

# PROCEEDINGS

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sustainable development  
in the digital era**

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# *Welcome to the 13<sup>th</sup> RSAI Congress 25-28 May 2021*

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## ON SMART INSTITUTIONS: TOWARDS NEW TERRITORIAL ACTORS TO SUPPORT ECOLOGICAL TRANSITION AND REGIONAL DIVERSIFICATION<sup>174</sup>

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### ABSTRACT

The paper addresses the need for a change in the institutional framework of smart regions to address three challenges: (i) sustainability (SDG), (ii) innovation-diversification (RIS3), and (iii) the ability to properly allocate structural funds (Green Deal and Next Generation EU). These three challenges are assessed taking into account the complexity of managing smart regions, considering the presence of first and second-generation territorial commons, that lead to innovate the configuration of new institutional forms. In this context, the paper analyzes the role of territorial actors and their impact on the territorial systems. Some guiding criteria are outlined to support the configuration of smart institutions as the basis to enable the emergence and consolidation of smart regions.

### KEYWORDS

Smart Institutions, Territorial Actors, Smart Regions, Institutional Innovation, Sustainable Development

### 1. INTRODUCTION

During the last decade, significant efforts have been done to strengthen the configuration of Smart Regions where the main challenge was to support innovation-diversification and, at the same time take advantage of the different assets and capabilities already available in the territories and regions. However, problems to implement RIS3 have been observed, especially in the process of screening, selecting, prioritizing sector, and allocate the ERDF, where the idea of Smart Specialization is confronted with the difficulties that political operators face by managing innovation funds D'Adda et.al. (2021), remembering the problem of "picking winners".

Part of the problem is the complexity behind the idea of RIS3, and in our opinion, the lack of appropriate institutional settings to implement it. In contrast, the origin of the Smart Specialization policy, back to the work of the "Knowledge for Growth" Expert Group (see Forey et. al. 2009a), specified that Smart Specialization is an "entrepreneurial process of discovery"<sup>175</sup> and is far from being a top-down industrial policy or any form of "grand plan", where territorial actors, especially enterprises, are those that *discover future areas of specialization-diversification*. However, it has been the case for its implementation?

Capello and Kroll (2016) already observed the challenges regarding RIS3 in translating theory to practice, pointing out mismatches between functional and political-administrative regions, lack of inclination to admit bottom-up participation, lack of capabilities to engage regional entrepreneurial discovery; hence calling for *new governance* and linking projects with a broader approach considering the "*territorial capital*" (Camagni, 2009) avoiding narrow industrial policy perspectives and introducing more territorial complexities within RIS3, considering different actors and different typologies of assets and ownership.

Balland et. al. (2019) also remarked on the limits of Smart Specialization policies, especially regarding the lack of analytical tools and frameworks capable of orient policymakers in the selection-investment processes, where the authors propose to consider the analytical framework of *relatedness and knowledge complexity* as a valid instrument to foresee areas of feasible innovation and diversification of regions:

"We need to think more deeply about how to tackle the inherent tension within smart specialization policy between prioritizing and selecting activities based on regional potentials (as in the proposed framework), on the one hand, and reliance on the entrepreneurial discovery process in which this selection process is completely decentralized, bottom-up and process-led [...] One potential way to solve this tension is, first, to identify diversification opportunities in each region based on their scores on relatedness and complexity, after which, within that range of opportunities, the entrepreneurial

<sup>174</sup> The paper can not be cited without the permission of the authors

<sup>175</sup> Additionally, the experts of "Knowledge for Growth" not only conceived that SS was a bottom-up process, and spontaneous dynamic that would require governmental support on this matters, but also considered the need to *use one simple tool*: the General Purpose Technologies (GPTs) that can be diffused among regions promoting chatching-up dynamics base on waves of digitalization, Industry 4.0 , new business models, etc.

discovery process will unfold, in which a range of local actors will decide which activities to target..." Balland et al. (2019:1264).

Certainly, we can mention several limits and challenges that RIS3 where deeper analysis has been carried out by Hassink and Gong (2019) that deserved a reach and detailed response from Foray (2019), acknowledged that the word "specialization" was regrettably misleading. highlighting that "the main function of the concept is to introduce a bottom-up component in a process that also has a top-down component" Foray (2019a: 2074), what he called a combination of planning logic and entrepreneurial discovery logic. However, revising the policy after ten years he proposed a "more obvious process that regions will find easier to implement [...], the three steps needed for the design and implementation" Foray (2019: 2068): (i) identify priorities for the region, (ii) translate these priorities in transformational roadmaps, and (iii) implementing with an action plan.

So what we observe is that the Smart Regions approach, if embedded in RIS3, is strongly shaped by a policy-mechanical tool containing several planning-implementing aspects to manage financial resources to support regional development in the EU, that is expected to work, taking into consideration business bottom-up dynamics, where, is expected that in some stage policymakers will prioritize, select and support (see OECD, 2013). However, we ask if this intervention approach can make a region smart?; nevertheless, before deepen our analysis, we consider it important to understand what Smart Region is.

