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Should the concept of resilience be saved?

Hugo Carton, Raphaël Stevens and Pablo Servigne

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Translated by Alexandre Edwardes

Today, the concept of resilience is everywhere. Its success possibly stems from the fact that it can be used in a context of choc, trauma, disturbance... or "crisis". But can this concept really be applied to societies? Can we truly measure resilience? Could it help us understand the dynamics of a potential civilizational collapse and to build a post-carbon society? As such, should the concept of resilience be saved?

Act 1 – Be wary of "universal" resilience

The possibility of a future in which socio-economic crises and ecological disruptions become more intense, requires new types of governance[1]. We realize the (unprecedented) potential for shocks to propagate throughout our societies and industrial systems as well as the unwanted alterations that our incomplete and uncoordinated interventions could aggravate. From now on, all of this requires us to improve our capacity to detect systemic crises and to be much more flexible in the responses we put forward[2].

In this context, the notion of resilience becomes a new reference for a growing number of scientists[3], political decision-makers[4], economists[5] and civil society actors. In January 2013, the *Time Magazine*[6] declared resilience as the "buzzword" of the year. Resilience is everywhere and is often used to describe the reactions of individuals, local communities, institutions and ecosystems before, during and after a catastrophic event. For example, in Rob Hopkins *Transition Handbook*[7] published in 2006, he explains how towns and villages in transition – that count several hundred in Europe today[8] - can elude their dependence on fossil energies and prepare themselves for climate change thanks to "resilient" strategies.

Literally defined as the "capacity to absorb" or to "return to its initial state", the notion of resilience appeared during the 1960s and 1970s and was mostly used in engineering, scientific ecology and developmental psychology[9]. Today, the concept of resilience is rapidly diffusing itself in various areas such as ecosystem and natural resource management, natural disaster prevention, risk management and even national security issues. It is also used in many subjects in the social sciences: international finance and political economy, the psychology of trauma, development politics, urban planning, public health, electronics, the management of organizations, social innovation, etc.

All these disciplines define and apply the notion in a different and often contradictory and inconsistent manner. For example, researchers at the Institute of Development Studies have identified ten definitions that have been sorted according to their degree of normativity[10] and no less than sixteen different perspectives on climate change and natural disasters[11].We generally observe inconsistencies between the different notions that describe the concept of resilience such as resistance, stability, persistence, constancy, robustness, recuperation, efficiency, adaptation or transformation[12]. This plethora of words maintains a theoretical blurredness that doesn't seem to prevent international organizations from presenting resilience as a functional and positive concept that can be complementary or opposed to vulnerability. "Objective resilience" is in the process of being universally adopted, even though it still stirs numerous and vigorous debates as to its true meaning and potential application.

With regards to global environmental changes, the ideas elaborated around the notion of resilience are mostly elaborated around environmental research. After World War II, when scientific ecology really started its boom, Eugene Odum, one of its first thinkers, defined the resilience of ecosystems as the speed at which an ecosystem can return to its initial (stable) state, before it was disrupted[13]. Back then the notion of stability was central. However, this "engineer-like resilience"

1 E. Ostrom, "Coping with Tragedies of the Commons", *Annual Review of Political Science*, vol. 2, n°1, 1999, p. 493-535.

2 B. Walke et al., « Looming Global-Scale Failures and Missing Institutions », *Science*, n°5946, 2009, p.1345-1346.

3 A biometric study realized in 2013 shows that the concept of resilience now dominates environmental sciences and experienced a spectacular increase since the 1980s. L. XU and D. Marinova, "Resilience thinking: a bibliometric analysis of socio-ecological research", *Scientometrics*, vol. 96, n°3, 2013, p.911-927.

4 Its institutional importance emerges in its central position within a UN report published in 2012, "Resilient People, Resilient Planet: A Future Worth Choosing".

5 The principal theme of the World Economic Forum 2013 report was resilience. "Resilient dynamism" was the theme of the Davos conference in January that same year. See L. Howell, "Global risks 2013", in World economic forum risks report, 8th edition, World Economic Forum, Geneva, 2013.

6 B. Walsh, "Adapt or Die: Why the Environmental Buzzword of 2013 Will Be Resilience", *Time Magazine*, 8th of January 2013.

