



TERRITORIAL RESILIENCE:

PILLARS FOR A HOLISTIC APPROACH OF RESILIENCE FOR LAND USE PLANNING

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1 INTRODUCTION

Mature ecosystems in nature are those that have achieved greater complexity, stability and balance over time (E.P. Odum 1969); (Margalef 1958). This means that the components are interrelated in a harmonious and complementary way, so that it is possible to maintain the vitality of the system with sufficient use of energy and resources. Thus, the system remains dynamic, but in equilibrium, nothing is in excess and nothing is lacking. To achieve this balance, the community of species and organisms have had to generate their own adaptive mechanisms to survive and evolve over time, building their resilience. The evolution of human settlements is not exempt from this process. Cities and towns have also had to acquire response mechanisms to the various events that have transgressed and forced them to adapt over time. Each evolutionary leap has meant a process of adaptation that has also demanded changes in the ways of life. However, not all adaptive forms have been completely balanced with the natural environment. An example of this is what the technological leap of the 19th century industrial revolution meant for economic development in the 20th century, a highly polluting production system, based on the accelerated exploitation of resources and the extensive use of fossil fuels. The externalities of this production system have left an unprecedented ecological footprint, reducing the regenerative capacity of the systems. It is, therefore, necessary to address territorial planning, based on the principles of resilience and also taking into account the dynamic and temporal factor, given its condition in continuous transition towards a greener economic model.

The purpose of this paper is to expose a comprehensive conceptual framework that defines territorial resilience from a holistic viewpoint. To this end, an initial reflection is made on the dichotomy between the rural and urban worlds and the consequences of the urbanisation model of the 20th century. Urban resilience is then analysed as a reference vision and a starting point for defining the scope and objectives of territorial planning and development. Finally, it proposes the vectors that facilitate the symbiosis between the rural and urban worlds, especially in a Post-COVID19 era. This paper is part of the Territorial Resilience research area and the Sustainable Transition Initiative promoted by the Euro-Mediterranean Economists Association.

2 THE URBAN-RURAL DICHOTOMY

2.1 Urbanisation as a driver of development

Cities have been characterised as the poles of concentration of wealth in terms of economic capital and knowledge & information. Urbanisation has been the driving force of development, mainly from the second half of the 20th century onwards. According to data published by The World Bank (Figure 1), in 30 years (from 1990 to 2020) the share of world’s urban population increased from 43% to 56.2%. We can see that the most relevant growth happened in Africa and Asia. In Africa, some of the most extreme examples of growth are countries such as Botswana, which developed from a 42% urban population in 1990 to 70.9% in 2020; Angola increased from 37.1% to 66.8% and Equatorial Guinea from 34.7% in 1990 to 73.1% in 2020. In the case of Asian countries, the most significant urban population growth was seen in China, where the urban population share increased from 26.4% in 1990 to 61.4% in 2020.