For practical purposes, and although our intent in this contribution is not to explore a proper definition of Smart Regions, we need to specify what we understand by a Smart Region as a basis to deepen our analysis on "Smart Institutions". For this aim, we will synthesize this concept taking the main elements that characterized them as referred by the EC Smart Specialization Platform<sup>176</sup>, in part due to the lack of studies on this concept. Based on this review, we can define Smart Regions as those capable to take specific *actions* and mobilize *resources* to provide support to *bottom-up entrepreneurial dynamics* based on unique *territorial knowledge and innovation* capabilities, allowing the discovery and development of new sustainable regional growth paths, a process that takes place through a *polyarchy governance system*, avoiding top-down and governmental-driven industrial policy approaches.

In our understanding, Smart Regions are intrinsically characterized by collective actions that shape the regional development assuring its sustainability through innovation and new forms to preserve and expand its territorial capital. However, is for this type of region the main role of local and regional governments to screen, select, prioritize, and mobilized the main resources?

According to Rodriguez-Pose et. al. (2014) in the RIS3 approach are different territorial actors (firms, higher education institutes, public research centers, members of civil society, and other local actors) as those suited to discover the promising activities for regional innovation, where these different set of actors should be part of the formulation strategy, emphasizing that the role of the government institutions in more on the quality of the government system (efficient, transparent, inclusive) with effective control and incentives; so providing good conditions for the operation for the territorial actors that implement the innovation and transformation processes. On the other hand, Cortinovis et.al. (2016) highlight that the role of the regional government to foster diversification matters when "bridging social capital", it means when government supports the emergence of a specific type of social capital that "bridge", peoples and communities, enabling open networks of cooperation.

All these aspects indicate that the actions of regional authorities, to shape Smart Region, will be more related to exert a role for enhancing the institutional quality of the territorial. Such quality is achieved, with the presence of inclusive institutions, that encourage the participation of the great majorities in the economy using their talent and skills (see Acemoglu and Robinson, 2012:144). All these aspects pointed out that the configuration of Smart Regions depends on the role and participation of the regional stakeholders, configured by different territorial actors and under a polyarchic territorial institutional system.

Rodrik et. al. (2004), Acemoglu and Robinson (2008-2012) exposed how institutions precede development over trade and geography among deep fundamentals of growth, however, the latter two influence institution through its effects on integration patterns (distance, environmental condition, and linked diseases, ruggedness, natural resources, etc) and behavior of the actors. Nowadays, we are not facing malaria and colonization, however, our regions are facing a significant impact due to Covid-19, and climate change is putting under pressure on our eco-system; where urban development and land regulations have a key role regarding carbon dioxide emission, (see Glaeser and Kahn, 2010). Now, the EU has launched the largest financial package to deal with these exogenous variables, Covid-19 and Climate Change, where Next Generation EU and Green Deal will allocate in the following years an unprecedented quantity of economic resources. In this context, the question is, how these supra-national policies will shape the Smart Regions strategies? will this massive fund impact the institutional setting? Are the regions ready to allocate efficiently such resources?

## 2. SMART REGIONS: CHALLENGES FOR SUSTAINABLE DEVELOPMENT AND REGIONAL DIVERSIFICATION IN TIMES OF MASSIVE STRUCTURAL FUNDS

Smart Regions, as we defined above, face several challenges and opportunities in times where the EU is approaching to apply a significant amount of resources to change the energy matrix, achieve CO2 neutrality, support information technologies as GPT for a massive transformation of business models. In this historical momentum, we have identified five main challenges for Smart Regions as exposed below:

- (i) *Centralism in times of crisis and recovery*

176 See <https://s3platform.jrc.ec.europa.eu/home>



In times of crisis is known that subnational authorities are shadowed by the power of central authorities (Douglas, 2019), leading a process of centralization cascade (Raudla et. al. 2015). So we ask if the massive presence of EU funds for recovery and CO2 neutrality may lead toward more centralization and less participation of local actors in shaping sustainability? Previous experience of crisis management and fiscal stimulus have shown the possibility to observe that such kind of patterns. The challenge is relevant because if such a phenomenon takes place, regions and localities may lose bottom-up dynamics generating an effect on policymakers and local authorities to monopolize the use of the resources increasing the presence of bounding rationality in decision-making processes (see Nelson, 2012).

*(ii) Resource allocation model*

We acknowledge that *traditional government allocation models* in a time of crisis (pandemic and environmental) may face the main challenge different challenges: (a) *efficiency, fairness, and speediness* in resource allocation, (b) *precision*: allocate in the right territorial actors and projects, and (c) *effectiveness*: support the bottom-up entrepreneurship and innovation processes.

