



System Innovation Lab

SHAPING EUROPE'S ENERGY FUTURE

Handbook

IMPRINT

This document was developed in the context of a joint project of the **Wuppertal Institut** and the **Centre for Social Investment (CSI)** called the *System Innovation Lab*.

It combined sustainability transformation research insights with those of social innovation in order to design an on-the-job training and coaching that would enable participants to take a systemic approach to innovation and test what this means in their respective work settings. Focussing on the topic of sustainable energy futures in Europe it addressed young European leaders in government, the private sector and civil society working on energy issues and combined latest theoretical insights with novel innovation and leadership methods to spread the capacity and courage that transforming entire sectors requires.

For more information see: www.sysinnolab.org

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The Lab in a Nutshell

Europe's energy future requires us to master a substantial transformation towards sustainability. Europeans across all sectors – public policy, corporate, civil society and individual citizens – need to overcome their national ways of thinking and work together towards a sustainable energy system in order to secure prosperous living conditions for themselves and future generations.

Our goal was to create and bolster a network of inspired and inspiring system innovators with the objective of overcoming barriers towards a sustainable energy future across Europe.

OBJECTIVES

Understand different cultural and sector-specific perspectives

Design innovative solutions for a sustainable European energy future

Implement ideas in the professional environment of our participants

SET-UP

The Lab consisted of three parts:

- **Kick-off Seminar in Berlin** (6 days) with experts on energy systems and system innovations including field visits and coaching
- **Exploration Phase** (10 weeks) in which participants tested their prototypes in the context of their professional environment (supported by mentors)
- **Reflection Seminar in Warsaw** (5 days) where results were presented and participants had the chance to reflect on what they learned



KEY BENEFITS

- **Kick-Off Seminar**
Deep-dive into system innovation approaches
Understand your personal contribution to large systems change
Develop prototype interventions for change
- **Exploration Phase**
Test your prototype interventions together with your peers
Benefit from mentor expertise
Document your personal learning journey
- **Reflection Seminar**
Share your story with the group
Comprehend systemic common ground
Pinpoint success factors for systemic change

TARGET GROUP

The lab was aimed at 20 – 25 **young and mid-career professionals** who

- **Work in staff positions** across Europe
- **Work with energy related issues** in politics, economy, civil society, and science;
- Have the **drive to be part of a transformation** by making concrete change happen

1.1

Aiming at System Innovations: Genesis of the Lab


Complex (sustainability) problems require holistic solutions with radically different outcomes. These cannot be managed with the traditional linear planning and quantitative measuring frameworks. Rapidly growing interconnectedness and increasingly fast changes in today's globalized world lead to non-linear cause-effect dynamics, growing diversity (more people, knowledge, and choices) and uncertainty about the predictability of change. The silo-specialization in modern societies and extrapolations of future happenings from past trends no longer suffice to inform successful governance or management.

IDENTIFYING THE CHALLENGE

When talking about such complex challenges or “wicked problems” calls for “systemic” approaches are widespread. Yet, the term is often not well defined. What all definitions have in common is an emphasis on interconnectedness of single items or issues and networked relations. But most attempts of defining systems clearly and simply stay on levels of generalization or are “infuriatingly abstract” (NPC 2015: 6). The New Philanthropy Capital (NPC) created a study on Systems Change to systematize various approaches. The summary characteristics proposed are the following (NCP 2015: 7):

- **Systems are composed of multiple components of different types, both tangible and intangible. They include, for example, people, resources and services, as well as relationships, values, and perceptions.**
- **Systems exist in an environment, have boundaries, exhibit behaviours, and are made up of both interdependent and connected parts, causes and effects.**

Such definitions help to see why system thinkers criticize a “silo-ism” of disciplinary or single-issue approaches when dealing with socio-ecological-technical unit like societies, organizations or ecosystems. They do, however, remain vague about how systemic approaches can be put into practice, and the system thinking community is far from working with one theory of change: intervention strategies depend on the assumptions about how the described system's characteristics, behaviour and causal relations actually play out.



Some approaches use the term “systemic” when they call for a widening of the scope of what or who is considered to play a relevant role in solving problems. The theory of change is that opening up the traditional coalitions allows for more diversified insight and new collaboration potentials. Traditionally, this has been called a multi-stakeholder approach; now it is discussed under the label “ecosystem approach,” for example at the World Economic Forum.

Other approaches place the spot light on the cause-effect processes used to achieve particular, desired outcomes. Here, one view is of the mechanistic kind that fits well for machines or IT systems: the parts and the causal reactions in the system stay the same and are thus reproducible, even if the whole thing gets rather complicated. If something is broken, one or several parts will be replaced and the machine resumes production of the same outcomes. This view is not very helpful for explaining complex living system behaviour, even if a lot of economic theories use it to describe nature.

Approaches building explicitly on observations in complex living systems have identified some typical change patterns that could not be explained through linear cause-effect predictions: sometimes there were delays between cause and effect; sometimes causes did not seem to trigger effects at all, whereas at other times, small causes would cause disproportionately big effects. In order to find answers as to why this happens, it has proven important to search for connections between seemingly isolated elements or parts (a holistic view) and for circular feedbacks (where an effect in turn affects the cause) as well as for stock-and-flow dynamics (input and output do not change in fixed proportions).

Once the system one seeks to innovate is composed of living elements, it makes sense to apply this approach – which is what this Lab wanted to do. It drew on state-of-the-art knowledge in research on sustainability transformations/ transitions and social innovations as they start from either the system or product perspective but in essence describe changes of the same character:

“Transitions entail co-evolutionary changes in technologies, markets, institutional frameworks, cultural meanings and everyday life practices”

(Geels et.al. 2015: 2)

“Social innovations are new solutions (products, services, models, markets, processes etc.) that simultaneously meet a social need (more effectively than existing solutions) and lead to new or improved capabilities and relationships and better use of assets and resources. In other words, social innovations are both good for society and enhance society’s capacity to act”

(The Young Foundation, 2012: 18)

The results, as shown in the 2015 OECD System Innovation report, are “radical – insofar as they alter existing system dynamics – innovations in socio-technical systems that fulfil societal functions, entailing changes in both the components and the architecture of the systems” (OECD 2015: p. 6). This sounds like a huge task and it is. Adding insights from complex system research helps to see the multifarious and diversified incremental steps that precede radical outcomes and thus allows developing intentional strategic plans.

PINNING DOWN THE GOAL

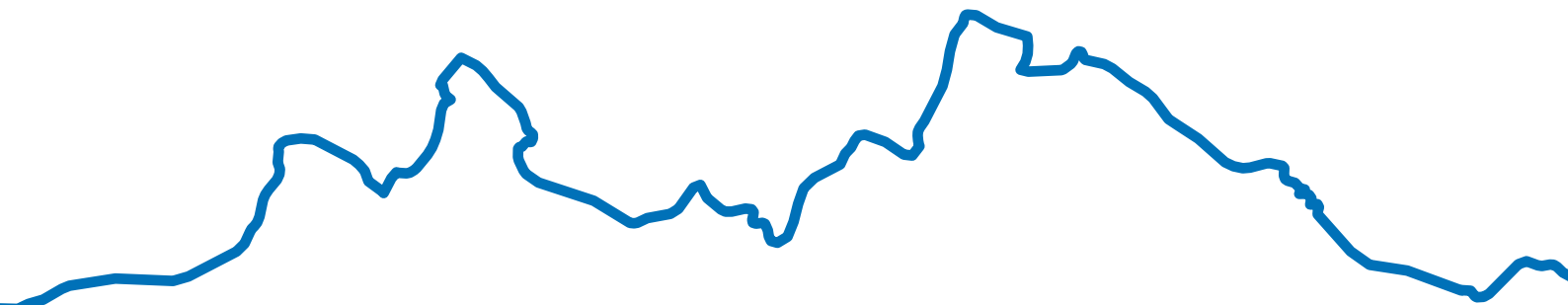
For anyone getting involved in such an endeavour it is important to think big but not get overwhelmed. And it is important not to forget that behind all of the changes and alterations foreseen there are people: purposefully acting individuals who see what could be possible beyond the status quo and work towards it. This is why the Lab was not only about analytical concepts but also about people. Its selection of concepts, methods and formats aimed at aligning the following questions:

- **What** needs changing (solutions, system rules and people's capacities)?
- **How** can this quality of change be understood and supported?
- **Who** can conduct this change and under which circumstance?

The resulting training should be helpful for any innovator, whether they seek to change global governance, their work department or a local community. System thinking does not oblige you to change the whole world but to see and understand how changes in your respective realm of influence and effectiveness are connected to what is happening elsewhere. It also means acknowledging that this realm is not a void but an inherited set of configurations and dynamics that can be divided into structures (institutions, infrastructure, technologies, nature) and agents (people, groups or animals). These configurations influence what seems possible, legitimate or desirable – and at the same time they are influenced by what people do.

When brainstorming about which systemic thinking would help to understand these configurations in a way that fosters strategic change maker qualities the following list emerged:

- Seeing the big picture connections whilst setting boundaries of one's sub-system according to the identified challenge;
- A holistic view when checking for key elements and relations – economic, technological, political, but also ecological and socio-cultural dimensions;
- Integrating both quantitative analysis (hard system aspects) and qualitative narratives (soft system aspects);
- Awareness of the historical past and contextual specifics that shape the uniqueness of each situation;
- Combining a radical vision with creativity, humility and persistence when choosing the multiple incremental steps necessary to get there;
- Differentiation between descriptive and normative aspects when identifying system dynamics and change strategies;
- Getting a feel for the range and timing of different kinds of interventions, and when windows of opportunity open;
- Combining intellectual knowledge and emotional-intuitive sensing in practice and communication;
- Acknowledgement and healthy handling of one's own mental models, interests and intentions.

