

Panarchy in the Anthropocene

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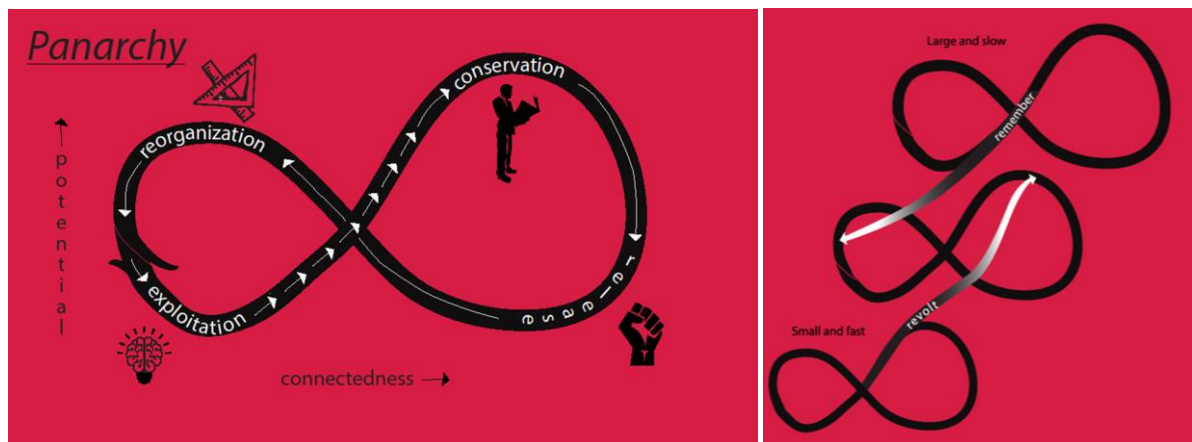
We, humans have our roots in pre-Anthropocene eras where we gathered skills for survival and establishing our culture. The cumulated tacit knowledge, the skills, ideas and experiences that can only be shared by personal contact and mutual trust, is evolved and cumulated during this pre-Anthropocene era. This tacit knowledge is geared to our existence and to local circumstances, it is the indigenous knowledge necessary for local adaptation and for (cultural) perseverance. The Anthropocene era however, is characterized by rapid changes with respect to environment, climate, food sovereignty, culture and more. Our tacit knowledge needs to evolve and adapt at the same pace as changes happen in our environment and culture. Changes in the Anthropocene era are fast and disruptive thereby challenging concomitant evolution of our tacit knowledge. Urban communities are embedded in the artificial world fostering learning and adaptation of new tacit knowledge geared to artificial environments. Remote communities, living in a more natural world, are especially vulnerable to effects of the Anthropocene because they are hampered in their access to other communities and/or environments to learn from and have limited access to (new) resources to live from.

Remote communities in polar areas are especially affected by changes the Anthropocene. Global environmental pollution is eventually transported by long range atmospheric and oceanic circulation to polar areas where they cumulate in glacier ice and accumulates in trophic chains. Climate change causes melting of glacier ice thereby releasing over years cumulated pollutants instantly in the environment thereby increasing exposure levels dramatically. Local communities still depending on traditional food supply are exposed to elevated levels of organic micropollutants compared to other populations monitored globally. (Gibson et al 2016¹).

The arctic area was long considered as pristine environment not touched by human environmental pollution. The unexpected effect of long range global circulation transports is accumulation of micropollutants in arctic environment and biota. Unexpected effects are typical in the Anthropocene because we cannot foresee or predict effects of human actions on environment or on fellow people and communities. Another example of an unexpected effect is the emergence of a cold-war secret military base “Camp Century” out of the Greenlandic ice shelf due to decreasing snow fall caused by climate change. This exposure was not reckoned upon at the time of discarding the base in the mid-sixties. The base is full of waste including gasoline, organic micropollutants and nuclear coolants, waiting to be melted out of the ice². The release of this waste into the environment puts another burden on the arctic communities.

Unexpected phenomena are typical for interacting complex adaptive systems. The famous butterfly in Brazil causing hurricanes and disaster in Texas. Small initial events can lead to large effects, small events can also lead to effects not anticipated upon because our (explicit) knowledge is incomplete and our imagination is bounded. Panarchy, a new paradigm originating from ecological science describes and tries to explain these phenomena. Panarchy is the evolution of multiple nested complex adaptive systems inter-acting on different space and time scales into different states of self-organisation³. A nice example of panarchy is the introduction of a few couples of grey wolves in 1995

in Yellowstone park who, through different cascading events including beavers, birches, grizzly and elk, eventually changed the hydrology and pattern of Yellowstone river⁴.



Complex adaptive system and panarchy after Holling cs.

Complex adaptive systems (left) consist of phases of exploitation characterized by fast exponential growth (r-phase) , followed by consolidation and conservation characterized by balanced forces and networks (K-phase) whose energy and information is released after system disruption (Ω -phase) entering the phase of reorganisation (α -phase) which initiates a new phase of exploitation again. Panarchy (right) is the cross scale nested set of adaptive systems acting on different space and time scales.