The first issue (efficiency, fairness and, speediness) is linked to the institutional quality in terms of administration quality, transparency, and processes; the second issue (precision) is a more complex task, and the decision-making in this context of potential increasing centralism and political pressure for resource allocation would face significant challenges to should screen, select and decide how, when and who will receive financial resources, where such concentration of power and resources may lead to institutional problems and even increasing corruption or collusion, with the possibility of leaving behind territorial actors that has not the political space and capabilities to access to benefits. The third issue (effectiveness in supporting bottom-up entrepreneurship) is even more challenging in a scheme where top-down priorities are leading the ecologic transformation and recovery. Consequently, is rational to expect that in a context of crisis and recovery the complex process of supporting discovery dynamics and bottom-up entrepreneurship, would become a marginal activity, finishing in standards project calls, classical schemes of incentives for SMEs among others that may not have the capacity to respond to the urgent challenge of fostering sustainable development, deeper economic diversification and increasing knowledge intensity in the local economies.

*(iii) From linear value chains to circular ones*

Another relevant challenge in regions that look for ecological transition are changes in the value chain configuration and management. For decades companies and local entities have been managing linear value chains; focusing on the required infrastructure to support input and output process under a linear value chain perspective. In this way, institutions were arranged to support the provision of energy, transport infrastructure, water facilities, as well as water management, and waste management. Nonetheless, the increasing pressure of waste disposals and raising environmental concerns increases the need to work with semi-circular value chain processes, with a massive introduction of recycling centers based basically on management materials that were easy to recovers. Even so, the ecological transition is demanding a circular economy defined as “a regenerative system in which resource input and waste, emission, and energy leakage are minimized by slowing, closing, and narrowing material and energy loops. This can be achieved through long-lasting design, maintenance, repair, reuse, remanufacturing, refurbishing, and recycling” (Geissdoerfer et. al. 2017:759). In this perspective, the traditional recycling system and waste and water management solutions, that currently, most territories have, may be insufficient to respond to the challenge of a broader circularity, even more, if the idea to create regions of a circular economy is targeted, the strategy would demand to rethink the institutional set-up to manage circular value-added systems.

*(iv) SDG as core goals among territorial system*

The SGD goals of the Agenda 2030 set clear and broader goals; showing that sustainability not only considers planetary boundaries but also social once as Raworth (2017) conceptualized. These goals to be implemented, necessarily go through the implementation of 17 SDG at the territorial level, showing that, is at this level where the problem can effectively tackle. Bramanti and Brugnoli (2019) proposed a synoptic framework of how structural transformations that include the green economy, digitalization, demography are interlinked with different models of territorial development systems, which are synthesized in three types (see Table 1), where in one pole are those with a high level of industrialization, in the other pole areas with high environmental value and the middle the urban systems.

**Table 1. Synoptic framework: structural transformations, territorial models and sustainable development in 17 SDG<sup>177</sup>**

| Model of territorial development                                  | Area with widespread industrialization | Urban systems                     | Areas of high environmental value     |
|---|--|-----------------------------------|---------------------------------------|
| <b>Structural Transformation</b>                                  |  |                                   |                                       |
| <i>green economy - decarbonization</i>                            | 4-5-7-8-9-10-11-12-13-16-17            | 5-7-8-9-10-11-12-13-16-17         | 2-5-6-7-8-10-12-13-14-15-16-17        |
| <i>digitalization Smart city / smart land</i>                     | 4-5-7-8-9-10-11-16-17                  | 1-2-3-5-6-7-8-9-10-11-13-16-17    | 2-5-6-7-8-9-10-11-16-17               |
| <i>demography - active aging / immigration</i>                    | 3-4-5-8-9-10-12-16-17                  | 1-2-3-5-8-10-12-16-17             | 2-3-5-8-10-12-16-17                   |
| <i>SDGs with high relevance for territorial development model</i> | 3-4-5-7-8-9-10-11-12-13-16-17          | 1-2-3-5-6-7-8-9-10-11-12-13-16-17 | 2-3-5-6-7-8-9-10-11-12-13-14-15-16-17 |

Source: Bramanti and Brugnoli (2019)

As the authors specified that SDG Goals SDGs 5, 8, 10, 16, 17 recur in all quadrants, indicating the unquestionable contribution that the territorial systems have, in particular bottom-up SMEs dynamics, can offer for the achievement of these goals.

Additionally, the achievement of ecological transition based on decarbonization, push up digitalization as GPT, and innovation to shape Smart Regions requiring the support of the overall territorial system, which is moved by its actors where large corporations play also a key role. Consequently, our main concerns and questions rely on the current *regional government and governance systems* have enough “smartness” to identify such level of complexity, where is required to capture micro-signals, foreseen potential opportunities, and can raise and allocate massive resources with *efficiency, fairness, speediness, precision, and effectiveness*; set of concepts that are closer to “smart actors” prone to entrepreneurial and innovation dynamic. Consequently, we believe that it is important to identify territorial systems and models that better can tackle SDG goals using the appropriate tools and policy frameworks relying on *smarter institutional settings* which in our opinion require to foster the emergence of smarter territorial actors.