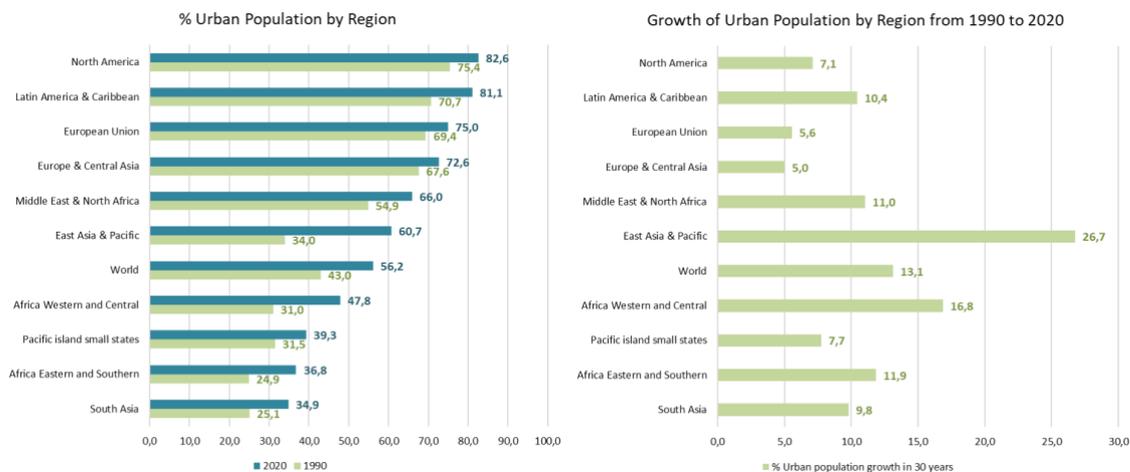


Figure 1. Urban Population by region, comparison between 1990 and 2020.

Source: World Development Indicators, reviewed December 2021. The World Bank.

Urban growth has a direct impact on resource use and also on the overall land use pattern. It is understood that cities, or urban environments, have a greater potential for transformation towards a more sustainable future, due to their high concentrations of people and activities and their capacity to provide services. However, the way in which the critical mass of people and activities is distributed throughout the territory has a positive or negative impact, depending on the urban model and its corresponding land use and connectivity model. Figure 2 reveals the predominant urban model in each region, for example North America, although the most urbanised - with almost 82% of its population

being urban - has a land use density of less than 20.3 inhabitants/km², which means an extensive land use model. On the opposite side is the South Asian region, where there is a smaller urban population (34.9%) but highly concentrated (389 inhab./km² of land use).

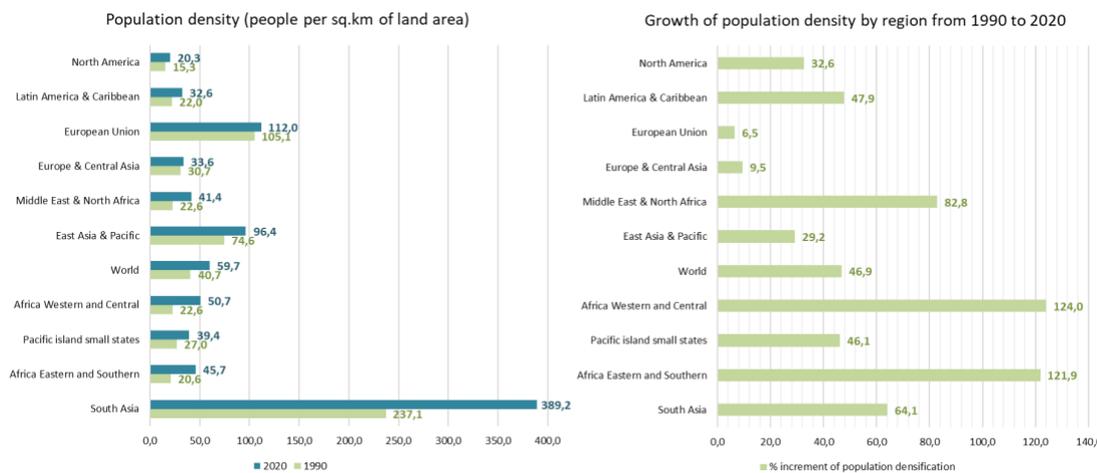


Figure 2. Population density by region, comparison between 1990 and 2020.
Source: World Development Indicators, reviewed December 2021. The World Bank.

Concentration of people and activities has a direct impact on resource consumption. Figure 3 shows energy use (tonnes of oil equivalent per capita) in the same regions mentioned previously. According to data published by World Bank, in 2014 North America reached 7 Tn per capita. Meanwhile, in South Asia it was 0.57 Tn per capita. European Union had 3.12 Tn per capita, with an overall density of around 111 inhab/sq km land use. Compact and diverse urban models can ensure a better transition towards a sustainable model (Rueda 1995; Burton 2002;), density plays a key role in the definition of territorial model, especially when talking about contexts in a continued and accelerated growth process, such as African regions.

