensa de la esperanza política*).

Therefore, we are compelled to rethink space, since –much as with the contemporary pathologies related to the experience of time– we also need to relocate ourselves in the face of a world that becomes stranger and more excessive every day, and in which we often feel the traumatic loss of the sense of place. In *The Corrosion of Character – The Personal Consequences of Work in the New Capitalism*, Richard Sennett describes quite well the way in which estrangement spread among some professionals, managers and young executives who took as their own the values of mobility, flexibility, adaptability, agility etc. and who progressively underwent job, company or country changes, to the point that they became lost, got deprived of their identity and, eventually, lost any sort of community loyalty.

The dialects of space are territory, environment, landscape, places. We need to (re)think space because we are space-located beings, but our location is in constant redefinition. Let us give an example of it: in the past, we used to think locally and to act locally; later, at the beginning of the 70s, a new slogan appeared, that of thinking globally and acting locally as a means to connect the sense of common space (the Earth) with the need of small, concrete actions in one’s own territory; further on, as a new globalization emerged, and thanks to the well-known works by Manuel Castells (on information society) or by Ulrich Beck (on globalization), a third version, supplementary to the second one, became apparent: if you act globally you need to think locally. The anchor for global navigation is the local bond. If we Argonauts of globalization do not want to lose our bearings, we must move through space using both roots and wings.

Joan Nogué is perfectly right in affirming that contemporary Catalanism has not been able to assimilate into its national rhetoric the territorial, environmental and landscape-related elements. It has been incapable of understanding that, along with language and history, territory in general and landscape in particular are also key pieces of national identity, not only from a rational point of view but from a sensory, emotional, esthetic and even spiritual one as well.

The commitment of 'twentist' Catalanism to a new territoriality compels us to rethink space in all of its dimensions: in the 'macro-' sense (as Max Scheler did in his work *Die Stellung des Menschen im Kosmos*); in the 'meso-' sense (rethinking our territory and our towns, as well as the value and the meaning of public space); and in the 'micro-' sense (improving our homes and dignifying our private spaces).

Being placed in the world will thus equal reoccupying in full conscience a physical space that becomes our existential space, our lived place, our memory place, our sacred place, our production place etc.

Space converted into territory; territory converted into landscape: this is the cultural projection of any human collective. Therefore, the material, emotional, esthetic, ecological, symbolic, historical, productive, social, axiological and spiritual dimensions get mixed up all together in space. One must be fully aware of the importance of each of these dimensions and learn to properly cultivate them.

If space interpreted as both territory and landscape is a state of mind, the questions might be: which states of mind do our vital spaces reflect when we look at them, and which states of mind would we like them to reflect?

An important initiative for the reform of time and working hours has begun in Catalonia. Would it not be necessary, maybe, a "ministry of space" as well?

The challenge that lies ahead of us is to become aware of the kind of use, administration, management, intervention or action that we want to implement in our space. The yin of our space intervention tells us about protection, conservation, preservation, planning, recuperation, order, improvement, etc.; the yang, on the other hand, reminds us of vanishing, neglect, deterioration, pollution, bleakness, fragmentation, scattering, depredation or destruction that we have exerted on our space. Therefore, the time has come for us to decide: the opportunity of the moment is ideal and propitious to establish, as in the biblical quotation, a new man and a new woman, a new time and a new land. Will we miss out on such a chance?

Renaturalizing culture

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1. Civilized versus rustic

"The countryside must be urbanized, the city must be ruralized". The sentence by Ildefons Cerdà that we recall here has its merit: it implies the search for a balance between the urban and the rural world. This balance may seem commonsense to us, but it goes against what for centuries and millennia was the main current when considering what progress meant: yearning for everything urban, abandoning everything rural.

The city was the destination. Therefore, we have praised civilization (a word from Latin *civitas*, 'city'), deemed to be fostered by the bourgeoisie (a word from Germanic *burg*, 'town'). The city lights were the lights of progress. We have often called 'cities' the utopian worlds imagined by theologians (Augustine, *The City of God*) and philosophers (Campanella, *The City of the Sun*).

In contrast, the rural world was associated with isolation and underdevelopment. There is a statement by Marx (and by Engels, though its main drafter was Marx) in *The Communist Manifesto* (published in February 1848, when Ildefons Cerdà was 32 years old) which is quite symptomatic of such association. That statement praises the bourgeoisie for having "subjected the country to the rule of the towns" and for having freed a growing number of people from "the idiocy [*Idiotismus,* in the sense of isolation and underdevelopment, and also of idiotism] of rural life":

> "The bourgeoisie has subjected the country to the rule of the towns. It has created enormous cities, has greatly increased the urban population as compared with the rural, and has thus rescued a considerable part of the population from the idiocy of rural life. Just as it has made the country dependent on the towns, so it has made barbarian and semi-barbarian countries dependent on the civilized ones, nations of peasants on nations of bourgeois, the East on the West."[1]

1 MARX, K.; ENGELS, F. *Manifest der Kommunistischen Partei*, I: "Die Bourgeoisie hat das Land der Herrschaft der Stadt unterworfen. Sie hat enorme Städte geschaffen, sie hat die Zahl der städtischen Bevölkerung gegenüber der ländlichen in hohem Grade vermehrt und so einen bedeutenden Teil der Bevölkerung dem Idiotismus des Landlebens entrissen. Wie sie das Land von der Stadt, hat sie die barbarischen und halbbarbarischen Länder von den zivilisierten, die Bauernvölker von den Bourgeoisvölkern, den Orient vom Okzident abhängig gemacht." The Greek word ἰδιώτης originally meant 'private, particular' (*cf. idiolect, idiosyncrasy*).

All of this seemed praiseworthy to Marx, and to most of his 'civilized' contemporaries. We could find loads of examples, even earlier ones: in the Catalan case, in the second half of the 15th century, a treatise on the correct use of language bore the title *Regles de esquivar vocables o mots grossers o pagesívols [Rules to avoid foul or farmer-like terms or words].*[2]

Thus, as far back as in the 15th century, *foul* and *farmer-like* were already practically deemed to be synonyms!

The city was the future, the country was the past. And we had to progress towards the future. The future that we face now, though, is not the one we had dreamt of. If inertia doesn't prevent us to be coherent, we must reconsider our view of history, of being human and of the world.

2. Progress and denaturalization

The contempt for the rural world is part of a more general behavior: the contempt for nature. Since many centuries ago, in the West –and nowadays practically throughout the globalized world– progress has been considered to mean, basically, moving away from nature's rhythms and elements towards an increasingly technological and artificial world. In other words, progress has been understood as denaturalization. This model of progress tends to make everything more and more:

- Delocalized, global (ignoring the spatial context, places);
- 'De-seasonalized', 24/7 (ignoring the temporal context);
- Abstract (ignoring what is concrete and qualitative);
- Artificial (ignoring what is natural, in the sense of spontaneous, *sponte sua*).

Commerce, human relations and, in general, all aspects of experience and existence have been progressively drifting towards this model based on delocalization, 'de-temporalization', abstraction and artificiality. This has had some advantages, obvious to us all, but it has also had some disadvantages, not so obvious because the collective focus of attention is elsewhere.

The first meaning the dictionary gives for the Catalan word *desnaturalitzar,* 'denaturalize', is "to deeply alter (something) causing it to lose its characteristic, essential features", not

2 The text can be found in the Chapter Archive of Girona. It was published by Antoni Badia i Margarit in *Butlletí de la Reial Acadèmia de Bones Lletres de Barcelona,* Nº. 23, 1950; pp. 137-152. As a curious fact, it reprehends as 'foul or rustic' the periphrastic past tense, perfectly common in contemporary Catalan, advising "to avoid [...] 'vaig anar' and 'vaig venir' instead of 'aní' e 'vengui', and similar".

in order to improve it, but to corrupt it. Could it be said that this is what is being done to nature, and to human nature? Progress as denaturalization is beginning to reveal itself as a false and empty utopia, like the eternal spring of plastic flowers.

3. Hyperurbanization and isolation

A century and a half ago, Cerdà asked for the countryside to be urbanized and for the city to be ruralized. The countryside has, surely, been urbanized: asphalt, electrification and acceleration have reached rural areas, and from them today it is possible to enjoy almost immediately many of the perks of urban life, such as communication with all kinds of people or access to documents previously found only in big city libraries.

But, has the city been ruralized? No, the city has become even more urban, has been hyperubanized. In fact, mid-19th century Barcelona, with a population of about 200,000 inhabitants, was obviously urban, at least in demographic and historical terms. However, if we could visit it and experience its way of life, we would deem it phenomenologically closer to what today is considered rural life, rather than to urban life: it would appear to us as a dense rural agglomeration; everything traditionally associated with urban life can more easily be found in the Catalan counties (*comarques*) of Pallars or Priorat of the second decade of the 21st century than in mid-19th century Barcelona.

And this is not what Cerdà asked for.

In his foreword Minister Rull told us about the "swirl of immediacy" that pushes us nowadays. The acceleration of the rhythm of life implied by urbanization is beginning to become a problem rather than an asset. And we can see that the isolation and the idiotism formerly associated with rural life do not belong any longer to a geographical space, but rather to some digital spaces (more inherent to urbanization than to rural areas). The city still boasts lots of values, but attention to the problems generated by hyperurbanization must be paid: there is a point when city lights dazzle or create dark shadows. Studies published in distinguished Medicine and Psychiatry journals show a correlation, not attributable to other factors, between the level of urbanization and the occurrence of a number of mental disorders.[3]

3 See for instance VAN OS, J. "Does the urban environment cause psychosis?", in *The British Journal of Psychiatry*, Nº. 184, 2004; pp. 287-288. Also, VAN OS, J.; KAPUR, S. "Schizophrenia", in *The Lancet*, Nº. 374, 22 August 2009; pp. 635-645. From a revision of epidemiological literature, it emanates that "the risk of schizophrenia and related categories increases linearly with the extent to which the environment in which children grow up is urbanized" (p. 637).

4. Unsustainability and blind alley

The metabolism of contemporary urban agglomerations is far from sustainable, for instance when it comes to food, water and energy transportation.[4] However, after all, what turns out to be unsustainable is the whole paradigm under which urbanization has grown: the paradigm of progress as denaturalization, delocalization, 'de-temporalization', abstraction and artificialization.

Now that we are getting closer to it, the horizon of progress as denaturalization no longer appears as it used to when seen from afar, as from the thought of Descartes, of the Age of Enlightenment, of Kant, Hegel, or Marx. It has cracks and fog, and some are warning that a tempest is building up there.

Since the mid-20th century an unprecedented acceleration of all kinds of human activities has been taking place, as shown by an independent scientific organization, the International Geosphere-Biosphere Programme (IGBP).[5] In 2016, a report by Oxfam International reported that "the global inequality crisis is reaching new extremes" and that "the richest 1% now have more wealth than the rest of the world combined".[6] In January 2017, the *Bulletin of the Atomic Scientists* set the hands of its symbolic doomsday clock only two minutes and a half to a global catastrophe, to indicate that since the worst moments of the Cold War the world has never been this threatened, and it has been set to only 100 seconds from midnight in January 2020.[7] *The Global Risks Report 2017* published by World Economic Forum does not appear to be any more optimistic, either.[8]

45 years after the report *Limits to Growth* was published for the Club of Rome, it can be said that the predictions of the report have not come true in their details, but they

4 On the energy metabolism of Barcelona, see COTARELO, P. *El metabolisme energètic de Barcelona.* Barcelona, Observatori del Deute en la Globalització, 2015. (You can access it online at https://odg.cat/wp-content/uploads/2015/12/metabolisme_barcelona_esp_v2.pdf)

5 "The second half of the 20th century is unique in the history of human existence. Many human activities reached take-off points sometime in the 20th century and sharply accelerated towards the end of the century." The International Geosphere-Biosphere Programme has produced two dozen graphs to prove it: the first dozen shows the acceleration of socio-economic trends (world population, urban population, use of primary energy, use of fertilizers, use of water, production of paper, transportation, telecommunication, and tourism, among others), whereas the second dozen shows the acceleration of impacts on biosphere (concentration of carbon dioxide, methane, nitrous oxide and tropospheric ozone; ocean acidification; capture of fish; shrimp aquaculture; nitrogen in coastal waters; land use; loss of tropical forests; Earth-surface temperature; and biosphere degradation). (You can access it online at http://www.igbp.net/globalchange/greatacceleration.4.1b8ae20512db692f2a680001630.html) See also STEFFEN, W. *et al.* "The trajectory of the Anthropocene: The Great Acceleration", in *The Anthropocene Review,* March 2015.

6 "The global inequality crisis is reaching new extremes. The richest 1% now have more wealth than the rest of the world combined." This Oxfam International report, *An Economy for the 1%* (2016), collects data from Crédit Suisse and determines that "the gap between the richest and the rest" is growing.

7 You can access it at https://thebulletin.org/timeline.

8 You can access it at https://www.weforum.org/reports/the-global-risks-report-2017

have come true in their general meaning.[9] The encyclical *Laudato si' [Praise Be to You]*, published in 2015 by Pope Francis, invites us to adopt a broader vision of reality (§ 112, 138, 141, 159), a difficult task in a world where the temptations of diversion and (self-) deception are growing more and more powerful.[10] If we look at reality with honesty, we will have to acknowledge that "our contemporary lifestyle, unsustainable as it is, can only precipitate catastrophes" (*ibid*., § 161). The world today is clearly unsustainable, and what is unsustainable cannot be sustained: it can stand up for some time, in an increasingly difficult balance (our current situation), but it shall eventually collapse.

That horizon has turned into a blind alley. We must take another direction.

5. Flowing with natural processes as a model for rural management

In biology, the words *renaturalization* or *rewilding* (*renaturalització, Renaturierung*) have now become commonplace. For instance, on 24 April 2015, the Catalan Institution of Natural History held a session on the *renaturalització* of habitats, defining[11] this word as "a new management model that must flow with natural processes". Management according to natural dynamics is ecologically and economically more efficient than the two extremes in comparison to which it constitutes a middle way: management against natural processes (as practiced in the last centuries) and lack of management (abandoning natural spaces to themselves).

In Catalonia, some renaturalization processes are already taking place, though they started in an unplanned manner and must be managed somehow. Some examples of these processes are the boar population increase, the return of the wolf (on its own initiative, from Italy, crossing all kinds of road and railway infrastructures), and the spread of woods and scrublands, as a result of the decline of farming and grazing activities due to changes in agricultural practices and policies.

About two thirds of the Catalan territory are currently considered forest area. This increase in forest area is concurrent with a higher aridity and fire risk due to the growing climate chaos. There is a need for policies that protect biodiversity and agrobiodiversity in our country while enhancing its renaturalization, eradicating invasive species and managing the overabundance of socially problematic species (if necessary).

9 TURNER, G. "Is Global Collapse Imminent?", in *MSSI Research Paper*, Nº. 4. Melbourne: Melbourne Sustainable Society Institute, University of Melbourne, 2014. This update of the forecasts of *Limits to Growth* concludes, for instance: "Diminishing *per capita* supply of services and food causes a rise in the death rate from about 2020 (and a somewhat lower rise in the birth rate, due to reduced birth control options). The global population therefore falls, at about half a billion per decade, starting at about 2030. Following the collapse, […] average living standards for the aggregate population (material wealth, food and services *per capita* basically reflecting OECD-type conditions) resemble those of the early 20th century." (pp. 5-6).

10 PIGEM, J. Àngels i robots: La *interioritat humana en la societat hipertecnològica* (XXV Joan Maragall Award). Barcelona: Viena Edicions, 2017.

11 You can access it at http://ichn.iec.cat/pdf/Renaturalitzacio_resum_final.pdf.

When realizing the scale of our impact on the biosphere, we could think that our intervention in ecosystems should be reduced to the bare minimum. Nonetheless, not only are human beings a constitutive part of the biosphere, but there is increasing evidence of the mutually beneficial coevolution between human communities and the natural spaces they inhabit. We are not mere spectators, but co-authors of the landscapes that we contemplate and that shelter us. This is valid, obviously, for the agriculture and forest patchwork of many typically Catalan landscapes; but also, for natural spaces that might seem more distant from any human intervention. A thoroughly documented study published in *Science* in 2017 shows that indigenous communities have been having an influence on the Amazonian flora since at least 8,000 years ago, caring for some kinds of trees and plants in their original location and helping them to spread to other areas. This conclusively rebuts the idea that the pre-Columbian Amazonia was a natural space almost untouched by human beings.[12] They were, though, human beings who had learnt to flow with natural processes.

6. Renaturalizing knowledge, experience, and action

Flowing with natural processes (*renaturalization* as defined above) is not something that must be limited to biology or to the management of natural spaces. Since some decades ago, a major shift in our perception of nature is taking place. Descartes' view, asking for us to become masters and possessors of nature,[13] could hardly be held today. This shift is still far from being able to counter the destructive dynamics we have inherited, but it does keep growing. Although most economists still speak as if the economy was independent from the biosphere and only had to do with the abstract fiction of *Homo* œconomicus, there is an increasing acknowledgement of what is called *natural capital* and *ecosystem services*: this might be the first step towards the understanding that the economy is a subsidiary of the biosphere, without which it would have no air, no water, no life.[14]

The advancement of knowledge also shows that, for instance, photosynthesis is incomparably more efficient than our photovoltaic energy.[15] Have we ever invented anything more efficient than a tree? A tree produces oxygen, absorbs carbon dioxide, fixes nitrogen, generates complex carbohydrates, distills water, produces timber, harvests solar energy with an extraordinary efficiency, becomes a changing and polychromous sculpture, creates a microclimate, creates itself, and reproduces in countless variations. The prodigious architecture of Antoni Gaudí takes inspiration from the shapes of trees (as in

12 LEVIS, C. *et al.* "Persistent effects of pre-Columbian plant domestication on Amazonian forest composition", in *Science*, Nº. 355, 3 March 2017; pp. 925-931. There we can read: "[...] modern tree communities in Amazonia are structured to an important extent by a long history of plant domestication by Amazonian peoples." (p. 925); "In Amazonia, plant domestication started earlier than 8000 B.P." (p. 925); "Detecting the widespread effect of ancient societies in modern forests […] strongly refutes ideas of Amazonian forests being untouched by man." (p. 931).

13 DESCARTES, R. *Discourse de la Méthode* (1637), VI: "[...] nous rendre comme maîtres et possesseurs de la nature."

14 PIGEM, J. "L'economia, filial de la biosfera", in Pigem, J. *Bona crisi: Cap a un món postmaterialista*. Badalona: Ara, 2009.

15 BALL, P. "The dawn of quantum biology", in *Nature*, Nº. 474, 16 June 2011; pp. 272-274.

the columns of the Sagrada Família) and from those of sea creatures (as in many details of the Casa Batlló). In 1997, the discipline of Biomimetics was born, aiming to learn from nature in order to devise more efficient and livelier materials, processes and structures.[16]

Nevertheless, this cultural renaturalization process has an even broader scope. It is linked to a renaturalization of our perception about who we are and what is our place in the world. It implies for example:

- The rediscovery of the places that shelter our existence (the Catalan word *país,* 'country' is related to Latin *pagus*, 'rural environment'; and a major part of what constitutes a *país* are its *paisatges*, 'landscapes', as in this country of ours, stretching between the Pyrenees and the Mediterranean);
- The acknowledgement of the biodiversity we live with;
- Less attention to things, more attention to relations (one conclusion from twenty-five centuries of Western thought is that the world is not made up of things, but of relations);[17]
- Less attention to everything abstract, quantitative and mechanical, and more attention to everything concrete, qualitative and vital (and rural).[18]

Economic growth has turned into a mirage and a trap. We must transition from materialism to post-materialism. We must grow not in possessions, but in what makes us truly human: we must grow in awareness, knowledge, creativity, sensitivity, wisdom.

If we leave behind the "swirl of immediacy" of today's world, accelerated on the outside, empty on the inside, and we reach a lucid maturity, we can learn to live in a sensible manner –which would surely include learning from Nature. Let us end with a sentence by the Catalan poet and thinker Joan Maragall, who, as his contemporary Gaudí, learnt much from Nature: "Truly, the great miracle is Nature herself; but man is still too much of a child to realize it".[19]

16 PIGEM, J. "La vida com a enginyera i artista", in Pigem, J. *Intel·ligència vital*. Barcelona: Kairós, 2016; pp. 29-33. A Biomimetic Sciences Institute has recently been established in Barcelona.
17 As explained in PIGEM, J. *La nova realitat*. Barcelona: Kairós, 2013.
18 As explained in PIGEM, J. *Intel·ligència vital*. Barcelona: Kairós, 2016.
19 MARAGALL, J. "Montserrat", in *Obres completes*. Barcelona: Selecta, 1947; p. 638. The English text given here is a free, non-literal translation thereof.

The natural revision of modern artificiality: towards a comprehensive territoriality

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Times have certainly changed and we are no longer living in what used to be defined as modernity. We do not live in modernity anymore, but many attitudes and behaviors of mankind are still, directly or indirectly, modern. The 20th century has lived, therefore, in an obsolete cultural and social model, one that, since outdated, was unsuitable for its time. Modernity was born with Galileo and Newton, basing on a model that conceives nature from a mechanistic and corpuscularistic, of corpuscles that only collide, under the umbrella of determinism (Auletta, 2004).

The rationalistic excess of the modern world, the one of Newton's and Galileo's science, has given birth to a way of seeing the world that stifles both man and nature living therein. Determinism, corpuscularianism, mechanism with which attempts to encapsulate world and reality have been made are still burdensome elements of our culture, of our way of seeing the world and interacting with it, because this model has entered the social world, especially since the positivist theories of the 19th century, and is, nowadays, a widespread model that common people, acritically and most times unwittingly, follow.

The pervasive individualism in our society, along with selfishness, scientism, and the extreme technologization of our humanity, is not it all a result of the modern model of society? Is not it all its radicalization? A scientist model, making of science the only source of knowledge and of access to the world; a radically rationalist model; a model that takes to extremes the positivization of law, with regulations becoming infinite; a model that regulates land, splitting it into urban and rural; a model that has made technology the key element in our lives.

It seems quite clear that the mechanism made us understand nature in an artificial way: everything is a construct of reason, working according to the laws of classical mechanics. The image of the big clock, of the crystal palace (in Dostoevsky's fortunate expression) only reinforces the artificial look of modernity on the world. Therefore, we can talk about

the artificialization of modernity. The reality around us, especially throughout the 20th century, has been an artificial one.

The artificial reality is one that ravenously consumes resources, gobbling them up without taking into consideration future generations, without submitting to an intergenerational ethics. This is the model that has taken us to climate change, one of the most serious threats to the survival of mankind on our planet.

The contemporary world behaves in a modern way also when, sick of the classical rationalism that encapsulates life in a crystal palace, unleashes a will deprived of references, aim or limits: a will which does not even respect the limit put by others, by those living next to us, and that even dares to trample that limit with impunity, as much of Europe's 20th century has sufficiently shown us, if we concentrate only on our part of the world: a will that revolts. Such rebellion of will only reinforces the thesis that modernity is still present among us, and that whilst we think to be living in a new world, we are still rooted in modernity, either settling for it or opposing it. When we break away from reason we cling to will, to the affirmation of our own self, to extreme individualism, the one that turns freedom into the only human absolute. That rebellion is voluntarist, not purposive but referred –as all rebellions are– to the model against which it revolts. Voluntarism, which appeared along with naturalism in the 19th century (an irrational naturalism, conceiving nature as a reason-lacking source of life; the vitalistic strength of nature, that of the heirs to Schopenhauer and Nietzsche), replaces the rationalistic image of the crystal palace with that of the self-devouring monster.

Both conformity and rebellion are valuable witnesses that we have not yet changed our way of seeing and thinking the world, and of relating to it. Undoubtedly, the 20th century is one of big wars and destruction, of oligarchic, technologic and economic totalitarianism: a century which, while trying to be post-modern, does still have strong modern roots. Behind such social conception, not comprehensively described, lies a conception of man: a conception containing the very anthropological humus from which the contemporary man is born. We are sons of modernity and we still live (outdatedly) according to this model, which can be compared to that of the ideal gases: modernity conceives the human being as an ideal gas, that set of particles referred only to themselves which, at the very most, collide from time to time, without interfering in the least, without entering into relation with each other. This model is at the basis of the growing individualism of our society, of the selfish and egocentric individualism so many of our fellow citizens are living in. A model of self-reference: the man without an aim, without references, living in absolute freedom, i.e., without any reference beyond themselves, deciding what is good for themselves, regardless of the others and of the world.

There is an answer to the 'twentist' model and to the cultural problem of the 20th century which the 21st century provides us with: transhumanism. This response, in my opinion,

only stretches to the maximum, to the extreme, the modern traits of the 20th century: it radicalizes everything that the 20th century inherited from modernity and takes it as far as to want to change what is human (therefore the use of the prefix *trans*-). With transhumanism, artificialization reaches its limits: the artificialization of man produces a robot, a transhuman, something that is no longer human, for it is 'trans-'.

In fact, transhumanism basically proposes three ways of overcoming what is human: the first one is longevity; the second one, mental agility; and the last one, elimination of suffering (Cortina & Serra, 2016). In other words, transhumanism proposes making us immortal (infinitely long-lived); provide us with infinite computing power and data processing capacity (a super powerful reason); and wants pain to completely disappear from our lives. Such are the proposals to overcome what is human. Nonetheless, does the fact that we are beings in growth, in evolution, yearning for improvement, mean that we necessarily must overcome what is human? Is this a logical consequence? Far from that, such inference rather reveals an ideological vision of man, one that, as all ideologies do, proposes from its final goal some veritable premises, then distorts them in a subtle manner, and makes them conclude what was proposed (read: imposed) from the very beginning.

A great number of scientists, especially from the Anglo-Saxon world, are working in many research centers on the achievement of these goals through the use of new technologies, biological and molecular engineering, and robotics, as well as the incorporation to the human body of nanosystems and nanoelements able to control all of our life data and, therefore, all of our life. This artificialization of human life will reach a singularity, a point of no return, where the long-waited overcoming of man will be achieved. "According to the transhumanist movement, that singularity will be an event that will take place in a few years from now, with an impressive advance of technological progress thanks to the development of artificial intelligence and the convergence of NBIC technologies (nanotechnology, biotechnology, information and communication technologies, and neurocognitive technology)." (Cortina & Serra, 2016).

It is not difficult to realize that this technology, besides destroying man, takes the essential traits of modernity to the extreme. The reason in rationalism is in itself a geometrical, calculating reason, to the extent that whatever is not known by reason does not even exist. In perfect harmony with this vision, transhumanism proposes the achievement of an infinitely powerful calculating reason, a reason that enhances to infinity its own reduction to mere computation, taking artificial intelligence and supercomputers as its functional models. The immortality proposed by transhumanism is that of the perpetuation of our own will, the absolutization of our self-assertion, i.e., of our self-reference. Therefore, this conception of immortality brings along the elimination of suffering and the utmost impassibility: is not this one the logical consequence of absolute self-reference? Self-reference entails lack of relationship (Savarese, 2014), and without relationship, without relation-

ships, how could suffering ever exist? In other words, impassibility comes at the (very high) price of the impossibility to build relationships.

The new, transhuman man might be an immortal being, endowed with a super powerful reason, and utterly impassible... But because of all of that, he will no longer be a man. And this is, in the end, what transhumanism proposes: the elimination of man through the generation of a new being; a being that, if it ultimately arrives, will become man's number one foe, destructor, annihilator, for the self-deified being that a transhuman can end up becoming is, after all, a being that harbors an existential hatred towards himself. The new man harbors hatred towards the limited, concrete men that all us human beings are: he is an ideal that turns away from what we are because it is unbearable for him. The new, transhuman ideal destroys everything which is genuinely human: an anthropophagous monster has been created. A society of transhumans will be a daily hell: denying themselves, they will refuse all trust in others, whose face and expression are lost as they become unnecessary. A world of transhumans will be a hell populated by wolves and monsters that, nonetheless, will not bite nor claw each other, since doing so would mean to experience contact, God forbid.

Nevertheless, there is a model that we can counterpose. It is a model that does not take inspiration from modern science –as the one expounded– but from contemporary science, i.e., from the science that was actually born in the 20th century. Here we can recall the fact that the social model of the 20th century was an outdated one because it was not adapted to the knowledge the very 20th century generated. Science in the 20th century did in fact open new ways of understanding the physical world which fall far from the traditional paradigm. We refer especially to quantum physics, born right in the beginning of the 20th century: if we had looked further into the philosophical consequences of such new way of conceiving the world, perhaps we could have averted the ravages that the model proposed by modernity caused throughout the 20th century.

Unlike classical physics, quantum physics is neither determinist nor corpuscularistic nor let alone mechanistic. It should be noted that just because of this, the vision of nature that emerges from this theory is dramatically different from the artificialization we criticize. The model that arises with the new science is one based on the interaction and, therefore, the interrelation of everything. Besides, this model proposes a new way of understanding the relationship between the global and the local, by bringing in the instant remote action (without transmission of any physical signal), and thus incorporates an organic conception of the world (Auletta, 2000). It has also generated innovative computation models that are far removed from the current ones.

Whereas physics moves away from classical mechanism, biology in the 20th century moves away from reductionism and opens up to complexity, taking life itself as the basic model of comprehension. This makes interdisciplinarity one of the most important param-

eters in the research of the 20th century: sciences do not work in a hierarchical-reductive manner anymore, as if elementary physics were able to give an account of all the phenomena of the world; rather, the model is one of interacting networks, where each area of knowledge gives account of its own perspective of study while receiving from the other areas enlightenment and new ideas that assist in the research. In short, science in the 20th century, without abandoning rationality, does not confine itself to the reductionism of scientism and to deductive, pre-constructed mental frameworks, but rather mirrors itself in the absolute richness of reality, which gets said richness from its complexity. Science in the 20th century lives on the appeal of nature's intelligibility and on the amazement over the phenomenon we call life.

If such is science in the 20th century, why have we been living, why do we still live taking former scientific models as a basis? Why do we live in an outdated way?

New science suggests a new model of thought, a new comprehension of the world, right on the polar opposite of the conceptual bases that have created the modern artificialization of the world. This new model of thought can offer new elements to think our social and cultural models in a renewed manner, more in accordance with interaction, network, complexity and reality levels; models that should always emerge from the deep knowledge of the functioning of nature, natural cycles and life; that should also respect the resources and their finiteness, as well as biodiversity; models that should generate and ensure a renewed territorial balance: in short, not gobbling up models, but models that can integrate everything society is composed of, like the 'twentist' model.

What will that new territorial balance look like? In order to be based on new models, resulting of a new science, it will have to allow a constant interaction between the rural and the urban world, avoiding the division which modern artificialization has caused; it will also have to allow a constant transmission of goods, which belong to us all (the ones living now, the ones yet to come); it will have to integrate both aspects, rural and urban, in both settings: cities integrated into nature, and sustainable, environmentally friendly rural development. In sum, a balance that ultimately helps regenerate, from its very roots, the relationship between man and nature, facilitating the development in the form of landscapes or microcosm, always at a human scale and in optimal relation to the surrounding environment.

Talking about human scale implies talking about limits. Transhumanism profits from the yearning for improvement within every person and offers its proposal for a new humanity overcoming all limits. Yearning for growth and for improvement: these are deeply human, for everything human is in itself limited and for that very reason it can grow and, properly understood, it even must grow. As a personal, relational and open being, a man is forced

to abandon self-reference, to open up, and to grow: this is the exact opposite of the transhumanist proposal, trying to freeze man into self-reference.

The limit is not an obstacle, rather the opposite: it makes a starting point for actual growth, the one integrating all human capabilities and dimensions. From this point of view, there is a way of improvement that constitutes an alternative to transhumanism: a comprehensive human improvement which, based on new sciences and new methods of study of nature, bolsters everything that human nature as a whole, not only in its material dimension, can achieve, without perverting it. An example to follow is regenerative medicine, which can rival on equal terms (and with far less lethal consequences for the human race) all the research on bionic, intelligent and robotic prostheses. Preventive medicine, as well as the research on the boost through nutrition of natural physiological processes that can stop ageing and cell necrosis, are instances that we can counterpose with genetic manipulation. These are just a pair of examples to understand that the new model does not go against social and human development and improvement but enhances an improvement that is comprehensive in itself.

Moreover, a social and cultural model based on interaction, relation and integration is intended to run on the common good and talking about the common good makes no sense if not in relation to people. Therefore, this new model cannot be a dehumanizing one (as individualist modernity and transhumanist proposals are), for it has in its center the human being, the human manner of being a person, namely the relational being and his ability to create a history, to live a fully human time, i.e., to live a present that is not self-referential but rooted in the past and hopeful for the future. Thus, talking about the common good equals talking about the very possibility of man to become the aware, responsible author of his own history, in which resorting to cultural and socio-political institutions makes full sense (Savarese, 2014). Common good generates a social order with specific roles which help achieve the proposed good, accepted as beneficial to all. The orderly structure generated ingrains itself into society by nature, for it is a common thing. It integrates, it does not exclude nor dilute. Such is the essential structure of common good. In this structure the subsidiarity principle rules, because in order to reach the common good each structural component must meet its own inescapable responsibility, while helping when necessary more impaired components to render their personal contribution to the good of all (Savarese, 2014).

Thus, the 20th century is hiding a treasure for the 21st century: if we make use of it, it will allow us to live with hope and intensity, like men and women, without dehumanizing or distorting ourselves, in full harmony and integration with our surroundings, our environment and our territory.

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2nd WORKING DAY

Towards a new development model based on environmental efficiency

(Biophysical bases)

Program

2nd WORKING DAY

Towards a new development model based on environmental efficiency (Biophysical bases)

Date: April 26th 2017

Place: La Pedrera
Passeig de Gràcia, 92 Barcelona

Where are we? What are the driving forces generating new opportunities and conditions that can enable more progress and simultaneously a higher degree of environmental, economic and social resilience? What are the risk thresholds we can assume in order to define an intervention space in favor of a sustainable development?

Elements such as energy, water, food security, and the use of our own resources along with the circularity of materials and waste constitute the pillars that build up every development model; they are also its limiting factors. At the same time, current society becomes more and more aware of the fact that progress is not such if it puts at risk three essential values: social cohesiveness, people's quality of life, and the preservation and improvement of biodiversity.

What are the likely scenarios regarding water, energy and food availability? How much of them will be needed taking into account demographic trends? How will we be able to obtain these resources? From an anthropological, demographic and climate-related perspective, what will we do? How many of us will there be? How will we be distributed? How will we move? What will our living conditions be?