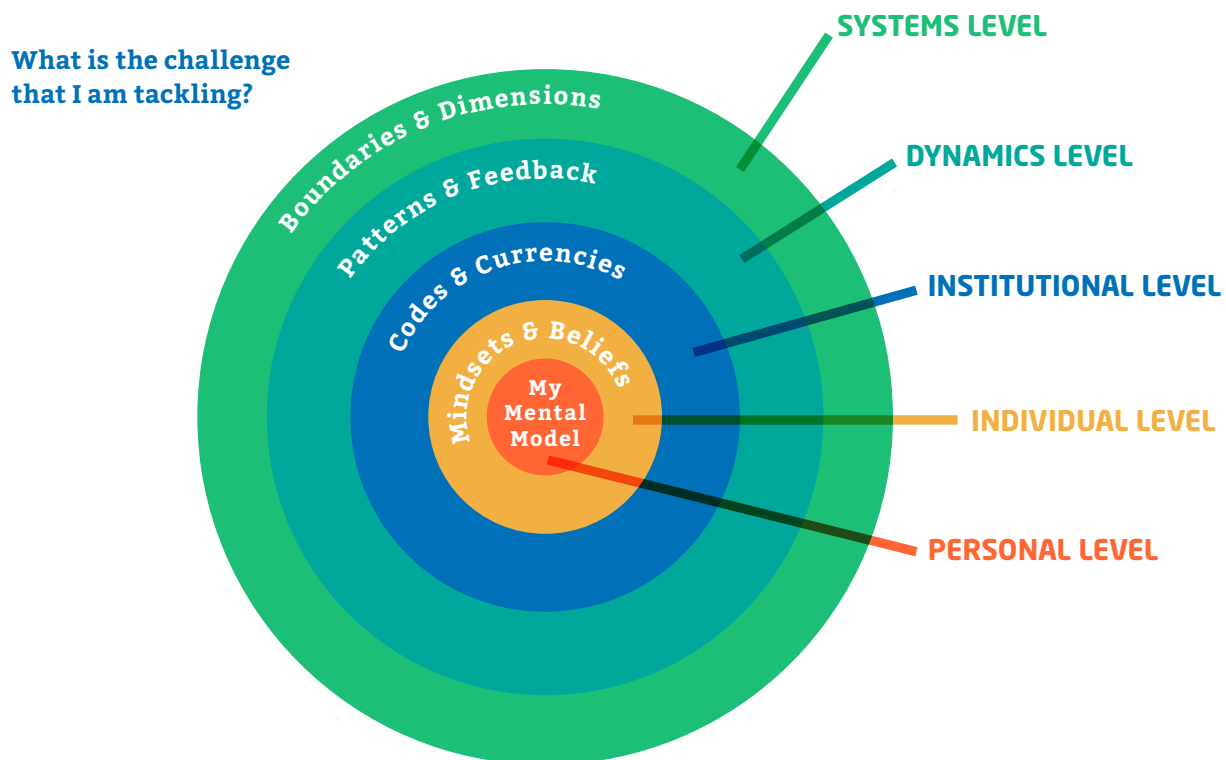


DISTILLING A CONCEPTUAL FRAMEWORK

In the next step we condensed these points into five guiding assumptions along which we structured the flow of the Lab and the choice of methods and formats.

1. **We want** systemic innovation,
so we make sure we capture the whole system.
2. **We say** that our system is complex,
so we anticipate its change patterns to be non-linear.
3. **We operate** in historically grown circumstances,
so we investigate their grammar.
4. **We acknowledge** that individual mindsets and beliefs
guide human actions, so we seek to make them explicit.
5. **We know** our own mental modes frame reality,
so we seek to keep them open to change.

Fitting these five key assumptions into a conceptual image resulted in a target which can be used to aim at system innovations:



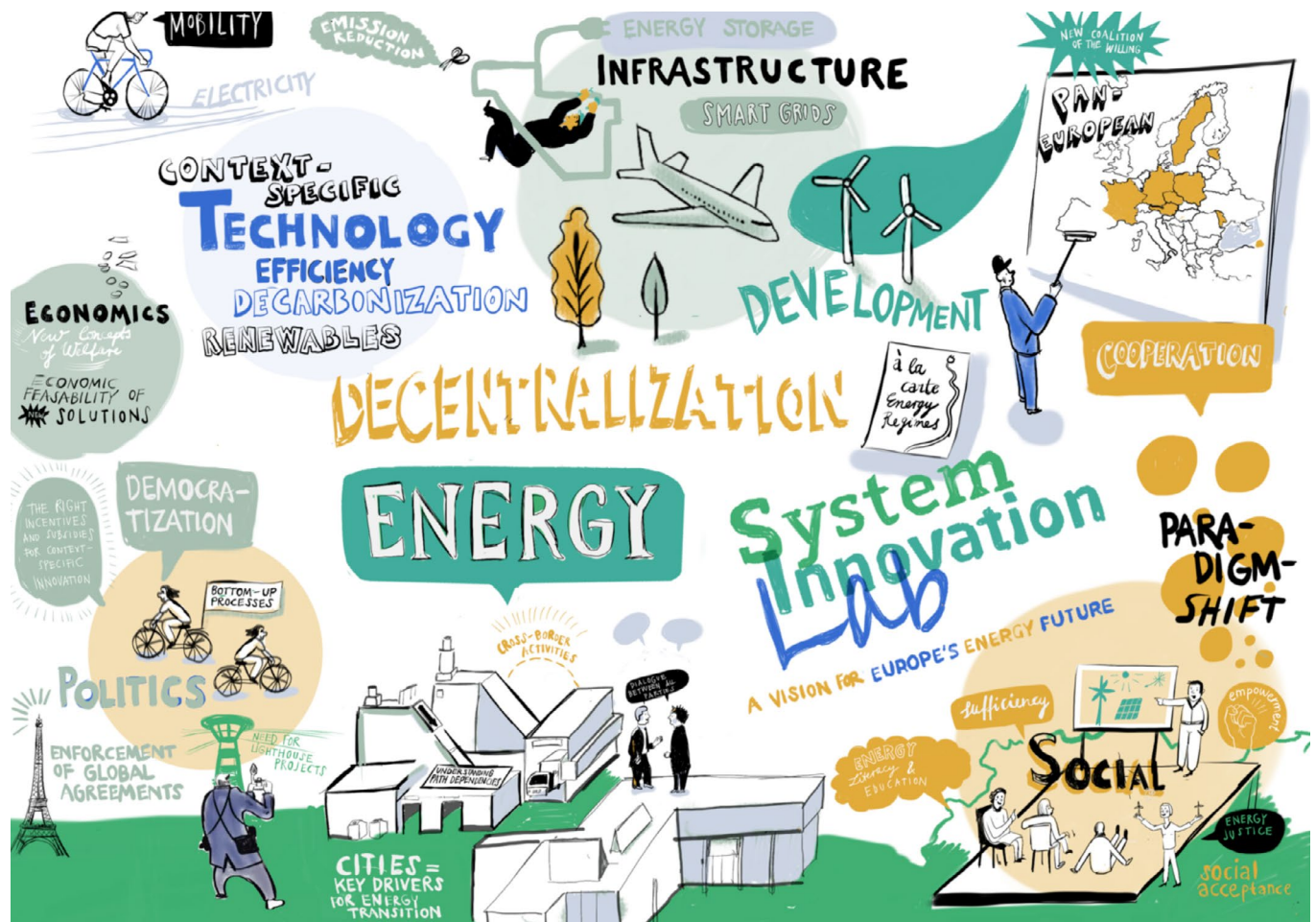
The target helps to move from the identified “wicked problem” or challenge to mapping the system that needs is relevant to its existence: the key elements and relations that give rise to the problem define the system boundaries (including all dimensions) and observing the patterns and feedback behind the behaviour and dynamics that this system shows indicates which types of interventions seem promising. Along with this ideas arise about which groups to get involved and how one could create relevance for these actors in line with their roles and identities (institutionally defined codes and currencies). In addition to institutional codes single person’s worldviews or mental models impact what is seen as desirable, feasible or promising (individual mindsets and beliefs). Finally, each change maker’s own worldviews and values will impact the entire analysis and the choice of interventions and judgment of results (my own mental model).

PUTTING THE CONCEPT INTO PRACTICE

For training purposes we developed dedicated sessions for each of the layers. The objective of the presence phases was to combine experiential learning through gaming and field trips with intellectual and personal reflection through presentations and dialogue with experts in the field or among participants. This included a newly developed simulation game, which went on for half a day. In this simulation participants experienced the complexity of implementing a transition towards renewable energy systems, and they were introduced to methods that can be applied in tackling this complexity in one's own work context (e.g. Design Thinking, System Mapping, Collective Leadership Planning, Pitch Training, and Journaling). Through elements like joint cooking, a dragon's den staging for pitch practice, and a dragon boat ride we explicitly emphasized building an atmosphere of appreciative inquiry, trust, and fun so that the benefits of a strong and dedicated peer-group could emerge.

The overall structure of the Lab and its sessions was designed along two leading approaches in conducting and understanding change processes: Transition Cycles and Theory U – combining project planning with people's awareness of their own roles in shaping the system (see: 1.1 Genesis of the Lab). This meant that the target framework was not introduced all at once but layer by layer. They were re-capped at different stages during the Lab as a means of tying things together.

ILLUSTRATION OF PARTICIPANTS' ESSAYS



The following two tables provide an overview of the presence weeks and show the combination of methods and formats. During the ten-week practice phase participants were divided into peer teams of four to five people that had bi-weekly telephone calls with one of the hosting team per group.

