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► **To cite this version:**

Elvira Martini. Social cohesion and innovation: increasing resilience. International Conference of Territorial Intelligence "Vulnerabilities and Resilience between Local and Global". 4th - 7th 2012, Jun 2012, Salerno, Italy. halshs-00813909

HAL Id: halshs-00813909

<https://shs.hal.science/halshs-00813909>

Submitted on 21 Jan 2014

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SUSTAINABILITY AND INNOVATION: INCREASING RESILIENCE

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Summary

At a time of crisis like the present it seems that the territories are even more vulnerable and fragile: emerging social issues, made of new poverty, new needs, a frayed social fabric and lack of social networks. This “syndrome of weakness” can be remedied only if the collective intelligence of an area fails to activate development policies for education and culture of legality, stimulating communities practices and investing in intangible factors of development (such as construction and socialization of new knowledge, social capital, good practices of a territorial intelligence). There are many different conditions in which these invisible factors are materialized, differentiating the performance of certain areas than others. It is so spoken about external economies; of benefits of cooperation in a context of stable and repeated relationships; of use of trust as the glue of a local division of labour; of community spirit in the relationships between economic operators who share the same vision of things and the same story; of increasing returns triggered by localized dynamic learning; of sharing knowledge, professional practices and rules of social behaviour in order to favour social and systemic innovation. This new paradigm - that sees social cohesion as a premise and not as a result of the development - should ensure the broadest participation of citizens in the decision making processes of governance and therefore the sustainable human development.

Keywords: innovation, resilience, sustainable development, public policy.

Abstract

In un momento di crisi come quello attuale, sembra che i territori siano ancora più vulnerabili e fragili. Questa “sindrome di debolezza” può essere risolta solo se l'intelligenza collettiva di un territorio riesce ad attivare politiche di sviluppo per l'istruzione e la cultura della legalità, per la creazione di pratiche di comunità e per l'investimento in fattori immateriali dello sviluppo (socializzazione di nuova conoscenza, capitale sociale, intelligenze territoriali). Questo nuovo paradigma - che vede la coesione sociale come premessa e non come risultato dello sviluppo - potrà garantire la più ampia partecipazione dei cittadini al processo decisionale di governo e quindi uno sviluppo umano più sostenibile.

Parole chiave: innovazione, resilienza, sviluppo sostenibile, public policy

Sustainability and innovation: increasing resilience

1. INTRODUCTION: SOME TERMINOLOGICAL NOTES

The literature on systems dynamics is bedeviled with loose terminology and multiple definitions. To minimize confusion in what follows it is necessary to clarify here our use of the terms “state” and “resilience.” The “state” of a system at a particular instant in time is the collection of values of the state variables at that time. The term is often used without reference to its fundamental dependence on time. In complex systems whose description requires many state variables, the term “state” is loosely used to describe a characteristic of the system, rather than its state. For example, the lake is in a eutrophic “state”, or the rangeland is in a shrub-dominated “state.” Such a loose definition is acceptable in everyday situations, but not when we want to analyze a system more carefully (cf. Grimm et al. 1992).

In the case of a social-ecological system, we are usually interested in preserving a particular set of general criteria. The system can be in many different states and still meet this set of criteria. It does not make sense to describe a system that meets these criteria as being in a desirable “state” and we adopt the term “configuration” to describe a collection of states that meet a certain set of criteria. It then makes sense to refer to a system as being in a desirable or undesirable configuration.

The terms “resilience” and “adaptive capacity”¹ are sometimes used interchangeably.

For resilience, one can adopt Holling’s (1973)² original meaning, as opposed to the notion of

“engineering resilience” (Holling 1996); in this sense, resilience has three defining characteristics:

- the amount of change a system can undergo and still retain the same controls on function and structure;
- the degree to which the system is capable of self-organization. The resilience of a region is a community’s ability to continue its development by organizing itself against external shocks that may increase its vulnerability and even its existence.
- the degree to which the system expresses capacity for learning and adaptation (Walker 2003: 12).