Inauguration
Marta Subirà. Secretary of Environment and Sustainability

Session 1: Limits and cycles

Agriculture competitiveness and sustainability: the different hues of green
Montserrat Viladrich i Grau, economist. Professor of Business Administration and Economic Management of Natural Resources at the University of Lleida (UdL)
Improvement or mirage. Towards a life-cycle perspective
Pere Fullana i Palmer, engineer from the Chemical Institute of Sarrià (IQS). Director of the UNESCO Chair in Life Cycle and Climate Change of the School of International Studies – Pompeu Fabra University (ESCI-UPF)
New paradigms of water management in the 21st century
Lluís Sala i Genoher, biologist. Head of Water Supply and Reuse in Costa Brava Consortium
Debate
Josep Maria Tost (rapporteur/moderator), Director of the Waste Agency of Catalonia

Session 2: Networks and self-sufficiency

Access to digital meter data by the consumer: a necessary step towards energy transition and the digitalization of the power sector
Pep Salas, agricultural engineer, PhD from the Polytechnic University of Catalonia (UPC), Head of Smartgrid.cat
The electric storage vector and the territory reaction regarding energy transition
Montserrat Mata Dumenjó, PhD in Engineering. President of Emelcat SCCL
Networks, ecosystems and creativity: towards new proactive models of advanced sustainable development
Manuel Gausa Navarro, architect. Chair Professor at the Architecture School of the Università degli Studi of Genoa (UDIGE)
Debate
Assumpta Farran (rapporteur/moderator), Director of the Energy Institute of Catalonia

Session 3: Vulnerability and resilience

Vulnerability and rural world: diagnosis and drivers of change
Lourdes Viladomiu Canela, economist. Professor at the Department of Applied Economics. Research Group on Rural
Development at Barcelona's Autonomous University (DRUAB)

Water, energy and climate change: a global vision with a Catalan accent
Carles Ibáñez Martí, biologist. Head of the Aquatic Ecosystems Program of the Agri-food Research and Technology
Institute (Institut de Recerca i Tecnologies Agroalimentàries, IRTA)
Health as a driver for change: from a grey city to a green one
Jordi Sunyer, physician. Chair Professor of Preventive Medicine and Public Health at Pompeu Fabra University (UPF). Researcher at Barcelona Institute for Global Health (ISGlobal)
Debate
Mercè Rius (rapporteur/moderator), Director-General of Environmental Quality and Climate Change

Work group

2nd WORKING DAY

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Agriculture competitiveness and sustainability: the different hues of green

Montserrat Viladrich i Grau
Economist. Professor of Business Administration and Economic Management of Natural Resources at the University of Lleida (UdL)

Introduction

Today the world food system is facing a number of important challenges, among which the need to ensure sufficient food for everyone must be highlighted. Not only will food have to be sufficient, but healthy as well. The achievement of this goal is hindered by the great increase of the world population[1] and by changes in diet composition thanks to the improvement of people's living standards. An obstacle for the growth of food production is the allotment of agricultural lands for bioenergy, industry, and animal feeding crops. Also, the necessary adaptation of crops to alterations associated with processes such as climate change can slow down their production increase (Martín-Vide *et al.*, 2017). The response to the inescapable need to increase agricultural production cannot be at the expense of intensifying the environmental impacts of agriculture. Doing so would have devastating consequences for the preservation of habitats and soils, the sustainability of biodiversity, the conservation of natural resources such as water, and for climate change. The feasibility of making a sufficient increase of food production compatible with environmental sustainability is one of the global challenges that current society will have to face. Agricultural activities are essential for ensuring the future of mankind, but some of them are not compatible with the preservation of natural environment and biodiversity in a given territory.

The Catalan agricultural sector has always been of great economic importance, and it has helped increase our social resilience enabling the existence of an active population throughout our territory, especially in the most distant areas. Even so, at present our agricultural sector, besides facing the great global challenges mentioned above, will also have to respond to its specific social, economic, and environmental challenges. It will have to be more competitive globally, increasing its weight in the food chain; it will have to be innovative, diverse and versatile in order to easily respond to sudden changes in

1 The United Nations Department of Economic and Social Affairs foresees a global population of 9.7 billion by 2050. In order to feed this population, it is estimated that the world food production of 2050 will have to approximately double that of 2000 (see IAASTD, 2009; Pelletier & Tyedmers, 2010).

consumers' likings and preferences. Furthermore, Catalan society, like societies in every developed country, also demands the necessary increase of agricultural production not to endanger people's living standards, biodiversity conservation, or natural environment.

We are going through a historic moment that offers big technological opportunities in all spheres of society, and especially in the agricultural sector. New biotechnology products allow an improvement of production to obtain more nutritious food, with fewer production risks and with a reduced environmental impact. Innovation and new technologies such as tele detection, nanotechnology, biosensors, or precision agriculture in general, make possible an increase of production and a decrease of waste generation, as well as a reduction of the environmental impacts of agricultural activity. The Catalan agricultural sector will have to assume these innovations and respond to both local and global socioeconomic challenges, while being environmentally sustainable, too.

Is this possible? Is it feasible to make the agricultural sector's economic development compatible with environmental sustainability in our country? Are economic and social goals compatible with that of environmental sustainability? Below we will analyze how to respond to these challenges. Many possibilities remain open. Every one of them has its advantages and its downsides. Almost all of them can contribute to agriculture enjoying a green future in Catalonia, though not all hues of green are the same. In our article we will analyze how the Catalan agricultural sector should act in order to be socioeconomically sustainable, and which features should its response show for it to be environmentally resilient and sustainable.

Economic challenges and environmental sustainability

Despite its small size, Catalonia features a great edaphic, orographic and climate diversity, which enables a great variety of crops. 27% of our arable land relies on irrigation, uses suitable technologies and has capacity to compete: we find examples of it in the fruit cultures of the plains near Lleida and in periurban agriculture with high added value produce, such as vegetables and ornamental plant, in the Maresme county (*comarca*). However, most of Catalonia arable land is rainfed, it faces a wide number of difficulties and its yields are lower than the average market values. Nonetheless, in conjunction with intensive livestock production, it has shown a high economic resilience and has allowed to maintain population throughout our territory, like in the case of the Noguera county. Such diversity has enabled a great variety of crops but has also hindered the implementation of production methods that could benefit from scale economies to increase the efficiency of production processes.

Technology has made great advancements that allow to temper the effects of physical constraints on the costs of agricultural production, but the increase in yields of many types of produce are still linked to scale economies. In the last decades agriculture has

become industrialized, and the managed areas are bigger every day. According to the Economic Research Service of the United States Department of Agriculture, the most common size for agricultural holdings in the United States was 1,100 acres (some 445 hectares) as of 2013. In Catalonia, that very year, the average area of agricultural holdings was 13.88 hectares, and only one hundred and forty-seven holdings exceeded 200 hectares. The yields of irrigated corn crops in the Catalan county of Pla d'Urgell reached a maximum of 9,700 kg/ha in 2016, whereas in the United States Midwest the average yields reached 11,742 kg/ha in 2016. Such lack of scale economies still persists and makes our produce less competitive.

Nonetheless, there is hope for small holdings, because we must take into account the consumers' tastes: we are moving towards a more and more customized health and nutrition system. Since such customized nutrition will demand a more individualized produce, agriculture can dramatically change in the next years. This trend could end up coming in handy for small holdings to be able to search for their own market niches. Exploring the possibilities of these new niches can be economically significant for small holdings.

On the other hand, the food chain has become longer and more complex in the last decades. It has become, in fact, a network of corporate interaction through which a flow of raw materials and processed goods, becoming food when combined, takes place. The weight of traditional agricultural companies has greatly decreased, and these companies are now trapped between the suppliers of seeds, phytosanitary products and fertilizers, and the large retail oligopolies. Moreover, it must be considered that in the European Union the production costs are higher than the ones in most competitor countries, due to the strict European regulations, among other reasons. Furthermore, the specific standardization demands by large retail chains have resulted in an increase of production costs for small-sized companies. Therefore, our agriculture must be put into this perspective, and we must admit that these factors do condition and hinder the cost competitiveness (hence, the price competitiveness too) of our agricultural produce.

It seems clear that one of the strategies to boost the competitiveness of Catalan agriculture must be to opt for interventions that increase the productivity of our agricultural sector and that lead its produce to reach higher quality levels and added value. In order to reduce the need to compete in costs, we will have to compete in quality, making our produce stand out whenever possible.[2] Thus, we should move towards the creation of agricultural produce with high added value. Moreover, if this value is linked to production methods that respect the sustainability of natural environment, the green future of our agricultural sector will be secured. This is especially true for ecological agriculture marketed through short distribution circuits, such as proximity markets and specialist shops.

2 Data of gross value added generated by agricultural and agri-food industries show us that Belgium produces an added value of €2.89 per every euro invested in agricultural production, whereas Catalonia only produces €2.31: there is still some margin to increase it.

Nevertheless, the productivity of this kind of agriculture will hardly be able to secure the increase needed to provide the whole population with food.

Furthermore, such solution is not feasible for all agricultural holdings in our country: they will need some alternative strategies, like those likely to come thanks to the implementation of new technologies. Recent progress in robotics and precision agriculture can enable small producers to become competitive (King, 2017). It seems that farmers will soon have at their disposal robots able to harvest pieces of fruit faster than humans, measuring their sugar content and picking only the ripest ones.[3] Water savings will also be enabled by sensors planted among fruit trees, measuring humidity levels at several depths and transmitting these data to a central computer capable of identifying trees in need of irrigation and the water amounts they require. In these cases, the irrigation system will be able to automatically satisfy the needs of each tree. The implementation of such technological advancements in irrigation is especially urgent for Catalan agriculture, 27% of which needs irrigation (with 77% thereof using gravity-fed irrigation).

Other types of biosensors can identify the need for fertilizers or phytosanitary products in both extensive and woody crops. Data and images captured by drones or by sensors embedded in tractors can discriminate the different densities of weeds in sown areas, or the need for nitrogen in specific places, thus enabling the farmer, for example, to minimize the use of pesticides or to adjust the doses of nitrogen to be applied. The Catalan agricultural sector can be globally competitive and environmentally sustainable, but it will have to invest in technological innovation in order to increase the efficiency of its production process while reducing the use of fertilizers, phytosanitary products, and water. These kinds of actions are compatible with respect for the natural environment and for environmental sustainability, but the high-end innovation they require puts our agriculture far from what one tends to imagine when green economy is discussed; it is merely, after all, a different hue of green.

Another alternative to increase the production and competitiveness of our agri-food sector entails clustering agricultural production in territory-decoupled production systems. We know that the most competitive strategy, the one returning the most added value to our agricultural sector, is intensive livestock farming, which has shown to be very resilient in economic and social terms, for it has enabled local inhabitants to remain in their territory. Intensive pig and poultry farming has allowed for the conservation of rainfed agriculture and for population retention in naturally difficult areas.[4] It must be noted, though, that such processes have not been environmentally friendly, because they have contributed to the nitrate pollution of both surface and ground waters in vast areas of Catalonia. But on the other hand, and returning to the advantages of intensive pig farming, it must be

3 "The Future of Agriculture", in *The Economist*, 2016.

4 The two most important sectors of intensive meat production in Catalonia are pig and poultry farming.

noted that according to the FAO the levels of greenhouse gases emissions from this kind of livestock farming are significantly lower than those from extensive cattle farming, for the same volume of meat production.

Nonetheless, what we should consider now is intensive, territory-decoupled plant production. Hydroponic and/or aeroponic production enable the cultivation of (mainly) fruits and vegetables in warehouses, industrial estates, and greenhouses near big population centers. These types of crops can also contribute to the conservation of the natural environment for several reasons: their location near consumption centers not only reduces their transportation costs, which necessarily makes this produce more competitive in economic terms, but it also contributes to environmental sustainability, for the CO_2 emissions needed to supply fresh food to the population decrease; these crops are also environmentally friendly because they free up agricultural hectares that can now be allocated for uses more compatible with nature; furthermore, they can have a positive impact on the social economy, for they are a tool that enables self-consumption while also putting nutritious, healthy food within reach of the urban population; they even offer the opportunity to grow certain foods in one's own home, which allows a customized nutrition. Though produced in industrial warehouses near cities, this future will also be green.

No matter which food production system we choose, it will generate waste. For our agricultural production to achieve a green future we will have to minimize that waste and reuse it by turning it into products. We will have to bestow use, and therefore value, on the waste generated by all agricultural activities. The reduction in waste generation must necessarily encompass the reduction of agricultural sector contribution to greenhouse gases emissions.

For this management to be economically and environmentally resilient it will be necessary to innovate and to make by-products successively usable in different manners so that they can yield some profit at every stage of their life cycle. We will have to learn to obtain benefits differently: it will no longer be a matter of benefit increase merely from higher production, but also from single-product crops. By-products will have to be reused and generate profit at every stage of their reuse. Initially, it will be necessary to stimulate the reduction or reuse of waste, and to penalize its excess generation as well as the generation of waste damaging the environment. The excess generation of non-recoverable waste will have to become more expensive, and public authorities will have to play a significant role in this process, forcing agricultural holdings to internalize the environmental costs resulting from their activity. The agricultural sector must ensure that natural ecosystems, those providing many of the inputs it needs, are protected. Most of these inputs (for example pollination, water and nutrient cycles, or soil production) are currently free of charge: damaging them, though, should be costly.

Conclusions

Current society simultaneously demands economic well-being to be maintained or improved, the natural environment and biodiversity to be protected, and social justice to be increased. Regarding the agricultural sector, all of the aforementioned results in the demand for sufficient, affordable and healthy food production, one which moreover improves the environment and biodiversity while being totally compatible with social justice. Furthermore, the income generated by agriculture must be high enough to maintain a significant share of the labor force in their territory: it must provide jobs, and agricultural holdings must be profitable and generate benefits.

Until now, the increased competitiveness and economic well-being often defied environmental sustainability, or, conversely, the protection and sustainability of the natural environment usually hindered economic growth. Thus, to achieve these goals, the agri-food industry will have to provide everyone with healthy and affordable food, though increasing production oftentimes defies the protection and sustainability of the natural environment.

The production of affordable food for everyone will demand the use of different production strategies and of new technologies. We will not be able to achieve the quality of food needed to provide everybody with balanced diets only through the use of traditional production systems: the advancements made (and to be made) in different areas, such as genetics or digitalization, can enable a healthier produce and a more efficient production. Simultaneously, the desire for local and ecological produce will have to be satisfied. It will be necessary to make compatible with innovative technology all the existing agricultural production strategies, from traditional and ecological production to those originating from more innovative holdings.

We have seen that all of the possible agricultural production strategies can contribute to a green future for Catalonia. At every step, every partaker will have to decide on which green future they want and choose the one that suits them the most in economic terms. We will have to decide whether we want a green future where the green is produced in industrial estates or in greenhouses, or in totally ecological agricultural holdings. These strategies do not exclude each other, and each of them entails different, not necessarily negative consequences for environmental sustainability. We cannot rely on a single system of agricultural production because none of them fully satisfies the needs of every producer and every consumer. The future of agricultural production in our country will certainly have all the hues of green.

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Improvement or mirage. Towards a life-cycle perspective

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Reason or ideology

"Do we want to recycle?" If this question is put to any audience, the answer is always "Yes!". But firstly, it must be understood that people, when talking about recycling, really mean "separate collection", for a specific waste to be recycled. Secondly, most of the population ignores what is behind the chain of processes of separate waste collection and recycling. Thirdly, they do not know what the alternatives are, or which their different environmental impacts are.

Do we want to maximize the recycling figures or to minimize the environmental impact, in terms of climate change, for example? As we have recently seen, recycling is something similar to a religion, an ideology that, once formulated, is followed by a group of people, no questions asked. There are some other 'ideologies' of this kind, such as the reuse, the use of renewable materials, etc. These strategies can help us improve our systems, but we will not know, in our specific case, which one is the best, unless we quantify them in terms of the environmental impact they can avoid.

In order to know to what extent a given initiative implies an environmental improvement when compared to another, some reasoning must be made, and science must be applied; furthermore, a life-cycle perspective is needed, and, in some cases, when the decision to be taken could affect many people, a life-cycle analysis must be implemented (ISO 14040:2006).

For example, Directive 2008/98/EC, on waste, states in article 4.2: "When applying the waste hierarchy referred to in paragraph 1, Member States shall take measures to encourage the options that deliver the best overall environmental outcome. This may require specific waste streams departing from the hierarchy where this is justified by life-cycle thinking on the overall impacts of the generation and management of such waste". The very waste hierarchy, that seemed to be set in stone, can be changed if a life-cycle analysis so advises.

Moreover, what happens if those ideologies conflict with each other? Let us suppose a case of fruit and vegetable logistics, between producer markets and consumer markets, where wood, cardboard or plastic boxes can be used.

The postulates of the circular economy lead us to different *Rs*: recycling, refilling, reuse, rehabilitation, renewable, reduction, rethinking, renovate, etc. What could wood box advocates say? "We are the best; our products are renewable!". What could cardboard box advocates say? "We are the best; our products are recyclable!". What could plastic box advocates say? "We are the best; our products are reusable!".

But what could others say about wood boxes? "Hey, once used they will have to be incinerated!". What could others say about cardboard boxes? "Hey, they are single-use!". What could others say about plastic boxes? "Hey, they are made of plastic!". (The stability of such material and, therefore, its permanence in the environment make it appear as something superfluous: thus, on a communication level, there is enough said.)

How can this dilemma be overcome? The only way is to carry out a scientific study (Albrecht *et al.*, 2013) to find out under what conditions one system is better than the other. We are not meaning "which material is the good one?", because there are no such things as good or bad materials, but rather systems that, for certain functions under certain boundary conditions, provide a better or a worse service. Strangely enough, and against common opinion, in this example the choice of plastic would offer better results in rather normal conditions.

Systems are not linear

When asked "do you want to recycle this felt-tip pen?" or "do you want to recycle this used blood donation bag?", people begin to understand that recycling processes have environmental effects that can be more severe than, let us say, those of a controlled incineration.

When asked "do you want to go to collect the very last soda can in the most remote place of the country?", people realize that the amount of energy needed for the separate collec-

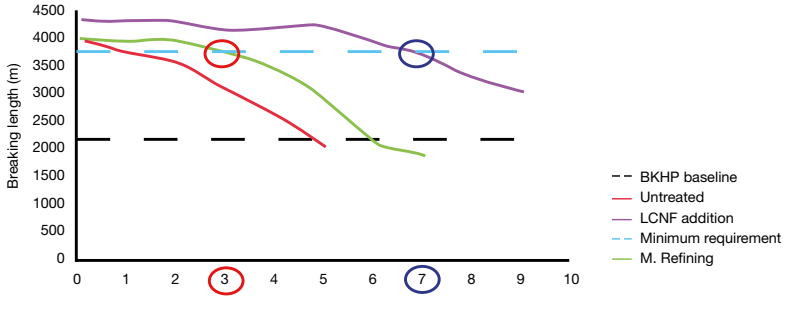
tion of small amounts of different kinds of waste is higher than the one we could obtain from them. Making three half-loaded trucks go up the hill to pick up a few kilograms of each waste fraction, and making them come down afterwards, consumes lots of energy and generates lots of emissions. On the other hand, using a single truck to collect it all together and segregating its fractions later, in a selection plant, will result in lower quality fractions and in some irrecoverable portions. Even so, one must consider whether the resources and emissions savings compensate for the reduction of quality. Most probably, they do.

Systems are not linear, and the environmental benefit of separate waste collection is not always proportional to recycling percentages. The function reaches a maximum after which the benefit obtained for every additional collected unit is lower than the resource and emission efforts needed for said separate collection.

In this respect, it should be carefully studied whether it is worth the pain to slightly increase the recycling figures of certain drink containers, through highly complex systems –therefore implying more polluting processes–, such as those of deposit, refund and return. It can be seen that some studies, for instance those in the ARIADNA Project, show that those initiatives should be at least questioned, for they can imply, based on how they are implemented, a higher environmental, social and economic impact than leaving things as they currently are.

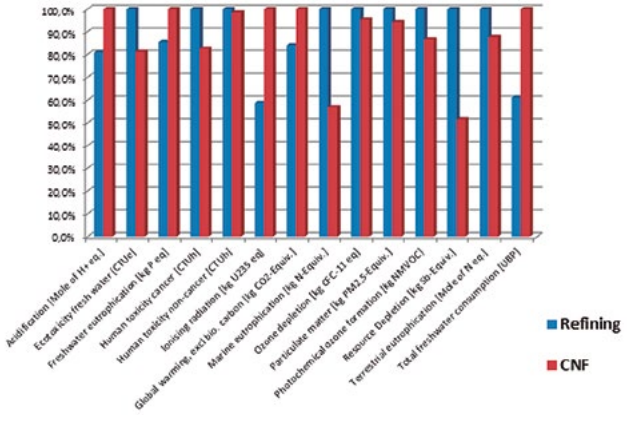
The relationship between biosphere and technosphere is complex

Some environmental debates are monopolized by big media furor. For instance, thanks to 'saint' Al Gore (among others), we have entered a constant debate on climate change; or thanks to the promotion of the circular economy by the European Commission, we cannot stop talking about resources depletion. Certainly, these two categories of environmental impact are really important, but there are others that should also be taken into account, such as toxicity, acidification, eutrophication, lack of water, urban smog, etc. What happens when two categories conflict with each other?



For instance, the addition of cellulose nanofibers (CNF) makes it possible to achieve up to seven paper recycling cycles instead of only three, so paper remains (see image above, abscissa axis) in the technosphere more than two times longer (Delgado-Aguilar *et al.*, 2015) as compared to the traditional refining method. Combining nanotechnology and an increase in recycling can be seen as something extraordinary.

What happens if environmental impact is assessed with a scientific method, such as life-cycle analysis? It depends: if our policies are aimed at resources saving, we will try to promote new technologies, for they consume half the resources as compared to old ones (see 'resource depletion' in the Figure below). In contrast, if the most important impact for our community is climate change (see 'global warming' in the Figure below), we will stick to traditional technologies, for they are 20% better in these terms. If we look at the whole set of impact categories, we will see that the decision is not clear. Nonetheless, knowing that traditional technologies are not likely to improve much, whereas new ones have, conversely, a long way ahead, it will likely be worth it to invest in their efficiency improvement for them to be able to replace current technologies in the future.

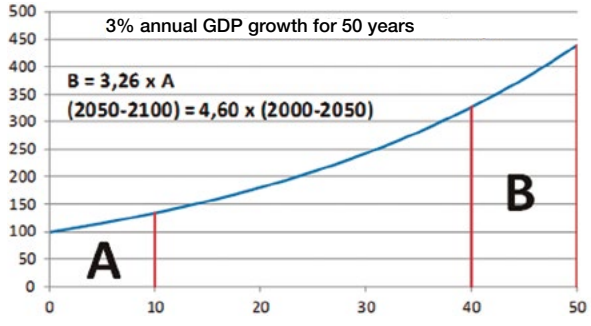


We must break some eggs

There are three main causes for the exponential growth of environmental impacts in the world: population increase (more people consuming), GDP increase (each of us wants to consume more than the year before, or more than our parents did), and the rise of new markets (both producer and consumer markets, for instance China or India).

Let us suppose that these three factors cause a 3% rise in the number of products annually brought to market (and, as we all know, just one of these factors could suffice to

reach said 3%!). A 3% annual growth rate implies that consumption (along with the whole life cycle, from raw materials extraction to end of life, going through production) follows an exponential function.



If we take as a starting point the environmental impact of 100 units, representing the environmental impact of the current year, after ten years we will be causing an environmental impact of 134 units (34% higher than that of the present year), and the aggregate impact of the decade *A* will reach about 1,170 units. If the growth remains at 3%, in the fifth decade we will consume *B* resources and produce *B* emissions. Making the calculations, *B* turns out to be 3.26 *A*, i.e., we will need 3.26-fold resources and we will generate 3.26-fold pollution than in the current decade. How will Catalonia collapse, due to lack of resources or to excess pollution?

Obviously, many things must be changed, and some eggs must be broken to avoid such a big problem. To get us out of this financial crisis, our politicians are currently offering the following solutions: population must increase, otherwise we will not be able to pay pensions; consumption must be stimulated, otherwise our companies will not stay afloat; new markets must be found if we want to produce more. Weirdly enough, the solutions proposed are in fact the main causes of most environmental issues.

Truly, we will have to break some eggs. Catalonia will be green or will not be at all. Among other things, economic growth or human development should be detached, as soon as possible, from the need of matter and energy, and that is something that can be assessed and quantified only from a life-cycle perspective: otherwise, we will be running the risk that solutions only shift the problem from one place to another.

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New paradigms of water management in the 21st century

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Water, the renewable resource par excellence, is becoming scarce. Not because there is less of it on Earth, but because the extraordinary population growth of our planet in the last century has reduced its effective per person availability. This reduction is to some extent due to a higher consumption of water by each of us, but is especially a result of the increase in demand from irrigation farming, which produces the food needed in order to sustain a growing population, and also of the spread of urban, industrial and agricultural pollution, that has caused some water resources to become non-immediately available due to their poor quality.

Water as a planetary resource has also entered the Anthropocene era; it is not a classic geological era, but rather a way to designate the times we are living in, when human activities have a significant impact on Earth's resources and ecosystems. The manner in which development has taken place has meant a massive use of resources belonging to the past (oil, natural gas, phosphates, etc.) and the generation of pollution belonging to the future, by a population experiencing exponential growth and therefore accelerating both the causes and the effects of said pollution.

As of April 2017, world population is estimated to have reached 7.5 billion people, and some forecasts point to ten billion by 2056, while 11.2 billion could be reached by 2100. These figures pose a formidable challenge to mankind because prompt and, above all, accurate decisions will have to be taken in order to sustain such population as well as to provide them with minimally decent living standards. Furthermore, the non-renewable resources the planet has to offer, including biological wealth, should not be squandered in a short time span. A question not yet answered, but demanding an answer shortly, is how we will be able to feed ourselves once phosphorus mines become depleted and this element is scattered throughout the planet in the form of biomass and eutrophication: phosphorus is a limiting element of plant growth, crops included.

The Anthropocene has accelerated in a diabolic manner most global indicators, be they ecosystem-related or socioeconomic. Among the first, the most well-known one is the concentration of atmospheric CO_2, already above 410 ppm (parts per million) according to the reference station established on Mauna Loa volcano (Hawaii); there are many others, though, which have also grown exponentially, such as the atmospheric concentration

of methane and nitrous oxide, ocean acidification, the concentration of nitrogen in coastal waters, the loss of tropical forests, or global fish captures in open waters. Among the socioeconomic indicators, the most obvious one is world population, along with associated increases in the total consumption of energy, fertilizers, transportation, paper, telecommunication and, logically, water, among many other resources.

The acceleration of the metabolism of our planet shows in the form of global warming and climate change. The Earth has a fever. In this sense, the 3rd Report on Climate Change in Catalonia is straightforward: models predict, with a high degree of probability, an increase of both average and extreme temperatures by 2050; they also project a possible decrease of precipitation or, at least, an alteration of rain patterns, with less frequent but more intense precipitations. With higher temperatures and more occasional rain, the perception of drought will grow.

From a hydrological point of view, Catalonia can be divided into two areas: its inner basins, where the management of water resources depends on the Catalan Water Agency (Catalan Government), and the Ebro basin, whose management depends on the Ebro Hydrographic Confederation (Spanish Government). The two territories show a clear antagonism regarding the availability of their water resources, and their socioeconomic realities: the first area concentrates most of the population of Catalonia, whereas the second holds most water, which is used, in a really high proportion, for agricultural irrigation.

According to the Management Plan for the River Basin District of Catalonia (2016-2021) of the Catalan Water Agency, the inner basins reveal an important limitation of water resources, which shows in an especially intense manner in the basins supplying water to the Barcelona Metropolitan Region (the Ter and Llobregat rivers system), as well as in the basin of the Muga river. The Ter and Llobregat system comprises not only the basins of these rivers, but also the areas of the Tordera, Besòs and Foix rivers, along with the region of Central Costa Brava and Maresme and Garraf counties (*comarques*). It currently displays an estimated average yearly deficit of 2 m^3/s which could, in the long term (2033-2045), reach up to 6 m^3/s. The other basin falling short, that of the Muga, has an estimated water deficit of 0.25 m^3/s. In these cases, water shortages usually result in limitations of the circulating flow and, in situations of drought, in the reduction of supply to farming irrigation. In the South system (basins of the Gaià, Francolí and Riudecanyes rivers, as well as some coastal streams in the Tarragona area), despite its lower rainfall in comparison with that of the inner basins first mentioned, no lack of water is detected in the short term, because the water needs of the population and industry are met thanks to water from the Ebro river mini-transfer. Finally, at present, the only river basin that shows enough resources to meet its demand, even the environmental ones, is that of the Fluvià river.

Given this diagnosis of the current situation, how can water be supplied to the metropolitan Catalonia in the middle and long term, if climate change trends are confirmed and if a more than plausible population growth takes place? It is not a minor challenge, and it needs to be immediately addressed, for in the sphere of infrastructures solutions cannot be improvised. There are more difficulties, though, because in the last years two new conceptual variables have come into play, and they limit the feasibility of some of the possible solutions: the first of them is the environmental respect, expressed, in Europe, in the form of a water framework directive; the second one is the energy consumption of the water cycle, expressed in the form of a quotient between the consumed kilowatts and the cubic meters supplied, taking also into account the origin of the energy sources.

Thus, the European Water Framework Directive states that environmental flows pose a restriction to any other use, supply included; this means that situations such as the repeated droughts experienced throughout the 1998-2008 period, when the flows of the Ter and the Llobregat became severely reduced because they were needed to ensure the water supply to Barcelona Metropolitan Region, should not arise anymore. In relation to the link between water and energy, it constitutes a factor of growing significance for the global costs of services, for CO_2 emissions and for general sustainability, especially if energy sources are mainly non-renewable. Since it does not rain oil, coal, or uranium, the use of non-renewable resources for the production of a renewable resource as water is contrary to sustainability. It means that at any given time it will be necessary to use the resources that are available with the lowest associated energy consumption, and that the ones that are more costly in energy terms will be reserved for exceptional situations.
An increasingly important resource that can ensure urban supply is regenerated water, especially when it has gone through advanced treatments that anew allow its use as drinking water, be it directly, as in the case of Windhoek (Namibia, the only known instance thereof [as of April 2017]), be it indirectly, as in the cases of Orange County (California), Singapore, Koksijde (Belgium) or, more recently, Port de la Selva (Catalonia). This alternative resource is called ‘purified water’ or ‘re-purified water’ in the United States, and ‘new water’ in Singapore. New water, despite the technological challenge its production poses, features some characteristics that make it interesting enough as to incorporate it into the array of traditionally utilized resources.

- New water, when generated in an urban environment, features volumes that can be used in that very environment; thus, it could be labelled as a zero-mile resource, needing minimal transportation in comparison with water from other sources.
- Its production needs moderate energy consumption, especially when compared to resources demanding long-distance and/or height impulsion, or to desalination.
- Its availability is not affected by drought periods, because its production is directly linked to drinkable water supply, not to precipitations; thus, there should be no limitation in its available volumes as long as no supply restrictions were imposed.

- Its production has a minimal impact on water ecosystems and/or on aquifers, since no extraction from the environment is present.

The production and subsequent utilization of this resource demand, though, a radical change in water sanitation and the way to understand it: a new, disruptive vision is needed. To achieve it, the aim of sanitation must go from rhetorical to real, and we must overcome its current, elementary stage, in which we have transitioned from the total lack of wastewater treatment to the implementation of some treatments that successfully reduce the traditional parameters used to measure pollution (mainly, biochemical oxygen demand and suspended materials). But almost three decades after the enactment of the Directive 91/271/CEE, we must admit that the quality levels of purified water defined in it are in most cases insufficient to avoid impacts on the receiving environment, where high concentrations of nutrients, fecal microorganisms, and substances derived from human activity, including the so-called emerging pollutants, can still be found.

The disruption in the field of water sanitation will take place when the current vision, offering an answer to the needs of the 20th century, is overcome and transformed into a tool addressing the needs of the 21st century. This means that areas with water resources scarcity will need not only depuration of wastewater, but also its restoration to quality levels similar to those present at the moment of capture as 'pre-drinkable' water or higher, for water to be used again in a safe manner from the point of view of public health. The current reality in many regions of our planet (overpopulation, water demand increase, pollution, climate change, etc.) unavoidably compels to the realization of this new model, and, therefore, to circular water management, as already in place in the cases mentioned above. Such a groundbreaking approach will imply a consideration on the wastewater treatment plants effluent quality, and will give a broader sense to the function of these infrastructures, that will transform from rather passive installations collecting heavily polluted water and returning it to the environment quite less polluted, into proactive installations capable of generating new resources that can be used, if necessary, even for drinking water supply. The change of paradigm, from "depuration and discharge" to "reuse-oriented regeneration", will be significant.

In an increasing number of areas suffering from water scarcity, 21st century sanitation will have to incorporate treatment processes and management criteria that are still relatively incipient nowadays; among them we could mention:

- Upstream from wastewater depuration plants, a reinforced control of sewage inputs will be extremely important, in order to avoid the entry of toxic and/or non-biodegradable substances, through the implementation or improvement, if needed, of water treatment at the source of some wastewater streams, such as those originating in factories, hospitals, etc.

- The maximum effort will have to be put into biological depuration, in order to maximize the oxidation of effluents and the biodegradation of as many substances as possible. Depuration will make no sense unless it is carried out through the maximum use of implemented technology, not only to favor water regeneration and its subsequent use, but also to reduce the impacts of discharges on the receiving environment, thus enabling the compliance with the Water Framework Directive of the European Union.
- Regeneration treatment implementation will be widespread because the need to recover water and make it exploitable to meet certain demands will increase.
- Where possible, the harvest of other resources obtained from wastewater, such as energy and nutrients, will be commonplace, according to circular economy criteria.
- Water treatment facilities will show a higher degree of automatization in their different processes, with feedback loops supported by specialized systems, and with real-time data on the facilities functioning and on the achieved water quality, in accordance to current trends usually labelled as 'smart'.

The transformation of depuration plants in the 21st century will be accompanied by other profound changes, for example those already beginning to show in the field of energy, where a share of production is decentralized and comes from renewable sources. In consistency with such more than plausible reality, the energy effort put into the regeneration and the quality improvement of water should be based on the use of renewable sources, for this additional energy consumption not to generate CO_2 emissions contributing to climate change. Thus, not only will the future be far smarter than the present, but it will also have to be more sustainable.

In a Mediterranean climate context, threatened by a possible decrease in water resources availability because of climate change and also on account of the almost non-existent political feasibility of additional water transfers, new water is a resource that will predictably play a significant role in ensuring water supply to the Barcelona Metropolitan Region in a not-so-far future. With 5.1 million inhabitants, the total water demand of this area is 390 million m^3/year, which equals 1.1 million m^3/day and 13 m^3/second. Approximately, 45% of these volumes come from the Ter river, 30% from the Llobregat river, 22% from local aquifers, and 3% from desalination (which, with the capacity currently installed, could supply up to 18%, and more when the new extensions planned become a reality in a relatively short term).

A significant share of the water that reaches the Barcelona Metropolitan Region and that is supplied to households later becomes wastewater, subsequently treated in several depuration plants, being the most important, in terms of treatment capacity, that of Besòs [river] and the one of Baix Llobregat [county]. The combined volume of water these two discharge into the sea is 237 hm^3/year, which roughly equals 8 m^3/second: that volume represents, approximately, two thirds of the total water demand of the Barcelona Metropolitan Region. To put it into perspective, this means that in the worst days of the

2007-2008 droughts, in spite of the dramatic moments caused by the lack of water in reservoirs, water volumes worth almost 70% of the metropolitan area global demand were discharged, and lost, into the sea. Not much could be done in those times, because the production of new water and its connection to deposit supply networks were non-existent back then. Looking at future water needs, it should be kept in mind the fact that infrastructures demand years of social consensus, of planning, maturation and execution before being operational, so, in order to benefit from them in the medium term, works must have begun long before. Such a reflection should be considered within the framework of actions to be undertaken in order to reduce the impact of future droughts, or of situations that could simply become commonplace if water demand increased in a significant manner as a consequence of population growth.

The history of water supply to the Barcelona Metropolitan Region (likely the same as in many other areas) shows that the water resources firstly incorporated into the scheme were the closest, cheapest ones, later complemented by others, more distant and expensive; the last infrastructure included in the list of those currently in service is the desalination plant of Baix Llobregat. This scheme finds its logic in the linear vision of water management, the only possible one when technology did not allow other options. According to this vision, the issue of water scarcity in a given area was caused by the fact that no water had been searched for in more remote areas yet. This paradigm has been ruled by economies of scale, which have extended their dominance until reaching their own limits, be they material, when there is no more water to be imported (as in the case of southern California), be they social and political (as in the case of Catalonia). Under the current circumstances, one can hardly conceive new water transfers being implemented in the short or medium term from the Catalan stretch of the Ebro river, or from the Rhône river, in order to supplement the water resources of Catalan inner basins.

This situation is leading to seriously consider the transition from a linear water management to a circular one in which, thanks to new treatment technologies, local and current resources can be utilized and incorporated into the array of already existing resources (regional resources, capture and purification networks, desalinated water, etc.) so that they can contribute to ensuring water supply. As for the 8 m^3/second of water currently discharged into the sea by the two main wastewater depuration plants of the Barcelona Metropolitan Region, the transformation of such volume into new water, and the subsequent utilization of a significant amount thereof, would bring in self-supply capacity to meet an important share of water demand: this is a goal of strategic interest in view of the uncertainties posed by the 21st century. Tightly linked to this goal, it could be useful to assess the feasibility of converting desalination plants into new water production facilities, since the energy consumption of the latter is significantly lower than that of the former, with identical final quality levels.