AGENDA | BERLIN, FEBRUARY 21-27

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
	Arrival and Get Together	Systems and their innovation	Innovation and I	Inspiration from the Field	Prototyping my own project	Strategies for exploration phase	Farewell
MORNING		Welcome and Intro Introducing Frameworks	Input How to be a change agent in complex systems	Welcome and Intro to EUREF Campus	Fast Forward Prototyping (Partner challenge Design Thinking)	Input Collective Leadership (Petra Kunkel)	Reflection with Visualization
		Systems Modeling Workshop I (Piotr Magnuszewski)	Change Maker Open Space Short inputs by changemakers & world café style discussions	Keynote Germany's Energy Transition (Peter Hennicke)	Prototyping I	Project Plan Development (Individual & Teams)	Feedback
	Arrival			Lunch with Entrepreneurs			Optional Lunch
AFTERNOON	Getting to know each other	Systems Modeling Workshop II (Piotr Magnuszewski)	Synopsis How can individuals trigger systemic change?	Outlook on Exploration Phase	Input Advocacy (Stefan Schurig)	Feedback 3 exemplary projects	
	Outlook Lab Structure, the week, Monday	Reflection of the day/outlook on the next	Reflection of the day/outlook on the next	Half-time reflection: Where do I see myself as a change maker?	Reflection of the day/outlook on next day	Reflection of the day/outlook on next day	
				Freetime	Reflection of the day/outlook on next day	Alternative City Tour	
EVENING	Dinner & Drinks	Chef's evening – Cooking night	Drinks with change makers	Optional Dinner at "Brauhaus Südsterne"	"The dragon's den" (Pitching ideas)	Craft Beer Tasting & Dinner	

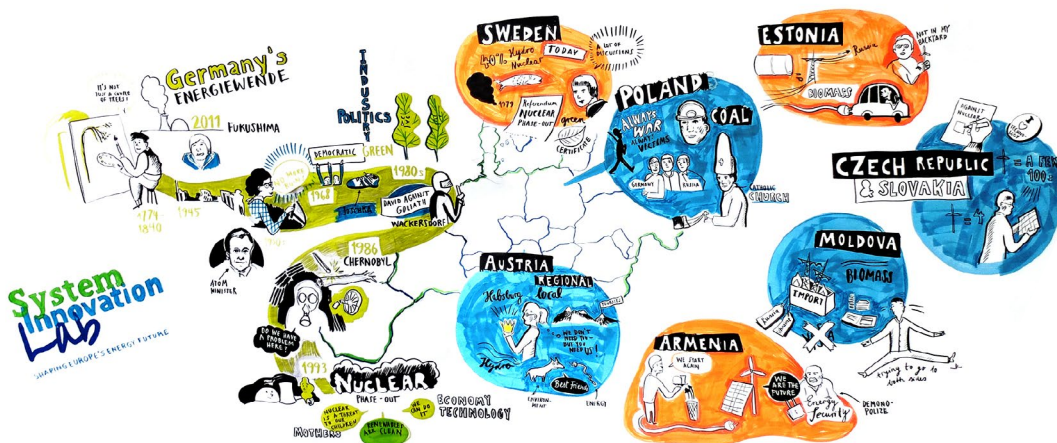
AGENDA | WARSAW, MAY 23-27

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
	Project Presentations	The Polish Energy System	Energy Perspectives & Visions	My own initiative	Feedback & Farewell
MORNING	Arrival & Optional Lunch	Reflection of Individual Learning Process Journey mapping & Dialogue Walk	The Bull's Eye applied Reflection of Tuesday	Impact Assessment Input & Exercise: Measuring your initiative's impact	Evaluation Reflection, Feedback & Outlook
		Intro to Polish Energy System Input by participant	Country Perspectives Presentation of cultural narratives		
	Lunch				
AFTERNOON	Poster Fair Presentations & discussion of initiatives	Field visits in small groups Dispatching Unit, Startup Hub and Institute for Sustainable Development	Visioning & Role Play Europe's Energy Transition – a trip to 2050 (Graphic Recording)	Reframing of initiatives Revisiting the big picture & planning next steps	Farewell & Departure
EVENING	Dinner in Warsaw	Panel Discussion The Polish Energy System and Europe	City Tour & Dinner in Warsaw	Dinner with Maciej Nowicki Discussion with the former Minister of the Environment	

RECORDING OF VISIONING



RECORDING OF COUNTRY NARRATIVES



Geels, F., Mc

- New Philanthropy Capital (NPC)** (2015). *Systems Change. A Guide to what it is and how to do it*. Abercrombie, R., Harris, E., & Wharton, R. Lankelly Chase, UK. Online at: <http://www.thinknpc.org/publications/systems-change>

- (OECD)** (2015). System Innovation: Synthesis Report.
- The Young Foundation** (2012). Social Innovation Overview: A deliverable of the project: 'The theoretical, empirical and policy foundations for building social innovation in Europe' (TEPSIE), Framework Programme, Brussels: European Commission, DG Research.

The Lab-Design: Transition Cycle And Theory-U

BACKGROUND IN BRIEF

From the complex systems point of view, the idea of a “systemic” approach summarizes the goal to think horizontally (across single departments, ministries, stakeholder groups) and holistically (across disciplines and perspectives), as well as with anticipation (focus on the desired outcome and not cling to existing processes). The assumption is that the boundaries of an effective social system will often not overlap with the ones depicted in organizational charts or constitutional charters. The emphasis thus lies on starting any analysis of a problem or situation with the question as to why it emerged in the first place or why it persists. After mapping the relationships between all relevant elements, one can see the particular system, which requires innovation in order to overcome this problem, and also which actors are key players in doing so.

By adding information about the quality of relationships between key elements (balancing or reinforcing) one moves from a static system map to a dynamic understanding of the inbuilt feedbacks that influence its behaviour and development trends. These feedbacks also influence the quality and quantity of important elements in the system, be they information, peoples’ norms and roles, economic or natural resources, or technological standards. This perspective shows why there is a lot of talk about uncertainty these days: neither elements nor relationships ever stay exactly the same, and the interdependency between different systems means that changing one system will also lead to ripple effects in others.

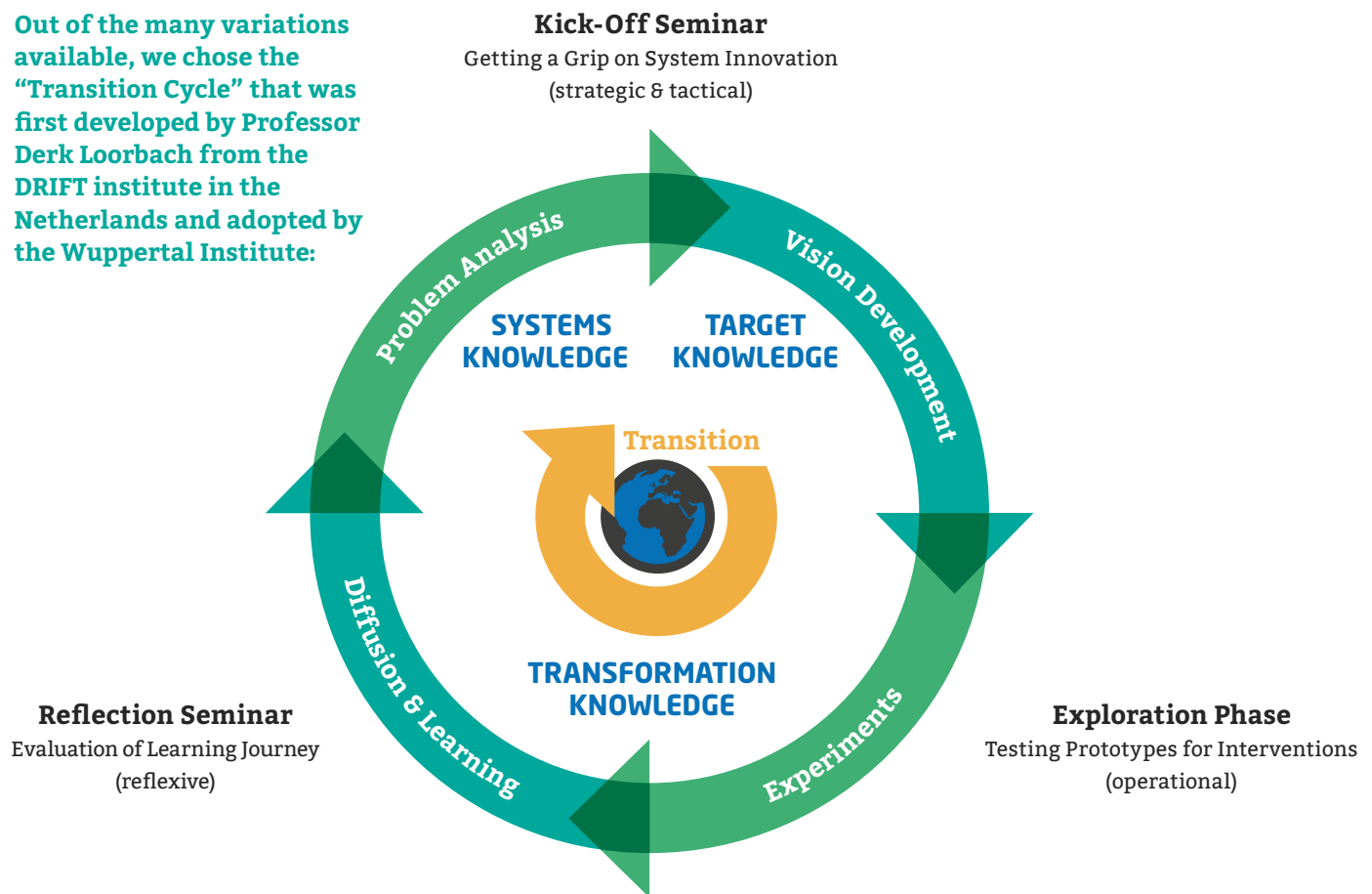
This view can be intimidating and at the same time encouraging: what seems to be a wicked or stubborn problem might at one point become solvable even through comparatively small changes at the right time and point in the system’s make up. Complex system change and system leadership scholars and practitioners therefore combine a thorough understanding of the system and a radical envisioning of how it changes with a step-by-step experimentation into that direction. The quality of these experimentations is supposed to be that of prototypes: showing quick results and causing little harm to the overall system if they fail.

STRUCTURING TWELVE WEEKS OF TRAINING: TRANSITION CYCLE

There is a four-step (sometimes five-step) circular pattern that is common to all strategic concepts dealing with systemic change (*see key caption below*):

1. System Analysis (define the problem); **2. Visioning** (design a desirable outcome); **3. Experimenting** (prototyping); and **4. Learning and Dissemination** (diffuse new insights). Ideally, this is an iterative process. One crucial element in this four-step process is the experimentation phase, indicating that something as yet “untried” is required to enable the systemic innovations deemed necessary. This is why the term “Lab” has gained such momentum: like in laboratories of natural scientists, the goal is to create safe spaces in which discovery and innovation prevail.