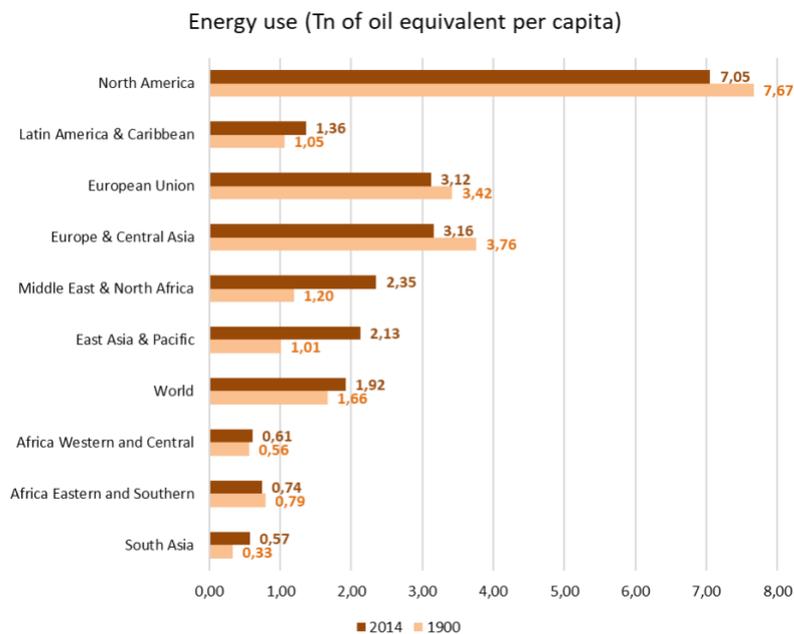


Figure 3. Energy use by region (Tn of oil equivalent per capita), comparison between 1990 and 2014.

Source: World Development Indicators, reviewed December 2021. The World Bank.

The exodus from the rural world to the large capital cities of countries has led to large agglomerations and the creation of mega-cities in different parts of the world. However, the concentration of activities and people does not always lead to an increase in people's quality of life; on the contrary, the strong competition for opportunities increases the cost of living and, to a certain extent, exacerbates inequality and urban poverty. Conversely, rural villages are losing population and also face a risk of poverty and social exclusion, especially due to a very high ageing rate. There are not enough young people staying in the rural environment and there is a marked fragility within these territories. Therefore, should there be a limit to urban growth, density and the degree of urbanisation of a territory? What parameters should adjust this growth to a more equilibrated land use and what should be the role of rural areas in XXI century?

2.2 Externalities of the urbanisation model

In the course of little more than 100 years, human activity has reached an accelerated rate of consumption and depletion of available resources¹, thus consolidating linear productive modes that have caused a high level of alteration amongst natural ecosystems through the generation of waste and emissions into the atmosphere, which scientists announce (and denounce) as going beyond

¹ IPCC Sixth Assessment Report, Climate Change 2021: The Physical Science Basis, the Working Group I contribution to the Sixth Assessment Report. <https://www.ipcc.ch/report/ar6/wg1/>

planetary limits (J. Rokström 2009). Over recent decades, the loss of biodiversity on the planet has been devastating. According to the United Nations, about 20% of the abundance of native species in terrestrial habitats has declined since 1900. It is estimated that about 680 species of vertebrate animals have become extinct since the 16th century to date. In the case of the aquatic environment, 40% of amphibian species and 33% of corals are threatened, amongst many other species. Human activity and the effects of climate change are already one of the main factors of alteration and endanger not only the life of animal and plant species but also their very subsistence. But beyond the obvious impact on the biological and chemical processes that regulate the functioning of the biosphere, the social impact of the linear economic model of production must also be highlighted. One would have assumed that the technological leap would have guaranteed the development of all societies equally through an equitable distribution of resources across the planet, but the opposite has been the case. With the passage of time, competition has intensified for resources, that sustain the consumption of some to the detriment of others with minimal access. Extreme inequality between countries has only accentuated the gradual impoverishment of the most vulnerable regions and an unjust dependency.