Resilience, therefore, is the potential of a system to remain in a particular configuration and to maintain its feedbacks and functions, and involves the ability of the system to reorganize following disturbance driven change³. In an operational sense, resilience needs to be considered in a specific context. As discussed by Carpenter et al. (2001), it requires defining the resilience *of what to what?*

Resilience is not necessarily desirable. System configurations that decrease social welfare, such as polluted water supplies or dictatorships, can be highly resistant to change. Some (social) systems may be resistant, yet not resilient, but some undesired ecological configurations may indeed be both resistant and resilient. Sustainability, in contrast, is an overarching goal that generally includes assumptions or preferences about which system configurations are desirable. Building resilience of a desired system configuration requires

cannot just reinvest in the manufacturing sector in the hope of recreating a prosperous economy based on heavy industry. Instead they must reinvent themselves to find a new profitable niche in the global economy (Swanstrom 2008: 5).

³ According to Resilience Alliance’s definition, resilience is the ability to absorb disturbances, to be changed and then to re-organise and still have the same identity (retain the same basic structure and ways of functioning). It includes the ability to learn from the disturbance. A resilient system is forgiving of external shocks. As resilience declines the magnitude of a shock from which it cannot recover gets smaller and smaller. Resilience shifts attention from purely growth and efficiency to needed recovery and flexibility. Growth and efficiency alone can often lead ecological systems, businesses and societies into fragile rigidities, exposing them to turbulent transformation. Learning, recovery and flexibility open eyes to novelty and new worlds of opportunity. The aim of resilience management and governance is either, to keep the system within a particular configuration of states (system ‘regime’) that will continue to deliver desired ecosystem goods and services (preventing the system from moving into an un-desirable regime from which it is either difficult or impossible to recover) or, to move from a less desirable to a more desirable regime (http://www.resalliance.org/index.php/key_concepts).

¹ Adaptive capacity means the ability of actors (humans and non-human species) in a social-ecological system to cope with novel situations without losing options for the future. Systems with high adaptive capacity are able to reconfigure themselves without significant declines in crucial functions in relation to primary production, hydrological cycles, social relations and economic prosperity (Walker 2003: 12). Despite this vagueness, it is useful to have a term for a broad class of flexible learning responses, which often turn out to be crucial when a social system is exposed to completely novel challenges.

² The ecological idea of resilience stretches back twenty-five years to a seminal article by C. S. Holling (1973). Ecological resilience differs from engineering resilience. Engineering resilience is the ability of a system to return to equilibrium after a disturbance, like a thermostat that returns the temperature in a house back to 70 degrees after an ice storm. The ecological concept of resilience is based on multiple equilibria. This means that ecosystems are able to respond to perturbations by changing their structure and functioning to a new system. The idea of multiple equilibria fits metropolitan areas better because regions must reinvent themselves in the face of challenges. When industrial jobs disappear, regions

enhancing the structures and processes that enable it to reorganize following a disturbance. It also requires reducing those that tend to undermine it (Walker et al. 2002: 5 ss.).

2. SUSTAINABLE DEVELOPMENT, EQUITY AND RESILIENCE

Resilience and vulnerability are both shaped by global and local economic forces. Yet the ability to promote resilience goals within environmental policy is dependent on the ability to frame sustainability questions in these terms and the ‘purchase’ of them compared to those of free trade, economic choice, or growth. Economic growth is not inherently desirable or undesirable in itself – it is a means to an end. The presently observed uneven patterns of economic growth have negative consequences for the resilience of both human and ecological systems (Adger, 2003: 2). Sustainable development is defined as a set of necessary constraints in the areas of efficiency, equity and resilience of social and natural systems. This is novel in its emphasis on social resilience which captures many aspects of the institutional architecture required for sustainability. Social resilience can be observed through proxy measures associated with property rights and access to resources, through demographic changes and other measures (Adger 1997: 1). It is now commonly asserted that sustainable development is development which does not jeopardise future well-being through reduction of the capacity of the environment. The central aspects of such definitions appear to be their focus on the environmental basis for human activity and the temporal dimensions of development and well-being. In particular the long term aspects of sustainable development, equity to future resource users, is often overemphasised, it is argued, to the detriment of present day equity considerations (Beckerman, 1992).