**3. SMART REGIONS AND THE ROLE OF TERRITORIAL ACTORS AND ACTIONS**

Forey (2019b) argues that in the last thirty years the policies of innovation “have been characterized by a moderate degree of interventions and neutral logics of resource allocation [...] of innovation policies are insufficient in supporting more radical transformation, such as the modernization of an old industry or the acceleration of innovation to solve certain grand societal problems.” Forey (2019b:1379-1380), suggesting that to increase the level of transformation, it is required to shift the level of intervention advocating for non-neutral policy intervention. Consequently, following this approach, is rational to think that in a Green Deal scenario, would be expected to move in the direction of radical innovation and transformation with strong non-neutral intervention, privileging the role of public authorities. However, the main problem of “transformational approaches” is how interventions take place?

Critical questions are in non-neutral intervention who is expected to (a) identity, (b) priorities, (c) allocated resources,(d) innovate, and (e) transforms?. Hence, in our opinion, the debate is not only about grades of intervention (moderate or radical) and orientation (neutral or non-neutral), but especially regards “*who acts*” the process. In the SIR3 approach, issues (a) and (b) are mainly led by policymakers and public authorities, with less of more degree of protagonism; issue (c) is also usually managed by central authorities and regional governments but also is supported in several cases by a financial mechanism where local bank systems matter; issue (d) is usually a cooperative process between the private sector and knowledge institutions (public, private or mixed) and the transformation (e), usually not discussed, is under the role of industries. So “a, b and c”, are the main areas of discussion in term o innovation and growth policy in the SIR3 approach, however, is not the case if we consider other perspectives.

For instance, transformational and planning shaped approaches are usually far away from remarkable schools of thought that have significantly impacted the understanding of innovation and sustainability (key vectors for Smart Regions), as is the case of the Austrian School and the Bloomington School, both schools that converge in different aspects as Aligica et. al. (2017) analyze, concluding that innovation - the whole processes from “a” to “e”- is linked to collective actions, where disruptive innovation take place through “non-linear and polycentric process whose participants include a wide

177 1: No Poverty, 2: Zero Hunger, 3: Good Health and Well-being, 4: Quality Education, 5: Gender Equality, 6: Clean Water and Sanitation, 7: Affordable and Clean Energy, 8: Decent Work and Economic Growth, 9: Industry, Innovation and Infrastructure, 10: Reduced Inequality, 11: Sustainable Cities and Communities, 12: Responsible Consumption and Production, 13: Climate Action, 14: Life Below Water, 15: Life on Land, 16: Peace and Justice Strong Institutions, 17: Partnerships to achieve the Goal

variety of actors (including researchers, university administrators, entrepreneurs, venture capitalists, corporations, and public officials)” Aligica et.al. (2017:12).

This polycentric approach allowed to reduced the problem of bounded-narrow rationality and reduced the problem of selection, prioritization, and resource allocation. A varied set of collaborative territorial actors are more fitted to manage the risk and evolutions of the whole territorial system.

For example, in the experience of Silicon Valley widely studied (see Engel, 2015; Kenney, 2000, Adams, 2003-2005; Bugos, 2001), the smartness of the place was configured by a network of specific territorial actors with precise action. It is also the case of the innovative milieus; however, part of the limitation to understand these smart places is that this experience has been mostly studied by urban economists and less by historians, where the role of the actors and their actions has not been fully captured and studied. From a historical perspective, we can learn more about historical facts, actions of people, families, groups, associations, universities, etc; to better understand dynamics without leaving behind a fundamental part of the “telling story” of smart places; where concrete (smart) people, or group of them, or specific institutions are the explanatory variables of outstanding experience.

Brugnoli and Garrone (2018) identified the case of the “Systemic Actor”, understood as a territorial actor that is capable to mobilize in a certain way the territorial capital of a place, capable to interact with Multi-Actors, Multi-Sector, and in Multi-Scale (3M) perspective; identifying that these kinds of actors can be entrepreneurs, or a group of them, or universities, local governments, or foundations, among others; so the sector o activity to which they belong, may vary, however, their traits are similar although different experience analyzed.

In this perspective, we consider that possibly much attention has been given to the “neutral” and “non-neutral” policy approach or the strategic and analytical frameworks that policymakers should take into consideration to “better select” sectors and activities. Instead, we suggest providing more attention to the study of “actors-actions” and adopt policies and practices according to the territorial actor setting. We argue that also several other potential categories or actors can be identified, characterized by a set of specific actions, and impact the evolution of territories.

To better explain this aspect, we have considered the experience of a well-known smart place, the Silicon Valley, analyzing, briefly the group of people that were behind this outstanding experience (see Table 2), where be trace, briefly the role of Leland Stanford.