In the report published by OXFAM and the Stockholm Environment Institute, "Confronting Carbon inequality: Putting climate justice at the heart of the COVID-19 Recovery"² (Tim Gore et al. 2020), they indicate that during the period from 1990 to 2015, the amount of CO₂ emissions increased by up to 60%, of which the richest 10% of the world's population was responsible for 52% of the cumulative emissions in that period. In contrast, the world's poorest population of about 50% was responsible for only 7% of these emissions. The study draws attention to the need to slow down the level of per capita consumption by the richest population, irrespective of where in the world they live. In the case of the richest population living in the EU, for example, the main consumption categories are linked to air transport and land mobility, housing construction, product manufacturing, food, services and clothing. Whilst the supply of products aligned to the green economy can help reduce this carbon footprint, the consumption profile becomes more relevant as it can condition market demand. It is important that lifestyles make a clear shift towards sustainability and emissions reduction, as a pillar in the transition to a decarbonised economy.

2.3 From post-carbon cities to post-COVID territories

Until relatively recently, there was talk about the challenges of post-carbon cities and how the productive model, based on intensive extractive industrialisation, could be oriented towards a more sustainable model and a low-carbon economy. Although warnings about the impacts of climate change from the scientific community have improved and have been heard around the world, it has not been enough to slow down and reverse the trend model. However, the pandemic caused by COVID19 from 2020 onwards has triggered a new paradigm on materiality and proximity, whose reflection transcends

² <https://oxfamlibrary.openrepository.com/bitstream/handle/10546/621052/mb-confronting-carbon-inequality-210920-en.pdf>

in human relations and also in productive processes. The intermittent confinement and continuous restrictions caused by the pandemic have led to an undeniable alteration of lifestyles and economic and work activities around the world. The pandemic has tested the resilience of health systems, the economy and also human and territorial relations. Post-COVID territories disrupt the dichotomy between urban and rural, allowing the incorporation of a new hybridisation and mix of uses and activities that transcend the strict classification of strictly urban, or vice-versa, rural. The focus is now on greener cities with more sustainable lifestyles at pedestrian and bicycle speed, as well as more villages with a greater emphasis on knowledge-intensive activities and local commerce. According to the OECD³, remote areas are leading the renewable energy generation covering more than 50% of its electricity consumption. Digitalisation will be the great driver change that will make it possible to incorporate new ways to access basic services, knowledge and innovation in remote locations. As for medium-sized cities, they must also play a fundamental role in post-COVID territories, as they become an opportunity for a better distribution of the poles of concentration of economic activity and, therefore, of proximity to cities.

3 RESILIENCE AND TERRITORY

3.1 Why do we need to be more resilient?

The concept of **urban resilience** emerges as an adaptation response to climate change from an urban planning perspective. By definition, the resilience of a city is the capacity of urban systems to respond, adapt and recover effectively to disruptive and unexpected events, such as natural disasters, epidemics or even economic volatility. Therefore, a resilient urban system is one that takes care to create the appropriate mechanisms that allow it, on the one hand, to understand and quantify its greatest vulnerability to a given crisis situation and, on the other hand, to identify strategic measures that prepare it assertively. To this end, it is important for a community or city to establish mechanisms for monitoring, assessing, planning and managing both the factors that make it vulnerable and the measures that make it agile in its adaptive response to uncertainty.