Equally contentious is the role of natural systems within the ‘standard’ definition of sustainable development, particularly since resources exhibit widely different characteristics. Renewable resources require different treatment to non-renewable resources, while there is no single rule for the sustainable utilization of the functions of resources and ecosystems, for example in terms of their assimilative capacity as sinks for the by-products of economic activity.

In attempting to incorporate these diverse aspects of human environment interactions, an alternative definition of sustainable development can incorporate these issues into a set of necessary criteria for sustainable development. These criteria are centred on efficiency, equity and social and ecological resilience. A summary of an approach to sustainable development which attempts to capture

the diversity of approaches is outlined in Table 1. This shows that such an approach results in multiple decision criteria, one of the reasons which makes sustainable development indistinct, but also why the concept itself is so popular but yet highly politicized and inherently ‘slippery’ (O’Riordan, 1988).

Criteria for sustainable development	Economic interpretation	Measured through:
Efficiency	Present economic welfare maintained and maximised	max [Benefits (B) - Costs (C)]
Equity	Welfare non-declining over time (inter-generational equity) Extremes in equity rules: (i) Resource allocation increasing total welfare (Pareto) (ii) Resource allocation benefiting poorest (Rawlsian)	max [$a_i \cdot (B_i - C_i)$] where a_i = distributive weight for stakeholder group
Ecosystem and social resilience	Maximise ability to withstand shocks and uncertain impacts of change	<i>Ecological resilience</i> proxies of diversity and functional integrity. <i>Social resilience</i> proxies of institutional change, property rights, and demographic change.

Table 1. Economic perspectives on modelling sustainable development

Source: Adger’s calculation 1997: 4

This conceptual framework for sustainable development, as set out in Table 1, is one of many ways by which these necessary criteria can be developed. But almost all definitions incorporate these elements to some extent. To give one example, Common (1995: 55) states that: ‘the sustainability problem can be stated as that of managing human affairs to address the problems of poverty and inequality while also minimizing threats to ecological sustainability’.

Efficiency in resource use simply means maximizing the economic welfare or well-being derived from the use of finite resources (see Pearce *et al.*, 1990). Resilience incorporates the ability both of social and ecological systems to withstand external shocks and stresses. For ecological systems, resilience may be indicated by the

disturbance and speed of return to an equilibrium position.

This indicator is relevant only if the ecological system is assumed to be in equilibrium, and alternatively resilience can be indicated by the amount of disturbance which can be absorbed before a system undergoes threshold non marginal changes to some other state (Holling *et al.*, 1995). In social terms, the resilience of both individuals and communities is a much less well defined concept, since social resilience is only perceived of as a necessary condition for sustainable development when those individuals and communities are linked directly to a resource system where ecological resilience in itself is important.

Sustainability, the promotion of resilience, and the avoidance of vulnerability are directly related to equity, autonomy, and freedom, arising from the entitlement and access to resources and to security. Thus, resilience and justice promote sustainability. They are both observed in and promoted through diversity in both social and environmental systems, and in diverse knowledge systems and ways of looking at the world. Justice in resilience needs to account for the outcomes of resource allocations and policy decisions. This distributive justice has formed the primary focus of the environmental justice social movements around the world. These movements seek to redress, through law or other means, the inequity in who suffers from localized environmental pollution or inequitable access to land and other resources.

Justice is also made up of fairness in representation - how can societies build the capacity to adapt when vulnerable groups are marginalized and excluded from decisions? Justice is also about fairness in procedures and institutions, recognition of difference, and participation in decision-making (Adger 2003: 3).

The “syndrome of weakness” can be remedied only if the collective intelligence of an area fails to activate development policies for education and culture of legality, stimulating communities practices and investing in intangible factors of development (such as construction and socialization of new knowledge, social capital, good practices of a territorial intelligence)⁴.