7 Rob Hopkins, "The Transition Handbook: From Oil Dependency to Local Resilience", Ecosociete/Silience, 2010, p.60 (original edition in 2006).

8 An interactive map is available here www.transitionnetwork.org/initiatives/map

9 A number of publications have traced the historical origins of the notion of resilience. See for example Martin-Breen and Anderies, *Resilience: A Literature Review*, the Rockfeller Foundation, 2011.

10 F. S. Brand and K. Jax, "Focusing the Meaning(s) of Resilience: Resilience as a Descriptive Concept and a Boundary Object", *Ecology and Society*, vol. 12, n°1, 2007, p. 23.

11 V. Aditya et al., "The Resilience Renaissance? Unpacking of Resilience for Tackling Climate Change and Disasters", *IDS*, 2010.

12 C. Folke, « Resilience: The Emergence of a Perspective for Socio-Ecological Systems Analyses », *Global Environmental Change*, vol. 16, n°3, 2006, p. 253-267.

13 In 1953, Eugene P. Odum emphasized ecosystem stability defined as "all entities or natural units that include living and non-living elements that interact to produce a stable system in which the exchange of matter between the living and the non-living follows a circular pattern …". See Eugene P. Odum, *Fundamentals of Ecology*, Saunders, Philadelphia, 1953.

did not allow the characterization of ecosystems undergoing very deep transformations. As such, a Canadian ecologist C.S. "Buzz" Holling developed the concept of "ecological resilience"[14] and applied the theory of complex adaptive systems theory[15] to ecosystems. For this theory, ecosystems embody different functioning regimes that each have their own distinct equilibrium (therefore differentiating from unique stability). Moreover, the evolution of this equilibrium is unpredictable. Resilience thus becomes the measurement for the disruption that a system can absorb before returning to a different state of equilibrium. Here, the notion of resilience becomes much more dynamic.

By creating the group "Resilience Alliance" in 1999, Holling and his ecologist colleagues were trying to extend the concept of resilience beyond the frontiers of ecology. They quickly saw that ecological resilience could not be studied in isolation from human factors because of two major reasons. The first is that there are almost no more natural areas without some form of human presence; the second is that changes due to human activity are much too great to be ignored[16]. But to include human societies within "socio-ecological systems" is to assert that they too, can experience inevitable and regular adaptive cycles (succession of growth phases, stability, collapse and spontaneous reorganization), just like any other ecosystem. These claims thus allow us to think that ecological resilience evolves in parallel with social resilience[17]. This whole theoretical corpus is called *resilience thinking*[18].

Close to systemic or complex thinking, researchers believe that resilient thought is articulated in the same way as a mind map[19]. This enables to link key concepts together including resilience, adaptive capacity, transformative capacity, early warning signals, breaking points, adaptive cycles or even panarchy (spatial and temporal succession of socio-ecologic systems). The aim is to study the way in which systems change and react to disruptions. As such, resilience puts forward the notion of shifting from strategies that aspire to control changes in systems with a stable condition, to strategies that aim to adapt to change in systems that have become unstable[20]. Thus, we must increase the possibility of maintaining desirable trajectories for humanity, particularly in turbulent environments where unpredictable events are now the norm[21]. In this sense resilience has become, according to the most famous definition: "the capacity of a system to absorb shocks and to reorganize itself whilst maintaining its essential functions, structure and retroaction cycles and thus its identity"[22].

It's this complex definition of resilience, called socio-ecological, that international institutions have appropriated with more or less success. In their discourses, socio-ecological systems are equally conceived as networks of actors maintaining complex relations and naturally self-organizing. Here, we can recognize a definition that is analogous to market theory, where the market spontaneously self-regulates and argues for the retreat of the state in favour of private entities. Hence, there is a form of process in social evolution. From this point, resilience, as it is understood and applied in many international institutions and economic powers, is often associated with a retreat of the state and traditional political processes towards a stronger role played by local communities and a decentralization of responsibility. However, a careful analysis of political discourses[23] reveals how the use of resilience in the framework of climate change perfectly supports status quo politics and frequently promotes "business as usual" scenarios.