Climate change has a direct impact on urban systems by altering: the microclimate of cities, causing an increase in the urban heat island effect and health effects; the rainfall regime and, therefore, an increase in flooding periods; and in the case of islands, coastal areas and areas bordering the sea, the increase in sea level and, therefore, the alteration of the sea front and the activities that depend on it. According to the IPCC and the commitments made under the Paris Agreement, the adhering countries must ensure that CO₂ emissions are limited and reduced in such a way as to avoid exceeding a temperature increase of more than 1.5°C, otherwise the effects on natural ecosystems will be irreversible and the impact on people's way of life will be greatly altered. The distribution of

³ OECD (2020), OECD Regions and Cities at a Glance 2020, OECD Publishing, Paris, <https://doi.org/10.1787/959d5ba0-en>.

greenhouse gas emissions by sector puts energy consumption in first place (73.2%), followed by agriculture and land use (18.4%), the chemical and cement industry (5.2%) and waste management (3.2%). Today, several cities around the world have already embarked on urban resilience plans, from which specific plans for the implementation of technical measures and solutions are derived.

3.2 Previous approaches to urban resilience

The first studies on urban resilience focus analysis on the definition of the factors that threaten or make a city vulnerable from the social, environmental and economic dimensions⁴. The concept of resilience has been approached from different disciplines, in order to identify vulnerabilities and solutions to improve the transformation of socio-ecological and technological systems. In the field of urban planning, urban resilience plans have mainly focussed on solutions that prepare cities to adapt to climate change⁵. For example, in the case of Mediterranean cities, these solutions are mainly aimed at designing the necessary infrastructures for the management of run-off and torrential rainfall, the mitigation of the urban heat island and the necessary easements to prevent rising sea levels in coastal cities. The urban sustainability criteria developed so far, embodies a set of parameters and theoretical frameworks that allow cities to be analysed holistically. Urban sustainability indicators are already well established over the last 10 years, whilst it is true that urban environments have a head start in advancing measures, policies and defining regulatory instruments that lead towards more resilient planning. However, there are still few examples of the implementation of a resilience strategy on a territorial scale, which not only takes into account environmental variables but also the socio-economic logic between cities and towns in a joint and especially dynamic way.

3.3 Approaching the definition of territorial resilience

Territorial resilience means not only looking at a single urban system in isolation but in constant interaction with other systems and sub-systems. Cities live from the supply of resources produced from other environments both near and far, shaping the so-called urban metabolism. The European Commission, through the resilience plans⁶, encourages member states to draft their economic recovery plans with tangible objectives across six pillars: 1) green transition, 2) digital transformation, 3) sustainable growth and Smart, 4) social and territorial cohesion, 5) social, economic and health

⁴ [URBAN CLIMATE ACTION IMPACTS FRAMEWORK: A Framework for Describing and Measuring the Wider Impacts of Urban Climate Action.](#)

⁵ Sara Meerow et al. (2016) "Defining urban resilience" Elsevier - Landscape and urban planning.

<https://www.alnap.org/system/files/content/resource/files/main/defining-urban-resilience-meerow-newell-stults.pdf>

⁶ https://ec.europa.eu/info/sites/default/files/document_travail_service_part1_v2_en.pdf

resilience (including increasing crisis reaction and preparedness; and 6) policies aimed at the education and skills of the next generation, youth and children. Following these pillars and the basic resilience principles of mitigation and adaptation over time, the following territorial scheme is proposed:

RESILIENCE	TERRITORIAL SCOPE	STRATEGIC OBJECTIVE	PLANNING DIMENSION
Mitigation and anticipation	Monitoring territorial risk and vulnerabilities mainstreaming into strategic planning	Prevention/awareness of: <i>climate change;</i> <i>sanitary emergencies;</i> <i>resource scarcity;</i> <i>distribution of economic poles</i>	Facilities and infrastructure provision: energy, transport, digital access Health care facilities Affordable housing Air pollution - UHI. Sea level/floods, biodiversity PTA/MPA planning CO2 Emissions regulation
Recovery capacity	Enhancing self-organisation and self-sufficiency	Emergency protocols Investment to recovery Sustainable financing Regenerative mechanisms	Temporary contingencies Networks of social support Financing schemes (PPI) Climate Bonds
Metabolic adaptation and transformation	Integrating urban metabolism with territorial planning and management	Encourage actions and plans on industrial symbiosis, innovation distribution of territory, collaborative networks	Climate law Plans for food km0 Zero waste culture, Renewable energy communities, Sustainable mobility and low carbon economy actions