The incorporation of new water in the Barcelona Metropolitan Region water resources management would imply a benefit not only for this territory, since a significant share of urban supply resources would become independent from rainfall, but also, as a knock-on effect, for the rest of inner basins and for the country as a whole, since the exploitation of resources throughout our territory, including those most energy-intensive, would decrease. At the same time, said incorporation would get our country closer to the goals of the Water Framework Directive, the compliance with which currently reaches in Catalonia a mere 36%, still far from the desirable levels. Moreover, such incorporation, if carried out ahead of time, not in a desperate manner, could also show a leadership capacity in policies of mitigation of the Anthropocene effects on water resources, which would not go unnoticed by other Mediterranean regions facing similar problems, and which would impel us to carry out cutting-edge research in the field of water treatment and management. To sum up, one can think that as an effect of Earth's overpopulation, of global indicators acceleration and of climate change, water scarcity will predictably become more pronounced in many areas of our planet, including Catalonia and especially its inner basins. In this context, it is plausible to think that the concept of circular economy will eventually reach the sphere of water, and that this new approach will play a crucial role in water resources management in urban environments. Only then will the sanitation goal become real instead of rhetorical, for the first step in water recovery will be the restoration of its quality back to the levels it showed at source, or higher. At present, the development in extracting water from sources we could not even think of until recently is still in its infancy; even so, a large-scale utilization of new water in Barcelona Metropolitan Region could reverse the chronical deficit situation of the Ter and Llobregat system, and could also help comply with the goals established by the Water Framework Directive of the European Union. Moreover, it must be taken into account the fact that infrastructures are not planned, executed and mastered in a short space of time, despite the growing international experience in this field. And finally, we cannot forget that, as with everything in life, the only way to learn is by doing.

Access to digital meter data by the consumer: a necessary step towards energy transition and the digitalization of the power sector

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Summary

The *Clean Energy for all Europeans Package*, whose final texts were published in June 2019, promotes the active involvement of consumers in the energy market. Beyond energy consumption, production or storage, consumers should be able to compete offering supplementary services in the electric market, for which hourly price indicators, among other elements, are needed. The implementation of digital meters in Spain should enable, from 2019 onwards, the collection of hourly data regarding domestic users consuming less than 15 kW: this is a milestone with potential disruptive effects, since it will allow, for instance, the aggregation of demand flexibility and of distributed energy resources (PV solar, batteries, etc.). This lecture analyzes the current situation regarding data access by consumers or by other actors they appoint, as well as the potential of the demand aggregator. In light of the data access limitations faced by third parties, a data hub or neutral data operator is proposed.

Keywords: smart meter, digitalization, data hub, active consumer, 'prosumer', aggregator, flexibility.

1. Smart meters and the digitalization of the power sector

The energy sector is a strategic field in any country and has deep consequences on its socioeconomic model. For this reason, it is a highly regulated sector. Following the indications given by European directives, Spain has begun sector liberalization, based on the splitting of power generation, transportation and distribution, and marketing activities. However, said splitting has not been completed, and some corporate groups with common interests in several links of the chain still exist. If we apply this analysis to Catalonia, the situation is aggravated by the dominant position of just one company in all three spheres: generation, distribution and marketing.

In this legal and market context, a process aimed at reducing CO_2 emissions has begun. In the case of electricity this process materializes in a massive input of distributed generation resources (renewable energy sources, storage, etc.) and in the need to increase the network flexibility in order to manage the fluctuations of renewable sources in real time; on the other hand, we find also some 'electrification' of economy, with electric mobility for instance. Thus, networks are no longer one-way, but two-way, and the management of information flows becomes the distinctive element of those systems capable of offering consumers competitive prices while ensuring power supply and reducing environmental impacts. Therefore, information management has become the key element around which the modernization of electric industry revolves and helps develop new business models that provide consumers not only with energy but also with related products and services. Thus, the time has come for electric smart grids and for the fusion of energy and telecommunication technologies, among which the measurement of electric consumption in the residential sector thanks to digital smart meters stands out. Their implementation is currently [as of 2017] regulated by European directives, since 2009, and used to be conditioned by a positive result of cost-benefit analyses (CBA), following the method of the Commission (you can see their results in Figure 1). Surprisingly enough, though, Spain began the deployment of such devices well before the European Directive, foregoing the CBA. This fact is crucial in order to understand the decisions that have been made regarding both the legal framework and the technical solutions adopted to collect the data, transmit them and put them at the disposal of consumers and third parties. Without a clear return on investment, the cost of changing meters is placed on consumers, through a lease which is paid for along with the rest of the power bill, and consumers cannot refuse it or receive detailed information on the most suitable options (purchase or lease).

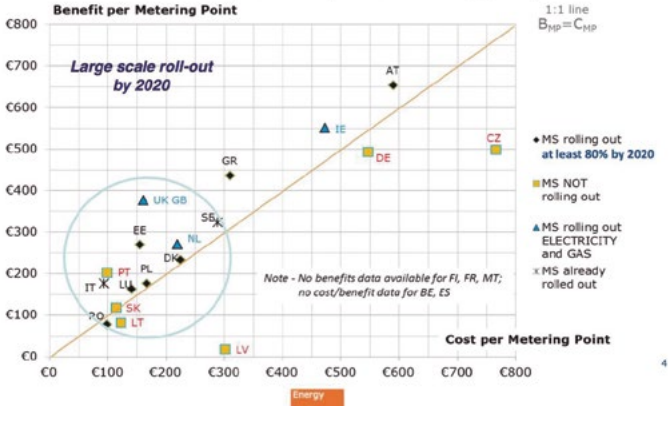

Figure 1. Results of the cost-benefit analysis of digital electric meters in the European Union (Source: European Commission)

This captive situation causes the consumer a clear hindrance in accessing consumption data, regarding both the access to information in the household in real time, due to the lack of interoperability with devices intended for smart homes, and remote access. In this case the consumer can access the data through the website of the distribution company, though they might be unaware of it. Furthermore, said access is rather confusing, because the company uses a commercial name similar to that of the marketing company, belonging to the same group, which generates a market distortion. Be that as it may, what the user sees is a curve, delayed by a few days, showing the hourly aggregate information on consumption, which prevents most of the energy saving potentialities and discourages the consumer to actively partake in the electric market.

The difficulty of utilizing the consumption information of a domestic user increases when the consumer wishes, under their own responsibility, to hand over the management of their data to a third party, be it another electric marketing company in order to receive a customized offer (indexed for instance to electric market prices), an energy services company in order to obtain some return for improving energy efficiency or implementing renewable energy sources, or an independent electric sector actor; let us suppose a user community or some public administration offering, for instance, a monitoring service for vulnerable families. In all these cases there is a lack of regulatory development establishing the technical and qualitative conditions in which the data transfer to a third party can be carried out in a systematic, simple and scalable manner, and this results in a hindrance for the market development.

All these elements make Spain a unique case in Europe. On the one hand, some countries have incorporated the implementation of digital smart meters into a clear national network operation and strategic goals update, firmly pushing for the maximum usefulness of consumption data and, inseparably, for their access by third parties (this is the case of Scandinavian countries and of the Netherlands). On the other hand, some countries have carried out the CBA and consequently limited the measuring system modernization to a subset of consumers in which there is an evident return on investment (such is the German case). The Spanish case is in contrast with that of other countries because the decision to invest has been made (and we are, therefore, economically and technologically captive), but no plans allowing to obtain benefit from it, nor economic studies establishing the return on said investment, have been carried out.

2. Digital meter data: the raw material for the demand aggregator

In the age of information, consumption data are critical, and can be a necessary, though insufficient, element for many new services. Thus, the emerging issue revolves around the management model we should adopt in order to benefit from all of their potential. This is a technical, but also political, legal, regulatory and corporate issue. It involves, for instance, defining who is responsible for the measurement, and under which conditions

the data are put at the disposal of consumers or of third parties; it also implies some privacy aspects related to the consumers rights. The electric business is targeting data management, and new actors appear (such as the aggregator) in order to catalyze the implementation of renewable energy sources, along with the management of power demand and the supply of related services.

2.1. Potential of data for consumers

A key element of the European Union energy policies is to confer the consumer a more and more significant role. This is usually referred to as 'empowerment', and in the case of energy such empowerment is based on consumption information access by the consumers (among other rights bestowed upon them), so that they can benefit from the potential of energy efficiency and of renewable energy sources in reducing costs and CO_2 emissions. It can also be useful in order to receive services that improve their living standards and their experience as consumers; for instance determining their consumption patterns, promoting energy and output savings though behavioral changes, spotting improvements in electric appliances and preventing unwanted consumption (standby mode, careless mistakes), assessing the potential of solar energy and offering the domestic user new opportunities based on the concept of collaborative economy and direct energy exchange between private individuals (an example thereof is the company Piclo, in the United Kingdom), as well as managing demand and allowing consumers to partake in balancing markets.

2.2. Potential of data for the network operator

Data offer perspective on the low-tension stretches of the network, which allows identifying illegal connections and operational issues, and also enables the agile detection and correction of incidents. This can be useful for both the power distributor (DSO) –in Catalonia Endesa-ENEL, mainly– and the system transporter and operator –Red Eléctrica de España (REE). The potential of digitalizing the low-tension stretches is especially significant, as it can transform the network into an infrastructure capable of integrating materially and digitally distributed energy resources with the needed cybersecurity standards. Solar energy in self-consumption mode, batteries or electric vehicles are just a few of the examples that can help us understand the technical and economic dimension of power demand management and its potential in order to provide the system with flexibility services.

2.3. Potential of data for new actors: the demand aggregator

The business model of power companies evolves: they used to sell energy (kWh), now they are beginning to consider the consumer their most important asset, to whom a wide array of energy-related services and products can be offered. For instance, whoever has an electric car can receive offers related to it. Therefore, the access to digital meter data is essential to confer transparency and neutrality to the electric market, and to ensure non-discriminatory access by any energy products and services company. On the one

hand, hourly consumption allows the visualization and establishment of prices in accordance with real consumption, which enables demand response strategies through customized pricing schemes (daytime, weekend, etc.); on the other hand, it helps modelling demand and making decisions in order to optimize the costs of power supply (connection or disconnection of certain loads, battery systems, etc.) in order to access, thus, a balancing market.

All these services can become widespread thanks to the 'demand aggregation function' offered by current market actors (as an evolution, for example, of former marketers), which is also open to the competition of new actors: independent aggregators of distributed energy resources.

Be that as it may, the data flow of residential consumption must observe high levels of privacy, at all times, and must also abide by the Constitutional Law on Data Protection (LOPD), which involves aspects regarding both the system design and the permissions between the different actors, keeping in mind the fact that the data always belong to the consumer and that the consumer is the only one entitled to allow their use by a third party, knowing who has them, who manages them, for what purpose, etc.

2.4. Potential of data for third parties not belonging to the electric sector

The obtainment of domestic consumption data can be useful in order to move towards a smart city concept focused on service to citizens. For instance, local authorities could use these data to monitor vulnerable households in their municipality: thanks to consumption patterns, a low-cost monitoring of people living alone can be implemented. Data can also be useful in the management of detected energy poverty cases, in order to assess the effectiveness of the measures adopted to fight it. Or, regarding mobility, data can enrich its management and planning algorithms. Data can also provide the citizen with the opportunity to create 'active consumers' communities. Last but not least, some emerging business projects can use data as their raw material in order to develop new applications and services.

3. Critical aspects in the use of digital meters data

The aforementioned potentialities for the consumer, the system operator, the market and third parties have, however, some critical points: the accessibility to data by the different actors, their neutrality degree, and the data quality. Furthermore, in all cases, all aspects related to cybersecurity are of the utmost importance.

By accessibility we mean who has access to data –observing in any case the existing constraints, such as those related to privacy, the LOPD and others. Firstly, we have the consumer and those entities directly linked to supplying power, be it the distributor (DSO), as responsible for the measurement, or the marketer, for billing reasons. There is another

group, third parties within the electric sector, such as marketing companies, who can propose commercial offers and try to attract new customers, which can help improve the competition within the market increasing the ratio of consumers changing suppliers (churn rate); or energy services companies who offer energy efficiency services. A third group is constituted by third parties not belonging to the electric sector, such as public administrations or consumer associations, among others. For each one of the aforementioned actors a clear definition of the access terms is needed: for example, the location (local or remote) and the means used for access (local energy monitor, ADSL, home area network, web server, application programming interfaces-API, etc.). Thus, accessibility is also critically related to the interoperability between the meter and other devices.

By neutrality we mean non-discrimination in the access by any actor allowed by law. For instance, a company related to the distributor, who is responsible for the measurement as a regulated activity, can have no advantage over other actors, regarding neither access nor quality. A total disconnection at all levels between the actor responsible for the measurement and its commercial exploitation is necessary.

By data quality we mean granularity of registers (frequency of available measurements, in minutes, every quarter, every hour, etc.), frequency of communication (in real time, with a delay of a few days, etc.), and measured parameters (apparent, active, reactive energy; maximum values register; tension, frequency, etc.). The measurement precision is taken for granted.

Therefore, combining all of the above we obtain a scheme with manifold options that will determine for each Member State the use potential of electric consumption data in the residential sector. For example, and among others, we can get real-time measurement with local visualization accessed by the consumer and shared with third parties through a home area network (HAN); or real-time data in a server managed by the responsible for the measurement that can be accessed through the cloud by all parties on equal terms; or hourly aggregate data transmitted with a delay of a few days to both the consumer and third parties.

3.1. Limitations and issues in Spain

Within the European context, some particularities constrain the use potential of data in Spain. The main peculiarities identified are:

- The deployment of digital meters in Spain began prematurely and the carrying out of their CBA was not considered; therefore, a suitable return on investment could not be obtained from the valorization of their manifold economic, environmental, technological or social benefits.
- Consumers pay for the whole deployment of meters (partly through a fee in their bills, partly through regulated costs), but they cannot choose the devices, nor decide not to install them.

- The service quality of data access by consumers through the distribution company web varies greatly from one DSO to another.
- The accessible data are hourly, and this frequency is insufficient in order to maximize the potential services that could be offered.
- There is no local access to information, or possibility to interoperate with other devices.

Moreover, another especially critical aspect in the transformation of the electric sector exists: the impossibility of transferring data to third parties even with the consent of the consumer. In this respect, contravening European regulations, Spain has not developed the norm that must establish the legal and technical conditions for the exercise of this right. The process is incredibly intricate, it varies from operator to operator, and could currently be considered almost artisanal, which prevents the service scalability and offers a sharp contrast with, for instance, Scandinavian countries, where there is usually an API that automatizes the data collection of a given customer by the actor allowed to. Furthermore, there does not seem to be any technical or economic justification for the situation to be as described. This has serious consequences, namely it holds back innovation in the electric sector, the development of new services, and the emergence of new actors, such as aggregators. This lack of accessibility is crucial to understand how power companies try to extend their dominance into the digital world of data and the appearance of new actors. In Figure 2 we can observe a flow diagram of data between the different actors:

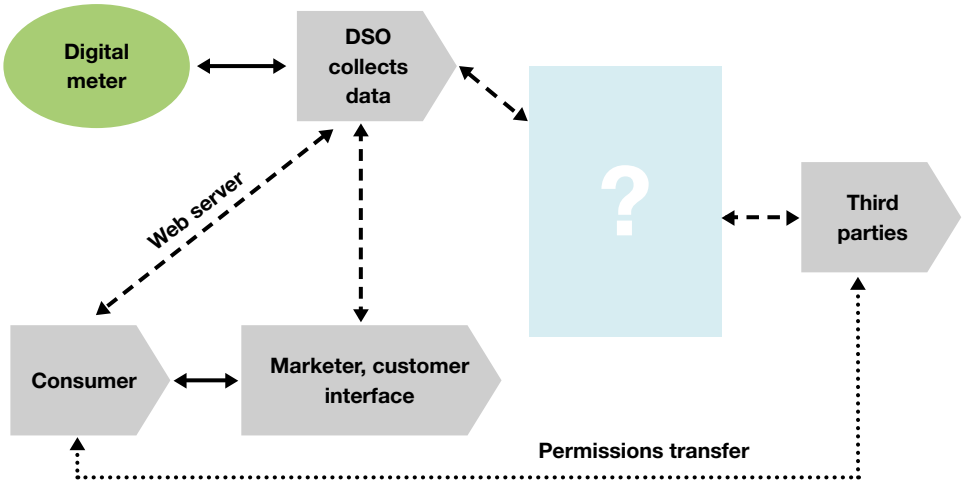

Figure 2. Concept scheme showing the digital meter data access process for consumers in Spain; the hindrances suffered by third parties are highlighted (Source: Salas, 2017)

4. The neutral data operator: a key element for the aggregation of distributed energy resources

The neutral data operator acts as a data aggregator (data hub) capable of receiving the registers of the hourly curve, the historic values of user consumption, and other data. After the harmonization and processing of the data, the neutral data operator enables those actors meeting the needed conditions to access the information through digital devices. This must always be done with the explicit consent of the consumer and abiding by the LOPD. There are different configurations and possible coordinating actors (such as the DSO itself). In Figure 3 we can see a concept scheme showing a possible way to articulate it:

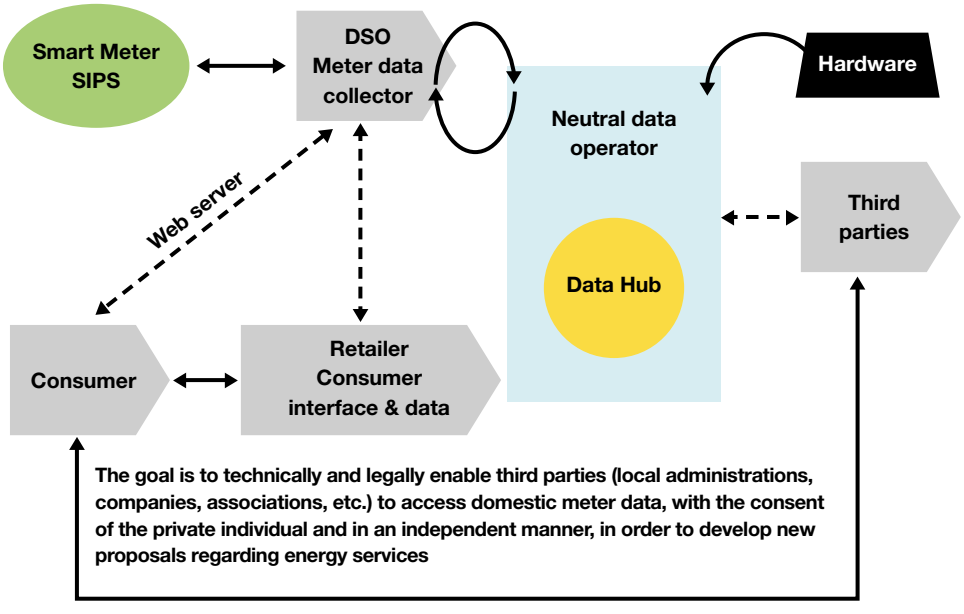

Figure 3. Flow diagram of information from digital meters to the consumer, the power company and third parties, through a neutral data operator. Moreover, the neutral data operator must incorporate information on distributed energy resources in order to become a market activating element and promote their aggregation, so that new services can be offered to both the consumer and the electric system as a whole. (Source: Salas, 2017)

Acknowledgements

We would like to express our appreciation to the Catalan Competition Authority (Autoritat Catalana de la Competència, ACCO, http://acco.gencat.cat) for promoting the elaboration of this study aimed at the modernization of the energy industry. The full report and the conclusions drawn from it by the ACCO can be accessed at: http://acco.gencat.cat/ca/detall/article/LACCO-fa-public-lestudi-que-ha-encarregat-al-Dr.-Pep-Salas-Acces-a-les-dades-de-consum-electric-dels-comptadors-digitals-i-el-seu-us (last checked 18 August 2020).

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The electric storage vector and the territory reaction regarding energy transition

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Summary

Electric storage is a key element for energy transition. A transition that must lead us to a more sustainable system, both socially and environmentally. Storage is the regulation element of the system, the one determining its structure and the way the electric system integrates in territory, from which energy must originate without spoiling its character or functioning, but on the contrary, revitalizing territory and integrating in it. To illustrate this vision, we introduce the question of electric storage and offer some brief comments on storage-related technical and legal aspects. We also make a special mention of the European directive proposal submitted in winter 2017,[1] where the concept of storage associated with the new expected model appears.

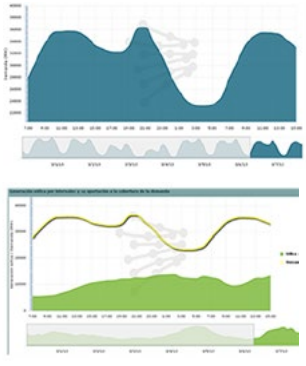
1. Introduction of Emelcat SCCL

Emelcat SCCL [Catalan Cooperative Limited Society] is a company whose aim is to develop the electric storage vector, as it is believed to be necessary for the energy transition towards a more sustainable model, both socially and environmentally. Emelcat was first envisioned in an academic environment (Polytechnic University of Catalonia – UPC), conceived in 2012, established in 2014 and started at the end of 2015. The task of Emelcat is the definition, development, implementation and management of electric storage systems, equipped with an optimal management and control system regarding durability, efficiency, and integration with the electric system and market. Emelcat currently involves 23 partners.[2]

1 The European Parliament and the Council eventually approved the Directive (EU) 2019/944, of 5 June 2019, on common rules for th e internal market for electricity and amending Directive 2012/27/EU (which can be accessed online at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019L0944&from=EN), as well as the Regulation (EU) 2019/943, of 5 June 2019, of the internal market for electricity (which can be accessed online at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019R0943&from=EN) (Editor's note).

2 As of June 2020 (editor's note).

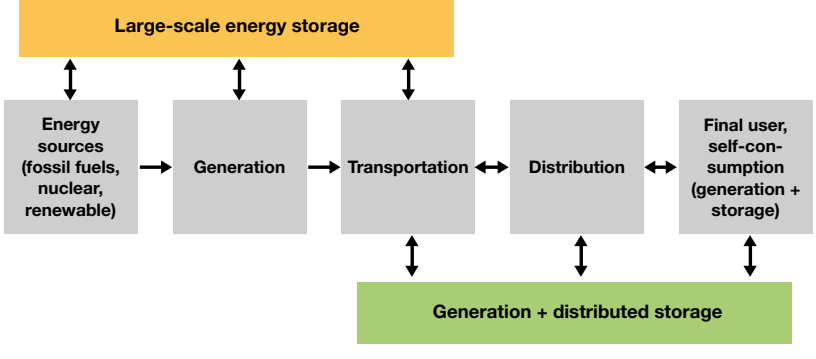
2. Electric storage, a regulation element



Source: REE

It is often said that a picture is worth a thousand words. Here we present two pictures, taken from Spain's electric system operator (Red Eléctrica de España, REE). The one on the left shows the nationwide energy consumption: highlighted in the larger graph we can see the daily consumption, and below it, in a lighter hue of blue, the weekly one; the image on the right shows us the wind power generation: highlighted in the larger graph we can see the generation for that very day, and below it, in a lighter hue of green, the wind power generation for the whole week. It can be clearly seen that the shapes are quite different from each other: we could perhaps increase the wind power generation until the needs are met, but there is no way of making the images match each other unless some regulation is implemented.

Furthermore, the total demand (i.e., the aggregate of energy needs) remains, as we can see, more or less stable: there is a similar pattern repeating itself day after day; in contrast, the energy generation from renewable sources depends to a great extent on weather conditions, which makes it difficult to bind together demand and generation: thus, for the network not to become unstable, some way to make the production more flexible is needed.



Some regulation is needed, but of what kind? Could the demand be met by increasing the production until the generation curve goes above the demand one, and then proceed to a regulation consisting in shutting down some parts of the system when necessary? Would such a solution be stable? Would it be efficient and safe? It could probably be far more useful to generate energy in accordance with the average needs of the system, and to

supply energy over time, keeping and storing it when there is a surplus of it, and making it available when needed. The latter choice is more efficient, more sustainable and secure, and contributes to a more stable system.

Another image can help us see how storage can be integrated into the electric system. Therein three energy storage approaches are identified. All of them are necessary and have interesting features, and the predominant one defines our energy model. It can be useful to understand what each kind of storage implies:

- To begin with, we have large-scale storage: into this category we can find the large fuel deposits, of different kinds, but especially those for fossil fuels; they can be used whenever needed but their replacement is today a political, social and environmental goal. Large hydraulic pumping systems also fall into this category: this sub-group was developed in the nuclear era, with large power stations working in a permanent point and, hence, often injecting into the system more power than demanded: something had to be done with the energy surplus, and the idea to pump water in order to use it later to move turbines and recover some of the energy was envisioned. This whole first group of storage systems constitutes the current regulation basis of the system, but some of its elements are pending replacement, and some others are highly constrained within their territories and greatly depend on water, a resource involved, and necessary, in many other activities.
- On the other end of the scheme we find small facilities, linked to a particular user. These systems try to utilize all available resources and store the power they generate in a battery of the same kind as the ones used by vehicles. They have their own regulation, allowing them to use stored energy when they need it. An example thereof could be a high-mountain refuge not reached by the electric network.
- And finally, what is beginning to be developed nowadays is the medium-sized storage, associated with new production systems, and located near the consumption point. This is the challenge, and technology already enables it: taking as a starting point the concept of traditional lead acid car batteries, which are electrochemical accumulation systems, a wide array of products based on the utilization of new materials is being developed; these products, and others with similar functions, are gradually appearing on the market, and there is an ever-growing amount of such facilities around the world. It is nice to see how many of them there are on a global scale: the Sandia National Laboratories (United States) have built up a database to collect all these experiences; in the first half of 2017 1,636 registered projects existed, of different sizes, quite homogeneously scattered around the world, and reaching a total power of 193,343 MW.

To give an idea about the mid-size facilities mentioned above some images of several such installations, from around the world and using different technologies, are offered: Canada (NaS, 1 MW / 6.3 MWh), South Korea (lithium ion, 1 MW / 1 MWh), China (lithium polymer, 1 MW / 3 MWh), and the United States (NaS, 2 MW / 12 MWh; and lithium polymer, 1 MW / 1 MWh). (Information drawn from the aforementioned North American database.)

Many of such mid-size facilities can be found within a relatively short radius: Spain (1 MW / 3 MWh), Italy (2 MW / 2 MWh), France (2 MW / 1 MWh), Germany (5 MW / 5 MWh), and the United Kingdom (6 MW / 10 MWh). There is none in Catalonia.[3]

3. Territory reaction regarding energy transition

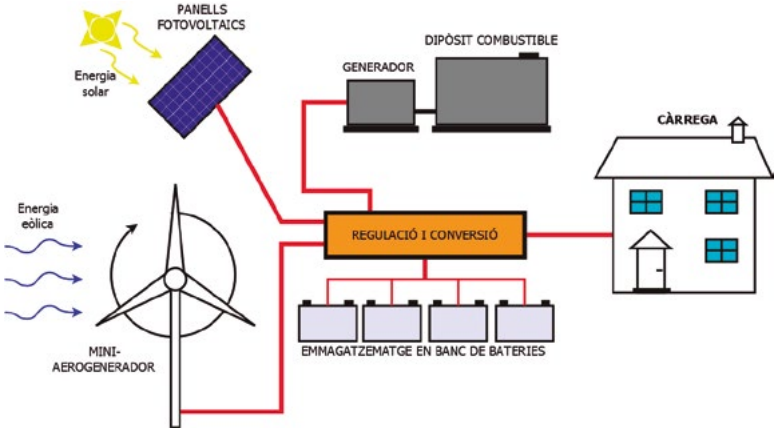
Energy transition is based on own electricity generation, which means that generation externalities remain on site, scattered throughout the territory: this has to be quantified and compensated for. Different studies on this issue exist, for instance the one carried out by the CMES, a collective for a new, sustainable social and energy model, whose results are shown in the Figure below, taken from the book *El col·lapse és evitable. La transició energètica del s.* XXI, by Ramon Sans Rovira and Elisa Pulla Escobar (January 2014):

3 All these figures and data are as of April 2017 (editor's note).

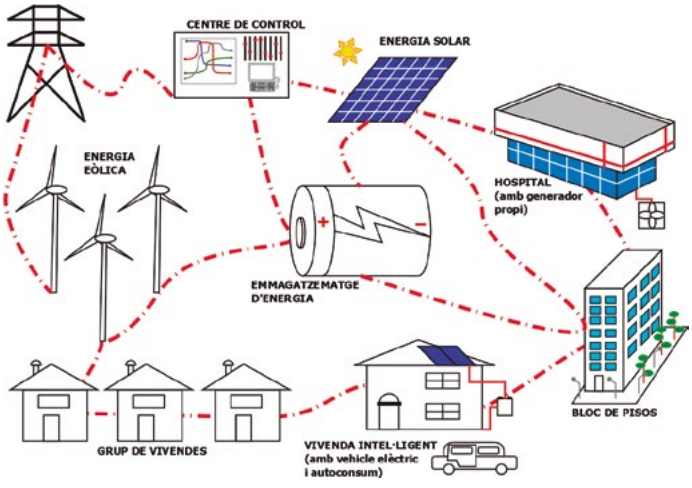
AREAS CURRENTLY USING RENEWABLE SOLUTIONS							
COUNTRY	CATALUNYA			S/PP (5)	AREAS		
AREA (1)	3,2	MHa	DIF.		TOTAL	PERCENTAGE	PER CAPITA
INHABITANTS	7,5	Mhab	GWeP	Ha/MWeP	Ha	%	m²/hab
THERMAL SOLAR			2,20	5,5	12.100	0,38	16
PHOTOVOLTAIC SOLAR (1 axis)			2,73	6,0	16.380	0,51	22
PHOTOVOLTAIC SOLAR (fixed)			2,20	4,0	8.800	0,28	12
WIND POWER			2,32	9,0	20.880	0,65	28
HYDROPOWER			0,17	10,0	1.700	0,05	2
			9,62		38.960	1,22	52

This effect, as well as some others, should be studied and planned, for the land occupancy to be beneficial for territory, and not the other way around. One possible solution would be to implement territorial energy units: urban energy units in areas where energy needs are higher than energy generation, and rural energy units when the situation is the opposite.

The traditional idea of harnessing all the available energy, storing and using it when necessary (which has been done in isolated areas for many years) can now be extended to much larger, collective, non-isolated areas. Digital electronics, power electronics, artificial intelligence and storage technology have developed to such extent that now significant energy flows can be managed in an agile manner.



'Energia solar' → Solar power; 'Panells fotovoltaics' → Photovoltaic panels; 'Energia eòlica' → Wind power; 'Mini-aerogenerador' → Wind mini-turbine; 'Generador' → Generator; 'Dipòsit combustible' → Fuel deposit; 'Regulació i conversió' → Regulation and conversion; 'Emmagatzematge en banc de bateries' → Battery bank storage; 'Càrrega' → Charge.



'Centre de control' → Control center; 'Energia solar' → Solar power; 'Hospital (amb generador propi)' → Hospital (with its own generator); 'Bloc de pisos' → Apartment block; 'Vivenda intel·ligent' (amb vehicle elèctric i autoconsum) → Smart home (with electric vehicle and self-consumption); 'Grup de vivendes' → Group of dwellings; 'Energia eòlica' → Wind power; 'Emmagatzematge d'energia' → Power storage.

An urban energy unit is a set of generation and consumption systems that are associated with a storage system allowing the balance between them through control tools. The unit can be connected to the rest of the energy network (or not) and can also incorporate some special consumptions, such as vehicle charge systems. According to their dimensions and to their connection to the energy network (or lack thereof), they can take part in the general regulation of the electric system, through the "balancing market".

Urban energy units tend to utilize all the energy existing in vicinity of the consumption areas: similarly, we can also speak of rural energy units, where, in general, the consumption is low in comparison with the generation potential. The concept of rural energy units is similar to that of their urban counterparts from the point of view of the elements they consist of; but for the rural units it is more important to take part in the balancing market (for the regulation of the system), in order to contribute to the stability of the public network and receive some benefits for this service. Achieving the real implementation of one of these units is the main goal of the Estorelot Project, led by the RIS3Cat Catalonia Energy Community, subsidized by the Government of Catalonia through FEDER Regional Funds. Emelcat SCCL is taking part in this project, thanks to which all necessary tools and specifications for the implementation of such facilities in our country are being developed.

The development of these energy units can enable the territory to take part in the specific use of its own resources. A significant decrease in distribution losses (traditionally ranging from 8% to 25%) is also achieved. Moreover, said development contributes to the general stability of the system, which is beneficial for the whole society.

The generalization of energy units scattered throughout our territory would mean an important change in the structure of the power network, which would in turn imply a change in the real energy model.

4. Regulation

4.1. European regulations and legislation

The European Commission is working to avoid climate change or reduce its impact at least. This implies a revision of regulations related to energy. In winter 2016-2017 a series of documents, the 'winter package', was released. Among these documents there was a proposal for a directive on electricity markets and a proposal for a regulation of the electric system.[4]

It may be useful to underscore the approach of these new rules: new elements, with no role in the electricity sphere until then, appeared in the proposals. Some of them are, for example, the active consumer, the energy storage, the local community, the aggregator, the independent aggregator, the demand management, the charge point, the companies responsible for the balancing market, etc.: a diverse host that responds to the new conception of distributed electric system, in which consumers take part, and whose sources are local and close to the user.

It can also be useful to highlight the definitions of some of these new elements (we offer them in a rather free version, for them to be easily understood), as well as some interesting excerpts of the directive proposal:[5]

- The active consumer is a user, or a group of jointly acting users, which consume, store or sell the electricity generated on their premises, either directly or through aggregators, as long as these activities do not constitute their main economic or professional activity.
- The local energy community is an association, a cooperative society, a non-profit organization or other legal entity effectively controlled by local entities or shareholders,

4 It must be kept in mind that the European Parliament and the Council eventually approved the Directive (EU) 2019/944 as well as the Regulation (EU) 2019/943 (editor's note). For the purposes of this article, also the Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources is of interest. You can access it online at https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2018.328.01.0082.01.ENG&toc=OJ:L:2018:328:TOC (editor's note)

5 The excerpts offered are from the very Directive (EU) 2019/944, not from the proposal (editor's note).

which takes part in the distributed generation and in the carrying out of activities as a distribution system operator, as an energy supplier, or as a local level aggregator.