For example, adaptation and resilience have taken over from short-term mitigation strategies to combat climate change: indeed, climate change has become our fate and resilience is used as a discourse by political decision-makers to avoid guilty feelings. Another unfortunate use of the concept took place during the reconstruction of the New Orleans after hurricane Katrina in 2005. Under the cover of resilience, social housing and public services were scrapped in favour of private institutions that were mostly aimed towards the most privileged classes. The political and economic effects of this type of resilience discourse could thus prove counter productive for the most vulnerable local communities over the long-term, from the moment it forgets to ask the question: "resilience of what, to what and for whom?"

The notion of resilience can also serve to ornate the discourse of neoliberal environmentalism that conceives the destruction of ecosystems as a global security threat, for which the only solution is the financialization of the biosphere and the privatization of "ecosystem services"[24]. With such a conception of the world, we risk not taking into account the complex dynamics that are present in the social sphere and "forget" from the equation for example, the particular interests of these actors, the balance of power, free will, confidence, reciprocity, leadership, etc.

14 C.S. Holling, "Resilience and Stability of Ecological Systems", *Annual Review of Ecology and Systematics*, vol. 4, 1973, p. 1-23.

15 For a summary, see S.A. Levin, "Ecosystems and the Biosphere as Complex Adaptive Systems", *Ecosystems*, vol. 1, n°5, 1998, p. 431-436.

16 F. Berkes et al., *Linking Social and Ecological Systems: Management Practices and Social Mechanisms for Building Resilience*, Cambridge University Press, 1998.

17 W.N. Adger, "Social and Ecological Resilience: Are They Related?", *Progress in Human Geography*, vol. 24, n°3, 2000, p. 347-364.

18 B. Walker and D. Salt, *Resilience Thinking: Sustaining Ecosystems and People in a Changing World*, Island Press, Washington D.C., USA, 2006, p. 174.

19 B. Walker et al., "A handful of heuristics and some propositions for understanding resilience in social-ecological systems", *Ecology and Society*, vol. 11, n°1, 2006.

20 See F. Berkes et al., *Navigating Social-Ecological Systems: Building Resilience for Complexity and Change*, Cambridge University Press, 2002 and B. Smit and J. Wandel, "Adaptation, Adaptive Capacity and Vulnerability", *Global Environmental Change*, vol. 16, n°3, 2006, p. 282-292.

21 W.N Adger et al., "Social-Ecological Resilience to Coastal Disasters", *Science*, vol. 309, n°5737, p. 1036-1039.

22 B. Walker et al., "Resilience, Adaptability and Transformability in Social-Ecological Systems", *Ecology and Society*, vol.9, n°2, 2004.

23 K. Brown, "Policy Discourses of Resilience", 2011 in M. Redclift et al., *Climate Change and the Crisis of Capitalism: A Chance to Reclaim, Self, Society and Nature*, Routledge, Studies in Human Geography, G-B, 2011.

24 Put forward by the Millennium Ecosystem Assessment (taking place from 2001 to 2005, involving 1360 experts sponsored by the United Nations), the notion of ecosystem services is now integrated within environmental governance and can be defined as: "flows of matter, energy and information from a natural stock of capital generating autonomously or in conjunction with services from other capital stocks, a flow of services that may be used to transform materials, to enhance the welfare of humans" (R. Constanza et al., "The Value of the World's Ecosystem Services and Natural Capital", *Nature*, vol. 387, 1997, p. 153-160).

To sum up, the theory of resilience remains abstract and confused and especially difficult to translate into practical terms. Its large and mildly rigorous operational application gives existing neoliberal structures the opportunity to use it for ends that are incompatible with a trajectory that is favourable for the survival of humanity.

Act 2 – Can we measure resilience?

"You can't manage what you don't measure", this old management saying claims that the operationalization of a concept must necessarily go through its measurement, or in other words its quantification. Indeed, what is more attractive than a lovely composite index or a coherent aggregate of various indicators that would allow us to navigate more serenely within the Anthropocene? But as we have just seen, the notion of resilience is rather polysemous. A number of studies point to the existing tensions in between these normative and descriptive views, especially when speaking about socio-ecological systems. Nevertheless, beyond these criticisms, the current efforts to research this topic illustrate a real desire to progressively integrate political and cultural aspects into the social dimension of resilience[25].