Out of the many variations available, we chose the “Transition Cycle” that was first developed by Professor Derk Loorbach from the DRIFT institute in the Netherlands and adopted by the Wuppertal Institute:



The Transition Cycle generally describes these four phases:

1. The strategic assessment of the problem one seeks to solve leads to a map of the system one thinks requires innovating in order to be successful. This map includes the institutions, actors, information, technologies, and norms relevant in creating the problem.
2. Based on the system map, a vision of how to change the problem-creating dynamics becomes the source of a plan of tactical interventions and which targets you seek to achieve with them: a Transition Agenda.
3. Testing possible products or technological innovations is common practice in business and equally helpful when seeking to change the dynamics or logics in a system. Testing goes hand in hand with the observations and experiences during this phase.
4. Thorough documenting during and of the operational phase allows for a thorough reflection on barriers and strategic alterations so they can be overcome. Further reflection on the material and personal resources required is important, as well as developing tacit knowledge on gauging the readiness of a system to change.

While designing this particular Lab, we put less emphasis on finding the perfect new prototype. Instead, we focussed on endowing people with the necessary skills to do this kind of work. We did so in order to pick up on **two typical shortcomings identified in the field of Lab practice and sustainability transition research**:

Deep Analysis

In real-life innovation work, especially in political or business contexts with an urge for quick answers, digging deep or mapping holistically in the phase of system analysis is often neglected. In addition, the prime emphasis is on setting various economic incentives or finding better technologies, as these promise relatively short-termed measurable or visible results. Institutional and socio-cultural change or structural adapting to ecological dynamics on the other hand are difficult to capture in standard metrics and will take more time. In effect, though, this makes unintended effects or resistances to implementation more likely, and proclaimed “solutions” temporarily alleviate the symptoms but do not eliminate the root causes of a problem.

Reflection & Iteration

The idea of an iterative process reflecting system level change is rarely adhered to, in particular when project-based funding ends after one round of testing interventions, a new reporting standard or technology has been installed, or policies are deemed to be “done” once adopted by government. Yet, systemic change takes time and persistence as well as good attention to the wider cause-effect patterns that result from the experimental interventions. Given the dynamic and interdependent nature of reality as well as delays in causes and effects, one might easily misread these relationships. Competitive cultures where short-term results determine performance judgments incentivize quick declarations of success and brushing over side-effects. This inhibits proper learning processes.

In order to pay more attention to these potentially underrepresented parts of the Transition Cycle, the Lab’s seminar phases (Kick-Off and Reflection Seminar) focus on how to carry out a thorough system analysis and achieve the best learning outcomes: the **Kick-Off** is dedicated to understanding the system relevant to one’s mission as well as one’s own potential role in changing it (Systems Knowledge). The **Reflection Seminar** focuses on conscious learning about the dynamic relations in one’s system, the accuracy of assumptions about cause-effect patterns as well as matching interventions with a system’s readiness to change. This includes observing changes in oneself (Transformation Knowledge). The actual interventions happen during the ten weeks between the Kick-Off and the Reflection Seminar called the “**Exploration Phase**.” Participants test the tools they have learned to use, implement a set of experimental interventions in support of their defined mission or challenge, and carefully document what they observe. Divided into peer groups with similar types of challenges they engage in regular exchanges, including bi-weekly mentoring calls with a Lab host. These explorations provide the basis for reflection and learning from real-world interaction so that bigger missions can be picked up after the Lab.

The Lab is thus conceptualized as the first round of a Transition Cycle that ideally leads to further, more comprehensive rounds following the Lab. The key take-away for participants is a view on leadership that fits with the complex system approach and is reflected in the five-layer didactical framework Aiming at System Innovation (see *1.1 Genesis of the Lab*)

LEADING SYSTEM INNOVATIONS COLLECTIVELY: THEORY U

One thing complex or living system approaches have in common is that they reject two ideas that traditionally have been very influential: one can solve problems by **a)** extrapolating from the past and **b)** counting on individual heroes. Instead, bringing out successful solutions is about envisioning and anticipating what might be possible and awareness for the current moment to see how it can emerge. This is what Otto Scharmer coined the term “presencing” for: it combines “sensing” (feeling the future possibility) and “presence” (the state of being in the present moment) (Presencing Institute).

This speaks to a reflexive quality of individual leadership and the important role that mind-sets play in anticipating future possibilities. Albert Einstein’s famous quote sums this up aptly: One cannot solve problems with the same mindset that created them. In addition, leading complexity requires an understanding where others in the system are and what could work for them. This element of who is something that this Lab puts additional emphasis on when introducing approaches of Collective Leadership (Petra Künkel). Collective Leadership brings together teams made up of people with complementary skill sets in order to successfully innovate systems. We emphasize this human dimension by training for literacy in the institutional and structural logics and how they shape individual behaviour, rationales, value orientations, and group dynamics.

All of these are important aspects in capturing a system’s self-organizing logics. Once we are aware of them we easily see that multiple interventions are needed, often simultaneously and based on a diversity of expertise. And that creating something new in an existing structure means that something else is discontinued, disrupted or destroyed. It requires skills to either facilitate a graceful, cooperative process of renewal and update, or to deal with the tactical resistance and power games. This involves a degree of intuition with regard to what can work and whose support will be crucial.

With this approach the Lab puts two aspects of innovation and leadership at centre stage:

1. Moving the focus from the output or products to the outcome or processes:

Leadership for system innovation means learning on the go and adapting in reflection of what happens. This is not the linear input-output planning but much more artful. Here, careful assessment of your system dynamics, its important elements and actors is essential for quick reactions, offering alternative perspectives and avenues, or also rethinking the timing of particular interventions.

2. Bringing the whole system into the room:

The root of the word leadership in Indo-European is “leit:” to go forth, to die. Given the diversity of perspectives, roles, and privileges that any status quo hosts, changing it will feel liberating or right for some and threatening or wrong for others. Agreeing on a problem is thus much easier than agreeing on how exactly to overcome it. Investing time into properly understanding and engaging with motivations and fears is crucial for change that should become the new normal - as is becoming aware of your own mental models that frame and bias what you think is best or possible.

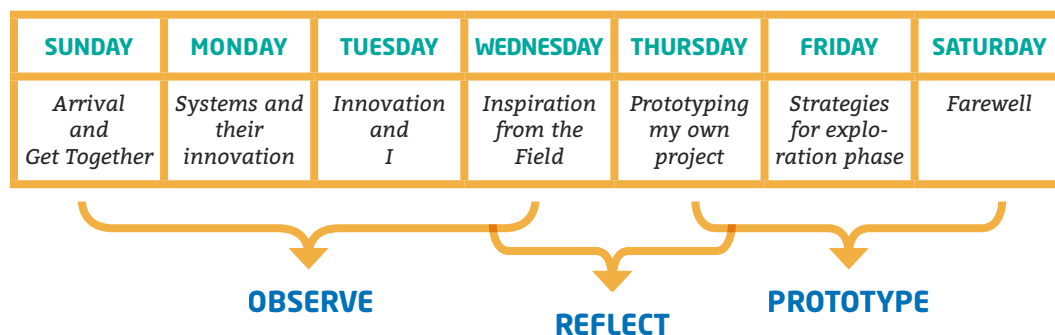
In the didactical set-up of the Lab, we followed Otto Scharmer’s Theory U as the overarching framework. Acknowledging the preceding approaches of Future Search, Deliberative Dialogue, or Appreciative Inquiry we find its dramaturgy helps to structure the process well and its emphasis on observing in the field is something that contemplative and dialogue methods cut short.



In the 2007 book Theory U has thus been presented as comprising three different components:

- **A framework** (process structure – how)
- **A method** for leading profound change (process content – what)
- **A mind-set** – connecting to the more authentic aspects of our self (under what condition)

KICK-OFF AGENDA & THEORY U



In addition to adopting the process design and some key methods like journaling or dialogue walks and field visits as well as short moments of meditative reflection, this Lab embeds the personal conditions for leading change into the five-layer framework offering a systemic understanding of the circumstances that change agents operate in (see: 1.1 Aiming at System Innovation). This means it also includes methods and tools like System Mapping, Design Thinking, Pitch Trainings or Collective Leadership Planning to get a grip on these more structural challenges.

Nevertheless, the emphasis in the whole twelve-week journey lies on inquiry, not output. The idea is to train in asking the right questions, selecting a few methods and thinking tools that help one's own system innovation journey and to create the safe space in which honest and deep mutual learning can take place.

REFERENCES

- Loorbach, D. & Rotmans, J.** (2006). Managing transitions for sustainable development. In: Understanding industrial transformation. Views from different disciplines. Dordrecht, Springer.
- Scharmer, O.** (2007). Theory U: Leading from the future as it emerges – The social technology of Presencing. Cambridge, Massachusetts: Society for Organizational Learning.
- Rodrigues, A. C., Cubista, J. & Simonsen, R.** (2014). Prototyping our future. Social labs for a sustainable, regenerative, & thriving future. Online at: <http://www.prototypingourfuture.info>

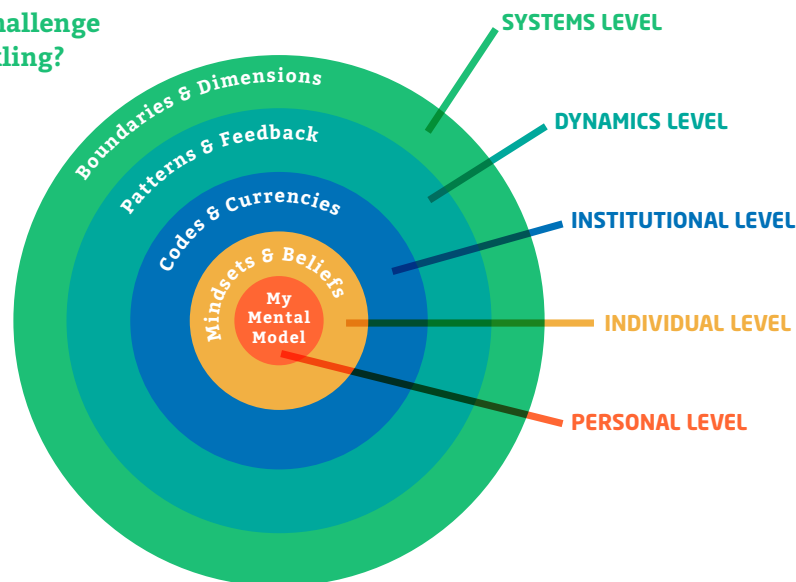
USEFUL LINKS

- The Presencing Institute:** www.presencing.com
- Social Labs:** www.social-labs.com
- Collective Leadership Institute:** www.theartofleadingcollectively.net
- Transition Research at Wuppertal Institute:** www.wupperinst.org/en/our-research/transition-research
- Drift Institute for Transitions:** www.drift.eur.nl

Factsheets for the Lab's System Innovation Framework

The System Innovation Lab is built around a five-layer framework called *Aiming at System Innovation* (see: 1.1 Genesis of the Lab).