- The aggregator is a market participant who combines multiple costumer loads or production systems for sale, purchase or auction in any established electricity market; the independent aggregator is the one who is not affiliated to a supplier or to any other market participant.
- "Distribution system operators [...] shall [...] establish the specifications for the flexibility services procured [that] shall ensure the effective and non-discriminatory participation of all market participants, including market participants offering energy from renewable sources, market participants engaged in demand response, operators of energy storage facilities and market participants engaged in aggregation."[6]
- "The regulatory authorities shall perform, at regular intervals or at least every five years, a public consultation on the existing energy storage facilities in order to assess the potential availability and interest of other parties in investing in such facilities."[7]
- "(For) distribution system operators (to) cost-efficiently integrate new electricity generation (they) should be enabled, and provided with incentives, to use services from distributed energy resources such as demand response and energy storage [...] Member States [...] should provide incentives [...] through network tariffs which do not create obstacles to flexibility or to the improvement of energy efficiency in the grid."[8]
- "Distribution system operators shall not own, develop, manage or operate energy storage facilities."[9] Also, "Transmission system operators shall not own, develop, manage or operate energy storage facilities."[10]

4.2. Spanish regulations and legislation

In the last years, the Spanish legislation regarding energy has been somewhat stagnant or, even worse, has gone against the general sustainability and social interest goals that seem to have been assumed by most of the world. Even so, there are some regulations that show some evolution of the system. Here we will mention two of them:

- The Royal Decree 900/2015, of 9 October 2015, on self-consumption, does not stand out for favoring this modality, though it regulates self-consumption to a minimum extent: in this sense, the Royal Decree supports self-consumption, with storage and with-

6 The original paragraph has been replaced with Art. 32.2 of the aforementioned Directive (editor's note).
7 The original paragraph has been replaced with Art. 54.4 of the aforementioned Directive (editor's note).
8 The original paragraph has been replaced with Explanatory Statement Nº 61 of the aforementioned Directive (editor's note).
9 The original paragraph has been replaced with Art. 36.1 of the aforementioned Directive (editor's note).
10 The original paragraph has been replaced with Art. 54.1 of the aforementioned Directive (editor's note).

out it, which can be considered a legal base for the connection of storage systems to the distribution network, an uncovered aspect until now.[11]

- The Ministerial Edict of 18 December 2015 opens the way for distributed generation to enter regulation markets (balancing markets) if some criteria are met, which was not permitted until now. [12]
- There are still some barriers to such development, being one of the most alarming the prohibition of sharing generation or storage, even though some progress can be observed. For example, the Spanish Constitutional Court has ruled in favor of the Government of Catalonia regarding electric self-consumption, which implies that shared self-consumption is permitted in spite of the aforementioned Royal Decree 900/2015, and that the authority regarding registers and management of such modality does not belong to the State anymore, but returns to the Government of Catalonia, which can use those elements in a different manner. There are still, nonetheless, some details and obstacles derived from the legislation that hinder the regulation of electric distribution.[13]

Conclusion

The need for energy transition is clear, technology already enables it, and regulations begin to adapt to it. Now society must assume it and react, for energy transition to be exemplary, properly integrated in territory and in society. In this process, electric storage is a key element and it shows a path: a good planning of the way in which energy is stored will define the environmental and social sustainability of the electric system as a whole.

11 The Royal Decree 900/2015 was repealed by the Royal Decree 244/2019, of 5 April 2019, on the regulation of administrative, technical and economic conditions for electric power self-consumption (you can access it online at https://www.boe.es/boe_catalan/dias/2019/04/06/pdfs/BOE-A-2019-5089-C.pdf). This new Decree allows and regulates shared self-consumption, as well as the use of the public network for this purpose. Besides, the previous approval of the Royal Decree-law 15/2018, of 5 October 2018, on urgent measures for energy transition and consumers' protection (you can access in online at https://www.boe.es/eli/es/rdl/2018/10/05/15), should also be mentioned. Furthermore, a note by the National Commission for Markets and Competition establishing the methodology for the calculation of electricity transportation and distribution tolls states that there is no toll for power storage. You can access this circular note (3/2020, of 15 January), at https://www.boe.es/boe_catalan/dias/2020/01/24/pdfs/BOE-A-2020-1066-C.pdf (editor's note.)

12 You can access it online at https://www.boe.es/eli/es/res/2015/12/18/(2) (editor's note).

13 It must be kept in mind that the Royal Decree 900/2015 was repealed by the Royal Decree 244/2019, of 5 April 2019. Even so, though the management of said Decree is attributed to the Government of Catalonia, the Spanish Government reserves the strict control on that management (editor's note).

Networks, ecosystems and creativity: towards new proactive models of advanced sustainable development

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Introduction

In opposition to the traditional dialectical contrast between 'polydiffuse' and 'monocompact' models, nowadays a new approach suggests the need to work with new intertwined, networked models capable of referring to diversified polynuclear systems showing a discontinuous nodal development and interacting with landscape in an integrated manner.

Thus, the orientation of such multipolar action (between urban and geographical structures, global systems and local subsystems, individual and general trends), inherent to current 'multiurban' territories, demands the strategic conception of new concertation frameworks and also of new development criteria and new directional schemes that can detect potential situations –strategic and environmental conditions– in the system, and induce qualitative actions and reactions in it, aimed at:

- The strengthening and reactivation of current urban structures.
- The coordination of the different landscape matrices.
- The articulation of the different infrastructural grids and of the mobility and programming systems into new models of integrated planning responding to the new challenges posed by an informational society, and to the critical implementation of a new 'logic of complexity'.

1. Mutations: ink spots and new urban geographies

The last thirty years have entailed a dramatic change of scale and paradigms regarding the comprehension and definition of societies, cities and territories. The entropic acceleration of mobility and long-distance communication, the growing delocalization of exchanges, and the technological and material capability to transform our environments

have revealed, more and more explicitly, the dynamic and informational nature of urban systems and their new 'geourban' dimension.[1]

Complexity, diversity, discontinuity, connectivity, irregularity and, in all cases, interaction –both global and local– between phenomena, processes, structures and configurations (i.e., between simultaneous layers of information and diverse exchange, flow and relation networks) are some of the new definition parameters that appeared at the start of this century, when we have become aware of the inefficiency of most urban planning models, especially the exacting ones, directly inherited from past situations, more linear and apparently stable, though overly deterministic.

Thus, the harmonious music of a complete, prefigured, balanced city has succumbed to the evidence of a complex, arrhythmic score, showing perhaps some random melodic fragments but overall characterized by a syncopated, chaotic and discontinuous 'no-rhythm', with points and counterpoints making urban contemporary space a definitely incomplete, unfinished and fractal body.[2]

In the case of Catalonia, a black and white light spectrum of occupied territories shows us a sort of irregular, simultaneously scattered and polyfocalized constellation, similar to that of other European multiurban configurations. This pattern features, in our country, high degrees of concentration in Barcelonès and Vallès counties, and a filamentous trail along the coastline (especially in Maresme county as well as in the Costa Brava and the coast of Tarragona), and also some inland intensity foci with dispersion haloes showing ambiguous borderlines and related in a discontinuous manner within this big nebula in which limits, territories and cities melt together into a big, diffuse, multifaceted and multinuclear 'geourbanity'[3] or 'landurbanity'.[4]

In the conceptual and instrumental comprehension of the new urban structures that emerge today, the former vicinity borders seem indeed to have suddenly succumbed to the diverse scales of a new 'urbanterritorial' field of maneuver, far more complex, elusive and lively, that takes place within an exchange framework open to amazing combinatorial processes generated beyond former material or geographical conditions: with both far and near, virtual and real territory/-ies, place/s, memory/-ies and context/s.[5]

1 BATTY, M. "Sobre el crecimiento de la ciudad", in *Fisuras*, Nº 5, 1997; p. 6.
2 HELBING, D. *et al.* "Strukturbildung dynamischer Systeme" and BECKER, S. *et al.* "Selbstorganisation urbaner Strukturen", in *Arch* +, Nº 121, 1994.
3 GAUSA, M. "Hiperterritoris – multiciutats – geourbanitats", in Gausa, M.; Guallart, V.; Muller, W. *HiperCatalunya: territoris de recerca.* Barcelona: Generalitat de Catalunya, 2003.
4 According to the sense given thereto by Francesc Muñoz (MUÑOZ, F. Urbanalización. Barcelona: Editorial Gustavo Gili, 2008.
5 GAUSA, M. *Multi-Barcelona, Hiper-Catalunya. Estrategias para una nueva Geo-Urbanidad*. Rome-Trento: List Editore, 2009; pp. 1-280. Also, GAUSA, M. "Repensando la movilidad", in *Quaderns (Mobility)*, Nº 218, 1997; p. 46; and "LandLinks: operative lands", in the *Archilab* catalog. Orleans: Mairie d'Orléans.

In this new relational framework the traditional infrastructural and eco-structural networks should in any case coexist with other connection networks (telematic, financial, etc.), as evidence of the complex nature of a global system of movable, variable and discontinuous geographical and conceptual limits, in accordance with the different agents who tend to impinge on said system.[6]

We have transitioned from the city as a stable shape to the city as a fluctuating, dynamic, non-linear system of relations and interactions, both real and virtual, both material and immaterial.

2. 'Multinter' strategies: sustainability and innovation

In this sense, the last decades have implied the emergence of a double equation based, on one side, on the competitive positioning of cities and territories within a global economic framework associated with the growing internationalization of markets (and of land-related revenue), and on the other side, on the emergence of a new cultural, environmental, more sustainable sensitivity that nowadays suggests a growing need to favor more holistic reflections on new urban redefinition processes while simultaneously promoting significant, responsible, qualitative and innovative identification criteria in these global flow and exchange 'circuits'.

The definition of possible 'multinter' ('multilayer' and 'internetwork', but also 'multiurban' and 'interterritorial') strategies to address the big challenges currently posed by these complex interaction scenarios calls for the consideration of some of the main cross-cutting issues associated with the 're-' factors (reinduction, refoundation, re-information, restructuring, recycling, etc.) that tend to set new urban and territorial agendas at the start of this century. It also demands the examination of the interactive and informational (reactive and responsive) gradual condition caused by the digital revolution (which is conceptual and instrumental, too) currently taking place and necessarily implying a strong commitment to innovation, both technological and formal.

In 2011, the Advisory Board for Sustainable Development [Consell Assessor per al Desenvolupament Sostenible, CADS] of the Government of Catalonia promoted the study *Cap a un habitat(ge) sostenible*[7] which put together some reflections by experts and research groups aimed at proposing new, higher quality dynamics regarding habitat and lodgment (respectively *hàbitat* and *habitatge* in Catalan, hence the wordplay in the title of the work), considering these concepts in a broad sense that included residential spaces, ways of living, and urban, territorial and landscape-based spaces for exchange and,

6 SHANNON, K. "Re-politizing the Metropolis: the strategic project approach", lecture given at the XIX Congress of the International Union of Architects (1996). Barcelona, 1996. Also, ZAERA, A. "Orden desde el caos", in *Exit*, Nº 1, 1995.

7 GAUSA, M. (E–d.) *Cap a un habitat(ge) sostenible*. Barcelona: CADS, Generalitat de Catalunya, 2011.

therefore, the very notion of 'habitat(ge)' as a space for biodiversity and social balance through several scales (territory, city, building, household, etc.).

The sustainability parameters of the study were classified into four basic areas, linked to possible dynamics of closed cycles, and each one referred to one of these four key concepts: energy; water; materials and waste; and food, health and well-being. Five more concepts were later added (ecosystem integration and relation with context; accessibility and vicinity; economic balance and rationale; social interaction and cohesion; and diversity and mixed use), in line with those currently established by the Ministry of Sustainability of the Government of Catalonia.

Nonetheless, and in spite of its subjectivity and lack of measurability, a last criterion was finally deemed to be the key to ensure a qualitative, fertile, well-oriented progress and renovation vector, with sociocultural gains for the system as a whole. This criterion was innovation and creativity, be it in design, in planning, in morphological and typological conception, in a more holistic, cross-cutting and integrated vision on systems and between systems. Said criterion is capable of directing, stimulating and driving the system towards higher quality goals; its lack will lead the system to settle in a state of complacency, inertia and –eventually– subsidiarity.

It seems clear that within this new framework of urban and territorial definition (which is also environmental, structural and cultural) all scales (city, building, landscape, use and user) are intertwined and interlocked in pursuit of new, more efficient mechanisms able to address the new relation scenarios that currently emerge, beyond the traditional, closed mechanisms based on layout, position, occupation and/or delimitation.

3. From city as an enclosure to city as a network

It is from considerations like the aforementioned ones that the new, heterogeneous, dynamic and complex dimension of the city, 'in' the territory and 'along with' it, should be addressed.

The strength of the new 'multicity' drives the territory, but in turn, the lesser or greater balance of the latter has a decisive impact on the various structures that shape the city.

In this sense, one of the main goals for the future will be to assess whether old inertias associated with the terms *metropolis* and *metropolitan*, applied to the plural city and considered to be the ultimate elements of a certain neo-industrial conception regarding expansion and 'unihierarchical', 'monoreferential' urban continua, should not give way

today to the evidence of a new kind of more polyphonic, multifaceted, discontinuous and differential structures, urban and geographical at once.[8]

In opposition to traditional 'monofocal' realities inherent to historic cities, the importance of new intermediate polycentric nodes is emerging today. They unfold as substantive elements of current 'metapolitan' structures,[9] along with the former central attractor nodes.

This dimension is clearly 'multi-', 'geo-' and 'interurban', and especially in scenarios with the matrix scale and configuration of gradual city-regions like those in Northern and Southern Europe –the Randstad in the Netherlands, the Swiss Interland, the Supermilano and the Lungaliguria in Italy, the BCN.CAT or Hiper.Cat in Catalonia, etc., all of them acting like virtual 'multicities', articulated or not–, it should analyze new relation mechanisms within the features, situations, strategies and responses associated with it.[10]

In this respect, one of the main conclusions to be drawn from most current urban research frameworks is the one regarding the implicit need to articulate new ways of collaboration between 'plurimunicipal' and interterritorial scenarios, and also between 'polynuclear' and 'interrelational' urban areas, and, in both cases, between global structures and local situations. Those new collaborative practices should also bring about a better directed and coordinated approach (differential by its location, rebalanced by its allocation) to functions, uses, reserves and growth (and/or gains) on territory. This would favor a more asymmetrically balanced, supervised, projected, calibrated and diverse, as to its burdens and functions, planning of urban developments, far from the usually local decision spheres (and from the subsequent particularist profit drawn from urban planning). And also, far from the traditional occupation, zoning and distribution models, based on patterns that have become too isotropic (as they try to be balanced) and on outdated, unique land classifications.[11]

Therefore, it could be necessary to implement new supramunicipal interconnection and collaboration frameworks capable of compensating burdens, distributing income and gains, and attributing urban-planning roles among development scenarios and preservation or reservation scenarios.[12]

8 ASHER, F. *Métapoles ou l´avenir des villes*. Paris: Éditions Odile Jacob, 1995. See also ASHER, F. "La Métapole ou la fin des périphéries", in *Construire la ville sur la ville. Catalogue Europan*. Paris: Europan, 1995.

9 NEL·LO, O. *Ciutat de ciutats. Reflexió sobre el procés d'urbanització a Catalunya*. Barcelona: Empúries, 2001. See also GAUSA, M. "Hiperterritoris – multiciutats – geourbanitats", in Gausa, M.; Guallart, V.; Muller, W. *HiperCatalunya: territoris de recerca*. Barcelona: Generalitat de Catalunya, 2003; pp. 1-704.

10 According to data from the Institut d´Arquitectura Avançada de Catalunya, 2003.

11 The background issue is the conception of a new type of metropolitan governance whose definition goes beyond the usual local/municipal decision spheres, but also beyond the traditional global/regional regulation and planning structures.

12 See the analysis by PUIG VENTOSA, I. "Polítiques econòmiques locals per avançar cap a formes més sostenibles d'habitatge i ocupació del territori", in GAUSA, M. (ed.) *Cap a un habitat(ge) sostenible*. Barcelona: CADS, Generalitat de Catalunya, 2011. See also TORRES, P. "Territoris de risc", in *VIA*, Nº 5, 2007.

These aspects could refer to a possible mesh-patterned orientation of territory, of its development areas and of its nodal concentration or transfer points; but they also could mean the (re)definition of articulated fabrics and the reuse and recycling of pre-existing elements; or the efficient relation with landscapes and between them, as well as the reflection on the borders where nature and artifice meet; the conception, in fact, of a new kind of active, relational space designed to overcome the traditional notions of free space and public space.

The very idea of landscape would then become instrumental: it would no longer refer to an empty, interstitial space –a relic or an allegedly bucolic reservation– but to an operative system 'of' the territory and 'within' the territory: landscape, thus, understood as an 'in-', 'intra-' or 'in-between' productive space for particular and collective uses and activities; as the overlapping area for growth and events.

4. 'Land-links' and 're-citying'. Urban systoles and territorial diastoles: intertwined systems

We have used in several occasions the terms *land-links* and *re-citying*[13] to define these possible integrated and interdependent strategies, aimed at ensuring local developments and global 'contracts' (concertedly qualitative), in the large scale (territorial/regional) and in the medium scale (urban/interurban), and able to combine in an effective manner movements of weighed growth and of active conservation, of global articulation and of local reactivation, of urban systole and of territorial diastole, within new, intertwined relation models. Spreading the landscape and reinforcing the city.

This kind of strategies involves the transition from an 'extraurban' territory to an 'interurban' one; from a territorial mesh (a net) to a mesh-shaped (networked) territory; from a passive territory to an active one. To achieve this, compression structures (urban concentrations), connection structures (infrastructural matrices) and relation structures (in-between landscapes) must be agreed upon, in a new type of discontinuous, networked urban geographies, simultaneously intertwined and integrated. Discontinuity must become connected, density must be concerted, diversity must be worked on, and an efficient interaction between environment, spaces, territories, flows and activities must be favored. It is also necessary to articulate coordinated infrastructures, eco-structures and 'intrastructures', interpreting, at the same time, infrastructures as landscapes and landscapes as infrastructures (or, if preferred, infrastructures as eco-structures and eco-structures as 'intrastructures' and infrastructures).

13 GAUSA, M. "LAND-LINKS & RE-CITYING: verso una nuova geourbanità in rete", in Gausa, M.; Ricci, M. *AUM 01 Atlante Urbano Mediterraneo*. Genoa: Università degli Studi di Genova. Also, RICCI, M. *Nuovi paradigmi*. Trento: List Laboratorio Editoriale Internazionale, 2012.

Thus, 'monocompact' and 'polydiffuse' models are no longer desirable. Instead, there is a chance for intertwined, interlocked, articulated and focused, intensive and extensive systems, capable of combining, in new territorial networks or patterns, density structures (urban fabric), connection structures (connection mesh) and relation structures (active landscapes): around these structures it should be possible to articulate new discontinuous, dense urban geographies ('dis-dense geourbanities'), open to spatial, functional and social 'mixtion', and associated with a differential organization of the new metropolis: a material and virtual 'hyperplace' (a 'place of places', a metabolic, metamorphic, and diversified in a metamorphic manner complex), rather than a hypothetical, ideal, essential and/or referential place.[14]

5. New ways of doing

Obviously, this recent leap of the former compact city outwards (which should be considered in all its importance and dimension) demands, today, in turn, a parallel movement of re-information, restructuring or inner recycling, related to the sustainable use of resources and of existing assets.[15]

In these new dynamics, the traditional (now 'pluricentral') city and its associated population clusters should simultaneously ask themselves how to grow (how to redefine and restructure themselves) 'inwards', favoring new action criteria aimed at directing inner operations of restructuring, reassessment, reinforcement and reactivation, through new networked schemes, associated with parameters of connectivity, mobility, renaturalization and urban articulation, but also with new functional (typological and/or morphological) models defined on the basis of a possible (and desirable) 'mixtion' (regarding residence, production and leisure) and of a new relation between habitat, landscape and technology, which implies paramount elements of a new urban reformulation where developing would not necessarily imply growing, and growing would not inevitably imply occupying.

This new condition of 'endourban' redefinition and reinforcement is related to a reactive and reactivating approach based on the combination of ten 're-' factors:

- Urban recycling (restructuring, renovation, reuse of existing buildings and urban fabric);
- Local and global reconnection (territorial and 'intermunicipal' re-articulation);
- Functional rebalancing (typology and program 'mixtion', and diversity);
- Central renaturalization (green factor);
- Energy re-efficiency (holistic eco-efficiency);
- Collective reaffirmation (social interaction);

14 ECHEVARRÍA, J. "Telépolis", in *Quaderns*, Nº 211, 1995. Also, GAUSA, M. "City Sense: Territorializing Information", in Vv.Aa. *City Sense, 4th Advanced Architecture Contest*. Barcelona: IAAC-ACTAR, 2012; pp. 6-13.

15 GAUSA, M. "BCN-GOA Re-Citying", in Gausa, M.; Ricci, M. *AUM02 Atlante Urbano Mediterraneo*. Trento: List Editore, 2014; pp. 42-51.

- Economic re-impulse (supporting talent and business creativity);
- Innovative research (promoting creative and technological creativity, with respect for memory and tradition);
- Sensitive, creative and proactive reinvention;
- Smart re-information: qualitative and efficient management of information through a new environmental sensorization and interaction (smart environments).[16]

It is necessary to qualitatively consolidate and reinforce centers; to strengthen and profile (or shape) margins, whose contours, perimeters and density areas must be clearly defined for every associated population cluster; it is also necessary to re-articulate (or re-urbanize) disperse vicinity areas (always according to possible equations of city-city continuity, of landscape-city contrast, or of city-landscape transition). All of the above would help define operation processes associated with new equations between weighed density, concentration, agglomeration and dilation parameters, which would in turn be able to generate new sensitive, innovative urban strategies, be they central or perimetric.

Furthermore, it could be useful to propose not only the usual operations of morphological continuity and contextual suture –conveniently necessary–, but also possible eruptive accumulation and re-impulse operations (of localized height growth), and/or hybridization (or interaction) operations involving landscape, generated beyond former standards (contextual and conventional to different extents), and affecting alignment, density, gauge or height.

For such processes to take place new types of urban repertoires should be promoted: they should be associated not only with the aforementioned regeneration, renovation and/or reactivation strategies, but also with new, variable conditions of density and volumetry, of intersection and exchange (between grids and fabrics, between architectures and landscape, between structures and infrastructures, between cities and geographies).[17]

As a matter of fact, the conception of territory as a manifold scenario for exchange and simultaneity demands a new look on the traditional tools of planning and land classification. This new look is aimed at the reassessment of former formulations: contemporary cities should no longer rely on rigid models, zoning classifications and old ground layouts as the only mechanisms of urban planning.

A multilayer comprehension of reality needs, in fact, a multilevel comprehension (and compression) of its activities and uses, of its functional programs and its spatial organizations, from a new land qualification no longer based on two-dimensional classifications or

16 GAUSA, M. "BCN-GOA. Re-Citying (Fattori: verso una città attivata, verso un'urbanistica attiva)", in Gausa, M.; Ricci, M.; Scaglione, P. *AUM 02 Atlante Urbano Mediterraneo 02*, MED.NET.IT.2.0, Trento: List Editore, 2013; pp. 42–5

17 GAUSA, M. *Otras naturalezas urbanas: arquitectura es ahora geografía*. Castelló: Espai d'Art Contemporani de Castelló, 2001. Also, GAUSA, M. *Housing, nuevos sistemas, nuevas alternativas*. Barcelona: Ed. ACTAR, 1998.

monofunctional zonings (residential, industrial, green spaces, etc.), but on 'n-dimensional' criteria capable of combining shares, levels and use strata, programming and informational exchange through new hybrid devices conceived as possible interfaces between habitat/s and environment.[18]

There will have to be mechanisms capable of articulating the necessary tridimensional 'mixtion' from which new collaboration frameworks between former dual categories can be proposed: natural and artificial, urban and geographic, landscape and architecture, public and private, ordinary and extraordinary, virtual and real, material and immaterial, form and information, etc.; all of this in new, complex scenarios capable of putting into relation emergence, ground and underground: diverse layers of the city activated through relations of connection, but also of interconnection and/or interweaving between uses, activities and programs; between architecture, landscape and infrastructures; between milieu, environment and information.

The digital universe and the information technologies have exponentially widened the exchange potential between scenarios, situations and demands. The capability to parametrize, program and manage variable, mutable and changing data, messages, connections and demands, in order to direct them with different degrees of strategic or qualitative ability, is also growing. All of this is possible thanks to precise and adjustable algorithms that can be recorded and recalculated, and later re-edited into manifold, variable formats, pathways and contexts.

The aforementioned processes affect urban mobility, energy efficiency, social economy, collective space, collective self-organization, environmental response, etc.; they simultaneously invoke a new, smart dimension of cities and their management, an interactive, informational one, related, in fact, to the growth of new technologies and to their progressive development into digital networks, and also related to their capability to connect matrices and material structures (spaces, environments, atmospheres, assets, appeal, etc.) with strong environmental value/s, for them to become networks articulating scenarios with real worth and potential latency into new integrated, interconnected urban systems.

This informational, interrelational, gradually open and variable condition should be combined, simultaneously, with the ability to create shared horizons: visions and strategies for the future that can express, direct, and proactively induce a more inventive and open development, one that brings together advanced technological models and new cultural, spatial and social expressions; in brief, innovative and sustainable strategies enabling the

18 GAUSA, M. "Barcelona Metàpolis: salt d'escala", in *Espais*, Nº 47 *(La metròpoli del 2010)*. Barcelona, 2001.

simultaneous convergence of sensory, sensorized and sensitive logics in new spaces for living (*sense cities*).[19]

6. The new challenges, summarized

Today, the issue is not only the redemption, regeneration or recentralization of the 'multicity', but also its reinforcement, reactivation and enhancement, and the strengthening of its cross-cutting features.

The 'multicity' must be interpreted and provided with direction schemes and scenarios from which new cross-cutting comprehensions can be articulated (brought together). These interpretations must be able to improve the identity features and peculiarities of every space, place, sector or scenario (their heritage-related, environmental, social, sensory, symbolic traits), and supplement them with timely operations of urban re-induction and of interurban interweaving.

These conditions belong to a reactive and reactivating approach, linked, as stated, to urban recycling, to green renuralization, to environmental quality, to sustainable engagement, to the affirmation of cultural identities, to social balance, and to a new 'mixtion', not only a zonal one, but a tridimensional one, encompassing life, production and relation spaces.

As a summary (or synthesis 'dodecalogue') we can note:

1. City today unfolds as a 'multicity'.
2. It is read not only as a set of (static) shapes, but also as a system of (dynamic) layers or levels.
3. It is not defined as a place, but as a 'hyperplace': a place of places, a place between places, real and virtual, material and immaterial.
4. It is not placed in a territory but moves through territories or between territories.
5. Its territory is that of its landscape. Landscape is the 'other' main building of the current 'multicity'.
6. Planning today implies programming possible open scenarios. Nonetheless, they are qualitative, processed and directed, sensory and informational, simultaneously abstract and sensible.
7. Thus, design gives way to strategy; the outline, to the map for action; the layout, to the network; the formal object, to the informational process.
8. Therefore, the challenge of the current city is not growth, but (self-)reinforcement: it is a matter of recycling, rather than building; of articulation, rather than occupation.

19 GAUSA, M. "City Sense: Territorializing Information", in Vv.Aa. *City Sense, 4th Advanced Architecture Contest*. Barcelona: IAAC-ACTAR, 2012; pp. 6-13.

9. The identity of the city does not revolve around the preservation of essences, but around the (re-)innovation of values: amending deficiencies, projecting potentials and strengthening assets and appeal; betting on a strategic vision that respects heritage while opening up to creation.
10. Thus, its identity is not fundamental, but conditional. It depends on the capability of the very urban system to simultaneously preserve and reinvent itself, to re-impulse and re-inform itself, both in a qualitative and in a strategic manner.
11. This strategic direction cannot be based on closed formulations (single, closed, absolute planimetry), but on open formulations (differential criteria), with forward looking, sustainable dynamics.
12. The equation 'economy + environment + society' can be worded today 'innovation + interaction + information (knowledgement)'; or, if preferred, 'pioneering technological development (innovative) + spatial and urban quality (interactive) + sociocultural and creative impulse (integrating)'.

The latter equation invokes a new type of logic, a decidedly advanced, informational one.

If the sustainability of any system implies empathy and innovation (evolution, sensitivity and progress), its future relies on its capability to innovate –and improve– its present.

Cities today have set sail across a new kind of drift in which network and networked relations (economic, but also trans-spatial, trans-territorial and transcultural) multiply beyond former local limits of circumscription and definition. Their capacity of development depends mainly on their efficient belonging to those structures, and, especially, on their ability to make themselves visible, with leadership ambition, as nodal, creative, generative points within the system, i.e., polarizing and distributing information (creative, not merely productive energy).

Otherwise, cities curl up and enter a dynamics of inertia and routine, tending to self-involution and to a dependence that makes them, to some extent, subsidiary to imported habits and products, rather than generators of goods and references.[20]

20 GAUSA, M. "Barcelona Metàpolis: salt d'escala", in *Espais*, Nº 47 *(La metròpoli del 2010).* Barcelona, 2001. See also GAUSA, M. "Territorios de investigación", in *La Vanguardia*, 27 January 2004.

Vulnerability and rural world: diagnosis and drivers of change

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Introduction

Our presentation puts together some reflections derived from different studies carried out by the Research Group on Rural Development at Barcelona's Autonomous University (DRUAB), especially *Innovation, diversification and European agricultural situations* (IDEAS; EU Project Nº FAIR6-CT98-4228); *Agriculture and employment in the rural regions of the EU* (RUREMPLO; EU Project Nº FAIR 3-CT96-7666, 1997-1998); and the assessment of the Leader Program and of the rural development programs (PDR) of Catalonia in different periods.

This lecture aims to discuss some drivers of change that can be observed in the Catalan rural world and determine how these drivers contribute to the vulnerability or the resilience of Catalan society.

Firstly, we will approach the analysis of rural world vulnerability, taking into account its indicators and the traditional actions seeking to address it. Then we will consider the drivers of change that impact on the Catalan rural world nowadays, and how they can help mitigate vulnerability in an environment that is gradually becoming more periurban. Lastly, we will try to find out what rural-urban interconnections should be like in order to ensure a higher degree of resilience for Catalan society as a whole. This lecture aims to contribute some answers to one of the questions put forward in this second session of the Catalunya Futur Verd cycle, more specifically, "Which forces for change generate new opportunities and conditions enabling more progress and simultaneously a higher environmental, economic and social resilience?"

Depopulation and the vicious circle of development in the rural world

Loss of population is, in our view, the most significant indicator of rural world vulnerability. Not only does the progressive depopulation process generate socioeconomic vulnerability, it also affects all biophysical elements. When the population density in a rural area falls below the threshold of 10-15 inhabitants/km^2, a vicious circle of development entailing a progressive deterioration of socioeconomic and environmental parameters begins. Loss of population implies the abandonment of pastures and agricultural lands, the expansion

of forests, and a change or disappearance of the landscape patchwork; moreover, fires become more difficult to control, the cultural heritage turns to ruins, the management of many natural resources becomes more complex, and so forth. On the socioeconomic side, it must be noted that the disappearance of population leads to the closing of services, the disappearance of herds, the loss of food production processes, the lowering of living standards and the loss of jobs. All of this contributes to further depopulation.

Changing this dynamic is far from easy.

In order to break the vicious circle of rural depopulation, authorities have traditionally proposed measures of a rather interventionist nature aimed at "tying population" to territory: this concept is unsympathetic and has a strong mandatory character. The results of such proposed programs have been really disheartening. Within the framework of this philosophy we put forward, on several occasions, a proposal that used to be popular some years ago: it involved the public sector creating jobs for women. This population segment is usually the first to abandon a given rural territory, and the lack of occupational options seems to be a significant explanation for this in strongly agricultural areas, where men kept on working as farmers while women had no occupational alternatives. In Sweden we were told that for each agricultural holding remaining in business in northern areas of the country, the generation of 0.5 jobs had been calculated to be necessary in occupations usually carried out by women: librarians, nurses, teachers, etc. Nonetheless, we have observed this job generation to be insufficient to change some demographic dynamics: for example, in rural areas of the Zamora province where we worked twenty years ago, the population keeps on diminishing even though major initiatives, aimed at tying population to small villages and involving the creation of jobs for women, have been implemented. When we asked why they did not work, it turned out, on the one hand, that women increasingly commute thanks to the improvement of roads, and on the other hand, that the job profiles created do not match those of the population there. Some of the initiatives implemented were a nature interpretation center, a senior citizens' club and nursing home, and a rural golf course, among others. And most times the golf instructors, the nurses or the biologists were not native to the area, but commuted from the towns of Zamora or Benavente, where they lived. Thus, the jobs created had not contributed to tie people to the area, and the population kept on decreasing and clustering in bigger towns.

Drivers of change in Catalonia

Catalonia is a country with a complex orography and a wide diversity of territorial socioeconomic typologies. Its rural world underwent a process of population loss and concentration in bigger towns and in metropolitan areas; this process was especially intensive in the second half of the 21st century. In more recent years an array of factors opens new opportunities, though we are aware that these factors do not impact all of our rural territories to the same degree. In our intervention we will focus on four factors that are substantially

interconnected and which might be helping reduce rural vulnerability, as we see it. Because of this, they should be promoted within the characteristic framework of Catalonia.

Agricultural production

Firstly, a strategy change can be observed in agricultural holdings.

The agricultural modernization prototype that caught on throughout Europe since the 60s of the 21st century led to large agricultural holdings with a significant specialization in few agricultural or farming products. This model was considered the only possible way towards profitable and viable agricultural holdings, and it relied on the utilization of scale economies, i.e., it involved producing more kilos and liters with a lower unit cost. Reality, though, has revealed that such model is not as dominant as scholars foresaw, and in recent years we can even remark agricultural holdings that produce short series with a higher added value, thus obtaining higher economic profit than large specialized holdings.

This added value strategy shows a significant potential in Catalonia: on the one hand thanks to the diversity of Catalan agriculture and farming (wine, vegetables, sweet fruits, nuts, olive oil, pig, ovine and bovine cattle, etc.), and on the other thanks to the vicinity of important markets, because we live in a highly peri-urban society. Furthermore, many regulatory restrictions on transformation and direct sale are being lifted, and farmers' markets appear on the agenda of almost every village.

Production diversification in the rural world

Secondly, the diversification of economic activities in the rural world is a key element for the vitality of these areas.

A rural world based solely on agricultural activities has little future in terms of population: diversification is a key factor to keep the rural world alive. In Catalonia, tourism is becoming an essential element in rural diversification: it implies more than just rural accommodation; it also drives many other activities, promotes local markets, enhances local food and crafts production, generates different leisure activities and contributes to the economic viability of services for the population. Second homes, widespread in Catalonia, also contribute to the strengthening of links between the rural and the urban world.

Diversification does not mean only tourism: it also encompasses crafts, small industry, all kinds of professional services and activities, and new market niches.

At this point we would like to mention the legislative proposal for the Act "Sustainable Rural Development Promotion within Programming and Execution of Catalonia's Rural Development Program [PDR] 2014-2020, funded by the EU", placed before the Bureau of

the Parliament of Catalonia at the end of January 2017, and supported by all opposition parties. This legislative proposal claims to seek sustainable development, but it endangers the support provided by the PDR to the diversification of the Catalan rural world: as we see it, the agricultural lobby that promotes the Act is making a mistake by trying to avoid the PDR resources supporting rural diversification so that they become mere money transfers to the ensemble of "farmers". The *par excellence* program of rural diversification through European funds is the Leader Program, started in 1991, and through the aforementioned revision a limitation of the PDR within the mandatory minima established by the EU regulations is sought. In this respect, farmers are at fault if they really want to keep the rural world alive as a space allowing them, their families and neighbors to live: rural families, in Catalonia and in Europe, do in fact live mostly on income from different sources, among which non-agricultural activities are of great importance.

Living standards and new technologies

Thirdly, living standards are a key element in keeping the rural world alive and in preventing its depopulation.

Socializing and breaking isolation, along with accessing services, are key elements in the living standards of the population. But as for the provision and management of services, it should be understood that urban standards are not directly transferable to rural environments: customized measures are needed, and in order to define them new communication technologies open many opportunities. Similarly, these technologies imply significant changes in terms of socializing and of breaking isolation, but a *sine qua non* exists: the broadband network coverage must reach the whole country, and this is still an unresolved issue in Catalonia, some spots of whose territory still lack suitable access, though some significant initiatives have been carried out in this respect. Complete, high quality network coverage is a key element to improve living standards, to promote both rural diversification and new activities within agricultural holdings, and to attract new residents capable of partially delocalizing their jobs.

Image and rural world

Finally, a change in the image of the rural world must be noted.

Nowadays, society is offered an image of the rural world that contributes powerfully to making this environment attractive. For many years, the media conveyed an image of the rural world limited to some farmers' union representative complaining about the too much or too little rain, or to some elderly people sitting in the village square. Such were the protagonists of the news. Furthermore, second homes, oftentimes located in residential developments, seemed to be completely independent from the local population.