For example, a recent study reveals how the free will and collective action of the powerful or the excluded affects the management of ecosystems and thus suggests the creation of a space to deliberate where pluralist views are integrated[26]. Another study examines the role of value systems in relation to research on human well-being within the context of resilient thought[27]. Finally, numerous studies have been published in interdisciplinary reviews that show that the debate around resilience is currently focused on "community resilience"[28]. They especially integrate the issues of social justice[29], human psychology[30] and health[31]. Community resilience has become a significant field of analysis, for its geographical scale would allow for researchers to more easily integrate human and social aspects. But a study of these social parameters of resilience at a greater scale could prove problematic for several reasons.

Firstly, all these systems are interconnected and imbricated. The resilience of an isolated social system therefore does not exist. In a hyper-connected world, no local community is independent from others, whether at a larger scale (whole region) or lower scale (individuals and families)[32]. For example, the food resilience of a town in transition, whatever its desires of autonomy, is intimately interrelated with the vulnerable and complex industrial food systems, based on just-in-time distribution and responsible for the degradation of ecosystems and the depletion of natural resources. Today, it is extremely difficult to develop means of subsistence that are not narrowly dependent on the formal economy. For individuals in local communities, the development of their long-term resilience is often counter-balanced by the low resilience of the systems in which they are based.

Secondly, resilience depends on the position of the observer. In scientific debates, a frank distinction is made in between *resilience* and *transformative capacity*[33]. Indeed, the notion of resilience is essentially conservative (in the sense that it aims to absorb a shock whilst maintaining the same structures and functions), which sometimes renders it incompatible with more serious changes of state. The concept of transformative capacity is in this case much more functional as it is "*the capacity of a system to reinvent itself completely (as it creates a completely different system based on the old one) when its own supporting ecological, economic and social structures make it untenable*"[34]. *Hence, it all depends on what we want to do with society… making the research for objective indicators of resilience an arduous task".*

Thirdly, resilience is the function of the relative importance that we give to each of its components. In the case of natural systems, some principle variables have been identified: diversity, redundancy, modularity or available reserves[35]. But the act of adding a social dimension, plunges us into unfathomable complexity as much because of the multiplication of variables than by the influence of various spatio-temporal scales within it: social networks, feelings of belonging, confidence, reciprocity, collective and individual capacity to learn, capacity to face change and innovate, collective memory, positive thinking, infrastructures available before, during and after a catastrophic event, governance, balance of power, free will, value and leadership systems, are but a few examples of the social elements of resilience found by researchers[36]. As such, even if we achieve the task of measuring these elements through valid qualitative studies, consolidating the obtained results into one single index of performance seems not only impossible but also not very credible.

Fourthly, to quantify the resilience of an ecosystem, we often take a critical threshold as a mark that indicates the quantity of disturbance that a system can still endure. For this, three parameters are generally used: precariousness (the distance that separates the system from a

25 See for example K. Maclean et al., "Six Attributes of Social Resilience", *Journal of Environmental Planning and Management*, vol. 57, n°1, 2013, p. 1-13.

26 M. D. Robards et al., "The Importance of Social Drivers in the Resilient Provision of Ecosystem Services", *Global Environmental Change*, vol. 21, n°2, 2011, p. 522-529.

27 D. Armitage et al., "The Interplay of Well-Being and Resilience in Applying a Social-Ecological Perspective", *Ecology and Society*, vol. 17, n°4, 2012.

28 Designates the capacity for a community (never well defined but suggests neighbourhoods, towns, town centres, hamlets or villages) to recover after a shock.

29 See for example F.H. Norris et al., "Community Resilience as a Metaphor, Theory, Set of Capacities and Strategy for Disaster Readiness", *American Journal of Community Psychology*, vol.41, n°1, 2008, p. 127-150.

30 F. Berkes and H. Ross, "Community Resilience: Toward an Integrated Approach", *Society and Natural Resources*, vol. 26, n°1, 2013, p. 5-20.

31 L. J. Kirmayer et al., "Community Resilience: Models, Metaphors and Measures", *International Journal of Indigenous Health*, vol. 5, n°1, 2009, p.62-117.

32 These interdependences of scale are studied in the framework of "panarchy".

33 See for example S. Wilson et al., "Separating Adaptive Maintenance (Resilience) and Transformative Capacity of Social-Ecological Systems", *Ecology and Society*, vol. 18, n°1, 2013.

34 B. Walker et al., *op. cit.*, 2004.

35 L. H. Gunderson, "Ecological Resilience – in Theory and Application", *Annual Review of Ecology and Systematics*, vol. 31, n°1, 2000, p. 425-439.