⁴ There are many different conditions in which these invisible factors are materialized, differentiating the performance of certain areas than others. It is so spoken about external economies; of benefits of cooperation in a context of stable and repeated relationships; of use of trust as the glue of a local division of labour; of community spirit in the relationships between economic operators who share the same vision of things and the same story; of increasing returns triggered by localized dynamic learning; of sharing knowledge, professional practices and rules of social behaviour in order to favour social and systemic innovation.

To do this, a different model of citizenship is necessary, which provides the broadest participation of citizens in the decision making processes of governance.

This new paradigm, that sees social cohesion as a premise and not as a result of the development, should ensure good governance and therefore the sustainable human development.

For these reasons, as an example, ecologists have applied the concept of resilience not just to biological systems but also to the socio-eco-systems, or the interaction of human and natural systems. The basic idea is not just that humans need to understand the emergent systems of resilience in nature and make policies that take into account complex feedback effects. Instead, the human system of ecological management is modeled on the same type of processes that bring order in nature. Applying the framework of ecological resilience to human institutions and governance processes generates paths to greater understanding (Swanstrom, 2008: 6).

3. RESILIENCE AS PRINCIPLE KEY FOR INNOVATION POLICY

The challenge of designing public policy in societies that are undergoing rapid change and increasing complexity was addressed (in an almost prophetic way) by one of the great theorists of the learning society, Donald Schön. His arguments have a special relevance for the issue of public sector innovation, not least because it was a book which had such little influence. Indeed, it constitutes a kind of benchmark against which to set a good deal of the attempts to redesign the public sector in recent decades. Schön argued that we had to understand the shift from being a pretty stable society to one which was fundamentally unstable due to the accelerating pace of change facing industrial societies. This called for a new way of thinking for both individuals and society as a whole. He showed how the old command and control models would become increasingly inappropriate and that ‘network’ type organizational designs would replace hierarchical models (Parsons 2005: 3). “Social systems must learn to become capable of transforming themselves without intolerable disruption. But they will not cease to be dynamically conservative - not if dynamic conservatism is the process through which social systems keep from flying apart at the seams. A learning system, then, must be one in which dynamic conservatism operates at such a level and in such a way as to permit change of state without intolerable threat to the essential functions the system fulfils for the self. Our systems need to maintain their identity, and their ability to support the self-identity of those who belong to them, but they must at the same time be capable of frequently

transforming themselves” (Schön, 1973: 57). The dominant design for innovation has, he argued, been the centre-periphery model, and its elaboration in the form of the proliferation of centres model. However, he (correctly) discerned the emergence of new modes of diffusion, in business firms and social movements. Centre-periphery models were giving way to forms of complex networks and human beings were no longer simply defined by the organizational membership, but as members of complex network patterns. In such conditions: “The principal problem of design shifts from the design of a product or technique to the design of a network...and the pattern of social learning shifts from successive ‘sweeps’ of limited innovations from a centre throughout a periphery, to the formation of self-transforming networks” (Schön, 1973: 108).

As for policy making, the implications of his analysis was clear: “For government to become a learning system, both the social system of agencies and the theory of implementation must change. Government cannot play the role of ‘experimenter for the nation’ seeking first to identify the correct solution, then to train society at large in its adaptation. The opportunity for learning is primarily in discovered systems at the periphery, not in the nexus of official policies at the centre. Central’s role is to detect significant shifts at the periphery, to pay explicit attention to the emergence of ideas in good currency, and to derive themes of policy by induction. The movement of learning is as much from periphery to periphery, or periphery to centre as from centre to periphery. Central comes to function as a facilitator of society’s learning, rather than as society’s trainer” (Schön 1973: 166). Therefore, is innovation the outcome of learning and ‘form following failure’, or is it produced by creating a mentality of showing that you have hit targets and have not ‘failed’? Innovation that is not grounded in failure is likely to be innovation that is grounded in very thin soil indeed. When fear of failure replaces a capacity to experiment and create trial and error learning, the result is unlikely to be an artifact that actually works. A key design principle that seems to be critical for those who design physical artifacts is that of resilience. Given Schön’s argument that organizations face a more unstable world and less predictable world, it follows that our capacity to anticipate the future is not what it was when the world moved a good deal slower. One way of looking at the learning society model, where experimentation takes place all over the place, is that we do not place all our eggs in one basket: by allowing learning to take place in a more decentralized fashion we better manage the risk of big mistakes, and we increase the likelihood that more solutions will be generated. We also make society as a whole more resilient: better able to bounce back and cope with the unexpected.