**Table 2. Traits of a Systemic Actor in the experience of Silicon Valley**

|   |  |
|---|--|
| <i>(i) Engagement and empathy with the community and the territory:</i> | Leland Stanford, founder of Stanford University, before ist endeavor, and even before be nominated Senator of the Union, became the Governor of California; a sign of its interest and commitment with the place, building a broad view of the region.   |
| <i>(ii) Capacity to mobilize and raise large economic resources:</i>    | Standford was a railroad magnate, and entrepreneur, capable to understand the economic environment. He can mobilize its 8.180 acres (stock farm) in Palo Alto to configure the campus of Standford University (territorial anchor institution).  |
| <i>(iii) Inclusive mindset and behavior:</i>                            | On of the co-founder of the university, D. Starr Jordan shared with the Stanford family and collaborators the idea to build an institution "nonsectarian, co-educational, affordable, to produce cultural and useful graduates, to teach traditional liberal arts and technology and engineering" (Standford Univestity). As matter of fact the US West Coast, was already a place with strong migration dynamics and the university bridge different cultures and backgrounds and create a vibrant community. |
| <i>(iv) Market-driven and practical approach</i>                        | Frederick Terman, a historical professor, was focused to teach their students not only to invent and create, but also tocommercialized, linking the invention with market dynamics, to better read needs and providing useful innovations.   |
| <i>(v) Vision and purpose:</i>  | Since its foundation, the university clearly states its purpose “to promote the public welfare by exercising an influence on behalf of humanity and civilization” (Standford Univestity). This statement goes beyond short-term and pecuniary approaches, rather was focus on transcendental goals for the community with a global purpose.  |
| <i>(vi) System mobilizers</i>   | The systemic actor has a particular capacity to shape territorial institutions and to mobilize collection actions and support territorial capital creations. Its core capacity is to protect, expand and co-create different types of "commons".   |

Source: Own elaboration based on Nicholas, and Lee (2014).

They built was a strong community in the territory, with the will to transform the place, adding a strong quote of collective actions. After this dynamic was very well established, attracted the attention of Federal Government funds, with directionality in some specific areas, allocating, producing more radical innovation, and reinforcing the human capital, and innovation capacity of the place, adding significant knowledge spillovers in the area.

We understand that similar processes were also carried out in milieux (see GREMI contribution 1991 and 2004) experience and industrial districts (Becattini, 1979); however, as mentioned, a historical review of the actors among Smart Regions would significantly contribute to understanding the role and specific actions of the place.

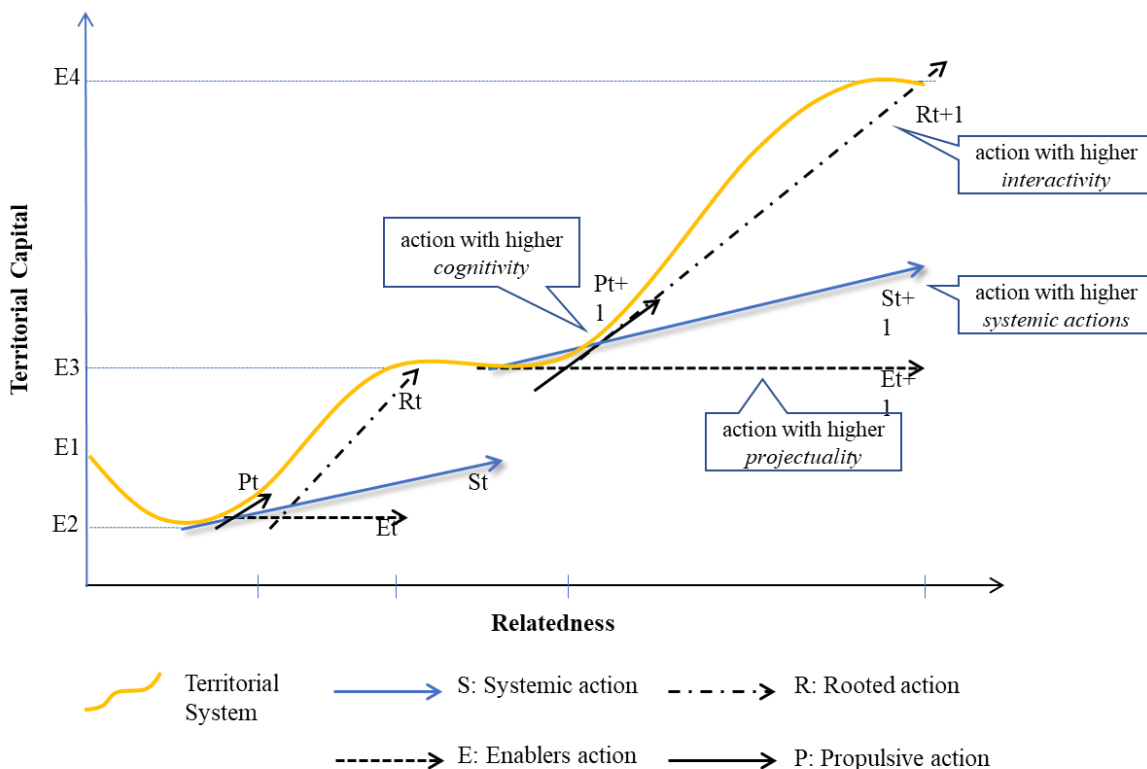
What we wish to emphasize is that the transformation towards Smart Region cannot be built without the presence of certain types of actors-action, given their capacity to generate changes in the territorial system structure and to mobilize the institutional system. Following the case of Silicon Valley, that due to the scope of this contribution we will not fully expose, we wish to extract also the presence of other specific typology of actors-actions, where we found the following profiles:

- *propulsive*, characterized by its R&D capabilities, able to ignite new development trajectories; configured by researchers institution, think tanks, R&D enterprises, etc.
- *enabler*, characterized by its capacity to mobilize capital (financial and human), hence configured by financial institutions and educational ones.
- *rooted*, characterized by actions and actors that are deeply engaged with the territorial dynamic, these are citizens, manufacturers, investors and usually are not under a free-rider scope and its activities are deeply rooted in the place.
- *systemic*, as mentioned, it can mobilize the whole territorial system and attract different actors. Systemic are from different nature (public, private, mix) and scope (profit, not-for-profit, or fourth sector).

It is important to mention that Territorial Actors are not separate from governmental institutions (from different levels), rather in several experiences systemic actors may coincided also with local government in certain characteristics and capabilities, but due to the heterogeneity or regions, this can vary on nature and scope.

Such preliminary typology of territorial actors-action shapes new institutional settings and fosters collective actions mobilizing and transforming the territory in growth or backward performance. Hence, what we are highlighting is that RIS3 policies and the problem of industries and resource targeting should take into consideration the actors perspective and do not rely only on one typology of actor – usually public one – as those that lead resource allocation, selection, and investment activities to look for a Smart Region configuration.

On the other hand, we think that is also important to model in some way the dynamics of the territorial action that shaped innovation-diversification and increase (when positive) the territorial capital of the place. In this analysis, we found that *Boschma (relatedness)* provides key elements for understanding the *flow* dimension and *Camagni (territorial capital)* provides also key elements for understanding the *stock* dimension, to the complex dynamics behind the territorial transformation. Consequently, we consider that RIS3 and the Smart Regions policies require to rethink their approach giving more attention to the actors-action point of view. Fig. 1 provides an intuitive model of the function of the territorial system, where relatedness interplay with the territorial capital supported by specific actor-actions.



Source: Own elaboration



**Fig 1. Territorial System and growth trajectories based on action-actors**

**4. ON SMART INSTITUTIONS: THE CHALLENGE OF INSTITUTIONAL SETTINGS FOR SMART REGIONS**

The main two challenges that we observe when Smart Regions are approached, are: how sustainability-transition and innovation-diversification can be shaped. Main issues rely on the *nature of the problem* which is deeply rooted in the problem of the *commons*. The territorial system, cities, and regions deeply rely on the quality of the commons and its institution for collection actions (see Foster, 2018). This aspect has been deeply by Rajan (2019) who emphasized the need to support local actors to provide balance to the territorial system, as an essential pillar to achieve sustainability. Moreover, Giraud (2013) remarks also the nature of the problem, considering novel forms of commons that demand the reconfiguration of local and global actors to achieve ecological transitions.

Here we approach essentially two types of commons, one of first-generation, part of the territorial Common-Pool Resources (CPR), from natural resource base, and one of the second-generation, the commons of knowledge (Hess and Ostrom, 2007).

Hess (2008) defines CPR as “resources shared by a group where the resource is vulnerable to enclosure, overuse, and social dilemmas. Unlike a public good, it requires management and protection to sustain it” Hess (2008:37), presenting a large number of second-generation commons, among these are traditional commons and global commons (agriculture, forest, land tenure, water and irrigation, wildlife, biodiversity, pollution, waste, etc) as well as knowledge commons (universities, civic education, internet infrastructure, access, libraries, open sciences, genetic commons, peer production as open-source software, etc). The complexity of the commons relies on the innovation-collaboration capacity to design and agree on institutions for collective actions. In this perspective; Ostrom (1990) approach the commons under three fundamental institutional models for its management:

- Leviathan as the “only” way: argue that the tragedy of the commons cannot be resolved by cooperation, hence to avoid the tragedy it is required a powerful central government to protect and rule the resource system.
- Privatization as the “only” way: argue that to avoid the tragedy it is required to end the common-property system and work only under private property rights.
- An alternative solution: Ostrom argues that due to the particular nature of the commons, and applying the game theory framework, is demonstrated that collaborative private-public solutions in different forms can maximize the benefits for the community, proposing an institutional system that promotes the development and balance exploitations of the commons, control monopolistic and purely extractive behaviors and proposing a polyarchy system where “institutional deals” are required. Such alternatives are varied and work on self-governance structures.