36 See for example K. Magis, "Community Resilience: An Indicator of Social Sustainability", *Society and Natural Resources*, vol. 23, n°5, 2010, p. 401-416.

critical threshold), latitude (the amount of disturbance we can impose a system before it looses its capacity to recover), resistance (the easiness or the difficulty with which the system can be impacted or transformed)[37]. In social sciences, these parameters only have little resonance. Indeed, what is a "balancing basin" or "tipping point" in a social system? How can you precisely measure the distance that separates us from another state of equilibrium? At this point, we simultaneously attain some conceptual and technical limits to resilience.

Fifthly, resilience has a cost. Identifying relevant indicators and measures in a recurring way before, during and after a disruption increases the demand for human ingenuity and technique, and hence the financial and energetic resources of the local community. In our societies that already suffer from an excessive over-complexity and future energetic shortages (and possibly of money too), this may not be the most relevant decision.

The sixth point is that resilience is an emerging factor. In a complex adaptive system, it is the multiple associations and combinations in between different elements of the system that reveal unexpected general behaviours. For example, the millions of interactions taking place in between ants (elements) eventually create living bridges and rafts (emerging behaviours that are not planned by chief engineering ants) that enable them to pass streams or survive flooding[38]. These general behaviours cannot be deduced from the observation and study of individual ants but only by taking the colony in its entirety. The whole is more than the sum of its parts. In a similar way, resilience can be seen as the emergence of interconnections and interactions in between different elements in a given system: natural, human, social, physical and financial capital interact in a non-linear way (evolving in leaps and bursts), self-organize and give birth to a system that is more or less resilient. The resilience of a system is not deducible from the sum of the resilience of its constitutive parts. Also, changing the behaviour of a system is difficult to undertake with a "top-down" process that directly acts upon emerging behaviours. One can try and act on the behaviour of each element, however the resulting behaviour that would emerge from it would be unpredictable… Trying to measure and control resilience (as a complex system) with Newtonian scientific tools (simple systems) can only lead to a stalemate. To sum up, "*the principal dilemma is the transition from a problem that needs to be defined by complex sciences to a solution that should be delivered by Newtonian sciences*"[39]. The use of simple indexes cannot account for the behaviour of complex systems.

Finally, resilience is volatile. When a complex system gets near or goes beyond a tipping point (irreversible), the nature of its internal mechanisms subtly change[40] and the whole system shifts into a new and unpredictable state. Its sensitivity to initial conditions, its non-linear behaviour and thus its unpredictability increases. In other words, when we approach, during or just after a catastrophic event, our capacity to predict the behaviour of a system dissipates completely. Resilience, which could be considered as an emerging behaviour, would not escape this conclusion. In this case, its measurement or modelling would be hazardous.

To sum up, in view of the theoretical considerations presented above and the practical experiences that have already been undertaken in different places around the world[41] it would appear that, in the case of complex socio-ecological systems and most particularly for human communities in real life conditions, the application of the concept via quantitative measurements is an almost impossible endeavour. This becomes completely impossible if we consider the time that is left before irreversible disruptions take place in terms of financial, intellectual and energetic capital that we have at our disposal. Even worse, we believe that simply attempting its measurement could lead us to false hopes and illusionary solutions.

Act 3 – Saving the concept of "community resilience"?

If resilience is a concept that is difficult to measure and apply, this does not mean that phenomena of resilience do not exist in reality. For example, we can quite easily observe numerous cases of human communities that undergo a shock of some sort (economic, social, energetic or geopolitical) and who manage to survive whilst maintaining some of their functions…

We can take for example the hurricane that devastated the state of New Orleans (United-States) in 2005. We all remember the thousands of soldiers and police officers sent there to prevent further crimes such as stealing, pillaging, etc. However, we now know for a fact that all this supposed violence was not real. Rather, it was the rumours of violence themselves that justified sending the troupes! Worse, it was these same troupes, stressed and briefed for violence that caused a climate of violence and dramatic accidents[42].