Wildavsky, who wrote a good deal about this issue (in the context of risk) had this to say about resilience as a design strategy: “A strategy of resilience [as opposed to anticipation] requires reliance on experience with adverse consequences once they occur in order to develop a capacity to learn from the harm and bounce back. Resilience, therefore, requires the accumulation of large amounts of generalizable resources, such as organizational capacity, knowledge, wealth, energy, and communication, that can be used to craft solutions to problems that the people involved did not know would occur. Thus, a strategy of resilience requires much less predictive capacity but much more growth, not only in wealth but also in knowledge. Hence it is not surprising that systems, like capitalism, based on incessant and decentralized trial and error accumulate the most resources” (Wildavsky, 2005)

An obvious question must therefore be asked: do innovations in public management make policy delivery more or less resilient? If we see the task of designing innovative public management as one of building knowledge and capacity at the centre and facilitating centralization and command and control, we may well be improving ‘policy capacity’, but as a result actually reduce the resilience of those organizations that deliver the policy. In other words, innovation in public management involves a trade-off between increasing the capacity of the centre to direct change in a certain direction, and enabling organizations and individuals who work in them to develop their capacity to be resilience. A second question thus arises: should we manage risk by learning at the centre, or learning at the periphery? When we think about the design of resilience, it may well be that Schön’s model is far more appropriate to the (more risky) unstable state than the stable state of old. The would-be designer therefore faces a difficult trade-off when it comes to the challenge of planning for the management of risk: balancing the requirements of resilience (decentralized trial and error learning) with the utilities (political and other) derived from innovation as centrally driven, monitored and control. In simple terms this means that innovation for resilience carries the risk of government having to let go (Parsons 2005: 7).

However, learning is all about risk. A complex society which exists in a world which is full of uncertainty, has to learn how to deal with risk, by developing a capacity for resilience: organizations must be designed for flexibility and adaptability. This does not sit well in the minds of (policy) risk-averse politicians who have promised that education - or whatever - will improve. In which case, the trade-off will have a tendency - where it can - to enhance command and control in public innovation than the facilitation of policy learning in

the periphery. Centralization carries the risk, however, that it may give rise to organizations and individuals who react poorly to situations which require flexibility and bounce back. In a world in which terrorism and environmental threats - amongst many others - require organizations to develop a greater capacity for resilience, innovations which may undermine the growth in this capacity should give us serious pause for thought.

A strategy for more resilient public policy suggests that we recognize the importance of polycentric designs, in which all the eggs are not in one basket, and in which the centre is not the only public agency capable of innovative problem solving, and in which the periphery is not afraid of making mistakes, but has a capacity to think and act under the pressure of events.

What is efficient may not be what is effective when it comes to actually delivering a service in an uncertain and unpredictable world. The existence of spare capacity also raises another important issue for innovation (possibly the most important): the space to be creative.

One of the consequences of a system operating at a very tight margin, and in which there is little tolerance of learning from failure, is that there is not sufficient space for people to experiment, try things out, play, explore new ideas, question existing ways of thinking. In other words, there is little space to allow for emergence (Parsons 2005: 8).