Fig. Territorial scope of resilience principles. Source: Cynthia Echave - EMEA (2021)

	Mitigation and anticipation	Recovery capacity	Metabolic adaptation and transformation
Green transition	Facilities & infrastructure provision: energy, water, transport, agriculture	Financing schemes (PPI) Climate Bonds	Mobility plans Energy Plans KM0 plans

Digital transformation	Digital Access	Flexible working places	Digital plans for schools, businesses and public administration
Smart, sustainable and inclusive growth	Vulnerable monitoring Access to basic services and enabling job creation	Protocols for covering vulnerable population	Poverty mitigation plans
Social and territorial cohesion	Land use regulation and population growth		Enhancing collaborative networks
Health, economic, social and institutional resilience	Health care facilities		
Policies for children and youth	Access to mental and health care to children	Schools and universities as community catalysts	Encouraging green skills in educational plans

Fig. Territorial scope of resilience and recovery pillars. Source: Author elaboration:

3.3.1 Pillar 1: Mitigation and anticipation

Monitoring territorial risks mainstreaming into strategic planning

Territorial planning and management establishes the land use patterns and land reserves necessary for the construction of services and facilities required for the functioning of human settlements. A resilient territory is one that plans for and anticipates possible risks of disasters and/or catastrophes arising either from the consequences of climate change, pandemics and health emergencies, or from social and political conflicts. Resilient territorial planning, therefore, requires the **identification of environmental, social and economic risks and vulnerabilities**. It is important to establish protocols for monitoring territories, in order to generate knowledge about the limiting factors in each case, for better decision-making. Once these limiting factors have been identified, adaptation scenarios must be analysed over time, in order to establish strategic objectives for occupation, development of activity and concentration of activity. The prevention of forest fires in protected land areas, the prevention of floods, the sufficient and sustainable provision of water, as well as energy and basic services to a population, are all aspects that must be integrated into territorial planning, prioritising the reduction of environmental impact, poverty and social inequality.

3.3.2 Pillar 2: Response and recovery

Enhancing self-organisation and self-sufficiency

The second pillar of territorial resilience refers to the capacity to respond to possible impacts and crises that may occur. To this end, it is essential to improve the degree of organisation and self-sufficiency of

the territories, in order to be able to respond autonomously or in a coordinated networked manner. From the viewpoint of territorial planning and management, the response to any unexpected impact or event must include buffering and regeneration mechanisms. Such mechanisms have to be foreseen, taking into account existing vulnerabilities. Access to funding for the activation of recovery plans is and will be an important aspect to consider.

3.3.3 Pillar 3: Adaptation

Integrating urban metabolism with territorial planning and management

Finally, the mechanisms for adapting the territories as a whole to the impacts of climate change, health emergencies or events that we cannot control, must respond to the transition towards more sustainable models of consumption, production and organisation that are resilient to change itself. To this end, from the territorial planning dimension, it is essential, on the one hand, to maintain the maximum symbiosis between urban metabolism and land use planning patterns and the preservation of protected areas and, on the other hand, to strengthen the organisational level of our communities. Collaboration and collective commitment are key elements in the adoption of territorial adaptation measures, in an ecological, inclusive and equitable manner.

4 SYMBIOSIS BETWEEN THE RURAL AND URBAN WORLD

One of the characteristics of mature ecosystems described from an ecological perspective, as described in the introduction to this document, is the dynamic and stable control of the variables that regulate their metabolism. Part of the mechanisms that allow it to regulate itself is the degree of internal symbiosis, which increases as the ecosystem matures. Different ecosystems are themselves interconnected and maintain a constant exchange of energy, matter and information.