Everyone imagines that in the case of a catastrophic disruption and rupture of normal social order, chaos, violence and the laws of the strongest will automatically become the norm. This myth has been used so much by the film industry, that we have come to believe it as true. And yet, ground observations do not correspond to this myth at all, in fact all testimonies converge in the opposite direction. Even during 9/11 in the emergency staircases of the burning twin towers, people were

37 See B. Walker et al., *op. cit.*, 2004. A summary of these notions is available in French on the site of the Institut Momentum: H. Carton, B. Thévard and Agnès Sinaï, "Freins et leviers des politiques de résilience local en Europe", Institut Momentum, 2013.

38 N.J. Miot et al., "Fire ants self-assemble into waterproof rafts to survive floods", *Proceedings of the National Academy of Sciences*, vol. 108, n°19, 2011, p. 7669- 7673.

39 R.A. Fenner et al., "Widening Engineering Horizons: Addressing the Complexity of Sustainable Development", *Proceedings of the Institution of Civil Engineers: Engineering Sustainability*, n°159, 2006, p. 145-154.

40 M. Scheffer, "Complex Systems: Foreseeing Tipping Points", *Nature*, vol. 467, n°7314, 2010, p. 411-412.

41 See for example S.L. Cutter et al., "Disaster Resilience Indicators for Benchmarking Baseline Conditions", *Journal of Homeland Security and Emergency Management*, vol. 7, n°1, 2010 or E. Buikstra et al., "The Components of Resilience-Perceptions of an Australian Rural Community", *Journal of Community Psychology*, vol. 38, n°8, 2010, p. 975-991.

42 Jacques Lecomte, *La bonté humaine. Altruisme, empathie, générosité*, Odile Jacob, 2012.

helping each other and descending in a calm and orderly fashion[43]. More generally, "*Thomas A. Glass, from John Hopkins University and his fellow researchers have analysed human reactions over ten diverse disasters that occurred in between 1989 and 1994: two earthquakes, two train derailments, one plane crash, two gas explosions, one hurricane, a tornado and a bomb explosion with a subsequent fire. The number of victims went from three to over two hundred. The researchers have systematically found that the victims had formed groups, led by a leader, established agreed rules and distributed functions in order to survive and save the most people possible. In another study that specifically treated fires, researchers looked into the behaviour of people who had fled the drama. They found that people fleeing the scene in panic was so rare that they finally gave up the concept of "panic behaviour"*[44].

These examples teach us that in the case of a disaster not only is there no panic, but also that cooperation and altruism immediately and spontaneously emerge. It was also noticed that these calm and cooperative behaviours are systematically associated with the emergence of new social norms (for example unconditional help) in a group of survivors. In a state of shock, survivors spontaneously give each other very powerful new rules to navigate an exceptional and dangerous situation. A new ad hoc "social order" emerges and prevails over pre-disaster rules. An exceptional situation breeds exceptional behaviours.

After a shock or a collapse, a community can renew itself on its own and find the potential to recreate structures that will allow it survive in its new environment. Human communities thus contain a formidable "self-healing" capacity or in other words, resilience. This capacity is hidden deep in our neuronal network and not only in external structures (humanitarian aid, police, institutions, etc.), as we could be led to believe.

We know that these behaviours exist and we are certain that we will need them soon, but how should we measure, quantify and control them when a crisis does occur? It seems obvious to us that the study of local community resilience should be concentrated on a qualitative description rather than a quantitative one, on intuition rather than analysis and in the hope of "maintaining the conditions favourable to emergence" rather than "commanding and controlling"[45]. Sadly, our Cartesian and Newtonian ways of thinking are not used to such cerebral gymnastics, but the time has come to start.

Super-social behaviours that emerge in times of disruption are very possibly fed by beliefs (for example of what others could do, of human nature, etc.), or in other words by the imagination of people and the deep convictions they hold within themselves. However, this imagination is probably built by the episteme[46] of the pre-disaster era and thus by its stories and myths. It seems imperative to work on these "stories" from this very day, in order to foster the emergence of resilient collective behaviours in times of disaster.

In reality the Transition movement is already doing this. Its success is due to its ability to transform the imagination of its participants by changing their vision of the future. By making their future better, transition groups give hope, stimulate action and enable us to believe in the existence of local social links on which we can count if a disaster situation occurs. Transition initiatives create confidence in each other and in the future. They are intuitively building collective resilience.