Panarchy is the paradigm of transition and change. Panarchy is interaction of countless interconnected and nested complex adaptive systems. Panarchy is the paradigm where small actions can have major effects for better or worse. It is to expect the unexpected. Panarchy holds the promise of positively changing the Anthropocene. By being prepared we can anticipate upon unexpected emerging phenomena which can be used as leverage for creating change.

Panarchy holds the promise that small individual actions may lead to major positive changes in environment and society. Panarchy is the promise of empowerment of the individual or local community to initiate change for reaching a new state-of-art.

The constant factor in human panarchy systems is knowledge, the skills, ideas and experiences necessary for coping different phases of the adaptive cycle. Codified knowledge, the theoretical knowledge has shown to be only partial effective for predicting adaptive cycles or panarchy change events. Tacit knowledge has that capacity neither but create skills for recognizing and seizing opportunities and to be prepared upon unexpected events, for better or worse. Tacit knowledge is shared by learning by doing, by gaming, by following examples, by learning from each other in contextual settings of mutual trust.

The power of art with the perspective of the artist is within this setting of mutual trust. We believe that art, when approaching challenges, can evoke chains of thoughts and (cascading) events which through tacit learning will eventually affect systems. This results not only in innovative sustainable social and industrial products but also in change of systems.

We have experimented this approach within the context of SDG-labs. SDG-labs are living labs for developing new practices fostering the United Nations Sustainable Development Goals (SDG-labs)⁵.

SDG-labs are the environment where we can experiment and create new resilient concepts for adaptation to the Anthropocene. SDG-Labs have two aspects, the first is creation of concepts for change within the lab-setting, its content; the second is the process of organisation of the lab within its environmental and societal context. The Lab itself can be regarded as a complex adaptive system while the organisation of the SDG-Lab is within panarchy, acting on multiple levels and on different scales. Both faces, content and context, of the SDG lab have their own emerging properties.

For facilitation of the SDG-lab we organised workshops where creative methods based upon TRIZ ("Theory of inventive problem solving") and CPS (Creative Problem Solving) were applied. TRIZ makes use of pre-established thinking patterns and proven abstract solutions to sets of abstract problems. TRIZ provides a toolbox for solving complex (wicked) problems. TRIZ uses the heuristics of intrinsic technological and societal evolution once a concept emerges. CPS is used for application of the TRIZ toolbox, by making concrete problems abstract and abstract solutions, concrete. TRIZ and CPS makes use of analytical and design thinking. Results of these workshops are emerged pre-concepts which have the potential to create change.

Contextual settings of the SDG-lab determine its rate of success. Many good ideas perish in the "valley of death", before they can realise their full potential. The contextual setting determines acceptance and hence increases probability of idea realisation. The action of organising SDG-labs generates curiosity, enthusiasm, resistance and other emotions with people and organisations. This lead to disturbances in panarchy, which is rendered in emerging opportunities that can be seized by imaginative people.

Sarasvathy and Simon (2000) coined for this approach the concept of effectuation as an entrepreneurial principle for seizing opportunities which emerge from entrepreneurial actions in contrast to causation where managerial thinking obscures seeing opportunities. Effectuation is actor dependent where given specific means, choice of effect is driven by characteristics of the actor and his or her ability to discover and use contingencies. This approach is also recognised in innovation theory where the concept of "exaptation" is explored. Exaptation is the attribution of a new functionality to an existing artefact (or organization, scientific achievement, or cultural model) (Bonifati, 2010). Once recognised, effectuation and exaptation are major change drivers based upon emergence of contingencies in existing systems.

Our SDG-lab has discovered by accident the power of effectuation and exaptation for creating impact and change by using content and context of the SDG labs at the same time. Our SDG-lab has resulted in tangible results in our community.

Back to the arctic pollution and its effect on people. We cannot solve this problem, however there are communities who have suffered similar problems in the past and they have found practical solutions for coping with their difficulties. People are eager to help each other as is demonstrated by the simple phenomena that when a stranger asks for directions, in most cases he will be helped by friendly people. Additionally, theoretical knowledge offers us insight into processes and opportunities we are not aware of and from which we can learn together to create new (tacit) practices. Bringing together these people in a trusted environment may lead to new insights and practices which might be worth to follow.

Exploring the paradigm of panarchy as principle of change and transition has opened up our minds for seeing and seizing emerging opportunities as change drivers and this to our surprise seems very promising.

¹ Gibson, J. Int.J.Circumpolar Health 2016, 75:33804

² <http://www.dailymail.co.uk/sciencetech/article-3807455/Melting-Greenland-ice-threatens-expose-Cold-War-waste.html>

³ Gunderson & Holling, 2002, Panarchy understanding transformations in human and natural systems, Island Press Washington 505 pp.

⁴ <https://www.youtube.com/watch?v=ysa5OBhXz-Q>

⁵ <http://www2.ir3s.u-tokyo.ac.jp/icss2017/sdg-labs/>