4. THE ADAPTIVE CYCLE TO PROMOTE RESILIENCE

Across both natural and human systems, processes that increase the efficient production of wealth and stored energy undermine resilience. For example, maximizing the accumulation of capital requires regions to concentrate resources on industries where they have a comparative advantage. Taking advantage of economies of scale in production necessitates concentrating capital in one or a few production sites. The result, however, is a regional economy lacking in diverse industries and vulnerable to shifting consumer demand or competition in the dominant industry. A successful economy creates tight connections between the industry, society, and the government (we can think about the Triple Helix Model) but these same tight connections can make it difficult to shift public policies and redeploy assets in the face of a crisis (Safford 2004). Similarly, lean companies with just-on-time production and global supply chains, may be highly efficient but they are vulnerable to disruptions (Sheffi 2007).

The ecological model of resilience reconciles this contradiction through the idea of panarchy that captures the “evolutionary nature of adaptive cycles

that are nested one within each other across space and time” (Holling 2001, 396).

All systems, are never static, and they tend to move through four, recurring phases, known as an adaptive cycle. Generally, the pattern of change is a sequence from a rapid growth phase through to a conservation phase in which resources are increasingly unavailable, locked up in existing structures, followed by a release phase that quickly moves into a phase of reorganization, and thence into another growth phase. However, multiple possible transitions among the four phases are possible and the pattern may not reflect a cycle. The growth and conservation phases together constitute a relatively long developmental period with fairly predictable, constrained dynamics; the release and reorganization phases constitute a rapid, chaotic period during which capitals (natural, human, social, built and financial) tend to be lost and novelty can succeed (see Resilience Alliance’s website). The original metaphor of the adaptive cycle that alternates between long periods of aggregation and transformation of resources and shorter periods that create opportunities for innovation, is proposed as a fundamental unit for understanding complex systems from cells to ecosystems to societies and portrayed it as a figure of 8 in two dimensions - increasing connectivity, and increasing capital⁵ (Figure 1).

⁵ The adaptive cycle exhibits two major phases (or transitions). The first, often referred to as the foreloop, from r to k, is the slow, incremental phase of growth and accumulation. The second, referred to as the backloop, from Omega to Alpha, is the rapid phase of reorganization leading to renewal. During the slow sequence from exploitation to conservation, connectedness and stability increase and a capital of nutrients and biomass (in ecosystems) is slowly accumulated and sequestered. Competitive processes lead to a few species becoming dominant, with diversity retained in residual pockets preserved in a patchy landscape. While the accumulated capital is sequestered for the growing, maturing ecosystem, it also represents a gradual increase in the potential for other kinds of ecosystems and futures. For an economic or social system, the accumulating potential could as well be from the skills, networks of human relationships, and mutual trust that are incrementally developed and tested during the progression from r to K. Those also represent a potential developed and used in one setting, that could be available in transformed ones. Adaptive cycles are nested in a hierarchy across time and space which helps explain how adaptive systems can, for brief moments, generate novel recombinations that are tested during longer periods of capital accumulation and storage. These windows of experimentation open briefly, but the results do not trigger cascading instabilities of the whole because of the stabilizing nature of nested hierarchies. In essence, larger and slower components of the hierarchy provide the memory of the past and of the distant to allow recovery of smaller and faster adaptive cycles. A nest hierarchy of adaptive cycles represents a panarchy (see Resilience Alliance’s website).

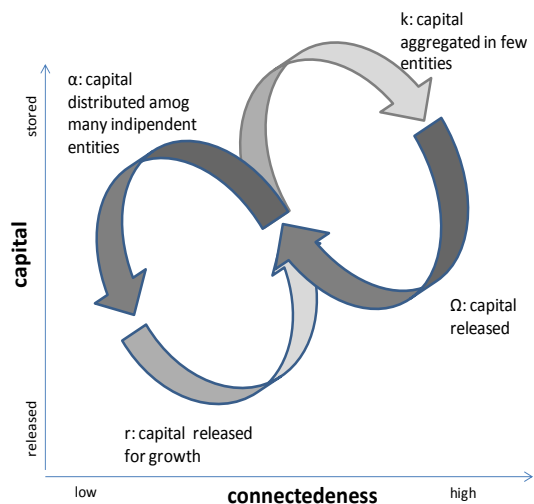


Figure 1. The adaptive cycle - in two dimensions, capital and connectedness, depicted as a figure 8 pattern of dynamics.