Such analysis is particularly in the case of natural resources is well known their different application in special institutions; however the common of knowledge reserve more detail. For Hess and Ostrom (2007) knowledge commons, which can also be referred to as information, commons are not pure “open access” information, rather a complex set of information and actors which parts are open and other managed under exclusive networks and are not free, protecting essential property rights and at the same time providing an open basis for knowledge capitalization. This is extremely important in the context of the negative ‘market stealing’ effect from non-interactive knowledge search as explored by (Roper et al 2016).

Additionally, knowledge commons are particularly important in the configuration of regional and territorial technological externalities where knowledge spillovers boost innovation (see Breschi and Lissoni, 2001). Such resources are essential to managing strategic knowledge of a place and, usually are not the proper institutional settings that protect and administrate such dynamics. In these conditions “knowledge leaks” take place, and actors, with not rooted in the place grasp knowledge to be copied and replicated in other regions, that later may directly compete with the territories that create them, threatening the competitiveness of regions.

However, what is also significant is knowledge commons where R&D externalities take place, are prone to create their institutional settings, a dynamic that may help to re-shape Smart Regions institutional settings. Weder and Grubel (1993), following Coase principles, found that R&D externalities will induce the creation of self-organized private institutions able to internalize these externalities, where a vibrant institutional setting may be established.

However, some may suggest that under EU innovation fund interventions, would be better to keep control and lead innovation processes. However, authors have explored the impact of regional governments on innovation, and the results are not encouraging. Cortinovis (2016) and Boshma (2017) found that the role of regional governments on diversification is only remarkable when these “bridging social capital”, so when support institutional relatedness, mobility, and interaction between territorial actors. These are indications that support polyarchy regional systems with varied institutions may significantly help to support innovation particularly under a bottom-up approach; where different institutions may be specialized in specific functions, as well as in practices for resource allocation, and to reach new market opportunities. This regional innovation system would prevail on pushing up selection, specialization, and prioritization, a process and may lead to significant errors and strong inefficiencies, and loss of resources.

On the other hand, Boshma and Gianelle (2013) argue that to face the tension regarding prioritizing, and selection of activities is feasible to identify opportunities based on scores of relatedness and complexity, so local actors based on this information may decide. We argue that this is a valid but very sophisticated strategy framework difficult to assess and promote at the territorial and regional level because few institutions are capable to understand and work on these parameters; therefore local leaders may relying on regional advisors to translate these interpretations and applications the risk to do not verify its feasibility with local actors. However, if these instruments are work by *propulsive actors* as

research centers, local think tanks, etc., and may cooperate with *systemic actors*, this kind of policy and a sophisticated instrument may find a feasible way to be implemented.

Additionally, a regional specialization on actors' functions, rather than in sector, may provide more efficiency to the territorial system. For instance, local financial institutions are essential for the adequate allocation of resources, having in good knowledge of clients and capacity to innovate with financial instruments. Such kind of *specialized institutions* exert an *enabling* action in the territorial system and are essential to be engaged in the strategic process of resource allocation, rather than rely mainly on public leaders that may divert resources due to political pressures as explored by Dellmuth and Stoffel (2012) regarding European fund allocation.

Moreover, from an accurate analysis of the Bloomington School, we can derive that "Green Deal" and "Next Generation EU" funds are configured as a precise type of commons, a fact that has a significant impact on the model in this regional institutions are configured. Such funds are a specific (second-generation) type of common, because of:

- Is a common-pool resource based on the large accumulation of collective action of EU members and financial institutions (tax collection, collaterals, assets, production).
- Impact the overall territorial system and his contributions are intended to provide a resilient and protective measure of essential commons or the regions.
- Resources are limited and face high pressure and competition among EU actors and may put the resources under significant stress, requiring special protection and administration procedures.
- The resource can be expanded and even replicated again, due to the particular circular nature, allocation, interest, returning of loans or return through future taxes increasing the CPR system.

So, what we consider is that regions and Smart Regions, require special settings or institutions to be able to manage such complexity of commons, rather we can observe an increasing centralization and a "leviathan way" unable to foster bottom-up dynamics, and shape Smart Regions.

Our analysis leads us to rethink the institutional setting of regions, to be able to achieve the Smart approach, with a structure able to support resource and knowledge sustainability fitting its particular nature. For this aim, we suggest considering that the following policy criteria to rethink institutions of Smart Regions:

(i) *Identify regional territorial actors*

Heterogeneity is intrinsic to regions as well as their institutional quality. And although EU regional administration may have similarities and the allocation of EU funds follow guidelines and rules for all the EU, the effectiveness of the allocation and quality of the efforts to pursue sustainability-transition and innovation-diversification will rely on the territorial actors-action. Consequently, it is important to identify, regional actor's capacities, specialization, and roles within the territorial system and support a new institutional arrangement.