The conclusion to this article holds in three points. Firstly, the term resilience, which is currently fashionable and used profusely in all kinds of situations, is not a universal panacea as it can also reveal to be dangerous and counter-productive in achieving transition. We thus invite everyone to be wary of the concept of resilience that is used in order to *maintain* current structures (public and private) that generated the environmental, political, economic and social crises that we are currently enduring. For such structures, we prefer to use the concept of *transformative capacity*. Secondly, we do not believe that it is possible to create operational resilience indexes in order to govern a complex system in this era of disruptions and uncertainty that is the Anthropocene. The creation of such indexes would be renouncing on the fact that our societies are complex systems, a situation that we consider to be risky and counter-productive. Thirdly, the concept of local community resilience remains interesting in the case of a transition/collapse of society, with the condition that they remain in the domain of intuition and qualitative description, in other words that they serve as guiding principles and especially as tools to transform our imaginations.

43 Rebecca Solnit, *A Paradise Built in Hell: The Extraordinary Communities that Arise in Disaster*, Penguin, 2009.

44 Jacques Lecomte, *op. cit.*, p. 30.

45 C.S. Holling & G.K. Meffe, "Command and Control and the Pathology of Natural Resource Management", *Conservation Biology*, vol. 10, n°2, 1996, 328-337.

46 Collection of scientific knowledge and prejudices from a certain era (Wikipedia, November 2013).

Hugo Carton is an engineer, a graduate of the Institut d'Études Politiques de Paris and a research fellow at the Momentum Institute. He is the author of the study *Freins et leviers des politiques de résilience locales en Europe* for the Greens/EFA group in the European Parliament (December 2012).

Raphael Stevens is an independent researcher specialized in prospective studies, the science of complexity and qualitative modeling. He is the co-founder of "Greenloop", a consultancy agency specialized in biomimetics and of the NGO "Biomimicry Europa".

Pablo Servigne is an independent and interdisciplinary researcher. With an academic background (Agronomist from the "Faculté de Gembloux in Belgium and with a PhD in Science from the "Université Libre" in Brussels) Pablo shares his life between the different worlds of academia (in seminars), politics (as a consultant), associative (popular education animator for "Barricade" in Liège) and media (as an independent journalist). He holds a particular interest for issues such as the evolution of cooperation, the global commons, agroecology, urban agriculture, the transition movement, systemic collapse, resilience and complexity.

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www.institutmomentum.org
33, rue de la Colonie
75013 Paris
Tel. 01 45 80 26 07

Change of Era

The Momentum Institute met for the first time on the 10th of March 2011, the day before an earthquake struck Japan and unleashed the nuclear catastrophe we know as Fukushima.

The starting point of the Momentum Institute is based on the awareness that today we are living at the end of the period marked by the greatest material wealth human history has ever known – a wealth that is founded on cheap, concentrated, temporary energy sources that made everything else possible. Just as the most important sources of energy for this material wealth are entering irreversible and inevitable decline, we are embarking on a period of generalised economic contraction.

The Momentum Institute is dedicated to responding to the challenges of our era: how can we organise the transition to a post-growth, post-fossil fuel, climate-altered world? How can we understand and act on the issues of the Anthropocene? What are the emergency exits? What will resilient societies look like in the time of the triple crisis: energetic, economic, and ecological?

The post petrol, post-nuclear, post-coal transition means completely redesigning and rethinking the infrastructures of society and alongside this, working to achieve a new social imaginary by envisaging a near future without petrol and without non-renewable energy. The objective of our approach is to establish a community of contributors made up of citizens engaged in the major areas of transition.

The contributors to the Momentum Institute intervene in their area of expertise, in relation with the thinking on transition. They produce diagnostics, analyses, scenarios, and original proposals regarding strategies of transition and resilience. The Momentum Institute is there to encourage them and to make them known, to individuals, to businesses, to local and national governments. We are also concerned with providing visibility to emerging solutions that are already put into practice by towns in transition, such as energy cooperatives, AMAPs (organic local produce cooperatives), non-profit businesses, social employment, and eco-districts.

If we manage to disseminate them, the initiatives and contributions for imagining and creating the post-petrol world will spread – both locally and globally. They will come to represent the status quo and the efforts that we go to today will not be unusual tomorrow. In the meantime, we have a chance, and it is perhaps our last chance, to step back from the precipice. A challenge, a singular moment, a window of opportunity: Momentum.