Source: <http://www.resalliance.org/564.php> (accessed May 23, 2012).

The tension between efficiency and innovation, tight connections and freedom to experiment, is also reconciled by being situated at different scales. Basically, the slower, longer term processes operate at larger scales and the faster, short-term processes operate at smaller scales. Usually, the larger scales processes dominate and shape the outcomes of the smaller processes. Thus, for example, climate, geomorphology, and large plants and species dominate over finer grained biochemical processes. But at times that require rapid innovation and change, the lower levels can exercise a “revolt” function, reacting back on the higher levels and changing their structure and function. A resilient system is one where these smaller scale processes are able to deal with the stressor without having to reorganize the larger scale structures.

In the case of regions, markets correspond to the faster, more localized parts of the system that are constantly adjusting to change. Local governments represent an intermediate level while the central government and larger culture represent the larger structures that adapt more slowly. A resilient region would be one in which markets and local political structures continually adapt to changing environmental conditions and only when these processes fail, often due to misguided intervention by higher level authorities which stifle their ability to innovate, is the system forced to alter the big structures (Swanstrom 2008: 9).

5. CONCLUSIONS: THE SPACES OF REGIONAL RESILIENCE

The concept of resilience is analytically useful but difficult to handle in complex socio-cultural, historically embedded settings. The issues raised

are grand challenges in the evolution of social and environmental governance. Resilience means moving away from simple limits on environmental resource use towards active promotion of dynamic evolutionary processes. Adopting resilience principles also entails a redistribution of power among actors to more multi-level governance systems. Much traditional resource management in effect promotes stability rather than resilience. Diverse evidence shows that locking systems into particular technologies can promote stability and reduce risk in the short term. However, such strategies may sow the seeds for chronic stress and non-linear systematic change (Adger 2003: 3).

Resilience must be understood as a process that takes place in three sectors: private, public, and civil society⁶. Each of these has a characteristic mode for promoting adaptation to challenges, as well as characteristic failures or rigidities. Regional resilience is most effective when each sector operates according to its own principals and is not contaminated by the processes of the other sector. In other words, resilient regional governance is not a holistic process or system, as is suggested by ecological theory, but requires maintaining borders between spheres of resilience (Swanstrom 2008: 20 ss.):

1. Civic (Nonprofit) Sector: The basic idea is that a diversity of stakeholders can devise innovative solutions that transcend the limits of self-interest. Innovative win-win solutions are possible if stakeholders collaborate. There is no doubt that many innovative ideas do emerge out of diverse networks in civil society in this scenario territorial intelligence plays a crucial role: in fact it is focused on the close link between knowledge production and local action, the importance of the human and social capital in the innovation process and the need of an approach that “can listen” the needs of people to promote sustainable development. On the other hand, civil society can become unresilient or locked when infected with “cronyism”.

2. Private Markets: Private markets are clearly the fastest and most rapidly innovative level of resilience. Properly functioning private markets are highly resilient because they motivate decision makers to respond quickly to changing technology and consumer preferences.

3. Public Sector: The public sector represents the broadest scale and the slowest moving parts of resilient systems. Competitive party processes enable democracies to innovate in the face of challenges. When control over the government changes parties, the opportunity exists to transform the rules that govern resilience. Government builds the infrastructure of resilience. Government action

⁶ “Good Governance” implies the same elements: an efficiently state, a mobilized civil society and a productive market (Agere, 2000).

must be guided by public interest considerations, governing for the entire society, not for any partial interests.

Inside this paradigm, the basic concepts underpinning a resilience approach to policy and management are: non-linearity, alternate regimes and thresholds; adaptive cycles; multiple scales and cross-scale effects - panarchy; adaptability; transformability; general versus specified resilience (Figure 2).