In the case of human ecosystems, a similar thing happens. The urban world and the rural world coexist and maintain a constant co-dependence. There is a constant transfer and interaction, mainly in the production and manufacture of products. Several authors have previously referred to urban symbiosis; on the one hand, industrial symbiosis (Mulder, 2015; Van Berkel et al., 2009; Vernay, 2013), as a framework for a more sustainable consumption of resources, and, on the other hand, social symbiosis (Espinosa, A., & Guzmán, D., 2017). Both cases emphasise the collaborative and synergistic approach that places value on the factor of geographical proximity. The pandemic, caused by COVID-19 from 2020, has triggered a new paradigm on this proximity factor. The intermittent confinement and restrictions caused by the pandemic have undeniably disrupted lifestyles and economic and work activities.

This publication proposes 4 vectors that enable this symbiosis between the urban and rural worlds as a strategy for territorial resilience. The pillars defining the proposed territorial resilience are based on this symbiosis and the transition towards a resilient production and land-use model.

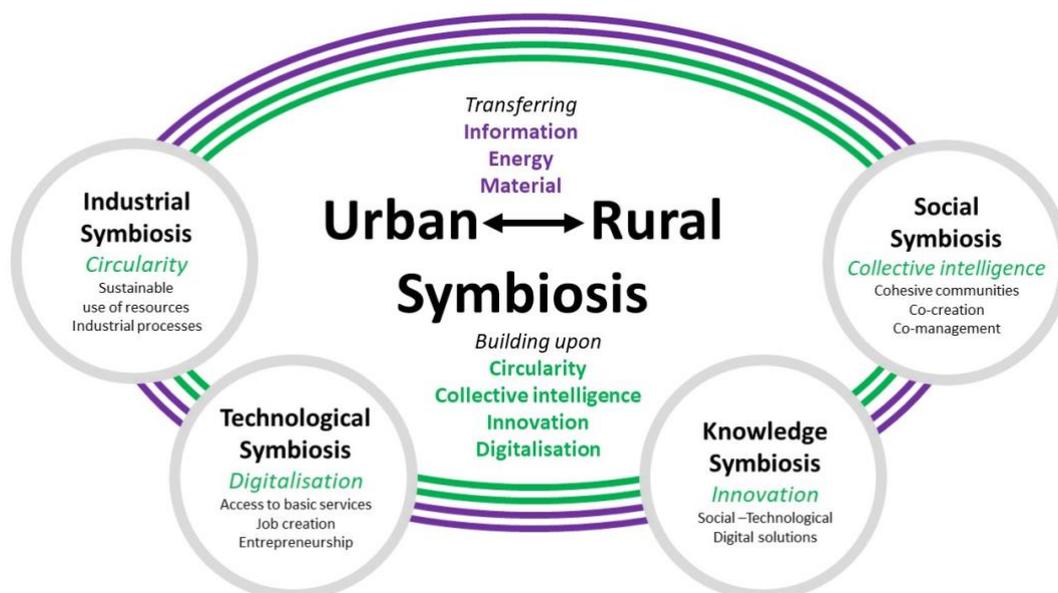


Fig. Vectors and enablers for urban and rural symbiosis. Source: Cynthia Echave - EMEA.

The symbiosis between the rural and urban worlds has as its main transfer vectors: **1) Circularity; 2) Innovation; 3) Digitalisation; and 4) Collective intelligence.**

4.1 Vector 1 Circularity.

The sustainable use of resources requires a transition from a linear economy to a circular economy. Circularity is based on industrial symbiosis, as a vector for change and adaptation of resource extraction, manufacturing and transportation processes. The relationship between the urban and rural world has been established in a purely service-providing way and globalisation has extended the distance that products travel along the global supply chain. Today, a single product can contain components from different parts of the world and can be assembled and returned to its place of origin. Proximity is a key factor in the development of the so-called industrial symbiosis. The consolidation of regional/national clusters will make it possible to strengthen the proximity value chain for certain products.