What is the challenge that I am tackling?



This framework is based on the following assumptions, each of which is the background to one layer:

1. **We want** systemic innovation, so we make sure we capture the whole system.
2. **We say** that our system is complex, so we anticipate its change patterns to be non-linear.
3. **We operate** in historically grown circumstances, so we investigate their grammar.
4. **We acknowledge** that individual mindsets and beliefs guide human actions, so we seek to make them explicit.
5. **We know** our own mental modes frame reality, so we seek to keep them open to change.

The following factsheets each provide one key concept of sustainability transformation or social innovation research that is helpful in translating these assumptions into practice. It also provides some background information to the discourse and research that informs the concept and a list of typical challenges that emerge when working with it.

3.1

Factsheet: Mapping a holistic system perspective

We want systemic innovation, so we ensure we capture the whole system.

BACKGROUND IN BRIEF

Typically, the innovation agenda, that includes the agenda for sustainable development solutions, puts a lot of emphasis on creating new technologies and products. One important focus is to set the right (primarily economic) incentives, so that cost-benefit calculations can tip in favour of the desired consumption or investment choices. With the ascent of the social innovation agenda, attention was focused on the role that relationships, institutions and cultural framing play in societal developments and human preferences. Lastly, there are also the strong sustainability advocates who continue to highlight the need to consider how human activity impacts the reproductive circuits of natural systems, which provide the means for development in the first place.

We think that each of these perspectives addresses important points when thinking about how to set up systems that can deliver long-term sustainable outcomes. This is why our framework for system innovations combines these. The goal is to ensure a holistic view of the whole system with its technological, economic, political, socio-cultural and ecological dimensions, and to understand the interactions between its diverse elements. It is in those relational connections that we find clues about dynamics and trends. One and the same element (e.g. a technological device) can fulfil many different purposes, as was shown when scientists first split the atom: to some it was the abundant provision of energy to solve conflicts, for others it was the effective eradication of conflict by total destruction.

So system innovations are considered “radical” because they do not only change elements but also the organizing rules:

“they alter existing system dynamics, (...) entailing changes in both the components and the architecture of the systems”

(OECD 2015: p. 6)

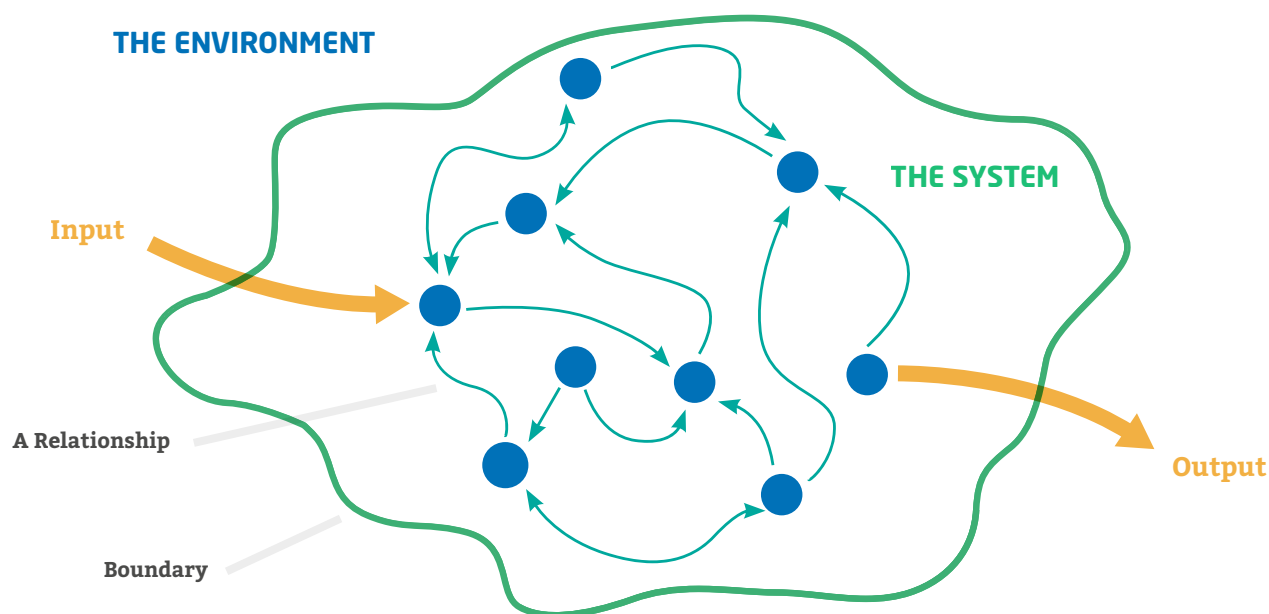
The process of innovating a system will thus dismantle former ways of doing things and establish new ones. This necessarily leads to frictions, even if everyone involved is convinced that the old solutions do not deliver any longer: it is much easier to agree on the existence of a problem than on how it might be solved. System thinking helps to see who and what is affected by suggested changes and which follow-on reactions a change in one part of the system may effect in others.

System thinking does not mean that one's innovation initiative must be huge in scope, which seems to be a common misunderstanding. Systems come in all sizes, from family to world community. They are a set of elements that are interconnected in such a way that they produce recognizable patterns of behaviour and thus have a boundary, even if it is a very permeable one. Every large-scale system is therefore composed of many subsystems and all of these are influenced by neighbouring systems. So it is important to understand such nested hierarchies or overlapping boundaries. But the actual size and shape of the system that I seek to innovate will depend on the problem that I strive to solve.

The primary challenge for a system thinking approach is therefore not so much to create something big but to capture all relevant elements and feedback relationships for my particular undertaking from a holistic point of view. These elements can be of material or immaterial quality, people or stocks of information or even a type of behaviour. The selection criterion is that they are important parts of the answer to the question why the problem I want to tackle actually occurs or persists in the first place.

Mapping tools like the one in the key caption are very helpful in creating these types of overviews for system. One starts by putting all relevant elements or variables in a particular problem on paper (people, institutions, policies, technologies, mind-sets). In the next step, one draws the connections between them: if this element or variable increases or decreases, how does it affect other elements? How does changing those elements feed back onto the elements from which the change emerged? The resulting map is the system one is dealing with.

KEY CAPTION: MAPPING THE RELEVANT SYSTEM



(Source: NPC's Systems Change guide, 2015, p. 7)

The drawing process helps you understand how elements are connected and which ones might be particularly relevant for the overall behaviour. Yet, the goal is not to map all aspects of the system. Focus on the most relevant elements and relationships and adjust the boundaries to your realms of influence or scope of resources and people you think you can mobilize. Your particular system's boundaries will then often be smaller than what the overall problem you are tackling might call for. That is fine. Changes in one subsystem will have ripple effects in connected or overarching systems.

For instance, tackling water scarcity in rural areas may involve different causes, such as household water consumption, water infrastructure, dams, deforestation, government subsidies and various incentives. Water scarcity may be related to or caused by massive water extraction in upstream countries. Typically, it is well beyond the capacities of local projects to tackle cross-border problems. Therefore, even if water scarcity is, to a significant degree, due to another country's behaviour, for reasons of project-effectiveness, the problem is better limited to internal dimensions that can be meaningfully tackled. The knowledge of crucial external factors should, however, be communicated to actors so that they may be in a better position to act on them.

CHALLENGE: CAPTURING THE WHOLE SYSTEM

Of course there are different ways that system thinking can be applied. In science one will be meticulous about identifying elements, search for quantifications and create massive system models with which simulations can be run. In the practice of leadership for change you might want to consult such models from scientists as part of generating the system knowledge or target knowledge that your initiatives are aimed at (see: 2 *The Lab-Design: Transition Cycle And Theory-U*). The goal here, however, is to train innovator capacities that help bring systemic change around in practice. **The following list thus summarizes important steps in the mapping process** while the literature recommendations provide more extensive information. The results of this type of system mapping are “mental models:” explicit and transparent visualizations of understanding the problem at hand.

Define your problem and derive your system's boundaries

A first and essential step is to clearly define the problem or goal that you want to take on. From this come your system's boundaries: they should be sufficiently wide to involve the primarily affected elements but also avoid a superfluous illustration of all potential ones. After a first collection, three categories can help: (a) internal aspects affecting the problem and being impacted by the problem in return; (b) external factors influencing the system and the problem, but without a direct cause-effect relationship; and (c) entirely excluded elements that should be erased. The rule of thumb is that including fewer elements will be more indicative of the total dynamic of the problem, but fewer than eight to ten elements hardly capture complexity.

Checking for elements in all system dimensions

The second step is to check for the five dimensions: have I really thought about all relevant elements and feedback relations? Especially the ecological and socio-cultural aspects are often given too little attention because they are soft variables that cannot be quantified. Thus, guiding the mapping process with questions like “why is xyz happening” can help to include aspects for which little hard data is available (e.g. “environmental policy” or “consumerist norms”). The dimensions are of course not clear-cut categories but another rule-of-thumb reminder to install a holistic view. Not every project will have relevant elements in all dimensions.