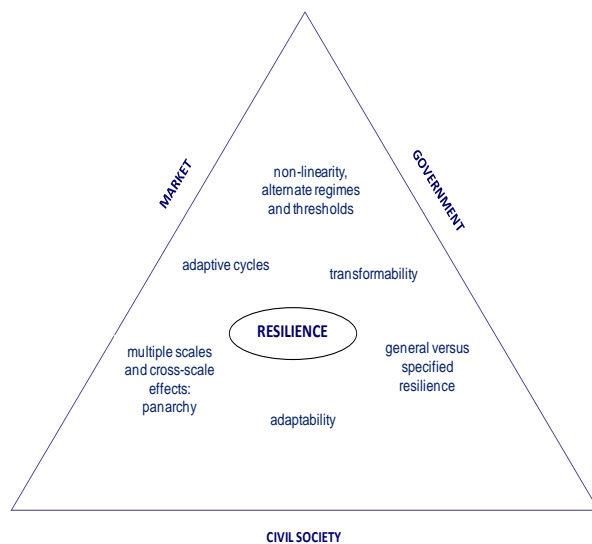


Figure 2. The spaces and the basic concepts of a regional resilience

Source: author's calculation by Resilience Alliance and Swanstrom 2008: 20 ss

A resilience of a region is not just economically successful but maintains economic success over the long term in face of the inevitable adaptation required by changes in international competition, shifts in consumer demand and other such 'shocks' to the system. As we have suggested, the success of a region can be measured by current and past economic growth, employment rates, standards of living and quality of life. The difficulty is in judging, at any point of time, whether such success will be maintained in the future and in particular whether the region will prove resilient in the face of economic recession or other challenges. One way to make this difficult prediction is to examine which regions have proved resilient in the past and to learn lessons from how such resilience was achieved. In this perspective, see resilience in terms of an ability, following an economic shock, to return to the previous equilibrium growth path is wrong.

The question becomes: what factors enable a region to adjust and adapt itself over time?

The answer is likely to lie in a number of areas, with the relevant importance of each factor being different across regions and over time, but the sort of factors that appear to have been helpful in the past would include:

- a strong regional system of innovation,
- strength in factors that create a 'learning region',
- a modern productive infrastructure,
- a skilled, innovative and entrepreneurial workforce,
- a supportive financial system providing patient capital,
- a diversified economic base, not over-reliant on a single industry.

The list could be added to, and the above factors are not exclusive, in that a skilled workforce will contribute towards the capability of being a learning region and likewise would be part of any successful Regional System of Innovation.

Thus, to the above, whether as additional factors or as contributory factors to the broad categories, could be added successful universities with strong links between the universities and the regional economies; close collaborative relations between companies and with other organizations, locally and globally; high levels of trust among and between economic actors; a supportive regional government promoting the above factors, actively networked nationally and internationally, combining regional industrial policy and innovation policy into regional innovation strategies.

Hudson's definition is consistent with the above discussion and captures the intersection between economy, society and environment as follows: "for socio-ecological systems, resilience requires consideration of three properties: the amount of change that a system can undergo while retaining its structure and functions, the degree to which it can reorganize, and the degree to which it can create and sustain the capacity to learn and adapt. Adaptability - the capacity of actors in the system to influence resilience - is critical in such systems" (Hudson, 2010, 2).

Wolfe (2010)'s study of two cities concludes that: "the most effective strategies for regional resilience rely on acquired levels of civic capital and the existing endowment of regional institutions to hart new paths forward [...]. Among the factors that determine their effectiveness are the ability to build on specialized regional assets, including public and private research infrastructure, as well as unique concentrations of occupational and labour market skills; the presence or absence of 'civic capital' at the regional and local level; and the ability of local firms and entrepreneurs to adjust their business strategies in response to changing economic circumstances. Path dependence lays a role in determining the outcomes, but that role is contingent; it is framed by the strategic choices of local actors and the degree to which local institutional structures constrain or support the realization of their goals.

Thus, one might say that regions make their own resilience, but they do not make it as they please;

they do not make it under self-selected circumstances, but under circumstances existing already, given and transmitted from the past (Christopherson et al., 2010: 6-7).

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