4.2 Vector 2 Innovation

Value creation is closely related to the degree of innovation generated in a territory. Innovation in territories, through the transfer of knowledge, is the third vector that will enable the application of new solutions in the field of biotechnology, the blue and green economy⁷, as well as resources and tools that allow for the maximum optimisation of resources in the various urban and rural activities. ICT solutions applied in productive sectors from industry, agriculture, tourism and urban services, contribute to increased efficiency and a better complementarity of urban systems with the rural world.

4.3 Vector 3 Digitalisation

Technological symbiosis, thanks to digitalisation, makes it possible to transcend the limitation of the geographical proximity of some processes, especially the provision of services in remote areas and commuting to work sites, reducing the forced internal and external mobility between municipalities. Flexibility in work activities provides a range of possibilities for the coverage of services and new business models that do not require a physical space 100% of the time.

⁷ https://ec.europa.eu/environment/strategy/circular-economy-action-plan_en

4.4 Vector 4 Collective intelligence

Social symbiosis is the fourth vector and refers mainly to the collaborative and co-creative capacity permeating the territory through associated capital and distributed and interconnected networks and clusters. This vector seeks to increase collective intelligence through actions that enable the promotion of public and private initiatives, with an important presence of citizens. Co-working spaces are becoming more relevant both in cities and towns, as well as the promotion of local energy communities, as a response not only to the infrastructure that promotes the use of clean energy, but also as a catalyst for self-organisation and increased collective learning aimed at common goals.

5 CONCLUSIONS

Spatial planning and development in the 21st century requires a more dynamic vision of productive processes, urban structure and the provision of services and infrastructure. The experience of the health crisis caused by the COVID-19 pandemic has marked a turning point in the way territories are managed. The viability of new business models and delocalised lifestyles has made it possible to rethink the dichotomy between rural and urban worlds that has existed since the industrial revolution. Undoubtedly, we are experiencing the transition from post-carbon cities to the paradigm of post-COVID territories and this document seeks to highlight the importance of incorporating symbiosis as a variable of adaptation and territorial resilience. Post-COVID territories present a new vision for encouraging sustainable transition roadmaps, where digitalisation and knowledge and skills transfer enables a new well-being framework built upon sustainability, inclusiveness and co-responsibility. Businesses, urban planning and social interactions will need to adapt by strengthening complementarities.

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⁸ https://discovery.ucl.ac.uk/id/eprint/10056364/1/final%20submitted_openaccess-RCR.pdf

ABOUT EMEA



The Euro-Mediterranean Economists Association (EMEA) is a Barcelona-based regional think-tank established in 2012 that serves as a leading independent and innovative policy research institution; a forum for debate on the political and socio-economic reforms in Mediterranean and Africa; and promoter of actions and initiatives that fulfill objectives of sustainability, inclusiveness, regional integration and prosperity. It strives to contribute to the rethinking of the Euro-Mediterranean and Africa partnerships in view of the new dynamics of an emerging multi-polar world.

EMEA has a large network of economists, high-level experts and institutional partners (research institutes, think tanks and universities) in the Euro-Mediterranean and Africa. EMEA builds on the collaborative research network MEDPRO (funded by the EU's Seventh Framework Programme (2009-13) and provides forward-looking thinking and political and socio-economic integrated analyses on the Euro-Mediterranean region. EMEA is also the promoter and co-funder of the Euro-Mediterranean Network for Economic Studies (EMNES), co-funded by the European Commission (DG NEAR) between 2015 and 2019. EMNES is a regional network composed of 30 institutions and more than 100 experts and researchers in the Mediterranean region.

From January 2020, EMEA coordinates The Euro-Mediterranean Network for Economic Studies (EMNES). EMNES, aims to provide a renewed vision for socio-economic development in the Mediterranean region, mainly focusing on employment creation, social inclusion, sustainable development and regional integration. It performs economic and policy research exploring the pillars of inclusive and sustainable economic models in the Euro-Mediterranean region.

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