In the last decades a change has taken place, and the media now favor a far friendlier image of the rural environment. At present, the rural world is associated with a healthier life, high quality food, and an alternative, less consumerist, less stressful way of life. The media often show young rural entrepreneurs, children and youngsters beginning a healthy life, rural schools reaching satisfactory performance, advancements enabling a more sustainable management of natural resources... Rural world and a healthier environment, rural world and an alternative, less consumerist scale of values, rural world and high quality food, rural world and happiness... are giving rise to a new imagery and a higher appreciation of the rural world.

Rural-urban interweaving and resilience

In our opinion, the four factors above do reduce the vulnerability of the Catalan rural world. Without population the functions of rural environments become diminished, or they downright disappear. The rural world means food, energy, water, well-being, leisure, culture, heritage and recycling, among many others. But all of these elements need to be managed, which demands population and a suitable rural-urban interweaving. If the rural environment specializes and becomes the destination of urban waste and of all bothersome and polluting activities, the resilience of our society will be seriously undermined and will undergo a loss of resources, which has a burdensome cost for highly urbanized societies.

The concept of resilience has a long history in the fields of psychology and ecology, but it is rather new in the sphere of social science: the last great economic recession put it into fashion, and many studies focused on trying to discover which elements make territories more capable of quickly responding to the impacts of economic crises. At the same time, social ecology has incorporated the concept of resilience in terms of availability and depletion of natural resources. In the sphere of the economy, studies have shown that when specialization reaches a high degree, territories suffer more from economic cycles and become more affected by shocks.

The four aforementioned factors limit the distance, the difference between the rural and urban world, and establish some linkages that show a fundamental potential for the resilience of Catalonia as a whole. This resilience needs the strengthening of the rural world, especially if we consider the fact that Catalonia has a very low ratio of available natural resources and a really high concentration of population in the metropolitan areas of its provincial capital cities (Barcelona, Tarragona, Lleida and Girona).

Water, energy and climate change: a global vision with a Catalan accent

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> "Our ignorance is not so vast as our failure to use what we know."
> M. King Hubbert (1903-1989)

Biophysical bases of economy: water and energy

Water availability used to be a determining factor for traditional societies, who depended also on renewable energy sources such as the power of rivers and wind. Therefore, human settlements were determined by the availability of water for human consumption and for agriculture, especially in arid regions. In fact, the first complex civilizations emerged on the banks of big rivers and in deltaic areas of the Middle East: such were the cases of Mesopotamia and Egypt.

Energy availability became a more critical factor for human economy when the Industrial Revolution took place. The economic and population growth of the last two centuries has been fueled essentially by fossil fuels, with water as a less critical, limiting factor (except for some poor countries). Throughout the 20th century, but also in the 21st, oil has become our main energy source. It was, and still is, a cheap, versatile and high-quality energy source. It only has two quibbles: it is a non-renewable energy source, and it is also the main culprit for climate change. We must be really aware that, right now, almost everything in our society relies on fossil fuels: agriculture, fishing, industry, transport, commerce, electricity, heating, etc. We must also be aware that cheap oil is running out. Currently, both water and energy are critical for sustainability, especially in places such as Catalonia, with a relative scarcity of water and highly dependent on foreign fossil fuels. Nonetheless, energy availability and quality, along with its consumption level, are the ultimate cornerstones.

Unfortunately, climate change, a collateral damage of fossil fuels massive consumption, makes everything more complex because, as we will see, it also nurtures further energy consumption and water scarcity. Mediterranean countries are on the side of the 'climate losers', and almost all of its expected effects, as well as those already unfolding, are negative: higher temperatures, more intense droughts, sea level rise, lower availability of

water and of hydropower, more heatwaves, more frequent forest fires, reduction of crops, negative (but also positive) effects on tourism, increase of health issues, etc.

GHG emissions keep on growing in spite of international agreements: our difficulty to reduce them is a reflection of our addiction to fossil fuels. Catalonia is very vulnerable to the scarcity of fossil fuels and to climate change. The first step to take in order to overcome this situation and become stronger (more resilient) is to acknowledge our addiction so that we can properly understand what happens to us and try to find adaptive solutions.

The reason for everything: we are carbon, we eat carbon, and we burn carbon

Our body is about 65% made up of water. We all understand its importance for life, we are taught about it at school. But few people know that the main constituent of the 'solid' part of our body is carbon (almost 50%). In order to understand what happens to us we must go to the root and realize that carbon is an essential element of the biosphere and of our society (the anthroposphere, which is in fact a part of the biosphere). In both of them carbon has a double function, as an energy source and as a structural element: it is the main energy source for organisms (as food) and for society (as fuel), and it is also the main element regulating the climate and the chemical processes that take place in the ocean (carbon dioxide). Therefore, any alteration of the carbon cycle has a strong influence on the functioning of the biosphere and the anthroposphere. Summarizing, we can say that throughout the Earth's history, the biosphere (life) has been transferring atmospheric carbon to the soil (organic matter), to the subsoil (coal, oil, gas) and to the oceans (calcium carbonate), whereas the anthroposphere (*Homo sapiens*) is carrying out the reverse process in an accelerated manner: through hydrocarbons extraction it is returning into the atmosphere ever-growing amounts of carbon that had been stored underground for millions of years.

It is important to understand that the growing exploitation of hydrocarbons, as that of all non-renewable natural resources, has some thermodynamic limitations that we cannot avoid –though we can temporarily circumvent them thanks to technological innovations. The key concept to comprehend this is the EROI (energy return on investment), i.e., the 'net' energy (the usable one), consisting in the difference between the invested energy and the obtained energy when putting the energy resource at the disposal of the consumer. For example, by 1930 the United States obtained about one hundred barrels of oil for every barrel invested in their obtainment (EROI = 100), whereas at present the EROI is lower than 10 and it keeps on going down. This reflects the growing difficulty of increasing oil production (the so-called 'peak oil') and is the ultimate reason why oil prices have been escalating in the last decades (although with some ups and downs).

The EROI principle also applies to other energy sources, even to renewable ones: at present, the EROI of the latter is generally lower than the one of fossil fuels (except for hydropower and wind power, whose EROI is usually higher than 10), and sometimes it is very low or even negative (which is often the case with biofuels). A really significant datum that we do not know yet is the minimum EROI needed by a complex civilization (such as ours) to sustain itself: some experts suggest a minimum EROI of 5. But beyond the EROI the total energy consumption is also important, which is still increasing due to the growth of population and its consumerist way of life. In my opinion, renewable energies will only be able to replace fossil fuels if their implementation is accompanied by a significant decrease in overall energy consumption, nowadays still relying (80%) on hydrocarbons. We Catalan people must be aware of our heavy dependence on fossil fuels and nuclear power: it is a vulnerability that we must address with courage and determination through transparent social debate, with the participation of experts and aiming at the biggest political consensus. Regarding energy sustainability, we could say that the future of Catalonia is up in the air and that everything must still be done.

The complex interlocking of water, energy, and climate change

The aim of this section is to carry out a qualitative analysis of the connections between water management, energy, and climate change, highlighting those cases in which feedback effects on each other may arise. As a backdrop to the challenge of supplying all citizens with water and energy in a sustainable and affordable manner amid a climate change scenario, we find the phenomena of a growing population and higher consumption of resources per capita: they make everything more complex and are, simultaneously, the source of the problems. Nonetheless, this global tendency is becoming reversed in western countries, and Catalonia is no exception. The decrease of population and of resources consumption per capita (of water for example) opens a window of opportunity for us to adapt with less pressure to a global scenario of growing complexity. Below we analyze some of the most notable interactions between climate change, water and energy, and how they can affect Catalonia.

Rainfall decrease, evapotranspiration increase and droughts intensification lead to a reduction of regulated water resources, which affects irrigation agriculture and hydropower production (and in many cases, nuclear power production, too). Furthermore, temperature increase implies a rise in energy consumption for air conditioning, which, in summer, takes our energy system to its production capacity limits while also increasing GHG emissions, which in turn feeds back into the global warming process. This can have a strong impact on population as heatwaves escalate, as we saw in Europe in July 2006. At that time, the electricity production in Spain and especially in France was jeopardized by some serious issues in the refrigeration systems of nuclear power plants (the main producers of electricity), due to the low flow of rivers and the high temperature of their water, which implied that a higher amount of it was needed. The collapse of electricity production during

heat events would cause health impairment and mortality increase in people sensitive to extreme heat. Also, as we have already observed in the Iberian Peninsula, hydroelectric production decreases because of climate change, which is detrimental to the production of renewable energy that could help fight climate change. Catalonia's dependence on nuclear power is similar to that of France, and this is a significant vulnerability factor that should be addressed. Moreover, we cannot expect to increase hydropower production through new dams, because there are few free spaces left to accommodate them, and they would imply negative environmental and socioeconomic impacts.

Longer and more frequent droughts in some regions of the Earth (such as the Mediterranean area or the south-east of the United States) imply a decrease and/or a higher irregularity of crops, whereas the increase in the price of energy makes the materials needed for agricultural production more expensive: fertilizers, pesticides and machinery fuel. The diminution of crops in some regions, along with the increase of population, entails lower amounts of food per capita and makes the population with lower income more vulnerable. On the other hand, the increase in biofuel production, aimed at replacing oil, is also causing a reduction of agricultural areas intended for food production, and therefore, the need to extend agricultural lands and water consumption. Hence, we find, in many regions, a scenario where water resources decrease as the pressure on them increases, which can entail a decrease in agricultural production and growing impacts on aquatic ecosystems and on aquifers. In the case of Catalonia such pressure does exist, but it can be managed thanks to the decreasing population and to the margin of improvement that still exists regarding the efficient use of water, especially in the agricultural sector. Nevertheless, the scenario could become more complex in the second half of the 21st century if warming accelerates, rainfall decreases, and droughts become more intense.

A driblet about water management in Catalonia

From a hydrological point of view Catalonia is a dual country in all respects: geographic, climate-related, administrative, and also regarding water uses and water management. The western half of our country falls into the Ebro basin: its population is scarce and its climate semi-arid; there is a high demand of water for irrigation, and its management competence belongs to the Spanish Government (through the Ebro Hydrographic Confederation, CHE). The eastern part of Catalonia falls into the so-called Catalan inner basins: it features a large population, a Mediterranean climate and a high demand of water for urban use, the competence of which belongs to the Government of Catalonia. This situation has caused, until now, the existence of two parallel realities, little connected and almost inconsistent with each other. But faced with the challenge posed by the construction of a new Catalan independent state, there is a need to reflect on water policies, here and in Spain, and on the way to reach a new scenario in which Catalonia has full competence on water in all of its territory and applies a new water policy based on the principles

of the European Union and its Water Framework Directive: sustainability, efficiency, cost recovery and good ecological features of water bodies.

An important question is why water policies in Catalonia (and in Spain) do not seem to be able to change and adapt to the new European and global political, social and economic context. To a large extent, the answer might lie in the deep roots of old water policies, trapped in the 'regenerationist' period of the late 19th and the early 20th century, whose top representative was Joaquín Costa. This political movement considered that Spain had to be modernized at all levels, and the proposal for the building of massive hydraulic works (reservoirs, hydropower plants, water channels and irrigated lands) became a significant element of that effort. Later on, in war and post-war times, with the population figures rising, this strategy still made sense: these policies were enthusiastically adopted by the Franco dictatorship and, in fact, the opening of water reservoirs seemed to be Franco's favorite 'sport'. This way of doing was also the one implemented, time and time again, throughout the last democratic period, until it was de facto stopped by the economic crisis. Even so, that stop has not found its reflection in planning documents such as the Hydrological Plan of the Ebro Basin, which still insists on infrastructures: more water reservoirs and more irrigation channels.

The whole society used to embrace as an indisputable dogma (and still does in their majority) the idea that building reservoirs and irrigation infrastructure was good by nature, without questioning their economic (let alone environmental) viability. By the way, the same policy, in an even more aggressive manner, was implemented in the United States in past times, and is currently being implemented in China, to name a few significant examples. This makes part of a more general, global social and political vision that considers the building of infrastructures (highways, railways, roads, reservoirs, etc.) good by definition, whereas those who challenge it are considered 'radical ecologists' and 'antipatriots'. Needless to say, this has deep roots in the core of old politics, that of the conspiracy between governments, political parties and big construction companies, which in Spain is called *cultura del pelotazo,* 'quick (and shady) buck culture', and which is the one that blew up right in our face, in a traumatizing manner, when the last economic crisis arrived.

In brief, the old water politics is nothing but a part of the old politics without further adjectives, and is tightly related to the old agricultural and infrastructural politics (or policies), still in full force in Catalonia and in Spain. This old politics advocates that irrigation infrastructures are good by definition, and that more irrigated lands are needed in order to save agriculture and ensure food sovereignty (weirdly enough, a concept usually defended by ecologist movements). Some of us think that this is a false position that, unless reformulated, could accelerate the decadence of our production model and make it fall into the hands of large corporations' interests, alien to our agricultural world and to our strong agri-food industry. In my opinion, if the old politics, as a whole, does not change,

the old water policies cannot change either, and neither can other policies: they all form an inseparable set.

A really clear indicator of the quality of water policies is the determination of environmental flows for our rivers. In most cases, the ecological flow has been established from 'what might remain left' once water has been distributed for other uses, even though the Water Framework Directive, as well as the Spanish and the Catalan regulations, state otherwise: the ecological flow must be determined in the first place, and then water can be allocated for other purposes. The difference between the ecological flow determined by hydrological plans and the one advocated by experts is often very significant, which reflects the politicization of some water management aspects that should be essentially technical and legal. The same happens when the question of irrigation is put on the table: political interests are often put above economic, social and environmental criteria. In this respect, we find in Catalonia (at least in its Ebro basin) the same contradiction found in many parts of Spain: on the one hand we want to extend irrigation, on the other hand we want to increase the ecological flow. Doing both things simultaneously does not seem possible. New water policies should address this contradiction in a decided and fair manner, so that reality can change and we can adapt to the needs of the 21st century: in this sense, the Government of Catalonia is granted a great opportunity to promote a new water culture. Old water policies could seem, by themselves, inconsistent with the will to build a new country.

Water policies: design them yourself, or someone else will...

Catalonia must assume with maturity the challenges posed by water management in a changing world. Former paradigms are no longer valid, and the first thing that needs to be done is a shared diagnosis of the current situation and a sound analysis of possible future tendencies, in order to establish a roadmap with the highest possible degree of consensus (a national water pact?). In my opinion, the prevailing diagnosis is little realistic. The dominant mantras are that in Catalonia there is water scarcity, furthermore exacerbated by climate change; that our economy gets limited by these factors, because there is a growing water demand that will not be met; and that irrigation must be extended in order to ensure our food sovereignty.

Nonetheless, this vision turns out to have little foundation, because contrary to what almost everybody thinks, the population of Catalonia is decreasing in a significant manner, and it will keep doing so in the next decade. Moreover, urban and industrial water consumption has remarkably decreased, and it still does, and even agricultural consumption is probably diminishing, though we cannot be fully certain of this because the real consumption figures are not very accurate. Furthermore, the water quality of our rivers has been improving, and this tendency should continue if appropriate policies are implemented. On the minus side, we find a decreasing flow in most rivers (in recent times, due

to climate change and to afforestation) and growing aquifer pollution. Nevertheless, we have a window of opportunity involving time and sociopolitical aspects: if we can take advantage of it, it could lead us to a scenario with a higher degree of water management sustainability.

Since the horizon for the next decades does not seem to be one of severe water scarcity, Catalonia can achieve a sustainable water management if a political and social change, focusing on demand management rather than on supply management, takes place. Climate change can make things progressively more difficult for us, but precisely for this reason a change in water policies, as soon as possible, becomes more important. Some clichés must be debunked though, and some 'politically incorrect' decisions must be made: water issues are nowadays, after all, and above all, sociopolitical. In Catalonia there are too many infrastructures (irrigation channels, reservoirs, water transfers, etc.) and too few innovative public policies or private initiatives aimed at promoting water saving and efficiency. Did someone say that we Catalan people want to be pioneers in Europe? If we do, water policies constitute a good opportunity for it! Abiding by the Water Framework Directive should be enough; it mandates one really simple (and complex) thing: "Do what needs to be done in your country in order to achieve good ecological features in its water bodies". In other words, the Directive sets chemical and biological quality goals, and we are free to reach them in the manner that suits our country the best, all according to one principle: "Limits first, efficiency later". This means that environmental flows, being limits established by regulations and based on technical criteria, are a restriction to water exploitation systems. And this is the reason why it is both so important and so complex to determine environmental flows for our rivers without the political interferences that have been taking place until now.

Water management can be relatively easily improved if we reach a political consensus and let the technicians work, but the problems faced by our (deteriorated) aquatic ecosystems are more serious. Paradoxically, as water quality improves, the decline of habitats and species goes on, because hydromorphological impacts accumulate and invasive species proliferate. We are not aware of the extent of the damages undergone by our rivers and wetlands, nor of the extent of the destruction that our territory has endured because of an unsustainable territorial model. The gratuitous abuse of our landscape and biodiversity is a symptom of our poor comprehension and sensitivity about nature (utilitarianism), and we are unaware of the benefits that biodiversity preservation implies for society as a whole. This makes us more vulnerable and less resilient to climate change and other global change factors.

A two-sided mirror

If we take a look in the mirror we can see our society in two different ways: on one side there is the 'developmentalist' vision, the one advocating 'sustainable growth' and believ-

ing that no limits for economic growth exist, because market, science and technology always find solutions for resources depletion, environmental degradation and all the human 'needs'; on the other side there is a 'sustainabilist' vision, advocating 'sustainable development' or 'sustainable degrowth' and believing that physical limits (resources, population, environmental degradation) for economic growth exist, as well as material limits for human well-being; this vision thinks that market, science and technology must be tools helping us adapt to limits and grow in terms on quality, not of quantity. As a conclusion, I believe it is imperative that both visions search for a common ground and work together, with the highest possible degree of objectivity, critical thinking and consensus.

Health as a driver for change: from a grey city to a green one

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Antecedents

At the heart of the big changes in urban planning that the city of Barcelona underwent in the 19th century we can find the hygienist ideas of Pere Felip Monlau, a physician, politician and philosopher who, with treatises as *Abajo las murallas* [*Tear down the city walls*], *Higiene pública* and *Higiene industrial* significantly influenced Cerdà and other urban planners of those times, as well as the city they finally designed. Now we find a new opportunity for public health to become or to aspire to become a driver for change in urban space, as is already happening in other European cities.

Mankind has been living in contact with air pollution since the Paleolithic when fire was discovered. Human concentration in cities, especially since the Industrial Revolution, has created an increase in the concentration of polluting emissions and in the number of people exposed to risk. Thus, since the beginning of the Industrial Revolution, the fact that the poor quality of air was harmful to health was already perceived. There are plenty of stories, in cities around the world, about unbreathable fogs followed by evident mortality increases. Now there is no steam or mills in our cities, and coal is no longer used as an energy source in them. That undisguised fog has disappeared, and pollution has become less evident thanks to the change in the sources of pollution and in the nature of pollutants. The main source of pollution is nowadays the motor vehicle, which, with its density reaching thousands of units per km^2, has become a blight that emits both extremely fine particulates and gases at very short distance from people. These reasons, though, do not explain by themselves why air pollution in cities has become again a priority of public health and a driver for change in the design of cities and in the pursuit of a new organization of mobility.

1. Effects of urban air pollution on health

In the last decade of the 20th century some studies carried out on healthy population of different North American cities revealed that people living in cities with a higher amount of fine particulates (those measuring less than 2.5 μm and, therefore, able to reach the

bottom of the lungs) were at a higher risk of dying. This risk increase was very significant (up to 30% as the number of particulates doubled), and its cause was unknown. This resulted in two actions: the regulation of the number of particulates in the air of cities, and the promotion of research aimed at understanding the mechanisms of said mortality increase. Thus, it was discovered that fine (and especially ultra-fine) particulates, generated by traffic in a direct or indirect manner through the transformation of primary gases into particulates, enter the human body through the lungs, from whose bottom they cause an inflammatory response of the whole body, or from which they migrate to different organs.[1] This way, we have learnt that particulates can cause arterial inflammation, and that they are a significant cause of cardiovascular diseases. In fact, the World Health Organization (WHO) estimates that up to two thirds of the diseases caused by air pollution belong to the cardiovascular category, and that two in every ten myocardial infarcts, as well as three in every ten ictus, could be prevented if air pollution were reduced.[2]

Moreover, new regulations regarding the permitted levels of particulates enabled interventions on traffic and a subsequent reduction of particulates in the air in cities across the United States and in some European countries. In all the studied cases, the improvement in air quality predated an improvement in health. Thus, there are evidences that the improvement in air quality is followed by an increase in life expectancy (six months for each 10 μm/m^3 particulate reduction) and by an improvement of children's development. It has been discovered that the new generations of children that have grown up in a cleaner air have a better lung function and a lower prevalence of respiratory diseases, even if other changes in lung-related factors have not taken place.[3]

We have carried out many studies, in Barcelona and in other cities such as Sabadell, on the effect of air quality on development, both during pregnancy and childhood. These studies have been reproduced in other places and show that the prenatal stage is already vulnerable to the quality of the air the mother breathes, and that pollution in school environments influences brain growth. A recent paper by a workgroup of the European and North American associations of respiratory health has put together all kind of evidence of the effects derived from air pollution, beyond the lungs or the cardiovascular system (Figure 1).

1 BROOK, R.D. *et al.* "Particulate matter air pollution and cardiovascular disease: An update to the scientific statement from the American Heart Association", in *Circulation*, 121(21), 2010; 2331-2378.

2 WORLD HEALTH ORGANIZATION. *Ambient air pollution: a global assessment of exposure and burden of disease.* Geneva: WHO, 2016.

3 GAUDERMAN. W.J. *et al.* "Association of improved air quality with lung development in children", in *The New England Journal of Medicine*, 372(10), 5 March 2015; 905-13.

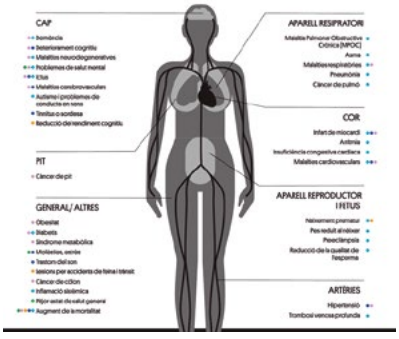

Figure 1. Diseases and disorders related to air pollution in cities.[4]

Proven and suspected effects, clockwise from top left: **Head:** Dementia, cognitive impairment, neurodegenerative diseases, mental health issues, ictus (stroke), cerebrovascular diseases, autism and behavioral disorders (in children), tinnitus or deafness, cognitive performance impairment. **Respiratory system:** Chronic obstructive pulmonary disease (COPD), asthma, respiratory diseases, pneumonia, lung cancer. **Heart:** Myocardial infarct (heart attack), arrhythmia, congestive heart failure, cardiovascular diseases. **Reproductive system and fetus:** Premature birth, low birth weight, pre-eclampsia, sperm quality decrease. **Arteries:** Hypertension, deep vein thrombosis. **General/Other:** Obesity, diabetes, metabolic syndrome, discomfort or stress, sleep disorders, injuries due to traffic collisions and workplace accidents, colon cancer, systemic inflammation, impaired general health condition, increased mortality. **Breast:** Breast cancer

Among the effects mentioned in the Figure above we can find neurodegenerative diseases and impacts on behavioral development. Thus, in a study involving almost 3,000 pupils from thirty-nine educational centers in the city of Barcelona, with very different levels of air pollution both inside and outside the school, we found that the growth of the repeatedly assessed cognitive functions in the same children was lower when the traffic-related particulates levels were higher (Figure 2).

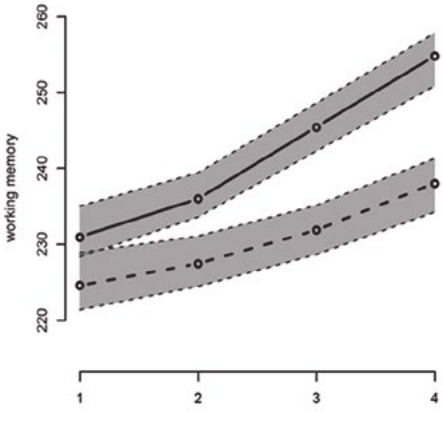

Figure 2. Increase in working memory throughout one year in 2,897, 7-9 y/o children, assessed through 10,700 tests, from schools near or far from traffic, after controlling the effect of education or socioeconomic level[5]

In this study we also discovered that greenery in school environments played a role in the decrease of particulates in the air, and this study, along with some

4 THURSTON, G.D. *et al.* "A joint ERS/ATS policy statement: what constitutes an adverse health effect of air pollution? An analytical framework", in *The European Respiratory Journal*, 49(1), 11 January 2017.

5 SUNYER, J. et al. "Association between Traffic-Related Air Pollution in Schools and Cognitive Development in Primary School Children: A Prospective Cohort Study", in *PLoS Medicine*, 12:e1001792, 2015.

others, has led to the suggestion that a way to improve air quality might be through a more significant presence of greenery in the surroundings of educational centers. Such increase in vegetation could improve the cognitive functions, mostly thanks to the air quality improvement associated with greenery, as we have observed, but also thanks to the beneficial effects of vegetation by itself: many studies on children with neurobehavioral disorders show that their attention and their behavior improves when a contact with nature exists. There are even brain image studies that confirm such findings, as well as studies connecting contact with vegetation and a better mental health.

In brief, thousands of studies and discoveries carried out in the last twenty years on the way particulates in the air (and to a lesser degree, ten times lower, gases such as nitrogen dioxide, NO_2) affect health have led to the conclusion that air pollution is one of the main determiners (among the ones that can be prevented) of the burden of disease at global level.[6] According to a recent study by the World Bank[7] its impact can cause a decrease of 5% in European gross domestic product (GDP). This scenario explains why urban air quality has become a determining change factor of urban planning and mobility model in our cities. This all takes place in a context in which health and well-being have again begun to form part of current values, just as they were in the 19th century.

2. Conflict between mobility and health

The air quality in Barcelona and its conurbation is poor, since it repeatedly exceeds the legally established values, and most of its population breathes air containing levels of pollutants far higher than those recommended by the WHO. The main source of these pollutants is traffic, more specifically motor vehicles, and among them diesel vehicles stand out. They are the most common in our cities, and the amount of nitrogen oxides (NO_x) and of particulates they emit, even the newest ones, are respectively four times and twenty times higher than those emitted by gasoline fueled vehicles, which are already quite polluting. Also motorcycles, very numerous, are a significant source of particulates.

The scenario thus created in cities is one in which motor vehicles (and therefore mobility) conflict with health and living quality. At present, we can say that our diagnosis is right: air in the city is polluted. We also know for sure that pollution originates mostly from motor vehicles traffic and, more importantly, that this traffic-related pollution is a health issue of considerable dimension. Finally, we know that solutions aimed at reducing urban air pollution demand the reduction of motor vehicle traffic, which generates a new conflict

6 GBD 2015 RISK FACTORS COLLABORATORS. "Global, regional, and national comparative risk assessment of 79 behavioural, environmental and occupational, and metabolic risks or clusters of risks, 1990-2015: a systematic analysis for the Global Burden of Disease Study 2015", in *The Lancet*, 388, 2016; 1659-1724.

7 WORLD BANK; INSTITUTE FOR HEALTH METRICS AND EVALUATION. *The Cost of Air Pollution: Strengthening the Economic Case for Action.* Washington D.C.: World Bank, 2016.

between mobility and health. As we describe below, this conflict is not limited to the harm caused by air pollution.

It must be noted that the negative effects of motor vehicles on health are not limited to air pollution (Chart 1): also the noise generated by traffic, especially the noise reaching the inside of buildings at sleep times, has a well-known effect on health, for example on blood pressure. The use of vehicles also implies that people stop moving actively. Non-active displacement (by private vehicle) to work or school, or to go shopping, is the main determiner of the lack of physical activity that currently characterizes our society and that is also one of the main factors of health decline: in fact, the lack of physical exercise is the fourth leading cause of mortality in the world. Finally, motor vehicles occupy up to two thirds of urban space, competing for this space with other activities such as greenery plans and with other uses such as leisure and social coexistence. We know today that living near a green environment promotes social contact and physical activity, and that it improves mental and even bodily well-being, which in turn is beneficial for children's better mental performance.

- Air pollution
- Noise
- Lack of physical exercise
- Space occupation (lack of vegetation)

Chart 1. Motor vehicle-related factors affecting health in cities

Surprisingly, from these motor vehicle-related factors, the one with a higher impact on health decline is lack of physical exercise, according to a recent study carried out in the city of Barcelona which aimed at calculating the reduction in the number of fatalities that would take place if the levels recommended by the WHO for these factors were met in order to achieve good health and good living quality (Figure 3). The explanation behind this is the fact that a sedentary lifestyle and diseases related to, or resulting from, a lack of physical activity are very common. The study also highlights that the impact of noise is almost as significant as that of air pollution if the high prevalence of arterial hypertension is considered (though it remains really difficult to distinguish to what extent hypertension is due to air pollution and to what extent it is due to noise). The Figure also shows the effect of the temperature increase inherent to cities when added to that related to climate change. The city is, by itself and also thanks to urban traffic, a source of increase of ambient temperature. Finally, the study shows that even the lack of vegetation has an impact on mortality, though to a lesser extent than the other factors. It must be taken into account the fact that with the data available for this study it is very difficult to discern the particular effects of each factor, since there is a significant correlation between them. For example, the density of vegetation improves air quality thanks to the ability to decrease

the amount of particulates that some trees feature. And both air quality and presence of greenery are related to physical activity levels. Thus, intervening in one of these factors, let us say expanding green spaces, could have a beneficial effect on all the others.

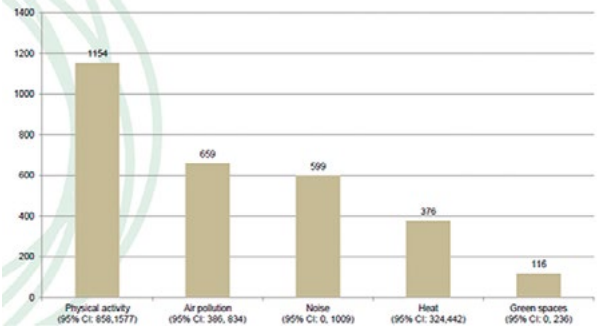

Figure 3. Amount of fatalities that could be prevented every year in the city of Barcelona if the values recommended by the WHO for each factor were reached[8]

This evidence should lead to a reassessment of the costs and benefits of motor vehicles as a urban transport means, and stand opposed to the productivity, comfort, privacy and freedom provided by cars the negative effects of traffic, such as the ones shown in Figure 3, and also other indirect impacts, such as urban driving-related stress and lack of urban space for social life. All of the above results in a personal dilemma for every urban dweller about their mobility choices, and impacts the political decisions aimed at protecting public health and the common good. We already lived, in recent times, this kind of dilemma between personal freedom and common good: it was the case of the smoking ban in public hospitality, restauration and leisure premises. The initial rejection of the 'Tobacco Act' turned into general approval thanks to its benefits, be they obvious (such as the well-being implied by breathing a cleaner air inside those premises) or unnoticeable (such as the 11% reduction in myocardial infarcts among people younger than 64 y/o after the smoking ban was implemented).[9] The challenge, thus, is complex, and it cannot be addressed by merely integrating the health and living quality costs into urban models and mobility planning. It demands a new city and a new values model entailing real change. In this respect, understanding that air quality and clean air could be considered a fundamental right by mankind in the 21st century constitutes a key factor. This is in fact the proposal of some social movements (http://www.qualitatdelaire.org/ in Catalonia, https://earthcharter.org/ at a global scale).

8 MUELLER, N. *et al*. "Urban and Transport Planning Related Exposures and Mortality: A Health Impact Assessment for Cities", in *Environmental Health Perspectives*, 125(1), January 2017; 89-96.

9 CESARONI, G. *et al*. "Effect of the Italian smoking ban on population rates of acute coronary events", in *Circulation*, 117(9), 4 March de 2008; 1183-8.

3. Taking the rural world into the city

Essentially, the conflict between mobility and public health leads to a reconsideration of the city model. This new urban planning model should ensure the balance between public health protection, urban space use, and mobility.

Cities that have already undertaken this transformation teach us, firstly, that there is a general tendency to reduce the space for private vehicles in order to increase both active mobility space and green space; and secondly, that new technologies can help ensure that motor vehicles use clean fuels (for example electric mobility, that is being especially implemented in public transport and logistics) and can also promote a reduction in private vehicle use in favor of shared vehicles (cars, motorcycles or bicycles). This change is already being implemented in cities around the world (Basel, Utrecht, Rotterdam, Copenhagen, Pontevedra, Vitoria, etc.), which teach us also that local changes are one of the ways to impulse the GHG emissions reduction and to gain control over the global crisis.

The key to change is to understand that private motor vehicles cannot be transportation means in cities: motor vehicles should be limited to public transportation vehicles and to logistics and, at most, to motorcycles and shared cars. Furthermore, in all these cases a swift transition to clean fuels, such as electricity, should be made, because technology for such shift is already quite effective. Moreover, whenever possible, the most common urban vehicle should be the bicycle, as it used to be in many towns of our country: this vehicle does not pollute, does not make noise, takes up little space and promotes physical exercise. In order to negotiate slopes, electric bicycles exist. As for motorcycles and similar vehicles, they could be “the other” urban vehicles, as long as they were electrically propelled. For those travelling to the city from its outskirts and for those who do not use bicycle or motorcycle, public or shared vehicles should be promoted. All these changes, along with a better, more frequent and farther-reaching public collective transport, could enable the reduction of public road space today reserved for private motor vehicles. These newly recovered spaces should be occupied by bicycle lanes, by new greenery interventions around school paths to promote children’s active displacement to school, and by superblocks. Educational centers should also be specifically protected through greenery walls and the ban of traffic in their surroundings.

This model takes us to a city capable of incorporating the benefits of rural life; brings nature closer to the city; expands the space available for physical activity and social life; reduces noise and pollution while contributing to climate change control. The green city has well-being and health benefits, as medicine, biology and psychology have recently and repeatedly proven, especially regarding mental diseases and neurobehavioral disorders. All in all, the goal is to turn the city into a space where well-being, living quality and health become top priorities. Therefore, we know today that breathing clean air is a fundamental right.

3rd WORKING DAY

A country strategy to make global vocation and local attachment compatible

(Political bases)

Program

3rd WORKING DAY

A country strategy to make global vocation and local attachment compatible (Political bases)

Date: May 18th 2017

Place: La Pedrera
Passeig de Gràcia, 92 Barcelona

Can the international positioning of Catalonia be built on the basis of its environmental aspects and the updating of its Mediterranean character? The new values of social and territorial awareness share as a common demand the need to benefit from the environmental factor and incorporate it into any strategy for the future. In order to develop the concept of new territoriality it will be necessary (among others) to promote a cross-cutting knowledge capable of generating an integrated and contemporary vision on sustainability and, therefore, also capable of positively influencing individual, corporate and institutional decisions. Ensuring the commitment of institutions and of the civil society to make compatible global vocation and local attachment, as well as disseminating some present and emergent success stories, can be the base upon which a Catalan model of progress relying on environmental efficiency in the context of the Western Mediterranean be built.