Mapping the dynamics of your system

Based on the network image a third step adds the dynamics and trends. It adds information about the quality of relations or feedbacks. There are only two directions here: more or less, positive or negative cause-effect relations usually indicated with a + or – sign. They work as reinforcing and balancing relations and underpin trends: unsustainable consumption, for example, is higher when consumerist norms prevail, which go up when lots of advertising is around - and while environmental policy might lower unsustainable consumption, its voluntary labelling might not be strong enough to counter the reinforcing feedback of advertising.

Getting literate in common patterns

There are some feedback patterns and thus types of system behaviour that one can observe in many systems. In his article, William Braun has collected them under the term “System Archetypes” (Braun, 2002). Knowing these will ease your search for patterns and typical system structures in your own context – but should not keep you from thinking through the details of your given situation.

Using mapping tools as means of communication

In addition to using mapping tools for your individual clarification of the sources of a problem you can also use them as a means of communication. Doing a group mapping exercise, or at least gathering feedback on maps that you drew is very helpful to guide a conversation about different assumptions, overlooked parameters and in the end a joint picture about what is at stake. One benefit of system mapping in multi-stakeholder processes is that they do not need any jargon when describing which elements and relations are important. Everyone can say what they see to be a relevant variable and why. This allows connecting different mind-sets or disciplines by drawing and explaining connections until a joint image of the issue emerges.

Getting out of the blame game

Also, working with system mapping can help a cultural shift to move away from blaming single actors or events to searching for structural patterns that keep all actors from achieving what they individually aspire to. It also shows that some problems will persist until some proper structural changes are undertaken:

“No one deliberately creates those problems, no one wants them to persist, but they persist nonetheless. That is because they are intrinsically system problems – undesirable behaviours characteristic of the system structures that produce them. They will yield only as we reclaim our intuition, stop casting blame, see the system as the source of its own problems, and find the courage and wisdom to restructure it”

(Meadows 2008, p. 4)

REFERENCES

NPC (2015). Systems change. A guide to what it is and how to do it. Abercrombie, R., Harris, E., & Wharton, R., Lankelly Chase, UK. Online at: <http://www.thinknpc.org/publications/systems-change/>. Graph adapted from Flood, R. and Jackson, M. (1993) Creative problem solving: Totalsystems intervention. Wiley. Fig 1.1, pp. 6

Haraldsson, H. (2004). Introduction to System Thinking and Causal Loop Diagrams. Lund University, Sweden. Online at: http://cmap.crs.org.pl:4444/rid=1244140954250_1167059429_1461/Introduction%20to%20Systems%20and%20Causal%20Loop%20Diagrams.pdf

Meadows, D. (2008). Thinking in systems. A primer. White River Junction: Chelsea Green Publishing Company.

OECD (2015). System Innovation: Synthesis Report. Online at: https://www.innovationpolicyplatform.org/sites/default/files/general/SYSTEMINNOVATION_FINALREPORT.pdf

Braun, W. (2002). The System Archetypes. Albany University. Online at: http://www.albany.edu/faculty/gpr/PAD724/724WebArticles/sys_archetypes.pdf

3.2

Factsheet: Understanding complex system relations

We say that our system is complex, so we anticipate its change patterns to be non-linear.

BACKGROUND IN BRIEF

Equipped with a system map that expresses the ideas about the dynamics behind a problem one can create a theory of change: given that we would like abc to stop or xyz to happen, which interventions could help unlock the relations or structures that perpetuate abc? Or alternatively: which new connections or elements would enable a dynamic to get to xyz? Such a theory of change is less about defining the exact steps to take over a particular period of time but to express the assumptions about the root causes of a problem and how these could best be addressed. The actual strategy would of course list specific interventions but they are viewed as evolving experiments with flexible timing and room for modification rather than set in stone. Given the often time-delayed and sometimes spatially remote cause-effect relations, complex systems often show non-linear change patterns and unexpected behaviour. It is thus important to continue observing how the system reacts. Next steps should be adjusted accordingly.

Three observations of characteristics of complex systems seem particularly helpful for an understanding of possible delays and non-linear happenings:

Stocks and flows

Elements of systems need not be of material quality. They can also be, for example, people, stored information, knowledge, or virtual money. Accumulations of elements, material or immaterial, are viewed as **stocks of resources that can be drawn on as the system functions**. These are interconnected. These relationships are also called feedback loops or flows, which can be energy, material or information. **Flows determine changes in each stock's quality or quantity**; a positive or reinforcing feedback means that upping one stock will also increase the connected stock, whereas a negative or balancing feedback means the opposite. As a result, **living systems, unlike machines, are self-organizing entities** and can at least partially compensate for changing conditions in their environment or within them. One prime example is the CO₂ circuit: small changes in input (more CO₂ in the atmosphere) will not directly change the output (stable climate) if some stocks are available to buffer the change (oceans, forests, soils that can capture more CO₂). Thus, we cannot expect every change in input to quickly show as a change in output.

Balancing or reinforcing feedback

Whether or not a system stays in a **rather stable dynamic equilibrium** depends on the type of feedback in a system (in political terms: whether things run rather smoothly), and how it will react to changes in its inputs or environmental conditions. Systems thinking dubs **negative feedback as balancing** because it counters a trend: changes of a stock in one direction (growing number of cars) can be balanced by changes in another stock (more and more traffic jams which makes using cars less attractive). **Positive feedback on the other hand will accelerate a trend** and is also called amplifying feedback (building more parking lots and roads). This feedback will lead to a break in the former dynamic equilibrium (conflict over land use choices, pollution and tax expenditures) and thus create a crisis for the system: things cannot continue as they were and adjustments are necessary. How these adjustments are chosen will influence if the crisis is solved and how. A next dynamic equilibrium can be either similar to the old one (still a car-based mobility system) or transformed (mobility is served by multiple modes of transport). In the context of climate change, we find the concept of run-away climate change as an example for positive feedback. It expresses how reaching a certain level of CO₂ concentration causes even more emissions from new sources: Take, for example, the effect melting glaciers have on oceans' acidification and temperature. This in turn diminishes CO₂ absorption, which then leads to further melting, potentially setting free methane from the permafrost, causing more climatic turbulences like storms and draughts, which then has an effect on soil fertility and, consequently, the capacity to absorb CO₂.

Tipping points

Tipping points are the moments of run-away feedback and also called "**the moment of critical mass**" or a "**threshold**." From the perspective of system innovation they are also considered **windows of opportunity**, because at this stage the dynamic equilibrium of a system becomes brittle. As long as the stocks were not run down they function like saving accounts, which can be drawn on for some time without harm to the system's reproduction (fertile soils for increased food production for a growing world population; or the cultural narrative of the "trickle-down" effect in economics – if the richer get rich, some of their wealth will trickle down to the poor). But without changes able to balance the crediting trend, **the system capacities to balance and buffer runs down** and a crisis emerges (intensive agriculture leads to unfertile soil and crop failures, resulting in increased conversion of forested land into farmland in an unsustainable farming system; or too many reports about the distribution of wealth create anger about cuts in government spending for social services, while taxation of wealth is exempted as it could be invested for everyone's benefit). Generally, tipping points are the moments of politicization when a lot of change will happen in a short period of time. How such a crisis will be solved depends on the available ideas and solutions and the people promoting them.

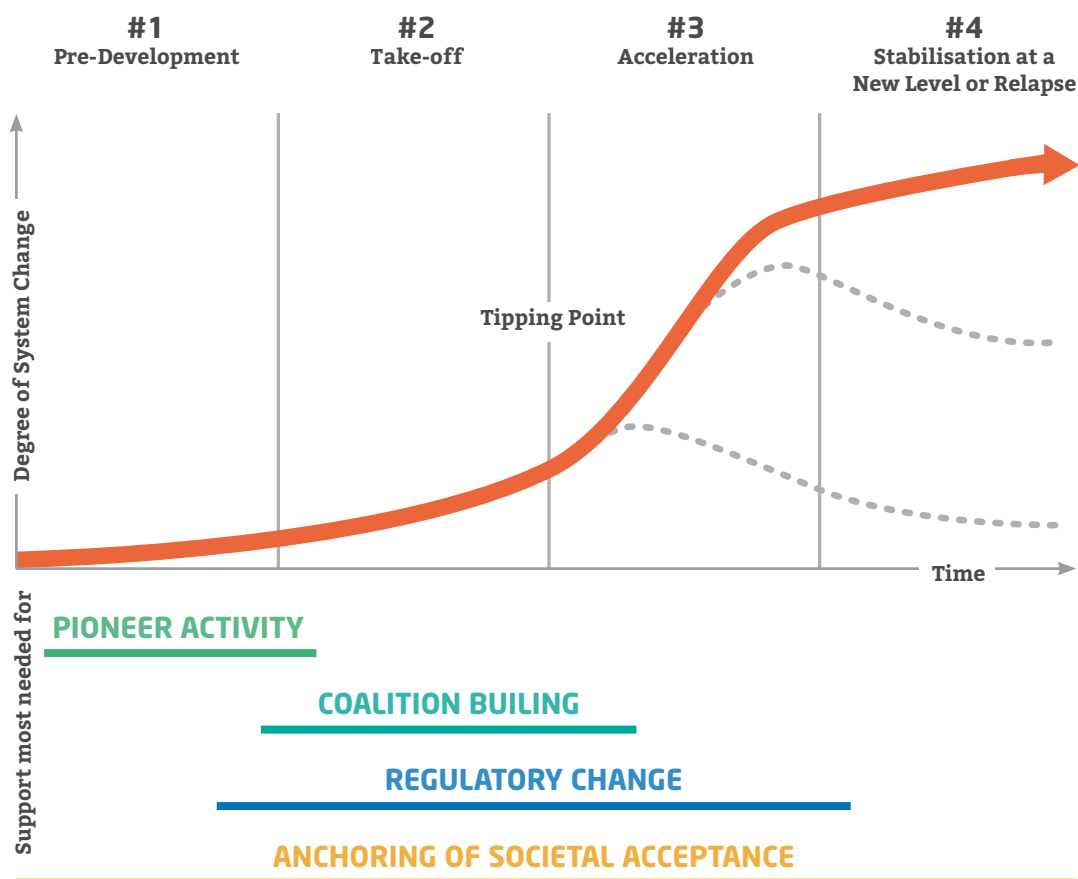
"All 'normal change' solutions keep line with the purpose driving the self-organising dynamics of a system. What is aimed for is a change in outcome, but not necessarily of the processes that lie behind the outcome. The general paradigm and existing standards on how to do things are not challenged, the old path dependencies remain intact, and the same pattern of development is to be expected.