(ii) *Apply the "golden rule": strong governance systems to manage commons including funds*

Polyarchy is essential to boost innovation and shape Smart Regions. This kind of regional approach implies a change of paradigm, particularly in terms of resource allocation. Smart Regions are not fitted to depend on top-down decision-making regarding funds and other resources. Smart Regions should be able to innovate on new institutional settings to manage public resources.

(iii) *Support institutional specialization and diversification, rather than targeting economic specialization-diversification*

Smart Regions should provide and support specialization on actors' functions increasing its capabilities.

(iv) *Support institutional innovation:*

Relatedness dynamics are not only essential for the evolution of business and more complex products; however, such kind of system also requires more complex and innovative institutions, where different types of actors (private, public, third, and fourth sectors) should configure new institutional settings to respond in a better way to territorial needs. Fear to lose control lead to path-dependence and lock-in dynamics. As an example, several policymakers see Singapore as a leader in the radical innovation process; however, little attention has been given to its complex institutional setting that has been created to manage different investment processes, governance structures, *fund allocation systems* to accelerate investment in new technology and knowledge capture. Singapore's "smart city" transformation cannot be understood without an accurate understanding of its complexity and varied institutional setting with mixed forms of institutions, showing how Ostrom's "alternative way" can release unique territorial dynamics to shape sustainability and diversification through institution innovation processes.

(v) *Support the emergence of strong territorial actors:*

Smart Regions require to reshape their institutional structure and be able to be supported by strong territorial actors that may exert *systemic, propulsive, enablers, and rooted actions*. This support is expressed in creating the proper legal framework for delegate, empower and support new roles and resource mobilization capabilities.

(vi) *Identify, expand and protect territorial commons:* Smart Regions should be able to identify traditional and new commons as having the smartness to support institutional agreements to support and protect them.

Finally, Table 3 synthesizes a process of change in the institutional setting of regions to support the emergence of smart dynamics.

**Table 3. Old and New Institutional Paradigms in Smart Regions**

| Old Paradigm                                      | New Paradigm  |
|---|---|
| Prioritization led by government                  | Prioritization led by territorial actors            |
| Target Sectorial specialization - diversification | Target Institutional specialization-diversification |
| Government-driven resource allocation             | Actor-driven resource allocation                    |
| Self-government control                           | Self-governance control                             |
| Innovation Agenda led by government and experts   | Innovation Agenda led by territorial actors         |
| Golden rule: government decision making           | Golden rule: governance decision making             |
| Institutional silos                               | Hibrid institutional structures                     |
| Fiscal packages and stimulus as public resources  | Fiscal packages and stimulus as commons             |
| Stakeholder participation                         | Stakeholder empowerment                             |

Source: Own elaboration

**5. CONCLUSIONS**

The Smart Specialization Strategy approach that shapes Smart Regions presents significant limits, particularly in its institutional setting approach that may reduce the capacity of regions to achieve the expected development results. Major limits of RIS3 are in process of screening, selecting, prioritizing, usually led by public authorities that decide on discovery-driven processes that are not inherent to their social functions. Smart Regions work on pivotal resources that take the form of “commons” (first and second-generation), where natural and knowledge common-pool resources are by nature complex and demand a more complex institutional setting to shape collective actions to preserve and transform essential territorial commons.

In the current context, Smart Regions dynamics expect to be reinforced through new massive structural funds as Green Deal and Next Generation EU. However, such resources may increase top-down dynamics and centralization, reducing the capacity of regions to achieve the goals that Smart Regions pursue and its SDG. Nonetheless, EU public funds, analyzed under the Bloomington School framework, shown that are configured as a new generation of commons, consequently demand the emergence of a new institutional regional system for resource allocation; rather new forms of “tragedy of new and traditional commons” would take place. In this perspective, we observed that the Bloomington School and the Austrian School, present similarities showing that sustainability and innovation fitted with a strong polycentric institutional setting; a paradigm that is coherent with the Smart Region approach.

We also observed that the development paths of the territorial system require considering Boshma actors-knowledge relatedness (flow dimension), and Camangi territorial capital (stock dimension), elements that support the mobilization and transformation of the territorial system through a specific actors-actions framework. Based on our work and using case studies analysis as Silicon Valley, among others, we have identified four different types of territorial actors: systemic actors, propulsive, enablers, and rooted. We recognize that such typologies require further analysis. Finally, we consider that to better understand the development of the smart regions from the actor point of view, it would be required to encourage its analysis using the historical method that can provide a wider understanding of the actors and its action in specific historical spaces.

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