Inauguration
Josep Rull. Minister of Territory and Sustainability

Session 1: Emerging activities

Companies and society: a new philanthropy for the 21st century
Sergi Ferrer-Salat, economist. Chairman of Grup Ferrer Internacional
Sustainable development and educational change
Eduard Vallory, social Analyst, Chairman of UNESCOCAT-Center for the UNESCO of Catalonia and Director of the Escola Nova 21 Alliance
Business and geometry: the diameter of the circular economy
Alba Cabañas Varales, economist, specialized in environment, sustainability and business
The end of territory as we know it
Luís Falcón, architect and town planner. Co-founder and CEO of InAtlas
Debate
Josep Planas (rapporteur/moderator), Deputy Director-General of Sustainability Information and Promotion

Session 2: 'Twentist' policies, fertile cities, creative fields

Efficacy, beyond effectiveness and efficiency
Pere Torres, biologist. General Manager of the Metropolitan Transport Authority (ATM) of Barcelona
From citizens to 'territoriants': inhabiting territory in the age of regional urban sprawl
Francesc Muñoz, geographer. Director of the Observatory of Urbanization at Barcelona's Autonomous University (UAB)
Social empowerment for the implementation of the 2030 Agenda
Anna Ayuso, lawyer. Senior researcher at Barcelona Center for International Affairs (CIDOB)
Effective loopholes in Politics
Josep Enric Llebot, chair Professor of Condensed Matter Physics at Barcelona's Autonomous University (UAB)
Debate
Agustí Serra (rapporteur/moderator), Director-General of Territorial and Urban Planning
Closure
Ferran Falcó, Secretary-General of the Ministry of Sustainability
Poster exhibition: presentation of successful cases

Work group

3rd WORKING DAY

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Economist. Chairman of Grup Ferrer Internacional

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Companies and society: a new philanthropy for the 21st century

Sergi Ferrer-Salat
Economist. Chairman of Grup Ferrer Internacional

From the synopsis of today's session, with the focus set on international positioning, on social awareness values, on the integrated and contemporary vision of sustainability and on business decisions, we would like to raise the question of what we must do in order to introduce environmental sustainability in companies and to achieve growth while satisfying the business needs to implement a fully sustainable development.

It is obvious that environmental awareness is greater now than it used to be, but judging by the interaction with many business owners, both Catalan and Spanish, we have come to the conclusion that said awareness is not yet deep enough in the face of the transcendental challenge posed by environmental degradation and the terrible consequences of climate change.

In a recent meeting held with representatives of the business fabric and of the leading financial institutions of our country, where big plans for the future were debated, at no time was there a single reference to the environment, nor to sustainable future strategies from an ecological point of view. And in fact, if we analyze the data from the Spanish Sociological Research Center (CIS), among the concerns of Spaniards and Catalans environmental issues, along with those dealing with immigration –two closely related concepts, as we will see further on–, virtually do not surface: they remain a marginal problem. Thus, even though there has been some improvement, we have still a long way to go. And companies, as the predominant institutions on Earth, must play a key role in the transition towards a fully regenerative economy.

In this forum we do not intend to talk about the importance of nature: everybody knows that she is the one making it possible for us humans to live on this planet, with the so-called "ecosystem services" that she provides us absolutely free of charge and with unbeatable effectiveness and efficiency. In 1997, professor Robert Costanza, with the intention of raising awareness among society –the business fabric included– about the importance of the services that nature provides us in a totally free manner, tried to establish an economical estimation of those ecosystem services: at that time (more than twenty years ago, though the concept is still in full force), the worth of those services (33 trillion dollars) almost doubled the global GDP (18 trillion dollars).

Edward Wilson, probably the most influential evolutionary biologist of the 20th century, clearly stated that without ecosystem services, the history of mankind would a cruel, brief one; and that if we destabilize nature, the most affected organisms will be the largest, the most complex ones –including, obviously, human beings.

Because of this, raising awareness on environmental degradation constitutes a huge challenge, but not for nature. We all say "Let's save the Earth!", but the Earth has no problem: everybody knows that the capacity of biological regeneration of our planet is infinite. The ones in big trouble here, as we have suggested, are human beings, because of their dependence on ecosystem services.

Unfortunately, in business circles this line of thought is often deemed quite a philosophical matter, a spiritual one, and is seen as a distant threat, both in time and space. Therefore, raising awareness and sensitivity on the subject becomes difficult.

We believe that the matter must be addressed from another perspective, and that we must return to the previous reflection on how to make the birth of environmental sensitivity possible within the business fabric. How could the pressing need of working for the sake of a fully sustainable future be introduced into business schemes?

Many examples can be given: to begin with, the question of air pollution, that affects us all and of which we have a very evident case in Barcelona, one of the most polluted cities in Europe. Air pollution is carcinogenic, it belongs to Group 1 of the IARC (International Agency for Research on Cancer, World Health Organization) and, as we know, it causes lung diseases as well as cardiovascular and cerebrovascular accidents.

But this issue, though it affects us in a very direct manner, is not the key question on which we want to set the focus. Conversely, we would like to stress the main challenge that we are facing as a civilization: climate change and the huge consequences that it already has, with examples right at the doors of Europe, as we will see below.

We will not discuss here the anthropogenic nature and the influence of human activity on climate change. Unfortunately, there is a non-negligible part of the business fabric of our country that still casts doubt on this scientific evidence. We find ourselves in an era of agnotology (a term coined by Robert Proctor, professor of the History of Science at Stanford University) caused by big corporate groups and big lobbies, who have generated uncertainty, confusion and ignorance among society through the fake or distorted scientific information funded by them, much in the same way we previously found in the case of tobacco and cigarette manufacturers. Nowadays, the main promotors of agnotology are oil and automobile companies, in their particular fight against climate change –or, more accurately, against the truth of climate change–. And they have certainly succeeded, for,

let us insist on that, the degree of skepticism when it comes to climate change is surprising, in spite of the scientific evidences about it.

At this point we would like to highlight the link that connects climate change, agriculture and food security: to begin with we can mention the fact that in the first 15 years of the 21st century, despite scientific and technical advancement, agricultural yield has decreased in areas of the planet that represent two thirds of the global food production, as a consequence of the extreme droughts that have affected some regions of the planet: Australia, China and Southeast Asia, as well as some parts of Africa, South America and the United States.

According to the Climate Vulnerability Index of 2016 and to the report *The State of Food and Agriculture* (a FAO publication) of the same year, it is estimated that, as a result of climate change –inasmuch as it alters the cycle of drought, rain, floods and heat events–, in some areas of Southeast Asia and Africa there will be between 35 and 122 million people at risk of extreme poverty (defined as having less than $1.90 available per day) by 2030, due to the effects of climate change on agriculture, stockbreeding, fishing and forests.

Besides, as we all know, the developed world is the originator of an overwhelmingly significant majority of GHG emissions. Thus, rather than about climate change, we should speak about climate justice: after all, this is nothing but a new, adapted to the 21st century, form of colonialism. Therefore, we cannot turn a blind eye to these issues and this extreme situation: firstly, because of an ethical imperative, since refusing to acknowledge these matters would equal a fall into absolute and total moral decadence. But, more importantly: even though this sensitivity did not exist, we cannot forget the really direct relation between climate change and the issue of immigration, which is probably the main challenge we face. We have this challenge right here, next to us, but we remain a little, or a little too much, impervious to its gravity, because we seem to be living in some kind of bubble. It is estimated that between 2008 and 2014 there have been 184 million climate refugees, i.e., people who become refugees, migrants, as a result of the pressures that climate change exerts on their ecosystems.

This is an extremely serious problem that currently affects us, and Europe, along with society as a whole, has been absolutely unable to manage it with the least efficiency. In the end, the only answer we have been able to come up with has been to turn Europe into a frontier, and we can say, a more and more militarized one. This is what we find in the fences of Ceuta and Melilla, in Spain; at the border between Greece and Turkey; at the frontier of Hungary with Serbia and Croatia, as well as at the one of Slovenia with Croatia, or of Austria with Slovenia... This all may seem science-fiction, but it is what is currently happening in Europe, and we cannot detach ourselves from it.

You might know Stephen Emmott, perhaps you read his book: he is not exactly what we would call a radical ecologist. He is the head of the research area of Microsoft, Bill Gates' right-hand man, and he leads the most advanced research group on the impact of mankind on the planet. In his book *Ten billion* he clearly states that the most fortunate regions, most of Europe and the United States, will become militarized countries, with their borders tightly defended as to avoid the arrival of millions of climate refugees. When first published some years ago (2013), this vision seemed a rather alarmist one; it is nowadays a reality that takes place, let us insist on that, right next to us, in Europe itself, as well as in other parts of the world: India, for example, shares a borderline more than 4,000 km long with Bangladesh, and as a consequence of climate change on the fluvial system of the latter, primarily on the Brahmaputra, it is estimated that Bangladesh will lose between 1/5 and ¼ of its territory, which will result in 15-40 million climate refugees by 2050.

It must be noted that this issue is not a new one: Harald Welzer, possibly one of the most influential sociologists in Germany today, published in 2008 a must-read book, *Klimakriege. Wofür im 21. Jahrhundert getötet wird* (*Climate Wars: What People Will Be Killed for in the 21st Century*), in which he proves that our socio-economical system is absorbing the natural resources that could make it possible for millions of people to live in a decent way; and that when economic ecosystems end up destroying those indispensable natural resources, people kill. This is what has always happened and what is currently happening, and it will get worse in the future.

Also the great Jared Diamond, professor of the History of Science and Physical Geography at Berkeley University, with his works *Guns, Germs, and Steel* (1997) and (of course!) *Collapse* (2005) proposes us intellectually stimulating exercises that demonstrate that throughout history environmental degradation has caused, directly or indirectly, the collapse of all the great civilizations of the past, and that this phenomenon is subtly, gradually finding its place into our geopolitical environment; a significant part of our civilization seems oblivious to it, though.

Even the Syrian conflict, right next to Europe (unable to decide, by the way, how to distribute 6,000 migrants among all of its countries), has its roots in climate issues. The main trigger of the Syrian war was, of course, Bashar al-Assad's extreme regime, but the fact that between 2006 and 2011 the north-east of Syria, the breadbasket of the country, from which the very subsistence of the Syrians comes, suffered the worst drought in its history, cannot be disregarded. This resulted in a food crisis, and misery, wrath and despair caused the exodus of about three million people towards the south-west of the country, where the main Syrian cities, poor and lacking in infrastructure, and utterly incapable of absorbing the afflux of migrants, are located. And this, as all the studies carried out perfectly prove, has been a key element in the origin of the Syrian war (let us insist on that: right next to us). Therefore, when we talk about refugees fleeing war in Syria, we are

also talking about climate refugees: directly or indirectly, their displacements are a consequence of the excessive emissions of GHG and of the climate change they provoke.

After all, the unconditional defense of the leadership of companies in the fight against climate change and for a fully green, totally sustainable future makes an indivisible part of business ethics; this ethics implies that all company activity must be aimed at leading the revolution towards a fully regenerative economy. Fortunately, the big North American clusters, which must play a key role in such a revolution, are progressively assimilating in their strategy the need of implementing the fight against climate change. Even so, the case of the United States today is disturbing: everybody knows that Trump is an utter climate sceptic, and that the Environmental Protection Agency is in the process of its dismantling. It must also be remembered that Trump disregarded the open letter he was sent by 360 of the most important North American companies (among them Coca-Cola, Unilever, Mars, Kellogg's, Starbucks, Nike, Levi Strauss, DuPont and a host of others), all asking him not to withdraw the country from the Paris Agreement. At least the commitment of those companies to a sustainable, regenerative economy remained evident, as did their clear awareness that the United States must go for a low-carbon economy: otherwise, the economic competitiveness of the country will be at risk, and as a result, so will its capacity of creating employment and progress.

We talked above about climate justice and injustice: climate change and its consequences cause greater and greater socio-economical inequalities, not only on an international scale, but, indirectly, in our society as well. On a global level, these inequalities are becoming more extreme every day: the degree of wealth concentration reached is absolutely obscene and unbearable for societies as a whole. There is a total disproportion between private profit and social benefit. The existence of islands of wealth within oceans of poverty, of which we are not always aware, ends up bringing disastrous consequences for the whole society: the more a society is unequal, the less sustainable it becomes in the medium and long term. Maybe there is no place in the world where such a tragedy is more apparent than in South America: cohesion there is shattered, social links corroded; hope, illusion and the engagement of the population have disappeared; the youth, the most important human capital, the key to economic progress in any country, are lost; a brutal insecurity arises, in a situation in which some people can live on their small island of abundance, in their little gilded cage, never going out; and also the environmental degradation in that area is a result of socio-economical inequalities. This is possibly the issue that should concern us the most, because we have already had some significant, bad scares with the irruption of populist leaders (a field in which Latin America is a paradigm) that end up giving room to an economic environment which is much worse than the one existing before their arrival. The history of Latin America throughout the 20th century is a clear example of how socio-economical inequalities (tightly related to climate change, too) have made the ascent to power of a host of populist leaders possible. We cannot forget either that it has been much the same in the United States: we must remember that

the promotion of Donald Trump can be explained, to a great extent, by the explosion of socio-economical inequalities in that country.

As it turns out from all the aforementioned, the responsibility of companies must not, by any means, confine itself to the maximization of their profit. They also have a huge, inescapable responsibility towards the harmonious functioning of society. And the ethics of business, which obviously also implies the fight for a sustainable, green future and for a fully regenerative economy, is an essential condition to reach a more cohesive, more equitable and fairer society, and to generate a better world in the end.

This, as the title of our speech suggests, must be the real philanthropy of the 21st century. The business fabric of our country must be fully committed to the fight, to the big, total and resolute bet on an economy that is completely regenerative and entirely sustainable from the environmental point of view. This is the way we must act in order to reach a better, more equitable and more cohesive world.

You can find the graphic elements the presenter used in his speech at:
https://territori.gencat.cat/web/.content/home/01_departament/actuacions_i_obres/actuacions_dr_d_i/jornades/jornada_futur_verd/ponencies/jornada_3/1-FERRER-SALATEmpresarioSociedadFilantropiaSigloXXI-CatalunyaFuturVerd.pdf

Sustainable development and educational change

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The debate on educational change, which has been going on for more than one hundred years, is essentially focused on the educational purpose of school –what does it want to achieve– and its learning practices –how to learn. The bureaucratic, industry-age inspired school system that began to become widespread in the 19th century worked on the basis that education had to convey definitive knowledge to all children alike, and therefore it mainly linked rote learning to passive information reception acquired through memorization and mechanization: back then, education was focused on what had to be taught.

A complete amendment to these assumptions was formulated at the end of the 19th and the beginning of the 20th centuries by movements demanding a complete turnabout in education, for it to focus on learning. Thus, the premise was that knowledge cannot be achieved through passive information reception, but rather needs to be constructed in connection with reality, and articulated so that it can offer answers thereto, understanding that all children are different though all of them have an intrinsic desire for learning.

This approach is the same that can be found in the first main UNESCO report on education (*Learning to be: the world of education today and tomorrow*,[1] chaired by Edgar Faure, 1972). Therein we can read, literally (Ch. 5, p. 116): "Pedagogy appears to have been confined, in the past, to giving instruction to the young, as its etymology implies. This idea is now out of date. Until our time, it was considered to be the unavoidable auxiliary to all formalized knowledge. The meaning we give to education today, and thereby to pedagogy, is infinitely vaster and complex. It includes the cultural processes of bringing forth and developing all an individual's potentialities."

The second main UNESCO report (*Learning: the treasure within*,[2] chaired by Jacques Delors, 1996) makes it clear that school learning must include, in equal parts, four pillars: learning to know, learning to do, learning to live together and to live with others, and learning to be (Ch. 4, pp. 85-96). And in a cross-cutting manner, as Faure pointed out, must enable people to become autonomous learners (learning to learn).

1 You can access it online at https://unesdoc.unesco.org/ark:/48223/pf0000223222.
2 You can access it online at https://unesdoc.unesco.org/ark:/48223/pf0000109590.

In the 1990's the modern concept on 'competencies' was formulated, in an attempt to overcome the rote acquisition of knowledge that cannot be articulated later. Thus, as defined by the most recent UNESCO report (*Rethinking education. Towards a global common good?*,[3] 2015), competencies enhance the ability to use the appropriate knowledge (information, understanding, skills, attitudes and values) creatively and responsibly in given situations to find solutions and establish new ties with others (Ch. 2, p. 41). Therefore, the bet on a competencies-based curriculum implies the assumption of what Edgar Faure himself wrote in the presentation of his report: "We should no longer assiduously acquire knowledge once and for all, but learn how to build up a continually evolving body of knowledge all through life." (Faure, 1972; p. viii)

The need to overcome the model of transmission-based education and to adopt a competencies-based approach aimed at the whole development of the individual becomes even more relevant in the current context, characterized by complexity and uncertainty. On one hand, this is due to big global changes: the growing impact that already imply climate change, massive people displacements, tension, intolerance and violence in more and more diverse societies, and the unfulfilled challenge of ending the huge inequalities. On the other hand, that need is due to the exponential transformations of technological change and to the Fourth Industrial Revolution, and their impact on personal, professional and social spheres, that transform (and will keep on transforming) our lives and our ways of knowing, interacting, working and taking collective decisions.

These transformations lead to the affirmation that "the purpose of education must [therefore] be revisited in light of a renewed vision of sustainable human and social development that is both equitable and viable. This vision of sustainability must take into consideration the social, environmental and economic dimensions of human development and the various ways in which these relate to education" (*Rethinking education*, pp. 31-32). Transforming the purpose of education (and therefore the curriculum) implies a revision of everything related to it: learning practices, assessment models, and the organization of the education system and of the school.

3 You can access it online at https://unesdoc.unesco.org/ark:/48223/pf0000232555.

This is exactly what recent educational reforms in two of the most successful countries in this sphere, Finland and Singapore, have in common: the adoption of a general competencies-based curriculum, the granting of autonomy to educational centers to contextualize the curriculum in their own educational project, and the empowerment of teaching staff to adapt it to the reality of their students, through the personalization of learning.

Both countries, quite different from each other, have carried out their reforms despite already having the highest scores in the PISA (Programme for International Student Assessment) report. Or rather, because of these scores. As Irmeli Halinen, responsible for those changes in Finland, told us when visiting Barcelona, the success measured by the PISA did not necessarily imply that students were ready to face the challenges posed by our ever-changing, accelerated societies, characterized by complexity and uncertainty. Recently, at Harvard, Pak Tee Ng, Dean of the National Institute of Education of Singapore, pointed out the same as Mrs. Halinen. Mr. Ng underscored that the competency-based deepening of the curriculum implemented by the Singaporean educational system, as well as the inclusion in it of the competencies for the 21st century, were indispensable to face the challenges of the exponential change we are living in.

Facing these challenges (summarized by the UN in the seventeen Sustainable Development Goals, SDGs) demands, as the UNESCO puts it (*Education for Sustainable Development Goals*, 2017), moving towards competencies-based curricula and holistic education methodologies posing the students more questions than answers offered, and overcoming the prescriptive model of subjects and definitive contents printed in textbooks. The more competencies-based a curriculum is, the more personalized learning becomes; the less space for unquestionable truths remains left and the bigger the empowerment becomes –achieved through critical thought, creativity, capability to respond to complex issues, and engaged citizenship.

Indeed, education plays a key role in making the sustainable development demanded by the 2030 Agenda possible, because a deep transformation of the way we humans think and act is needed. Global challenges are taking place in a context of social transformation that, as UNESCO says (*Rethinking education*, p. 10), means that "rethinking the purpose of education and the organization of learning has never been more urgent".

The World Education Forum organized by UNESCO and the UN system in 2015 in Incheon (South Korea) approved the Declaration "Education 2030", containing a reformulation of the definition of 'quality education' in light of the current context:

"Quality education fosters creativity and knowledge, and ensures the acquisition of the foundational skills of literacy and numeracy as well as analytical, problem-solving and other high-level cognitive, interpersonal and social skills. It also develops the skills, values and attitudes that enable citizens to lead healthy and fulfilled lives, make informed

decisions, and respond to local and global challenges through Education for Sustainable Development (ESD) and Global Citizenship Education (GCED)." (Art. 9, Incheon Declaration, as reproduced in *World Education Forum 2015. Final report*,[4] p. 15.)

This broader vision of the concept of 'quality' when applied to education is crucial because it is intrinsically linked to the basic pillars of sustainability. Thus, for education to be considered quality education, it must encompass the elements allowing the formation of free, responsible citizens, capable of making informed decisions that, in turn, enable a sustainable development.

In the same vein, the SDG #4, "Quality education", contains a paragraph (4.7) elaborating on this vision and specifying one of the goals of educational change:

"By 2030 [the target is to] ensure all learners acquire knowledge and skills needed to promote sustainable development, including among others through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship, and appreciation of cultural diversity and of culture's contribution to sustainable development."

It must be noted that, although education is, by itself, one of the goals of the 2030 Agenda, it simultaneously constitutes one of the means to achieve the seventeen SDGs as a whole. In fact, this poses the challenge of updating the traditional concept of education for sustainable development, and providing it with a new, more systemic dimension, linked to the SDGs and connected to the challenge of transforming the educational model itself. UNESCO expounds, in its latest document:

"ESD is holistic and transformational education that addresses learning content and outcomes, pedagogy and the learning environment. Thus, ESD does not only integrate contents such as climate change, poverty and sustainable consumption into the curriculum; it also creates interactive, learner-centred teaching and learning settings. What ESD requires is a shift from teaching to learning. It asks for an action-oriented, transformative pedagogy, which supports self-directed learning, participation and collaboration, problem-orientation, inter- and transdisciplinarity and the linking of formal and informal learning. Only such pedagogical approaches make possible the development of the key competencies needed for promoting sustainable development." (*Education for Sustainable Development Goals: learning objectives*, p. 7.)

Hence, education for sustainable development must enter a new, more ambitious dimension, from a globalized perspective that goes beyond the segregation by academic

4 You can access it online at https://unesdoc.unesco.org/ark:/48223/pf0000243724.

subjects and enables a systemic approach binding together educational competencies and action for the change the 2030 Agenda aims at.

The complexity of the new challenges faced by our societies exceeds the traditional, standardized problem-solving processes, and demands new competencies: concept analysis and relation, creativity, comprehension of the complex world we are living in, and capability to collaborate, debate and act in order to generate positive changes. Only an empowering education (such should be the main goal of any educational change) will enable our societies to face those challenges.

In the words of Colin Power, "an empowering education is one that builds the human resources that we need to be productive, to continue to learn, to solve problems, to be creative, and to live together and with nature in peace and harmony. When nations ensure that such an education is accessible to all throughout their lives, education becomes the engine of sustainable development, and the key to a better world".[5]

5 POWER, C. *The Power of Education – Education for All, Development, Globalisation and UNESCO.* London: Springer, 2015.

Business and geometry: the diameter of the circular economy

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If our aim as a territory is to ensure the engagement of institutions and civil society in making global vocation and local attachment compatible with each other, as well as to disseminate current and emerging successful examples as a basis on which a Catalan progress model relying on efficiency can be built in the context of the western Mediterranean, we must remember that commitment is a two way thing, and therefore we must look at economic activity in order to give it the signal it needs to take root.

1. Antecedents: the importance of perspective in order to prevent discouragement

As the author Yuval Noah Harari wrote in *Sapiens – A Brief History of Humankind*, the first extinction wave that accompanied the hunter-gatherers was followed by a second one accompanying the agricultural peoples, which offers us some perspective on the third one, currently taking place due to industrial activity. The sentimental ecologists should not be believed in their claim that our ancestors lived in harmony with nature: long before the Industrial Revolution, *Homo sapiens* did already hold a record, among all organisms, for having caused the extinction of the most animals and plants. We have the dubious distinction of being the deadliest species in the annals of biology.[1]

In his work, the renowned science disseminator Harari shows us that perspective applied to the history of mankind helps us clearly discern what is happening currently and, by extension, what might end up happening in the future if the context variables that caused damage in the past remain constant. Thus, he reminds us that the relationship of permanent contradiction between human beings and their natural environment is as old as their very existence.

The western world is at present at a turning point in the human and economic development process, and this should make us reflect on the key elements for the future in order to restore some harmony between society development and the use we make, in a broad sense, of territory in general and of our environment in particular.

1 HARARI, Y.N. *Sapiens – A Brief History of Humankind.* London: Harvill Secker, 2014.

Moreover, we must remember, in spite of the most pessimistic reflections on the effects that human development has had on the planet, that there is a need for a retrospective look on what has been achieved in the last century and for the realization of the extraordinary advancements of mankind, in light of some indicators. According to data from international institutions such as the World Bank, in 1945 50% of the world population was malnourished, whereas in 2015 this percentage had decreased to a mere 10%. Regarding life expectancy, in 1900 it was of 31 years, whereas in 2015 it was of 71 years. The illiteracy rate in 1950 reached 60%, whereas in 2015 it only affected 14% of the population. If we carried out these analyses focusing only on environment and on Catalan society in the last 25 years, the results would undoubtedly be also positive, if not extraordinary.[2]

Obviously, these contrasts do not mean that we as a society can afford to sit back and behold the work done, among other things because we will always find trends towards the opposite direction, like those pointed out by Thomas Piketty,[3] foreshadowing the exhaustion of the current growth model and a growing social inequality, which will worsen if everything remains as it is.

Therefore, a certain time perspective must be applied as to avoid falling into the trap of thinking that we cannot control all variables. The knowledge of some megatrends that have been observed at a global scale and their incorporation into our decision-making models are absolutely indispensable. On the other hand, though, we should avoid the blame-placing pessimism that does not encourage change nor promotes trust or cooperation, for it consistently sees other people as foes. If one thing remains clear it is the fact that cooperation, trust restoration and cohesion will be absolutely essential elements in order to move towards a model change.

2. A little history: business, territory and identity

> "In the Spain of the late 18th century three kinds of obstacles hindered agricultural, and economic in general, development: the political ones, i.e. those derived from regulations; the moral ones, i.e. those derived from opinion; and the material ones, i.e. those derived from nature. Charles III and his rulers dedicated themselves to remove the material and moral hindrances, but forewent the political ones."
>
> Jordi Nadal i Oller *et al*. *España, 200 años de tecnología*. Ministry of Industry and Energy of the Spanish Government.[4] (Free English version)

2 MINISTRY OF SUSTAINABILITY OF THE GOVERNMENT OF CATALONIA. *25 anys cuidant el medi ambient: polítiques ambientals*. [*25 Years Caring about the Environment: Environmental Policies*.] Barcelona: Secretariat of Environment and Sustainability, 2016.

3 PIKETTY, T. *Capital in the Twenty-First Century.* Cambridge, MA: Belknap Press, 2014.

4 NADAL I OLLER, J.; CARRERAS DE ODRIOROLA, A.; MARTÍN ACEÑA, P. *España, 200 años de tecnología*. Madrid: Ministry of Industry and Energy, 1988.

We begin our approach to the business-related field by placing the focus on industrialization, which is perhaps the factor that firstly highlights the importance of location for production investments (something that in the case of agriculture has its own logic).

Besides the textile colonies, the Asland cement factory in the Catalan town of Castellar de n'Hug is a remarkable illustration of those times. Looking at the economic development of Catalonia in the last century from that monument, somewhat dreamlike, helps us understand the extent to which 'natural infrastructures' did condition the location of manufacturing economic activity, along with the promotion of railway infrastructures.

These locations, determined by natural assets such as ores or water, were later replaced by the criterion of vicinity to road, airport and maritime infrastructures, which throughout the 20th century offset our lack of natural resources in order to nurture a fertile and growing industry that is, still today, one of the most powerful in Europe, though its relative weight in our GDP has significantly decreased.

Furthermore, the coexistence of industry and populated areas was as natural in those times as it seemed to be irreconcilable later on, in the last years of the 20th century, when industry had to face the serious competition of urban growth and of the construction sector expansion. In places where there used to be production centers, perfectly consolidated on their territory, new neighborhoods, residential developments and detached houses appeared, and step by step they turned their back on an industrial identity they no longer felt comfortable with.

Modernity, as understood in the second half of the 20th century, had arrived in our country, and the main topics were design, culture, commerce, fashion, tourism and a new way of life which made everything coming from abroad far more attractive than what we had been until then. The most significant example of it is our city, Barcelona, from the 1992 Olympic Games onwards. From a business perspective, in parallel with construction, services became the new paradigm of contemporary development. At this point, we could talk about a disagreement between society and industrial activity that we have not overcome yet.

As in all couples, the emotional distance between two individuals cannot be attributed only to one of the parties, but the two of them are responsible for it. Likewise, the two of them must restore the common dynamics if the shared project is considered to be worth it.

Past experiences have made us wary of business activity, especially the industrial one, until an unprecedented crisis reveals our need for our own manufacturing economic activity. In this context, despite the society in the abstract being a key element for its acceptance, public policies have a specific responsibility to decide on the future of this relationship.

Thus, Europe, through the European Commission, in its communication "For a European Industrial Renaissance",[5] declares the recuperation of industrial activity to be the leveraging engine of the economy, contributing territorial attachment to investments as well as stimulus to research and technology, and robustness and quality to the jobs created. Such industrialist vocation finds its reflection, in Spain, in the form of an agenda for the strengthening of the industrial sector of the country,[6] and in Catalonia, in the form of the publication *La Catalunya industrial, un futur compartit* [*Industrial Catalonia, a Shared Future*].[7]

By contrast, this industrialist push overlaps in time with the emergence of the digital era. On the one hand, this fact supports and updates the industrial commitment through an image of modernity that helps society shake off the fear of former smoking factory silhouettes. On the other hand, a collective imagery is being built up in which companies seem to be ethereal, lacking an unpleasant material basis, and able to do and undo on a territory without any effect. It is just as if we can do everything thanks to a computer, a good data connection and a smart network, no matter what might lie behind, or whether it is made in some other part of the world we cannot see.

The material basis is thus ignored, even though the material consumption does not diminish, as the per capita yearly waste production ratios show us: they remain stable year after year, though with slight fluctuations. In 2015 this ratio was of 493 kg per person.[8]

3. A little theory: territory, location and perspective changes

> "Let the sovereign and the nation never lose sight of the fact that the earth is the sole source of all riches, and that it is agriculture which multiplies riches. For it is the augmentation of riches that assures the wealth of the population; men and wealth cause agriculture to prosper, extend commerce, animate industry, increase and perpetuate all wealth (...)."
>
> F. Quesnay. *General Maxims for the Economic Government of an Agricultural Kingdom* (1767).[9]

From physiocratic thinkers like Quesnay, who despised industrial and commercial activity and considered that agriculture was the only productive activity, to nowadays, when the

5 Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: "For a European Industrial Renaissance". COM (2014) 14 final. Brussels, 22 January 2014.
6 *Agenda para el fortalecimiento del sector industrial en España* [*Agenda for the Strengthening of the Industrial Sector in Spain*], approved by the Council of Ministers in July 2014. Ministry of Industry, Energy and Tourism.
7 *La Catalunya industrial, un futur compartit*, presented by the Government of Catalonia in July 2014.
8 According to waste statistics by the Waste Agency of Catalonia (2016).
9 In BARBER, W.J. *A History of Economic Thought*. Baltimore: Penguin Books, 1967.

challenge seems to be the attraction to any given territory of as many companies and as much capital as possible, several theoretical economists have over time tried to decipher the economic logic that determines the location of companies, as well as the centrifugal and centripetal forces that can take an economic activity closer to a given region, or away from it.

The space dimension and, therefore, the effect of distance have usually been ignored in traditional economic analysis, despite the fact that some classic treatises on the matter did consider this variable one way or another. The theory of location as described by Dr. Duch[10] has evolved over time to the point that economic geography has become a growing research field.

Throughout economic history, using different theoretical arguments, there have been attempts to model reality in order to discover the logic of business location and, therefore, to try to give an answer to the mystery of economic development from a territorial perspective.

From Von Thünen's circles to Weber's isodapanes, triangles, polygons, circles, curve and straight lines have tried to graphically reflect the business dynamics of attraction or distancing in every territory. Besides being an interesting theoretical exercise, it all reveals that models have evolved over time in order to incorporate new variables into the system. And when it all seemed to be clear to us, new advancements altered the accepted model.

Even so, some classic factors determining business location can be clearly identified. Some of them are the availability and vicinity of raw materials, the availability and cost of labor, the cost of transportation of raw materials, the cost of transportation of finished products to markets, and the vicinity to the consumption center, among others. However, many things have changed thanks to the globalization of industrial value chains and the process of society digitalization.

4. A few current developments

In light of all of the above, we reach the current language defining what makes a territory competitive and, therefore, capable of attracting enough investments as to facilitate economic development as we know it now, or a little different.

Thus, for instance, competitiveness indices are invoked as a way to measure the relationship between our prices and those of our competitors, be they retail prices, exporting prices, industrial prices, unit labor costs, or a set of reference indicators.

10 DUCH, N. *La teoría de la localización*. Barcelona: Mimeo, University of Barcelona, 1997.

The European Commission has published its own indicators,[11] in which 11 key factors, divided into three groups, are considered. The basic group touches upon institutional quality, macroeconomic stability, infrastructures, health, and basic education; the second is related to efficiency, and it incorporates higher education and labor market efficiency, along with market dimension; the third group alludes to innovation indicators, ability to incorporate technology, business sophistication, and innovation.

With these new criteria, far more complex than geographical distance and encompassing several intangible elements, regions now emit their contemporary smoke signals in order to attract capital and investments to their cities and associated development areas. Without a structured and stable emission of said signals, foreign investments would not come to a given territory and, perhaps, even local investments would not stay there. The two reasons for it are obvious: firstly, because business nowadays does not necessarily have any roots; secondly, because the competition between territories is extraordinary and territorial effects are out of step in this dance.

Hence the usual demand of business owners, who call for the elimination of competitive disadvantages in order to avoid investments leaving a territory in search of more favorable locations somewhere else in the world. In multinational companies this competition takes place within themselves, with the top executives of the international subsidiaries competing with each other before the parent company in order to become the next recipients of the company investment decisions.

Therefore, it seems clear that the preservation of the competitiveness of the factors is the basic premise for the territory to remain active, attractive and in development, as we have understood until now.

5. Something is happening

Society evolves and, in some respects, places its preferences in directions that were not contemplated in classic schemes, to such an extent that some parameters can alter trends, perhaps in a very discreet manner, perhaps in the short term, perhaps only the smallest of them. But it could also be possible that these discreet moves of the basis implied further-reaching, longer-term alterations in some of the dynamics that were considered indisputable until then. Thus, are we moving towards the 'twentist' model? In the sphere of some of the resources used, such as water or energy, we have evolved from the scale-economy concept (i.e.: the more, the better) to that of efficiency logic (i.e.: the less, the better). Some causes for this change are, on the one hand, the realization of resource scarcity, as in the case of water during drought occurrences; or, on the other hand, the price volatility undergone by energy in the last few years. Be that as it may, these dynam-

11 *EU Regional Competitiveness Index 2016*.

ics have completely changed the perspective of both domestic and industrial consumers. Evidently, the price signals modification through the incorporation of charges that increased the cost of unlimited water or energy consumption has been a determining factor in this change.

Another example of how local conditions and the evolution of environmental sensibility can determine business attraction or expulsion movements on territory could be the concept of immission levels of certain pollutants into the atmosphere or river waters, among others. For those unfamiliar with environmental regulations, an industrial cluster or an economic activity pole in a given territory, or by a river stretch, could be, contrary to traditional logic, dissuasive elements for the implementation on new activities in the same place, because it would be necessary to prevent the overrun of certain aggregate pollution thresholds, or maximum pollutant levels tolerated by the receiving environment, which are usually established by the authorities. From this perspective, environmental logic invites the dispersion of activities throughout the territory, penalizing their clustering.

The lack of local availability of a basic production resource (such as water, for which use a maintenance flow must always be observed, for instance) can also limit, in an evident manner, the location of certain activities in specific points of the territory, for it becomes impossible to provide these activities, or even the already existing ones, with new water resources. A clear illustration of these dynamics was the discussion on the establishment of the Ebro river maintenance flow, and to what extent the determination of these thresholds jeopardized the future of economic (and in general human) activities taking place in the physical space of the river's final stretch.

Life-cycle analysis and environmental footprint assessment methodologies enable the measurement, with some degree of objectivity, of direct and indirect environmental impacts of any activity, product manufacturing or service supply. With this information we would be able to know, for instance, how much water is needed in order to produce one ton of beef, or how many tons of CO_2 it takes to put a toy made in China on the Catalan market, or of a jumper made in Catalonia, for example in the town of Igualada. With these data a consumer would be able to choose the option most consistent in environmental terms and, therefore, alter the dynamics of markets, conveying a competitive advantage to local products and services, with a lower environmental impact, be that the case. In this fight for markets, prices are still a determining factor, and a bigger market share of local products would be possible only in a context where price signals compensated for the environmental impacts associated with any given product. Be that as it may, it must be noted that any such initiative should be simultaneously proposed in global markets in order to prevent market distortions and unfair competition.