Transformational change, however, means discontinuing path dependencies and changing dominant feedback loops so that the entire set-up of what is aimed for and how will be different."

(Göpel, Navigating a New Agenda, p. 13)

One concept that captures these non-linear dynamic of complex system changes is the multi-phase-concept. It shows that changes in complex systems do not unfold in an obvious and linear manner, where the dosage of change-input equals that of change-output.

KEY CAPTION: MULTIPHASE-CONCEPT OF SYSTEM INNOVATIONS



(Source: adapted from Mersmann et.al. 2014, p. 34)

System transformations happen through a build-up in which only little seems to be happening: There might be some evidence about climate change and limits to fossil fuel usage. So, a few people start acting on it by spreading the news, engaging in research on alternative energy sources, thinking about where energy use could be substituted and how and which rules this would take. Some pioneers start creating alternative energy technologies that do not rely on fossil fuels, and they seek to find investors or consumers that would use their new solutions.

For a long time, this remains the undertaking of niche players, but in the long run both awareness and ideas about what could be changed intensify and computational power improves its capacity in showing the trends and effects of climate change, shifting the scientific consensus to stating that quick changes are necessary. In their totality, these diverse factors work as an amplifying feedback until a critical mass is reached – here indicated as the “tipping point” – where the perpetuation of the former ways of doing things becomes unfeasible. What follows is an acceleration period, where the crisis is clearly visible, resulting in an intense search and struggle over possible solutions to balance the positive feedback into a rather stable dynamic equilibrium again (or: political agreement).

CHALLENGE: FINDING AN ADAPTIVE THEORY OF CHANGE

The multi-phase pattern shows why system innovations take time: Looking for too much change too quickly can easily cause resistance or disturb the relationships or structures to a degree that the system's continuation is at risk. Planning successful interventions therefore should bear the following points in mind:

Getting a feel for the readiness of your system

The multi-phase concept posits that a system needs to be “ready” in order to achieve a successful innovation strategy. In practice this often means talking to many stakeholders in the system to get a feel about ideas, initiatives and groups of interest. In your concrete activities it probably means starting with small and subtle interventions to see what catches on.

Timing is essential

Unless there is a degree of real or at least perceived crisis (including the imagination that things would be better if xyz happened) it is very tough to find support for change. Timing of interventions is therefore key: the same thing can fail today, but it can work in two years time, depending on the system's readiness for change. The key caption therefore shows what kind of activities are promising interventions in each of the different phases.

Reality is not an S-curve

The S-shape of the pattern should not suggest that this is a new smooth line to follow in planning change. It is an idealized model of a longer-term process whose line would resemble a stock market curve. Reality will feel like a rocky ride with periods of stalemate, hectic activity, progress and backlashes.

“Soft” factors matter

Whether or not a crisis is viewed as negative (risk for something good to fail) or positive (finally a chance to change things) will depend on the values, norms and goals of the people and groups observing and engaging in it. For change agents that want to use or even trigger a crisis and thus have room for experimenting, it is therefore important to provide convincing narratives or evidence of how things can or should be improved or changed if xyz changes. This is why soft factors like mind-sets, beliefs, knowledge, and vision matter.

Tackling problems collectively

You cannot combine all the skills and expertise of innovating a system in yourself. All social system change experts therefore point to the importance of a collective approach. The NPC's guide on Systems Change summarizes key principles of such strategies as follows (NPC 2015, p.41):

Preparing and Planning System Change:

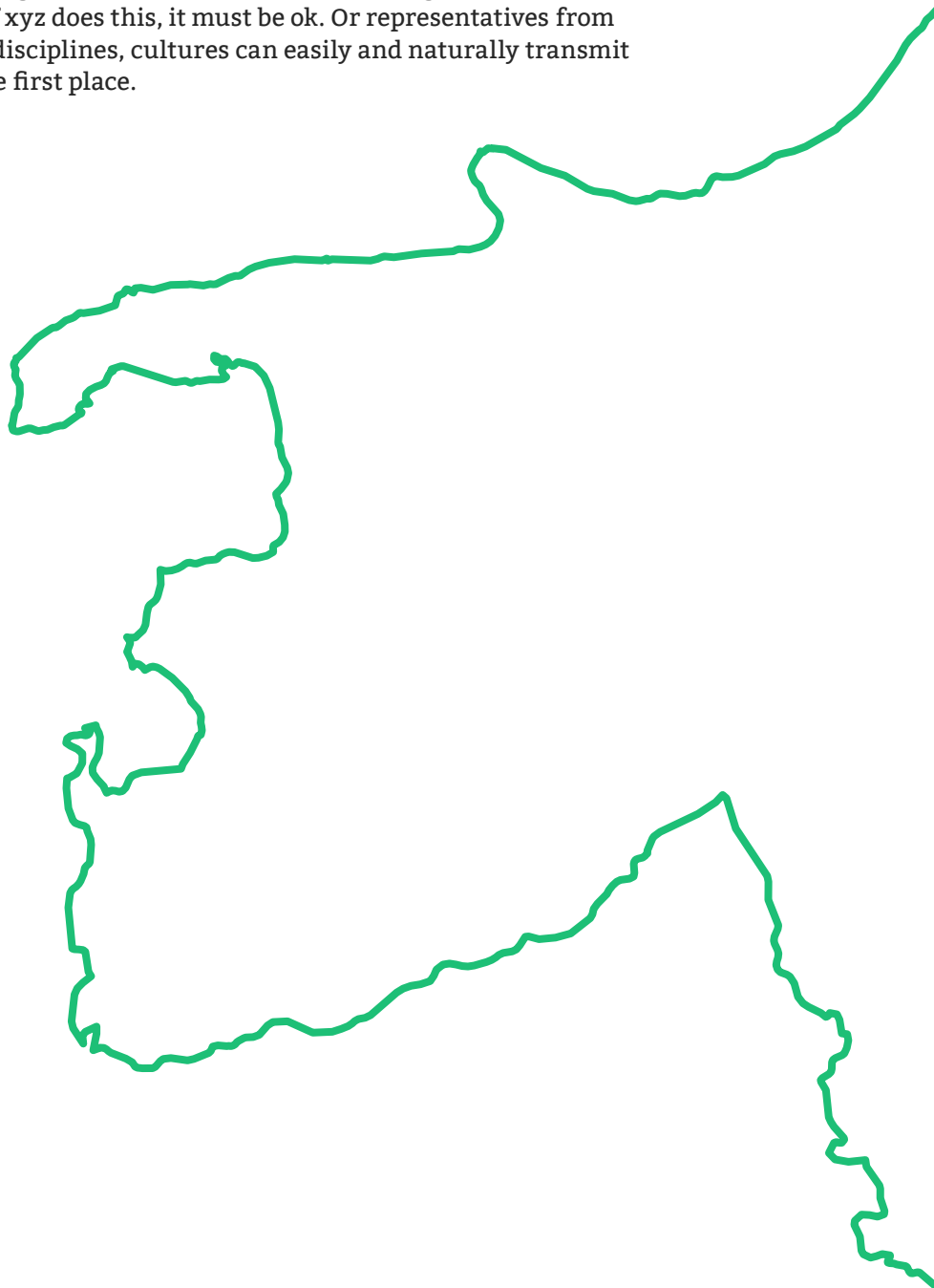
- Understand needs and assets
- Engage multiple stakeholders
- Map the system

Doing System Change:

- Do it together
- Distribute Leadership
- Foster a learning culture

Redefining your system when things don't move forward

Sometimes, when you feel stuck, it can help to extend the boundaries of what you think your system or realm of influence is. Which relationships with totally unexpected allies from neighbouring systems, from other countries, from subsystems could work for your ideas? What could collaboration with these look like and how could it lead to new connections and sustain or reinvigorate a change process that does not seem to move forward? This might help you address very typical resistance patterns and taking the risks and efforts that stepping outside of the mainstream entails: wow, if xyz does this, it must be ok. Or representatives from other institutional set-ups, disciplines, cultures can easily and naturally transmit what you meant to say in the first place.



REFERENCES

NPC (2015). Systems change. A guide to what it is and how to do it. Abercrombie, R., Harris, E., & Wharton, R. Lankelly Chase, UK. Online at: <http://www.thinknpc.org/publications/systems-change>

Göpel, M. (2014). Navigating a new agenda. Question and answers on transformational change. Online at: <http://epub.wupperinst.org/frontdoor/index/index/docId/5517>

Grin, J., Rotmans, J. & Schot, J. W. (2010). Transitions to sustainable development: new directions in the study of long term transformative change. New York: Routledge.

Mersmann, F., Wehnert, T., Göpel, M., Arens, S. & Uji, O. (2014). Shifting paradigms: Unpacking transformation for climate action. A guidebook for climate finance & development practitioners. Berlin: Wuppertal Institute for Climate, Environment, Energy. Online at: <http://epub.wupperinst.org/frontdoor/index/index/docId/5518>

3.3

Factsheet: Codes and currencies in the system

We operate in historically grown circumstances, so we investigate their grammar.

BACKGROUND IN BRIEF

System thinking captures the characteristics of elements with reference to the wholeness they are embedded in: without understanding the relationships and feedbacks around them, we miss out on key characteristics of single elements and how these may differ in a number of settings. Humans, for example, will behave in a certain way when at home (as part of the family nucleus), in the office (part of the work nucleus), or playing soccer (part of the team nucleus). They play different roles shaped by expectations and routine procedures set up in that particular context. Anecdotal evidence has it that many managers report to have to leave their private persona behind when they enter the office in order to be able to perform professionally.