Other technological advancements, such as the change of paradigm in energy production (from centralized to distributed generation, or the possibility to opt for self-consumption)

will dramatically transform the relations of dependence of territories and companies in the energy field, regarding both energy production and supply. Therefore, the distance of a given activity from an energy production source will become less important, whereas the availability of sun or wind can become, in the future, a competitiveness factor as significant as coal mines were in the last century.

In a completely different sphere, digitalization offers the university a real opportunity to become accessible and open to everyone everywhere, so that the identity between the walls of the university buildings and its students literally breaks down. Therefore, in a not-so-distant future, we will be able to share knowledge if we want to, regardless of our physical location.

Also, thanks to digitalization and to new models of goods distribution, what used to be exceptional some time ago is nowadays possible and common: from any territory, products from around the world can be purchased. Current logistic systems make it possible. On the other hand, though, these new models of goods distribution can also be the cause for production activities and their associated value and profit to be as far from our own territory as we can imagine.

Another indisputable trend that can also favor the dispersion of other business initiatives beyond great development poles are the new mobility models, which generate new economic activities emerging from new social sensibilities and new digital tools enabling them.

6. The concept of the circular economy

Some of these trends lead us to the concept of what is nowadays called 'the circular economy': in brief, and according to its definition by the European Commission,[12] it involves the transition from an economic model based on the obtainment, transformation, use and elimination of resources to another model in which said resources stay into the economic system for as long as possible, while reducing waste generation to a minimum.

The circular economy could be a great opportunity to support territorial attachment. Although the main recipients of the circular economy are industrial activities and, therefore, activity sectors, this concept can certainly be proposed from a multisector perspective, for it to encompass all sectors (agricultural, industrial, construction and services), with different opportunities of integration within each of them: for instance, industrial sectors with each other, or the agricultural sector with tourism or wine production sectors: these

12 Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: "Closing the loop – An EU action plan for the Circular Economy". COM (2015) 614 final.

are some of the infinite possible options that can help close the loop of production and consumption economic cycles.

The circular economy is also a multidimensional concept, because there is no need for a minimum size of the activities involved in order to try to find synergies and make products or services more efficient. For example, a small local retailer can market agricultural produce with designation of origin, or simply manufactured in the area. The concept also integrates public and private sectors, since diverse partnerships between operators on each side are possible in order to search for collective solutions favoring circular opportunities: for instance, the extraction of biogas from the sludge generated in a municipal water treatment plant can be used to produce the energy needed by a private operator.

If this multitude of possible connections is transposed to the territory, we find a concrete space in which we can generate, beyond a particular efficiency opportunity, a true collective efficiency process, searching for points in which all possible flows (energy, water, services, mobility, commerce, etc.) connect.

In my opinion, this aggregate approach to the broader concept of the circular economy constitutes, when applied to territory, a really interesting opportunity to grow according to the 'twentist' model addressed by the reflections included in this publication. But this leads us to another debate: what is the diameter of the circle?

The territory of Catalonia is characterized by a significant industrial sector, a really high sectorial diversification and a remarkable external orientation (the country exports about 30% of all its production, with 70% thereof having Europe as destination). On the other hand, the fact that value chains are global means that nowadays the georeference of a product only tells us where it was finished, but reveals nothing about its traceability. The amount of territories involved in current international value production chains is, in fact, impressive. In this context, we should worry about the position of our territory in said value chains, i.e., whether we are the essential link of the process as a whole or, on the contrary, we are utterly dispensable and, therefore, vulnerable.

Again, perspective is important, and in this case perspective is territorial. The radius of our circle is probably the European one. All dynamics that could emerge at lower scales should be aware of this reality, otherwise they could get caught in the trap of closing borders and drawing an artificial circle that would end up with no oxygen.

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The end of territory as we know it

Luis Falcón

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In October 2016 appeared the report "Travel Distribution, the end of the world as we know it?",[1] drafted by the Consulting Area of the London School of Economics (LSE Consulting).

The aim of said report is to provide information on the future of the world market of travel distribution, and to promote a debate among industry on the emergence of new commercial models responding to consumers' revolution. The report addresses the wide variety of the distribution sector perspectives, some of them conflicting with each other, on how the industry must and will respond to the new challenges this sector is facing. The report highlights the risk of the different agents focusing on their own area of the value chain, without a strategy encompassing the whole industry, thus giving rise to a period of complexity and potential confusion in the consumer, as well as of growth opportunities and associated losses.

But it mainly underscores the dramatic transformation represented by new global digital players, 'gatekeepers',[2] who are already revolutionizing our material environment through what can be considered the axis of the big digital revolution, i.e., the platformization of economy and services. A new organization of economy based on access[3] and on the building up of trust between its communities.

Trust is the last step for the establishment of a new environment in the access society. New relations and global services are being organized on the web, and they prize services more than propriety, unlike former generations did. Services networks integrate social networks, communities going beyond the spatial organization of countries or cities. The disruption of peer-to-peer (P2P) platforms alters the classic value chains. "The dematerialization and digitalization of our society made it possible for organizations to reach far beyond traditional markets."[4]

1 You can access it online at https://amadeus.com/documents/en/airlines/research-report/travel-distribution-the-end-of-the-world-as-we-know-it1.pdf.

2 The concept 'gatekeeper' was coined in 1947 by the German psychologist Kurt Lewin, in a study on interactive dynamics in social groups. In the LSE report the word is used to define the role of companies such as Facebook, Google or Amazon.

3 RIFKIN, J. *The age of access.* New York: Tarcher Perigee, 2001.

4 OSKAM, J.; BOSWIJK, A. "Airbnb: the future of networked hospitality businesses", in *Journal of Tourism Futures*, vol. 2, Nº 1, 2016; pp. 22-42

In this business account, the LSE report addresses five main disruptive factors that can have a huge capacity to transform the industry in the next ten years:

- The first one is the significant increase of consumers' expectations, with a wide array of products and services to choose from and a high demand for customization.
- The second, the use of mobile devices becoming commonplace, with their capacity to offer service access tools around the clock.
- The third, big data technology and artificial intelligence increasing segmentation sophistication and service customization.
- The fourth, the growing weight of travel-related risks, as a result of terrorist incidents or global natural disasters.
- The fifth and last, as the report underlines, is the huge challenge faced by regulatory bodies with jurisdiction over the activity derived from services reinvented by new global digital agents, and over these agents themselves.

In January 2017, the new Copenhagen's Tourism Strategy 2020 was published. It had been developed by the official tourism organization of the Danish capital city region. Named *Wonderful Copenhagen,* said strategy is headed by the central message "The end of tourism as we know it",[5] and does an about-face concerning the concept of tourism and territory, putting technology at the service of the most valuable asset: people and the value of their experience with the local and through the local. The strategy defines the present traveler not as the individual seeking the perfect picture to take back home, but the one searching for an emotional connection through an instantly shared experience based on interest, relations and authenticity.

Copenhagen's Strategy 2020 can be summarized in five main axes:

- The first one is the promotion of intersectoral innovation to bolster, through technology, co-creation processes involving the established industry, the newly founded models (the new forms of economy), the universities, researchers, students, travelers and local citizens.
- The second, the defense of the quality of life and social equity of the locals, who become the central subject of Copenhagen's territorial strategy because they are the main pillar of its destination branding Strategy.
- The third, a broad vision on how to generate added value on the territory, blurring the city administrative borders and expanding the Strategy scope into Greater Copenhagen metropolitan area.
- The fourth, the building of a shared, ever-evolving narrative that invites to be constructed from the inside and from the outside, as an open narrative.

5 http://localhood.wonderfulcopenhagen.dk/

- The fifth, the boost of new instruments with capacity and agility to adapt to changes constantly challenging their approaches and results.

"We are embarking on this journey with the shared ambition of co-creating sustainable and long-term value for our destination together with our partners and our locals – both the temporary and the permanent ones."[6]

From their respective points of view, both the LSE report and the Copenhagen's Strategy reflect a crucial moment for our society: we are living in a time of change of global paradigm, and simultaneously mired in a technology change process affecting our form of society and our way to conceive territory, its use and organization. It is a time daring us to assume the end of territory as we know it.

The new industrial age

The economist Carlota Pérez[7] describes technology change processes as big waves, each of which implies profound changes in people, organizations and capabilities, in a sort of hurricane that breaks habits.

Pérez frames the industrial ages in timespans of approximately fifty years, each of which can in turn be divided into five stages:

- A first stage of wild growth.
- A second stage of social disruption.
- The third stage is a period of severe clash between the current age and the former one. Pérez calls it 'turning point'. It is a period of deep economic, social and labor-related crisis.
- Thereupon, in the fourth stage, a readjustment.
- And in the fifth and last stage, a widespread adoption.

Pérez describes the fourth and fifth stages as the filtering of 'common sense' into other aspects of society. She says: "The new paradigm eventually becomes the new widespread 'common sense' that gradually integrates into social practice, legislation and other factors of the institutional framework, facilitating compatible innovations and hindering the incompatible ones."[8]

6 AARØ-HANSEN, M. (CEO) *The End of Tourism as We Know It. Wonderful Copenhagen – Strategy 2020*.
7 http://www.carlotaperez.org.
8 PÉREZ, C. *Technological Revolutions and Financial Capital – The Dynamics of Bubbles and Golden Ages.* Cheltenham: Edward Elgar Publishing, 2002. (You can access it online at http://www.carlotaperez.org/pubs?s=tf&l=en&a=technologicalrevolutionsandfinancialcapital)

We are currently living the turning point of our industrial age, the instant of its regulation for it to adapt to our general interest institutional framework. Ours is an age defined by three main technologies: biomedical, 'green' or eco-efficient, and digital. Green technologies, but especially digital technologies are the key attributes of contemporary cities.

The conservation and improvement of biodiversity in our territory cannot be understood as mere goals anymore, but rather as inalienable attributes. Territory, its uses and its utilization blur the limits established by the 'Fordist' industrial era planning and pose new challenges to the legislator and to planning. The new forms of society and of companies will boost into the territory a dynamism transforming the manner and the speed its uses are implemented. The continuous monitoring of these changes must be incorporated into a dynamic planning allowing a fast adaptation to said changes.

The progress of digital technologies blurs the limits between the virtual and material sphere. The platformization of economy demands the value of social cohesion to be addressed from the perspective of both the temporary resident and the permanent resident. But simultaneously the information speed, volume and diversity generated by our societies become the indispensable raw material to address and manage this new time.

A vision on territory through *Wonderful Copenhagen*'s interpretation

Copenhagen's Strategy 2020 is structured into eight main challenges, that in this brief text can be interpreted as a way to deal with a new territory.

• **The experience of temporary localhood.** People's global mobility will overcome the classic divide between tourist or visitor, and resident or local. Visitors move and experience everyday life. The way those visiting us use our territory will cause the points of interest to vary, and new points of interest will arise in a spontaneous manner, as fast as an offer can be viewed by millions of Internet users in an instant.
• **Locals are the destination.** People themselves become the main attraction for mobility and experience generation. A cohesive territory and society will be the main value of a community. The memory of the other, of the temporary resident, will be built up jointly with that of the permanent resident, giving rise to a collective narrative that will be constantly built and transformed and in which tradition and modernity will be reinterpreted.
• **Branding is all about relations.** Destination and territory are valued according to the personal experience lived therein. Sequences and experiences in a given territory go from material to time-based. Mobility will pose new management challenges to territory, due to temporary residents self-organizing their leisure time.
• **From marketing to enabling.** The destination will no longer be marketed in closed products. Territory will enable to invent and produce experiences and narratives generated from and for itself. The place is no longer packaged, it is open to be understood, reinterpreted and experienced by third parties.

• **A traveler is all kinds of human.** Service quality is not determined by temporary or permanent resident spending power. All inhabitants form part of the same community, which values service according to the best features meeting instant needs.
• **Global urban travelers.** Territory blurs the borders between natural and anthropized. Territory is not interpreted from the land use classification anymore, but from human traces that have defined it throughout time. Technology will allow the visitor to behave on territory as he does in town. Territory will be reflected upon from the marks left by humans, from what is thought and inhabited. The landscape catalogues published by the Landscape Observatory of Catalonia,[9] featuring all the 134 Catalan landscape units, is probably one of the best exercises on this integral vision on territory –as far as I know at least.
• **Digital is yesterday's question; new data is today's.** The digitalization of society moves into the background because it has become, like sustainability, an attribute. Urban processes dynamism and speed can only get an answer from the real-time monitoring of phenomena. Data and their efficient exploitation have become the only way to address the management of society and territory. A case thereof might be the Airbnb phenomenon in Barcelona: [as of 2017,] from the 17,000 weekly listed apartments (half of them offering rooms, half of them offered whole), 2,000 leave the platform every weekend, and another 2,000 enter it. Every weekend 300-400 new ads are uploaded to the platform.
• **Agility to change and fail fast.** Lastly, Copenhagen sets the last big challenge of its Strategy: its plan is conceived according to a flexible implementation. If phenomena hasten and reach a speed no one could even have thought of five years ago, the tools regulating and organizing them must feature the capacity to swiftly change and to unaffectedly absorb the mistakes that will arise in time. Because time, in the period we have to live through, goes by at a much higher speed than it used to in preceding periods.

As a conclusion

The references to the LSE report and to *Wonderful Copenhagen* have been used to illustrate two visions on what Carlota Pérez, in turn, defines as the turning point of the industrial revolution we are going through.

Two of the three technological disruptions defining our time play a crucial role in a new way of thinking about our territory: green technology (and hence, environmental sustainability), and digital technology. Both have been addressed here as attributes of contemporary cities (and, by extension, of contemporary territory). The first one, because its implementation must be a *condicio sine qua non* of the legacy a generation must leave to future ones, and only from the point of view of general interest can the obligation to incorporate it into our regulations in a broad sense be addressed; the second one, because

9 You can access them online at http://www.catpaisatge.net/cat/catalegs.php.

its speed has overgrown any prevision, and only from the integration of its associated logics can its regulation for the sake of general interest be addressed.

Digital technology is creating global communities parallel to traditional ones, defined by states and/or nations, which impact on our physical space. Urban experiences emerging from the phenomenon of products and services platformization give rise to negative and positive externalities that clash with regulations unable to accommodate them yet.

Platforms are nothing but digital environments that replicate material environments regarding community building. Their strength is based on the trust and safety of the environment, within a society that prizes material aspects less and less and prefers to opt for the possibility of accessing products and services in a shared and temporary manner. The spread of smart mobile devices enables the transfer of said environment to the very place and instant where the user is, allowing the access to customized products and services with validated trust, just as if the user were a local resident.

But they are simultaneously a chance to reflect on territory in a more systemic manner, to place more value on formerly inaccessible spaces and attractions, and to place more value also on something capital in a global society: the territorial self-esteem of a community made up of temporary and permanent residents.

Hence, territorial and urban planning, as the last link of coexistence organization, must address the challenge posed by this new industrial age: a dynamic, agile planning, capable of adapting to the ever faster and constant changes that our coexistence spaces will undergo. This is the only way for the new paradigm to eventually become the new widespread ‘common sense’.

Efficacy, beyond effectiveness and efficiency

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How are things made possible?

I have always conceived public action, political action, as the will, the calling for making things possible. For me, political action, the real public action, is not the one pursuing big headlines or big declarations, nor the one oriented to set up magnificent plans that can be shown throughout the world in spite of being devoid of any practical application; for me, political action, as I have just stated, is to try to make certain things possible. From the only asset that I have, which is a more than twenty-year long experience in this matter, I intend to explain which empirical elements I understand that must be taken into account to make certain things possible; as I said, I will speak from my personal knowledge and experience.

Hence the title of my speech and the word game, sometimes a little confusing, involving *efficacy*, *effectiveness* and *efficiency*. (We should note that in the Latin languages some of those terms seem to be the wrong way round: thus, *efficacy* is called in Catalan "efectivitat", whereas *effectiveness* is called "eficàcia"; thank God, *efficiency* remains much the same.)

The trend of the evaluation of public policies has excessively emphasized the concept of efficiency, mainly focused on the management of available instruments, i.e., how diligently and to which degree of compliance a certain budget is executed in the carrying out of an activity. But efficiency does not tell, in any case, if the implemented actions have a practical use, or if the result of the action does indeed meet a target that can be assumable or acceptable, or if it is even the one we had outlined in the first place. Therefore, from my point of view, efficiency should always be a secondary parameter, and should always be subject to the fact of one being able to make certain projects become a reality.

And this is what we call effectiveness: to achieve the materialization of a particular purpose. The problem is that effectiveness does not split hairs: as far as a certain action is carried out, effectiveness does not care about its cost.

At this point efficacy comes into play, trying to combine the former two: it stresses and prioritizes the main goal of making things possible, but simultaneously remains vigilant

that the target is reached with the best utilization of the available resources, be they human, conceptual or administrative.

Therefore, we can agree that the idea to convey is that we need instruments allowing us to measure our efficacy; we should also assimilate, in the decisions we make, the behaviors and the approaches stressing efficacy.

Anyway, for us to be able to talk about efficacy, it is indispensable to set a target. This poses one of the most relevant problems that may arise in any public or political action: making clear which goal must be served.

Too often, when considering objectives, one resorts to the available measures and sets a quantitative goal for them. But usually there is not a willingness to reflect on whether the approach that is to be implemented really constitutes the main objective, the one that allows for reaching the previously set goal. We are not very used to such a reflection, since it demands an attitude and a behavior of permanent questioning about what has been done and about what is needed to be done; and we generally do not like to assume this attitude.

In statistics the existence of errors is postulated: there are type I errors and type II errors. When transposing the concept from statistics to our field, a type I error would be to consider that we have the solution to a problem when this solution is not really the right one; a type II error would be to dismiss the solution to a problem when this solution is really the right one. But none of these two types of errors is the most common one in public management: in this field the error we come across the most is the one that Mitroff called a "type III error , consisting in having the right solution to the wrong problem. A magnificent solution to a certain problem has been found, but the problem has not been properly outlined. Thus, efficacy is absolutely dependent on the fact that we have correctly defined the problem. At this point what may happen is what Ambrose Bierce, in *The Devil's Dictionary* (a compilation of rather sharp definitions for certain words) proposed as the definition for *Self-evident*: "Evident to one's self and to nobody else". Well, this is the approach we often use to address problems, especially when we have a certain executive responsibility: one thinks that what is evident for them should not admit further discussion of any kind, precisely because one sees it as evident. But it is not evident, it is self-evident, in the sense Bierce conveyed to this term.

To address these issues, and to be able to carry out effective public policies (i.e., the ones with efficacy, which can be actually implemented and that satisfy objectives deemed of interest for society), there are five elements that, in my opinion, are worth a deep questioning:

The first one relates to the definition of the problem, and we have already dealt with it.

1. The second one is the lack of suitable evaluation instruments: we certainly must evaluate, and we must do it with quantitative measures; but we usually measure only those we know how to measure, and too often those ones convey no useful information. Thus, it is necessary to determine which measures are the real ones, the ones that allow us to evaluate the extent of the attainment of goals. In most cases one realizes that the tools needed to carry out this desirable measure are missing, and then one gives up on them and resorts to some other, substitute measure that may be suitable to draw charts and graphs but that turns out to be useless in the end.

2. The third point, somehow related to the second, is about the misuse of the mathematical apparatus: we often use numbers and statistics without understanding them. We lack the sufficient statistical or mathematical culture needed for the correct interpretation of the numbers we use. And this is a big problem, because we end up defining indicators that we cannot interpret (apart from the fact that most of them are unnecessary as well). Thus, a big effort must be made here, because we finally evaluate what we have done according to what we have measured, and if we cannot measure and interpret the resulting data, we cannot be on the right track.

   For example: our passion for percentages, which make terrible allies. Let us imagine a society of 100,000,000 inhabitants with an income per capita of €1,000, and where the GDP grows by 10% annually whereas the population grows by 5%; let us imagine another society of 1,000,000 inhabitants with an income per capita of €5,000, and where the GDP grows by 2% annually whereas the population grows by 1%. Let us also suppose that the cost of living is the same in both societies. It might seem that the first one, with 10% as the annual increase of the GDP, grows more than the second one, where the increase only reaches 2%; one year later, the citizen of the country whose GDP rose by 10%, with all of the other conditions of inhabitants and population increase as described, will have in their pocket €48 more than the previous year; meanwhile, in the pocket of the citizen of the second country, whose GDP grows only by 2%, with all of the other conditions remaining as stated, there will be €49 more than the previous year. Thus, if what really interests us is to measure the rise of the income per capita, it will turn out that the bigger increase has taken place in the second case. But we are in awe about the data of GDP annual growth (10%), and we put aside any other consideration. Many business owners are aware of that, they feel madly excited about investing in countries with increases of 5%, 10%, 15%... without paying attention to the other elements that should also be taken into account. When the basis lies really low, growth seems significant, though it is not.

   A few months ago, the editor of the UN Human Development Report said that there is an excessive concern about quantitative progress, but that there is no point in

improving the numbers of school attendees if children learn nothing at school. The schooling index measures only whether children are enrolled in a school or not; it does not represent their degree of learning. He also said that too much attention is paid to national level average data, which usually conceal huge inequalities in the living conditions of people.

Thus, numbers and statistics must be always correctly understood: we might be implementing policies lacking real efficacy because the way in which we have decided to measure and interpret those data is erroneous. Therefore, we might be progressing, but in such a way of no interest.

4. The fourth element that should be reconsidered is the regulatory quality that is gradually being implemented in administrative processes, and which is a hassle. The aim of regulatory quality is, theoretically, to do things better, but if as a result of that we end up not doing them at all, it makes no sense. If a decree trying to solve a concrete, current problem takes one full year to pass, it will arrive too late to solve the current problem. The interest in planning lies in the design of the plan, not in its execution: the really interesting thing is the diagnosis, especially if it is properly carried out, as well as the devise of future scenarios, the debate of several possibilities and the establishment of some guidelines towards the desired objective. But turning a plan into a set of instructions that must be strictly obeyed, that confines us and in which we are evaluated according to the efficiency of the plan usually turns out to be counterproductive.

5. The fifth element has to do with communication with society; the Irish playwright George Bernard Shaw said that the main issue regarding communication is to deceive oneself with the illusion that has taken place. And this, unfortunately, is our daily grind: we emit messages, and just because of that we believe there has been communication. This is false and gives room to a huge amount of problems for the fulfillment of our intentions, and we cannot understand why people react the way they do, hindering the correct implementation of our initiative, despite having been so thoroughly informed. Not long ago, in the field of psychology, the book *The Knowledge Illusion – Why We Never Think Alone* appeared. In it, after analyzing many instances, the authors came to the conclusion that in spite of the belief that persons are, individually, rational beings, in societies it is actually groupthink that prevails, as opposed to individual thinking. Therefore, the presumption that offering people, one after the other, actual facts and verified information will cause a change in their attitudes is false. That change does not empirically take place because people are unable to detach themselves from the background noise surrounding them, which creates certain ways of thinking.

Nowadays everybody talks about memes (nothing to do with the original idea of Richard Dawkins, a British biologist who coined the term *meme* in his work *The Selfish Gene*

(1976); in the field of ideas and thoughts, the meme would be the counterpart of the gene: the meme is a concept or idea able to spread and that tries to survive, as selfishly as the gene, which does the same). Certain ideas become ingrained in society with a life of their own and seem to be impervious to facts that could refute them. If we do not take this element into account, any rational policy that we might come up with will be ineffective. In other words: if what we plan, if what we try to execute is so good, how can the citizenry reject it?

Another problem hindering the application of scientific evidence lies in the fact that in the transition towards sustainability there will be losers, or people feeling like they are losing (and, unfortunately, in the field of environmentalism a certain tendency to the execration of losers exists); well, if we are unable to communicate scientific evidence without stigmatizing those people, we will be unable to stimulate a shift of habits in them, and they could end up becoming obstinate in their initial stances.

Moreover, efforts in the interface between scientific knowledge and political knowledge must be made so that scientific self-evidence becomes, at last, evidence for government action. For instance: the Third Report on Climate Change in Catalonia, though superb from a scientific point of view, is overwhelming for the public manager without some kind of mediation. Facts and evidences by themselves do not modify paradigms.

To sum up, the main idea that we wanted to convey is that we use too much alleged rationality and objectivity, and we act too much by force of habit in our ways to address public policies (which have repeatedly failed) as to make them succeed. If we remain unable to modify our approaches (from both the individual and the collective point of view, as well as from the one related to our administrative models, more bureaucratized every day), politics will become more and more boring, rejected and, in short, mediocre.

From citizens to 'territoriants': inhabiting territory in the age of regional urban sprawl

Francesc Muñoz
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Introduction

How should we act on territory? How can we manage and govern a changing territory?

As for the relationship between the diagnosis of territorial dynamics and the policies aimed at enabling a good management and governance of the trends driving and nurturing said dynamics, how should it be considered?

Taking as a starting point some experiences in territorial planning in Catalonia from the 80's onwards, we are aware of many examples of good territorial diagnoses and accurate analyses that did not lead to the good territorial policies they should have inspired. We also know about successful interventions on territory resulting from concrete leaderships and alliances between regional and local actors, not necessarily based on a previous exercise of diagnosis in the strict sense of this term.

In my opinion, nowadays, when the evolution of the global process of urbanization is living a moment in which change and transformation dynamics are far more complex than they used to be in former stages of urban and territorial evolution, the strong relationship between the diagnosis of territorial mutation processes and the design of strategies for their management and governance becomes more necessary than ever.

This lecture reviews some significant aspects related to the abovementioned questions taking as starting points two concepts proposed in former works: the idea of 'territoriants', or territory inhabitants (Muñoz, 2008), and the concept of regional urban sprawl (Muñoz, 2011).

Urban sprawl on territory: neither town nor countryside... urbanization

The growth of urbanization has caused old cities, physically straitjacketed on territory, legally limited in their extension and clearly identifiable as exceptions in a non-urbanized

agricultural or natural landscape, to multiply on a space that has become definitively metropolitan. Thus, urban shapes and landscapes of reference that we have always typically associated with the city –streets, buildings, spaces for consumerism– have ended up being ubiquitous, and at present we find them even in territories that had not been urbanized until now; in parallel, we witness the appearance of urban functions –from commerce through leisure and tourism to transportation–, that nowadays are part of the everyday reality of a broader, vaster urbanized space where urban uses and territorial preexistences hybridize.

The former differentiation between town and territory, between urban phenomena and landscape, appears blurry to our eyes and ends up vanishing, and what we seem to distinguish is nothing but a discontinuously urbanized territory; an intermittent landscape that directly derives from a really concrete fact: urban life, conceived in the 19th century as something characteristic to towns, as something essentially different from life in the countryside, has ended up spreading throughout territory.

Undoubtedly, such occupation of territory has been enabled by the acceleration and the intensification of urban growth processes that have been shaping urban regions since the second half on the 20th century. Thus, the urbanization of agricultural spaces close to the most densely populated areas, the continuous urbanization of coastal or mountain territories, or the construction in free spaces between towns are some of the variants that such continuous urbanization of territory has featured over time.

However, if we were to choose one process summing up the idea of territory urbanization in the last decades, it would perhaps be the one of disperse urbanization. Thus, the old definition of urban dispersion formulated by Venturi, Scott Brown and Izenour in the first pages of *Learning from Las Vegas* (1972) takes on a new significance at present times:

> "... a new type of urban form emerging in America and Europe, radically different from that we have known; one that we have been ill-equipped to deal with and that, from ignorance, we define today as urban sprawl."

Moreover, as we shall discuss below, this territorial dispersion of uses and activities no longer unfolds on a urban scale –in the outskirts of towns–, but shows a clear regional dimension –covering vaster, farther territories– and, therefore, the life formerly associated with urban environments has ended up characterizing the whole territory to a greater or lesser extent, not only regarding the location and layout of the uses of land and of material elements defining the urban habitat, but especially the global extension of the urban way of life, the one belonging to cities, that finds a clear reflection in a territorial culture fraught with urban references at the expense of the distinctive references of the agricultural world. Thus, we can talk about a regional disperse urbanization.

From urban sprawl to flow territory: inhabiting mobility

The current significance of telecommunications and the improvement of transportation systems and networks have characterized the form, the functions and the present state of cities on territory; they have even modified the way we inhabit them. Most urban inhabitants live in urban areas but carry out some activities in many other territories of different kinds. Furthermore, in their everyday life they inhabit spaces in more than just one town or municipality, depending on where they work, reside, consume or use services and urban facilities. Thus, a new regional urban space is defined, one in which mobility and the diverse, time-dependent uses of territory tell us about the true character of urban spaces as well as that of non-urbanized ones.

At present, the volume of metropolitan and regional mobility is increasingly significant: this phenomenon is related to diverse expressions of the capability and facility for moving across territory as compared to former moments of the urbanization process evolution. Thus:

- More people using different transportation means are recorded.
- A higher number of travels per person is detected.
- Non-obligatory mobility (for reasons of leisure, free time, consumption, visit or tourism) is as significant as obligatory mobility (for reasons of work or studies).
- The recorded mobility shows increasingly extensive arcs, i.e., displacements correspond to routes between more distant points on territory, often on a daily basis.
- In other words, an urban and regional mobility model that could be summarized as follows: "More displacements to go more times and for more reasons to more places that are more distant".[1]

In essence, a territorial model that combines time-intensive mobility and space-extensive uses, which seems to confirm the well-known hypothesis of the so-called 'time-space compression' that geographer David Harvey popularized in the mid-90s and that Marxism-rooted social science had already predicted through the idea of 'the annihilation of space at the hands of time'. All in all, well into the 21st century, this is a logical consequence of the progressive introduction of technology throughout the 19th and 20th centuries aimed at reducing the time needed for communication between individuals and territories, and that at present has reached its climax with the constant, continuous and daily experience of what philosopher Paul Virilio called 'the real time', i.e., the time that characterizes telematics and telecommunication networks, based on the criteria of speed and, above all, immediacy.

A conception of time and territory, thus, that allows us to clearly speak nowadays of the emergence of a true culture of speed and travel between places.

1 *Catàleg de l'exposició commemorativa dels trenta anys d'ajuntaments democràtics*. See MUÑOZ, F. (2010).

The cultural construct of speed: paradoxes of the relationship between mobility and territory

The result of this cultural construct of mobility is articulated mainly around an element that, though not new, does unfold now at a different territorial scale and does feature certainly diverse time patterns, taking as a basis the definitive advance of the global process of society's digitalization.

In this respect, the emergence of a 'visual digital culture" (Darley, 2000) is a key explanatory element: it refers to the quick, vertiginous consolidation, over a short time, of behaviors characterized by the use and the consumption, continuous and constant in time, of visual digital media, as shown for example by the ubiquitous and common presence of latest generation mobile devices, pervading both the private and public space, and both the productive and reproductive time of every individual.

Any analysis of the current sociology of metropolitan spaces shows that the overexposure of cities to digital technologies and communications is accompanied by the almost continuous mobility and connectivity of citizens. Somehow, the very technology that back in the 80s seemed intended to enable 'zero mobility', ended up, conversely, generating more mobility than ever before.

In fact, those first analyses and approaches (certainly, some of them naive, some other utopian) imagined future urban societies in which all activities and situations would take place in terms of telematics, as telework and remote shopping seemed to suggest. But, on the contrary, the progressive integration of telematics and informatics has helped universalize, nowadays, the use of digital devices that allow individuals to remain connected while physically moving through territory.

Thanks to this capability to make compatible digital connection and physical mobility, the very technology that seemed about to annihilate physical displacement flows through territory turns out, in fact, to exponentially nurture said displacements, characterizing to a great extent a way of life, a perception of time, a measure of distance and space, that are common and exchangeable everywhere: in towns and in the countryside, in cities and in villages.

The use of space in terms of time: the 'territoriants'

In this new metropolitan and regional context, both the way of inhabiting space and the kind of territorial experiences that can be lived in it refer to two clearly interconnected elements:

On the one hand, as we have stated before, mobility has become an increasingly significant element when it comes to the definition of how a territory is inhabited. In other words, the time-dependent use of regional spaces is the factor that determines the degree of territorial appropriation, and even the identification with said territory and its landscape.

On the other hand, the emergence of a culture based on travels between places can also be observed. This culture is associated with new kinds of behavior and cultural habits linked to notions of fast consumption and simultaneity that are deeply rooted in the global digitalization process of society and culture, accurately represented by mobile phones.

In this cultural and territorial landscape, the definitions of city and territory inspired by what Giorgio Piccinato called the 'concentrationist' universe of the industrial city, based on the experience of density as the main feature of urban reality, become clearly insufficient.

Thus, concepts such as 'inhabitant', 'living space', 'neighborhood', 'community', 'local culture'... lose some of their content or, at least, reformulate it in a context where behavioral flexibility and mutability shape a metropolitan individual who, as envisioned some decades ago, inhabits variable geographies in cities with, in fact, an equally variable geometry.

But if mobility is the element that gradually characterizes the metropolitan experience, how could the feeling of attachment to a given place, in a cultural and territorial context so defined, develop?

Indeed, individuals inhabit different territories and make them their own, but precisely thanks to the new mobility patterns, they do so taking as a basis a feeling of attachment that is analogous and standardized. Thus, despite the visited or inhabited territories not being always the same ones, the experience of the place that happens in them is, in contrast, quite similar and comparable. A place-related feeling, therefore, that is compatible with the logic of 'part-time'.

The 'part-time' consumption of territory: the experience of the 'in-between places' visitor

Thus, much the same way inhabited space takes its shape from fragments of the territory in which we live or work, or which we visit, the place-related feeling is also built up from the fragments of time we live in an equally segmented and discontinuous manner.
Both things reveal a new kind of really special interaction between the individual and the territory. This interaction features four main constants. Thus, said relation would be:

- Independent from legal or administrative urban boundaries.

- Disconnected from local vernacular characteristics, related to both the physical space and the social one, normally present in the traditional definition of the place, and that usually are transmitted to territory or represented by it.
- Unrelated to the common cultural background that glues together any given social community and that shapes the equally diverse character of territory.
- Unengaged in the contents that had traditionally characterized the city as the space of the *civitas,* i.e., a space suitable for being inhabited in social, cultural and political terms.

'Territoriants' or 'territory inhabitants' accurately draw the limits in this new relationship between the individual and the territory; they do it with every new mobility itinerary that nurtures their hypermobile culture and their part-time territorial experience.

In fact, the definition of a 'territoriant' goes beyond the classic idea that referred to an inhabitant of a given place: these new territory inhabitants do truly inhabit a place, but they are, simultaneously, intensive users and visitors of other places. They are certainly 'part-time' inhabitants of places, and they profit from territory in a diverse and time-dependent manner. Thanks to the advantages offered by accessibility and multimodality, but, especially, the huge capacity of digital connectivity, they can carry out different activities in several points of the territory, on a daily basis.

Thus, 'territoriants' multiply their presence in the metropolitan space, to the point that their relationship with territory is based on a mobility criterion –the different places where activities are carried out– rather than on a density criterion –the place that statistically attaches individuals to territory depending on where their main residence is located–. 'Territoriants' are the inhabitants of the 'multiplied city' (Muñoz, 2008).

The urbanization of the countryside: the urbanized countryside

Regional disperse urbanization faithfully reflects what is merely the last stage of the growth of cities on territory: the urbanization of the countryside or, in other words, the emergence of an urbanized countryside.

The fact is that the countryside hosts, still today, the agricultural and farming activities, as well as the work of land; but agricultural spaces have progressively ended up being a container for urban uses, to the point that in many urban regions the characteristic landscape of agricultural activity has become a merely aesthetic support, needed to keep the global tourism flow also in a countryside setting.

Thus, former agricultural landscapes, which had even helped geographers and anthropologists differentiate the culture and the way of living of different places, have gradually given way to environments characterized by the proliferation of secondary roads

and malls; parking spaces and residential areas of single-family homes; outlets and farm schools; racing circuits and trailer parks; photovoltaic or wind energy farms, along with urban waste recycling plants; transformer stations and mobile phone radio stations; regional airports and correctional centers; theme parks and a wide, diverse array of rural tourism resorts. A multitude of territorial settings which constitute the spearhead of the new shapes taken on by urbanization on territory and all of which have in common, despite their different functional orientation and territorial dimension, the fact that they exist on the territorial domains of what we, in an ambiguous manner, used to call, and still call, 'countryside'.

The final conclusion of the aforesaid is clear: concepts such as countryside and city, which used to be understood in an antonymous way during the 20th century, unfold today, rather, as different moments of one homonymous narration. Therefore, far from idyllic, bucolic or romantic scenery inherited from artistic and literary tradition, the urbanization of the countryside vehemently shows, throughout territory, what is perhaps a new, genuine cultural revolution, for the negation of the dichotomy between countryside and city means, in fact, the end of the distinction between rural and urban culture and, probably, by extension, the beginning of a new and total 'rurban' culture.

Regional urban sprawl in Catalonia

The dispersion throughout territory of settlements and economic activities has shaped an urbanization that greatly differs from the well-known image of urban growth as an oil spill: in Catalonia, a multitude of 'oil spills', rather than just one, did already show in the 90s, a settlement structure characterized and defined by urban sprawl. The intensification of the dispersion dynamics meant, besides the spreading of residences through territory, the general cloning of urban uses characterizing the concentrated city, now adapted to a regional scale. A process that ended up shaping, everywhere, an iterative and cloned suburban landscape, as the one we can see from the window of a passing car or an overflying plane.

The physical dilatation of the built urban space and of the suburbanization dynamics caused medium-sized cities, in the first place, and later small-sized villages, to witness a progressive emergence of what Richard Ingersoll called in 1999, 'sprawlscapes', characterized by the dissemination of elements that formerly used to make up, in a concentrated manner, the habitat and the visual order of built urban space.

Not only has the 'rurbanization' envisioned by Gerard Bauer and Jean-Michel Roux in the 70s[2] become a fact, but it also shows morphological and functional features significantly different from the ones those authors proposed, which can even challenge the

2 See BAUER, G.; ROUX, J-M. (1976).

origin of the term: at those times, Bauer and Roux specifically defined 'rurbanization' as the return of city dwellers to periurban spaces with a more rural character, from the late 60s on, caused by their desire to live closer to the countryside and enabled by the new opportunities cars offered for their travels. Thus, this definition was certainly linked to the countercultural trends that gave birth to the idea of neoruralism.

But as we have said before, the picture offered by urbanization sprawl is one in which we can observe –rather than a neorural occupation of periurban spaces– the functional and morphological incardination of agricultural landscape into the socioeconomic structure of a metropolis that multiplies on territory. Rather than 'rurban' spaces, what we have is a true urbanization of the countryside, with a broader scope that could include also situations such as the dynamics of residential migration to smaller towns, caused by their lower housing prices or by the opportunity to get a bigger home at the same price in towns far from urban centers of higher hierarchy. These constants have defined the evolution of many Catalan towns and cities over the last decades of the 20th century and well into the mid-00s of the 21st century, right before the economic crisis.

The multiplied city: from a Catalonia of compact cities to a regional disperse Catalonia

As aforementioned, the new residential production, and especially the low-density one, has been absorbed in Catalonia, to a great extent, by newcoming families from bigger cities that have found in the newly built housing stock better living standards, higher comfort and environmental quality, in some cases, or larger habitable surfaces at a similar price in comparison with those of compact urban fabrics of bigger cities, in others.

Thus, whereas in the 311 municipalities of the Barcelona province more than half a million homes were built between 1985 and 2005 (542,796 units), the figures of the 947 municipalities of Catalonia almost reached one million built units for the same period (962,487 homes). In other words, territories traditionally disconnected from classic urbanization trends, such as those of the Girona, Lleida and Tarragona provinces, counted for 419,691 newly built units in the total sum of those years. These figures closely approach those of the Catalan areas with a bigger urban and metropolitan tradition.

This building cycle responds to two main dynamics: on the one hand, the gradual urbanization of mountain, inland and coastal areas throughout Catalonia; on the other hand, and mostly, the importance of residential building activities in county and province capitals, as well as in medium-sized cities, which have in turn generated building processes in medium-sized, and even in small towns around them. This has ended up defining a multitude of small expansion rings of urbanization all over our territory.

Thus, the average of three newly built homes per hour in the territory with the highest metropolitan centrality, in the Barcelona province, perfectly matches the average of six newly built homes per hour, in Catalonia as a whole, for the period 1985-2005.[3]

The territory formed by Catalan medium- and small-sized towns shows, thus, the territorial match between building on territory, firstly, and the arrival of new population from bigger cities, secondly. Besides, all statistical analyses of that territory show that the growth of resident population in those places is accompanied by an increase in other parameters of big territorial significance, such as domestic water consumption thresholds, obligatory mobility, or motorized vehicles per capita.

In spite of the obviousness of these processes, and even though the urbanization dispersion dynamics come from far back in the past, the fact is that in the context of the territory of Catalonia these phenomena have just recently begun to be acknowledged.

This affirmation is not gratuitous if some considerations are taken into account: thus, between 1987 and 1989 single-family homes meant more than 45% of the total built homes, in almost all of the municipalities of the province of Barcelona (304 out of 311).[4] In other words, only in seven municipalities did single-family homes represent less than 45% of the newly built housing stock during those three years.

These figures from a recent past seemed already to anticipate what the living experience of individuals does confirm today, in the respect that obviously, and even out of town, the landscape in many Catalan municipalities already shows features definitely disconnected from the image of Mediterranean, dense and compact cities. In this sense, low-density developments, functional and morphological specialization, or the standardization of a territory through its monoculture production, are instances of dynamics that are no longer the heritage of the strictly metropolitan space, that closest to Barcelona, but that rather characterize nowadays suburban spaces throughout Catalonia. Thus, what shows us how the new landscapes of sprawl are shaped at present times is the territory between medium-sized cities such as Igualada, Manresa, Vilafranca or Reus, but also the territory of many towns and villages around these.

The analysis of residential production from the 80s onwards explains this model of production of built space well, characterized by the proliferation of single-family home typologies at a scale unknown of in many territories, and with a real use that not only is the one belonging to a second residence but that meets, to a great extent, the function of a main residence as well.

3 See OBSERVATORI DE LA URBANITZACIÓ (2006).
4 See MUÑOZ, F. (2007).

Thus, single-family homes meant more than half the newly built homes in eight out of every ten municipalities of the province of Barcelona between 1987 and 2001.[5]

Later data show that this trend accelerated in the first years of the 21st century: between 2002 and 2005, 40,281 single-family homes were built in the province of Barcelona, that is, more than 10,000 units per year. Besides, this production was focused on semi-detached houses, whose average aggregate volumes went beyond 7,000 units per year, with a growing presence in the housing stock of the smaller municipalities: thus, villages with less than 1,000 inhabitants ended up hosting up to 43% of the semi-detached houses built between 1987 and 2005 in just the last three years of that period.[6]

If these data by themselves were not enough to allow us to consider that the Catalan countryside is already urbanized, the analysis of the figures of newly built low-density residences in all the 947 municipalities of Catalonia between 1985 and 2005 is even more convincing:

- Almost one out of every three new homes built in the municipalities of Catalonia was a single-family residence: specifically, single-family homes reached a total number of 289,887 residences, the total number of newly built units 962,487.
- Between 1985 and 2005, semi-detached single-family houses, that constitute a building typology more representative of metropolitanization dynamics than detached single-family houses, clearly predominate over the latter, not only in Catalonia as a whole but in each of the four Catalan provinces. Thus, whereas in Catalonia semi-detached houses globally represent 18% of the total single-family homes and detached houses reach 12%, in Lleida, for example, up to three semi-detached houses are built for each new detached house.
- Between 2003 and 2005, 56,448 single-family homes in total were built in Catalonia, which represents a yearly average of more than 18,500 low-density residences. As for the particular typology of semi-detached houses, 40,756 units were built, which means a yearly average of more than 13,500 houses.

These data reflect the territorial footprint of low-density residential landscapes, in a state of urban sprawl most times. This is just one of the driving elements that have contributed the most to the characterization of the process of countryside urbanization and of territorial shaping based on regional disperse urbanization. It is not the only one, though.

5 See MUÑOZ, F. (2007), *op. cit.*

6 For an in-depth view on disperse urbanization in medium-sized and small municipalities in connection with territorial and social issues, see MUÑOZ, F. (2011, coord.).

The frontier of non-developable land in Catalonia: new urbanization modes in an urbanized countryside

The development of regional disperse urbanization in Catalonia shows another distinctive feature of great interest. It consolidated not only owing to the building of homes in territories with little metropolitan character, or merely thanks to the success and dissemination of low-density building typologies, with an ever-growing presence in historically recent housing areas, as we just commented: it also consolidated taking as a starting point another significant factor, such as the attribution of functional value to non-developable land around cities in our country.

Since its first definition in the Land Act of 1956, where it was associated with rustic land, non-developable land as we understand it today extended its attributes and contents at different times, when its use regime was redefined. Here and now, we cannot discuss in detail the evolution of its character in regulatory terms, but it might be interesting to highlight the fact that, since its redefinition by the Land Act of 1975, non-developable land has always been equaled to that portion of land that is neither urban nor developable; a land which, in attention to its agricultural or environmental value, or merely to the fact that its development was impossible, was not eligible to be incorporated into the urbanization process.

Throughout time, the prevailing approach to these lands has been the conservation of their natural conditions and of their inherently rural character, and the restriction on their exploitation –other than agricultural, forest or landscape-related.[7]

Even so, non-developable land can also undergo specific interventions putting it at the service of public interest activities or facilities that must be located in rural environments, and which can include some different types of infrastructures –accessibility, power, water, sanitation, waste treatment or energy production ones– but also facilities such as gas stations, apart from uses related to open-air leisure activities, to rural tourism or to campsites.

That said, in the context or regional disperse urbanization, these possibilities to intervene on non-developable land have taken on, in recent years, a significance that is far from residual, to the extent that one can witness the development of urbanization modes having little to do with the uses that urban space traditionally implemented on territory in former stages of urban expansion: it no longer revolves around newly built homes, or the location of productive facilities, or tertiary, commercial, logistic or cultural axes, or the abovementioned regional disperse urbanization elements.

7 For an in-depth explanation of these aspects, see MUÑOZ, F. (2010).

These new modes of urbanization have transformed the traditional nature on non-developable land taking as starting points four main processes that have usually characterized the evolution of Catalan cities and territory over the last decades:

- Firstly, the layout at a territorial scale of what Gabriel Dupuy called a few years ago 'network urbanism', that places on non-developable land new uses, such as mobile phone radio stations.
- Secondly, a regional transposition of leisure facilities, which, furthermore, multiply their format, modality and typology –outlets, paintball venues, racing circuits, etc.–, in parallel to the multiplication of environments enabling the part-time use of territory, especially on weekends, such as rural houses, educational farms or interpretation centers.
- Thirdly, a sectorial extension of community services and facilities of a more traditional character –such as correctional facilities or waste treatment plants–, which demand new locations that can be quite remote thanks to the better infrastructure and transportation conditions.
- And finally, a modal redefinition of the utilization of territory resources, with a range of possibilities that goes beyond agricultural and extractive activities and that encompasses sectors such as energy production and its proposals for the construction of wind or photovoltaic farms.

To sum up, if we consider everything said until now, and as we anticipated before, we observe in Catalonia a certainly complex structure of both urbanization and urbanized spaces. This structure has little to do with former simpler images, characterized by the concentration of urbanization in some specific points of the territory, and that followed traditional processes of urban expansion. Cities do not stop growing and conquering new spaces around them, and simultaneously, regional disperse urbanization means a redesign of the traditional urbanization process model, through three main factors, as we have discussed above.

- The urbanization of the countryside and the gradual hybridization and homogenization of periurban and suburban spaces, with an urbanization gradient that is certainly variable but also common to territory.
- The consolidation of urban sprawl and of the territories hosting low-density housing, in locations really remote from the urban centers of higher hierarchy, with powerful territorial formats and with a territorial footprint that clearly exceeds the one of former historic moments.
- The putting into service of non-developable land fringes thanks to new proposed uses. They show an equally disperse structure throughout territory as a result of the progressive integration of functions at a vast scale which constitutes a part of the regional disperse urbanization model.

Regional disperse urbanization: an air-conditioned Catalonia

In 1996, architect Mario Galdensonas ironically referred to the dispersion of urbanization and highlighted people's way of living approximately with these sentences: those commuting from outer neighborhoods travel from their suburban, single-family, air-conditioned houses, in their air-conditioned cars, to their air-conditioned offices, and from these to air-conditioned restaurants, and then back again to their car and their house, from which they will, in their leisure moments, go shopping to big air-conditioned malls and, from time to time, to some air-conditioned multiplex cinema.

Of course, Galdensonas was not talking about Catalonia at all, but about the big North American conurbations, where the phenomenon of disperse urbanization has already consolidated as the main attribute of their urban model. More than twenty years later, it is still amazing the fact that we all can feel familiar with the itinerary described in the paragraph above, while thinking about the territory of Catalan cities in identical terms.

Over the last thirty years, the process of rezoning and improvement of Catalan cities has suggested and strengthened the perception of a Catalonia made up by cities. This is a collective heritage gradually generated by democratic urbanism, and it must be preserved and acknowledged.

But simultaneously it is also true that these images have been accompanied by the progressive consolidation of regional disperse urbanization, that we have just characterized through some of its main features. As we said at the beginning, the current urban Catalonia is the result of not only the large concentration of population in some concrete points of its territory, in big cities. Consequently, the need for a change regarding the ways we understand and, especially, manage, direct and plan urban dynamics becomes obvious.

From all the above mentioned, it can be easily concluded that the rhetoric demand of Cerdà, advocating the expansion of the compact cities of the 19th century and standing for the ruralization of the urban and the urbanization of the rural, has already become true in the 20th century. Partly, at least, for the countryside has already been urbanized.

Thus, nowadays, a Catalonia of cities coexists with another Catalonia, one with its countryside urbanized.

It is a regional space where fewer and fewer 'territoriants' mostly work or consume in the same place they inhabit, and where mobility causes many other fragments of territory to which individuals relate to suddenly appear on the daily roadmap of people, along with those spaces in the city where they live.

In this sense, highway accesses to towns, with their toll booths, do remind us of the ancient walls that used to isolate the inner city of Barcelona, some 150 years ago.
Toll booths, even in an iconic and gestural way, continuously raising their barriers vehicle after vehicle with an almost ritual cadence, mark the moment in which we enter or leave today's Catalonia-city, oftentimes in an air-conditioned interior space.

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He has been awarded prizes such as the one given by the Victoriano Muñoz Oms Chair of the Polytechnic University of Catalonia (UPC) in 2004, recognizing the best doctoral thesis on human values in engineering, and the Bonaplata Award 2014, in its special category of Heritage, as the curator of the exhibition "La fàbrica de la llum".

He has specialized in urbanism, urban planning and territorial strategy proposals. He currently works on the design of landscape intervention and management projects in different types of urban and non-developed spaces.

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He has also been a member of the Advisory Council of the Cerdà Year (2009-2010) and the director of the international congress that closed this event: "Cerdà-Postmetròpolis: El govern de les regions metropolitanes al segle XXI". He has been the curator of the exhibition marking the thirtieth anniversary of democratic city councils, "Local, local! La ciutat que ve" (2010). He is a current member of the Advisory Board of the Neighborhoods' Plan of Barcelona City Council, and of the Barcelona Territorial Commission for Planning of the Government of Catalonia. He is also the director of the UAB's Observatory of Urbanization, and of the international master's program "Master's Degree in Landscape Intervention and Heritage Management (UAB – Museu d'Història de Barcelona-MUHBA).

Social empowerment for the implementation of the 2030 Agenda

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The Sustainable Development Goals (SDGs) adopted by the United Nations General Assembly in September 2015 are the new framework established by the international community in order to promote a new, more inclusive development model in the next fifteen years. Also called 'the 2030 Agenda", those goals are universal despite the development challenges being expressed in a different manner in every corner of the world: therefore, global commitments must undergo some adaptation to local goals resulting from really diverse realities. The debate on the localization of this development Agenda was factored in when the SDGs were drafted, and even a specific SDG, #11, "Sustainable cities and communities", stating the need to ensure inclusive, safe, resilient, and sustainable urban settlements, was incorporated. Moreover, the necessity of territorializing all SDGs turns local authorities into essential elements for the effective implementation of the 2030 Agenda as a whole, as well as for the mobilization of citizens.

One year later, in October 2016, the 3rd United Nations Conference on Housing and Sustainable Urban Development, focused on human settlements (Habitat III), approved the New Urban Agenda (NUA) and reinforced the importance of fully incorporating local authorities into the development Agenda of an increasingly urbanized world. The motto of the SDGs, "Leave no one behind", implies the challenge of reaching the very last corner of our planet. For the implementation of the 2030 Agenda an effective local governance is needed, to ensure the appropriation, commitment and responsibility of every institution within a multi-level vision (United Nations Development Group, 2014). This approach entails the transition to more complex governance models where public and private spheres interact, and into which less hierarchical decision-making structures must be incorporated (Bäckstrand, 2008). Some authors (Ansell & Gash, 2007) have named such process 'collaborative governance', in an allusion to the formal incorporation of heterogeneous agents into building consensus on the goals and priorities of public policies. This multi-level governance implies an effective application of the principle of subsidiarity between different administrations, favoring those closer to their citizens: the local ones. Nonetheless, coordination mechanisms must simultaneously be established between different levels, to ensure coherence and equity between different territories.

Localization through appropriation and participation

In order to adapt the global agenda to the features and circumstances of each territory, the concept of localization introduced by the 2030 Agenda also implies the idea of the participation of different coexisting agents. The interaction between them is largely determined by the institutions and political culture of each place. To achieve the agenda appropriation by the different territories, a dialogue will be necessary between the multiple parties involved, as well as the reaching of agreements prioritizing goals, with an ambitious but realistic action plan. The definition of concrete policies demands good diagnosis and widespread participation, because the effective implementation of the SDGs will need changes in current production and consumption models, and those cannot be imposed if a prior public awareness about the need to carry them out, both for common and for own good, is absent.

Policies must give an answer to the demands of different agents, whose interests sometimes conflict, and therefore attention must be paid to listening to the most marginalized sectors and to including cross-cutting issues, such as gender perspective and cultural diversity. It is important to assess the representativeness of the several agents partaking in the different discussion and negotiation levels; also, one must clarify the decision-making mechanisms, establish the distribution of responsibilities among the participating agents, and assign the duties according to the goals related to public policies (Ayuso & Costafreda, 2013). The local Administration constitutes a privileged space to implement participatory processes that would be difficult to manage on a national scale, and even less feasible at an international level. The creation of collectives' associations for the defense of their interests must be encouraged, for those can help establish the alliances the SDG #17 refers to (United Nations Development Group, 2014).

The first step in order to attract the interest of citizens in an effective manner is a wide diffusion of the SDGs goals, of the current situation in each country and region, and of the consequences implied if no action is taken to solve existing issues. Public officials, private sector and civil society must become engaged in the identification of the main weaknesses and in the development of baseline indicators upon which policies can be constructed. A detailed examination of the needs of every collective in relation to each SDG and each objective is needed to ensure that no person and no territory is left out of the Agenda, and that common interest, as well as that of the most vulnerable, is taken into account.

Not all local agents have the capabilities needed to carry out this process: therefore, a key task of international cooperation must be aimed at the strengthening of capabilities promoting participation and collection of the information needed for the formulation of a good diagnosis. These capabilities will also be essential for the subsequent implementation and follow-up of implemented policies. For agendas adapted to specific conditions

to be established, there must be a prioritization of goals in accordance with some criteria, for instance the ones proposed in the guide by Kanuri *et al.* (2016):

- The goals chosen must be relevant to a given territory, and feasible according to local capabilities.
- The established goals and objectives must be aligned with the responsibilities of the local government.
- The goals must be prioritized in accordance with the urgency of the gaps, identified through an analysis based on empirical evidence.

'Glocal': local-global interaction

Although the 2030 Agenda neither overlaps nor replaces previous local public policies, all pre-existing policies will have to be reviewed for their goals to match the SDGs priorities. New agendas should be a transformative continuity of pre-existing policies. Again, the participation of everyone involved is indispensable for the Agenda not to be deemed an imposition or a disparagement of former actions. Despite the fact that national indicators of compliance with the 2030 Agenda must be aligned with the 230 indicators developed by the United Nations Inter-agency and Expert Group on SDG Indicators (IAEG-SDGs) for the monitoring of SDGs at an international level, local agendas must establish specific indicators in accordance with local priorities, utilizing the available statistical sources and building up more local capabilities for the measuring of those indicators when needed (United Nations Development Group, 2014). Policy implementation requires continuous monitoring and feedback for learning mechanisms that allow the adaptation of policies to evolving circumstances and to changes taking place as the development Agenda is implemented.

This process implies a complexity in which developed and developing countries face different challenges: the latter must cope, especially, with technical, financial and institutional limitations, and need the support of international cooperation. In contrast, countries with higher degrees of economic and institutional development face the challenge of constructing a transformative agenda that often meets bureaucracy and vested interests that are difficult to modify. In all cases, the effective implementation of the 2030 Agenda demands the mobilization of the different public and private agents in processes of joint creation of innovative policies. The need to maintain citizens' engagement and mobilization spreads to the results evaluation and accountability process.

The UN-Habitat Local and Regional Governments Global Working Group and the United Nations Development Program (UNDP) have adopted the initiative of creating a toolbox for the SDGs implementation at the local level, offering means for the effective implementation of what has been agreed upon at the international level, with the incorporation of all agents present on the local one. Through participatory processes in regional and

global dialogues, an analysis is attempted on how to define and adapt the development Agenda to the local sphere, and on how the interests of its recipients can be incorporated into the layout of public development policies, in order to ensure their appropriation and democratic legitimacy without losing sight of their effectiveness. This process also seeks to ensure the accountability and the democratic political control by the diverse agents involved.

The practice of localization

The SDGs localization toolbox has been conceived with a practical and flexible goal, so that it can adapt to the needs and specific features of each territory. It has a triple objective:

- Firstly, doing an inventory of existing tools, through the analysis of the results of lessons learnt in former processes, such as the Millennium Development Goals (MDGs) pursued between 2000 and 2015.
- Secondly, providing local entities with communication tools in order to strengthen public officials' and citizens' awareness about the SDGs and their consequences for policy implementation.
- Thirdly, contributing to the building of arguments and evidence impacting on the development of public policies for an effective SDGs implementation.

One of the elements in the toolbox is the "Roadmap for localizing the SDGs: implementation and monitoring at subnational level", analyzing different experiences of SDGs localization carried out by several subnational entities, in diverse aspects, as well as the main challenges demanding an answer. The Roadmap underscores the need of avoiding top-down approaches in the implementation of the Agenda, and advocates for a bottom-up approach based on the evidence of successful experiences. In this respect, the Roadmap underlines the need of foreseeing the appropriate legislation regarding the transference of resources and administrative functions for the implementation of those policies. It also insists on the necessary engagement of local authorities in the SDGs implementation, and on the fact that each government level must be provided with the capacity to act in the sphere of its pertinent responsibilities regarding the Agenda application. The Roadmap also recommends the creation of joint working groups between different administrations in order to align local and regional plans with the SDGs, and to mobilize local resources through budget transparency tools. Furthermore, it calls for the establishment of cooperation and peer learning mechanisms between municipalities, to share methodologies and successful experiences, thus contributing to local strengthening.

The Roadmap mentions the role of local institutions in the monitoring and evaluation of the SDGs, stressing, again, the importance of mobilization and participation. In most countries, the existing indicators measurement systems are centralized at a national level,

but local institutions are the ones who have a direct knowledge of what happens in their territories. There currently exist wide data gaps that can only be corrected through the involvement of those governments closest to citizens. Local governments must incorporate the SDGs indicators, but it implies that these must be adapted to the regional context and that technical capabilities must be provided for said indicators to be applied to planning and management.

In turn, the Sustainable Development Solutions Network has drafted a guide aiming at helping practitioners adapt, implement and monitor the SDGs at local level (Kanuri *et al.*, 2016). Four basic steps for the incorporation of the SDGs to local planning are described therein:

- Step 1: Inclusive, participatory process to mobilize the multiple agents interacting in a given territory, for them to join the priorities identification process.
- Step 2: Establishment of the local Agenda from evidence-based decisions supported by citizens.
- Step 3: Application: goal-based planning, with financial resources and multiple associations.
- Step 4: Progress monitoring, and evaluation; support for the local capacity development in order to achieve a more sensitive and responsible governance.

Catalan contribution to the international SDGs localization Agenda

In light of the challenges posed by the 2030 Agenda localization, we can ask ourselves what the best strategy for Catalonia to carry out this process could be, also taking into account Habitat III – NUA. The Catalan municipal fabric has at its disposal planning tools, such as municipal action plans, as well as previous experience in localizing international agendas, such as the whole process of the 2021 Agenda, implemented throughout our territory after the United Nations Conference on Environment and Development held in Rio de Janeiro in 1992.

The first step is an effort to disseminate the SDGs among local authorities and citizens; such effort can also help us reflect on the current situation of the different goals in the diverse areas of our territory. This means that many municipalities will need some support in the generation of knowledge and of the indicators allowing a measurement of development gaps between reality and the goals to achieve.

Taking the planning tools already at hand as a starting point, we must seek a way to incorporate a diagnosis of the needs of the SDGs local Agenda, including citizen participation with innovative elements allowing bottom-up priorities building. Therefore, a strengthening of the local institutional capacities to outline and implement public policies is indispensable. And since the capacities of the different municipalities vary greatly, those with

fewer resources must receive some additional support: a way to obtain it is searching for alliances with other municipalities or with supra-municipal entities promoting cooperation and mutual learning.

The engagement of civil society is the key element for the successful implementation of the 2030 Agenda, not only in its planning stage, but also in their role of exercising a democratic political control on public agendas with the incorporation of the private sector. This implies the establishment of monitoring mechanisms and results indicators that must include not only the 2030 Agenda goals, but also the Administration action as a whole, avoiding duplications. Thus, the SDGs implementation is linked to an improvement of transparency and to accountability, which in turn contribute to an improved democratic culture.

In this task, the tools provided by the UNDP and the exchange of best practices between different agents can be helpful, but it should always be taken into account that for the Agenda to become really local it must be based on local features and political culture. Therefore, being at the top does mean learning from what others did, but it especially demands being innovative in the answers the new development Agenda requires and generating social transformation dynamics.

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Effective loopholes in Politics

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Behind these sessions Catalunya Futur Verd and their assertive title there is an idea deeply rooted in current collective thought, probably coming from the document "Our Common Future", also called "Brundtland Report", of 1987, where former reflections on the impact of modernity on the environment were collected, while confirming also the evolution of the world towards a global society, and the path induced by said evolution, with severe impacts on the environment and a growing amount of people falling into vulnerability and poverty. The document offered a widely known, repeated and described definition of *sustainable development*, underlining it as a development that leads to the satisfaction of current needs without compromising the capacity of future generations.

Today, in May 2017, in spite of the thirty years elapsed since that document was published, we are globally still facing the challenge of harmonizing economic and social development with environmental impact, though certainly not in the same manner everywhere. Next summer the 25th anniversary of the Rio de Janeiro Earth Summit will be commemorated. This meeting played a crucial role in the collective development of environmental awareness, and defined some strategies and actions for the development of the concept of sustainability: Framework Convention on Climate Change, local Agendas 21, Convention on Biological Diversity, the Forest Principles, etc.

Almost simultaneously, the administrative singularization of environmental issues within the Catalan Government, with the creation of the Ministry of Environment, was being implemented. Such specialization in environmental issues was groundbreaking among governments in our surroundings in those times, and looking back on it, it helped shape quite an orderly country. As examples of substantive actions undertaken in the first years of that Ministry, we could mention, due to their future impact, the Sanitation Plan and the Natural Interest Spaces Plan of Catalonia, which would have had a harder implementation under other administrative conditions. Twenty years later, though, this administrative practice was abandoned, and environmental issues began to be managed together with territorial issues, such as urban planning, mobility and infrastructure in general. Was this change in institutional architecture a result of the evolution of the concept of sustainability, or was it rather due to the fact that our country now perceives environmental issues in a more integral manner? The answer to this question will be developed below; nonetheless, we can already confirm that the concept of sustainability has become more diverse recently, for nowadays sustainability is invoked not only in its environmental dimension,

but is also invoked and reflected upon from the economic, social, territorial, and cultural points of view.

After reflecting on the changes in the global visions of the world since 1987 until today, we could affirm that, in spite of the fact that back then some awareness already existed about vulnerabilities in the availability of energy resources, derived from geopolitical changes of the former decade, the main issue of public debate was focused on maintaining the bases of economic growth, and therefore it relied upon the laws of the economy; now we can see those same questions have somewhat shifted, thanks to the technological evolution, to the links and restrictions existing between growth and resources availability. Throughout most of the 20th century, the environmental problems were those emerging from "local chimneys" and, therefore, local solutions and actions were implemented; by contrast, the present world is characterized by a great pressure on resources everywhere, and by the undoubted confirmation that environmental policies are a necessary factor of global sustainability, not something superfluous.

As for landscapes, Catalonia is a rich, diverse country; but its energy and material resources are rather scarce. Therefore, unsurprisingly, our path, as that of most European societies, is defined by the necessary transformation of our society and our economy into a more efficient structure. Also, it is often said, into a more competitive one, capable of producing more with less, consuming less energy while recovering in a more efficient and effective manner the waste generated. Relatively recent data reveal that each European consumes, for living, sixteen metric tons of material per year, generating six tons of waste, of which three end up in landfills.

These figures do justify, by their own right, the idea and the strategy of the circular economy as a method of making the smallest possible fraction of the available resources disappear from the economic circuit. These logical and widely known views can be attributed to an environmentally aware society, but it would be a mistake to ascribe this strategy only to an environmentalist analysis. The costs of raw materials for manufacture in the European industry represent 40% of the whole production costs, whereas labor costs constitute 18% thereof. With these figures, it seems obvious that the global improvement of production processes should be especially aimed at a better use of resources, for it is the most influential factor in the costs of many companies; but no less surprising though commonplace is the realization that in the last years many policies of big industrial corporations have been based solely on the reduction of labor costs, with the subsequent social costs of such measure.

Thus, the future path for our country seems to be clearly defined and outlined, but on the other hand, when analyzing our evolution as a society in the last years, one can recall the words of British economist John Maynard Keynes, who stated that the difficulty of social transformation lies not in the development of new ideas but, conversely, in leaving behind

the old ones. Arriving at this point, we can briefly comment on situations related to environmental issues showing the difficulty of escaping old schemes and adopting new ones.

The first example thereof, a successful one, is the criterion in place some years ago, when the measure of the progress and development of a country, a society or a company was drawn from its energy consumption. A few years ago it became clear that, even though this relation matches reality in the first stage of development, as the degree of development increases said relation is no longer useful, because higher electric consumption does not mean higher development once basic needs are met. Moreover, this indicator has become even less valid in recent times, thanks to the tendency and the need of improving energy efficiency and savings.

An example of the contradictions, as well as of the difficulties, when leaving old schemes behind can be found in the construction of the Midcat gas pipeline, a project[1] that the European Commission promotes in order to reduce Central Europe's dependence on Russian gas. Its aim is logical and obvious if a reduction of vulnerability to geopolitical issues, like those referred to at the beginning of this article, which can result in a disruption of gas supply, is sought. The project is pushed by the European Commissioner for Energy and Climate Action, but when said infrastructure is fiercely defended invoking its strategic value, such defense simultaneously conflicts with GHG emission mitigation policies, aimed at fighting climate change, a central matter in the policies of the Commissioner: necessarily, an infrastructure as the one mentioned implies a will to keep on consuming fossil fuels in the years to come.

A last example is the one I experienced in person, a few months ago, in Madrid. Those days, the city was living an especially severe pollution event, and the city council had promoted and implemented a plan for limiting the use of private vehicles. I was giving a lecture to a group of young students who were especially aware about environmental issues, and I happened to mention traffic limitations. To my surprise, some of the attendees argued, even angrily, against those measures. The intensity of some of their comments could certainly be due to their views on the political group promoting those measures but, in any case, they also showed a contradiction between the pursued goals and the implemented practices.

In this context, it makes sense to ask oneself whether the measures leading to a more sustainable society should be faced squarely or searching for loopholes. Can Catalonia undertake the green future mentioned in the title of these sessions?

My current vision is that, for measures to have efficacy, it is better that there be a commissioner for Energy and Climate Action in the European Union and a Ministry of Territory

1 The project was alive at the time of the lecture, May 2017, but was cancelled in January 2019 (editor's note).

and Sustainability in Catalonia, even if contradictions might arise. Before elaborating on this point, let me draw an analogy with a phenomenon that is significantly occupying public opinion these weeks: the international representation of Catalonia and the difficulties our country faces to be internationally welcomed and listened to. Catalonia has a strong representativity in the environmental sphere, and this implies a loophole through which our country has gained a presence in the international scene. In fact, thanks to the good work of Catalan representatives (among which the first head person of the Catalan Office for Climate Change, Josep Garriga, must be noted), the United Nations agreements on climate change fight did recognize the significant role of regional governments. In this context, the President of the Government of Catalonia Artur Mas attended the COP21 in 2015 on behalf of the Catalan Government, and he spoke of sustainability and of the role of our country in climate change management. In other settings, Catalan official missions have been received by heads of State and ministers in Morocco, Sri Lanka, Colombia, Peru, Brazil, etc., always to talk about Catalonia and about the environment. Could this be considered a useful loophole?

Within governments themselves this dimension is also important. The sectorial differentiation is not always synchronized with cross-cutting policies, as the environmental ones use to be. The significant push of the agri-food industry and the ministry managing it often find, or feel, that they are being curbed by environmental requirements of soil and aquifer protection which, from another point of view, mean a reduction of vulnerability rather than a hindrance. A few years ago, the environmental regulations our country has been enacting used to be understood as obstacles for the development of industry and, consequently, of economy.

Another example thereof can be found in the field of tourism, a still growing, strategic sector for our country's economy, when environmental requirements for some projects of territorial utilization appear and are often deemed to be spokes in the wheels of the development of said industry: this is erroneous, in my opinion, for the values to be protected by environmental requirements are precisely those making tourists head for our country.

Thus, our choice is the use of loopholes instead of total opposition: this is the basis of management and the most fruitful way to define consensual paths that can be accepted by the majority. Much in the same way that these loopholes are the entry point of environmental concepts into all the spheres of action of governments, for citizenry not only awareness, but also economy and health, are ways to achieve the incorporation of sustainability in everyday life. Among recent examples of it, the one of air quality is probably the clearest we can find.

The need to control air quality in urban environments has been obvious for quite a long time, but it is also apparent the difficulty of outlining and implementing measures in municipalities, because these actions often call into question mobility (not accessibility) in

towns as we used to conceive it in the 20th century. What has been the keystone, the loophole? It has been neither economy nor congestion avoidance, but, unfortunately, health (Jordi Sunyer told us about it in the second session of this cycle): only when the World Health Organization has published unequivocal data on the impacts of urban pollution on health, quantifying sick persons and fatalities, have public authorities been compelled to react, and to eventually outline (and have accepted) the planning of some inconvenient and restrictive measures that, as usual, are too timid for some and too radical for others.

We live in this small country of ours, but we also proclaim that our world is the world. This small country also features some characteristics that few others can offer: a strong, dynamic metropolitan environment that does not preclude us from reaching, in a matter of hours, rural areas with enviable landscape and environmental values. Our recent past reflects this country: our civil society, at the end of the 19th century, organized itself in order to become acquainted with the values of our natural spaces and enjoy them, whereas the basin of the Llobregat river already showed a powerful territorial and economic development thanks to the implementation of textile factories. In the presentation of this session the seeming oxymoron between the words *competitiveness* and *sustainable* was put forward. I hope that in the near future we will be able to shape a country that proves, precisely, such oxymoron not to really exist. I also hope for Catalonia to become an example thereof, an example that no longer needs loopholes.