Thus, people do not operate in a vacuum but in relation to the institutions and communities that they seek to be a part of and the individuals and groups they wish to cooperate with. For the creation of successful change initiatives it is therefore important to be aware of such contextual differences and to respect that different people may have different rational reasons for doing things a certain way. In order to raise the willingness to act in others I want to ensure that my proposals resonate with the place or people I want to address. Social science traditions of system analysis have come forward with some categorizations of typical societal subsystems, like markets, government, civil society, family, etc. Each of the sub-systems fulfils different primary functions and has developed system set-ups that seem conducive to fulfilling that function – or at least seemed conducive to it at the time of their creation.

“If a factory is torn down but the rationality which produced it is left standing, then that rationality will simply produce another factory. If a revolution destroys a government, but the systematic patterns of thought that produced that government are left intact, then those patterns will repeat themselves ... there’s so much talk about the system. And so little understanding.”

ROBERT PIRSIG, writer and philosopher

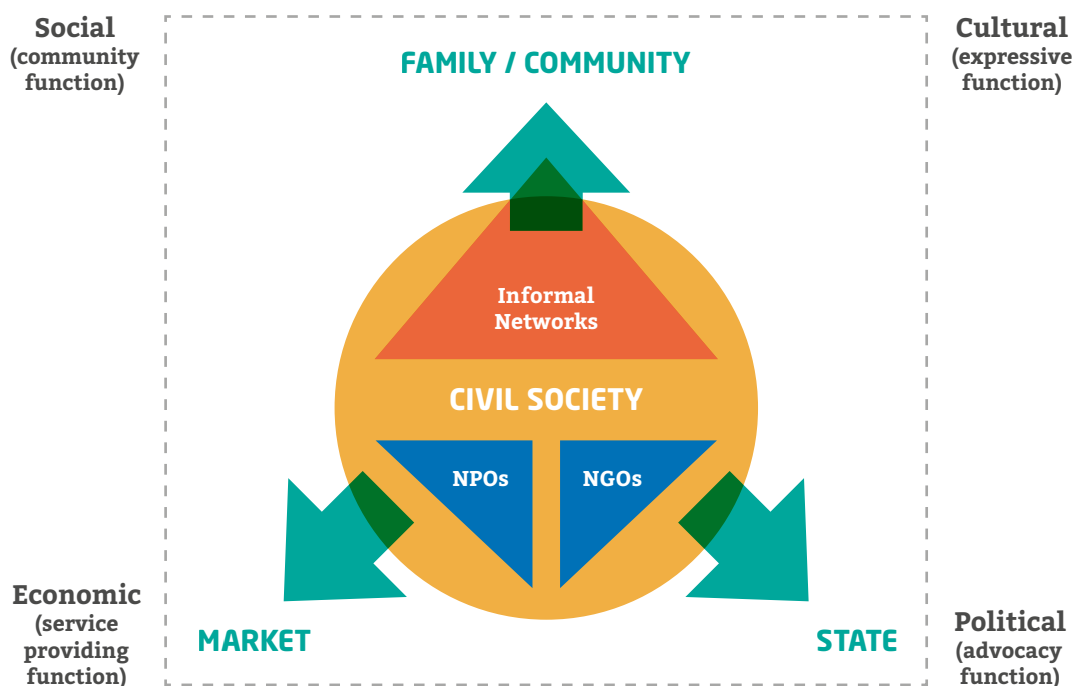
The resulting set up involves **typical practices (codes of conduct), language (codes of information) and currencies (incentives)**. The key caption here differentiates three big archetypical subsystems in society: markets or businesses systems work with money and prices because their primary function is to create economic output. The political system is said to use power and connections as its lead currency because its

primary function is to make and implement rules. Civil society on the other hand works with legitimacy, urgency or need claims because the primary function of the third sector lies in promoting issues of general interest. Similar coding differences can be observed along sectoral or disciplinary demarcations: industry and its business models are different from services or cultural production, and an economist uses codes different from those used by a biologist or social scientist when describing one and the same phenomenon – say: sustainable energy systems.

In Europe the discussions about renewable energy are strongly framed by the objective to reduce greenhouse gas emissions. Even if other aspects of renewables are also promoted (job creation, reducing energy imports etc.), climate protection is always acknowledged as the one key benefit, selling the topic primarily on the currencies of environmental need and urgency.

The discussion on renewables in the last decade in the US showed quite different features. Due to the fact that climate sceptics were very strong in the US (and still are much stronger than in Europe) the promoters of renewables could not build on the need and urgency currencies of the climate change discourse. They opted for framing renewables as innovative technologies, which support both local jobs and the USA's global competitiveness. The currencies here were money and the need argument, but more in relation to jobs than environmental protection. Obviously, there was a profound difference between both evidence sourcing and presentation amongst successful European and US initiatives.

KEY CAPTION: ARCHETYPES OF SOCIETAL SUBSYSTEMS



(Adapted from: Then & Kehl, 2012, p. 60)

The key message for system innovation leaders on this level is simply to acknowledge differences in how the world and its workings are captured and how this affects the outlook on what is a good or bad solution to a problem. It is not yet about judging any of the codes or currencies from a normative point of view. One can of course engage in discussions about the suitability of existing set-ups for the primary function that these subsystems were set up for. Creating a system map that will illustrate some key characteristics of the status quo and which feedback loops emerge from that would be one way to do this.

CHALLENGE: ADAPTING TO GRAMMAR WITHOUT LOSING ESSENCE

Understanding codes and currencies of a particular system is vital to understanding its way of stabilizing and reproducing itself. In order to operate within the system but also in order to change the system from within, it is necessary to use its grammar, however without losing sight of the meta-perspective. The following list provides some important aspects to remember with regards to a system's grammar:

Recognizing the importance of path dependencies

All living systems have self-stabilizing feedback loops. Pushing for too much change too quickly might cause defensive behaviour. In biological systems one easily sees how the goal of survival is guarded by multiple mechanisms that fight disruptive or intrusive attacks. In social systems we can observe similar traits that are often called "path dependencies:" deviating from status quo arrangements usually causes higher transaction costs, might well uproot privileges and threaten habits, go against the codes of conduct, or challenge personal identities and goals. Try dissecting those personal fears and interests from presumably factual arguments as to what you propose is not possible in the institution, sector, discipline or situation.

Stepping out of path dependencies takes investment and time

Within the given circumstances of quantitative key performance indicators, monitoring systems, metrics and incentive schemes it is difficult to sell the importance of lending time to assess structural system behaviour and translate between codes and currencies. We all talk about transformation and getting out of silo-thinking and silo-institutions. In view of the demand for quick and measurable results, it is difficult to move out of established ways of doing things. Breaking out of path dependencies takes more investment of time, money, energy and creativity than business as usual.

Getting people on-board and preparing for resistance

Promoting a particular change initiative means finding the balance between selling your idea well and not losing its innovative edge. The closer your innovation ideas come to challenging the primary function of the system you are addressing, the more resistance you will get: if you change the function or purpose this will likely lead to a whole lot of changes in people's roles, privileges, identities and familiar ways of being and acting. So prepare for resistance, think through the currencies with which you can gather support from different stakeholders, but do not compromise your original goal too much. Often it simply takes more time and more visible crisis to attract more people.

Using codes & currencies to make your ideas resonate with people

When thinking about promoting your change initiative, clarity about the institutional codes and identities in your system helps you to frame your ideas so that they resonate or sound relevant to the people you speak to. This does not mean that you should manipulate information. It means being clear about the essence of what you would like to say and to find the best terms of expression that would convey this essence to your audience. It also means holding your own convictions lightly and to be open to learn where your perspective might be biased or incomplete.

REFERENCES

- Beddoe, R., Costanza, R., Farley, J., Garza, E., Kent, J., Kubiszewski, I., Martinez, L., McCowen, T., Murphy, K., Myers, N., Ogden, Z., Stapleton, K. & Woodward, J.** (2009). Overcoming systemic roadblocks to sustainability: The evolutionary redesign of worldviews, institutions, and technologies. Washington: PNAS.
- Myers, N. & Kent, J.** (2008). The citizen is willing, but society won't deliver. The problem of institutional roadblocks. Iisd. Winnipeg, Manitoba. Online at: <http://www.iisd.org/pdf/2008/thecitizeniswilling.pdf>
- Probst, G. & Bassi, A.** (2014). Tackling complexity. A systemic approach for decision makers. Sheffield: Greenleaf Publishing Ltd.
- Then, V. & Kehl, K.** (2012). Social investment: A sociological outline. Paper presented at ISTR's 10th International Conference on 'Democratization, Marketization, and the Third Sector' 2012, Siena, Italy. Online at: http://www.csi.uni-heidelberg.de/downloads/ISTR_Paper_Social_Investment_20120723_KK_VT.pdf

3.4

Factsheet: The source of systems: Mind-sets and beliefs

We acknowledge that individual mind-sets and beliefs guide human actions, so we seek to make them explicit.

BACKGROUND IN BRIEF

As a purposefully acting species, humans design relationships, institutions, technologies and infrastructures to create the goods and services deemed necessary or desirable. They do so with ideas in mind about cause-effect relations and values-based judgments about what seems just, right or desirable. These ideas do not fall from the sky. They are learned, as the term “socialization” indicates. Social sciences speak of **paradigms, worldviews, mind-sets or mental models** when pointing out that people work with “filters” to make sense of the world and to orientate themselves in it. These filters simplify reality and lead to routines, habits and typical explanations and rationalizations of why we do things and how.

This is unavoidable, normal, and often unproblematic. But when we seek to find out why problems persist and how else things could be done, a conscious reflection about the framing effects and blind spots in mainstream mind-sets or common sense may lead to great insights:

“The complexity of these processes of transformation raises a number of questions, most notably about people’s capacity to imagine futures that are not based on hidden, unexamined and sometimes flawed assumptions about present and past systems.”

(World Social Sciences Report, 2013: 8)

Systematically exposing blind spots that come with codes, currencies and thought traditions behind different types of expertise can help a group to experiment with novel frames when speaking about the same problem. It holds the potential to overcome divisions that stem from simple translation challenges and foster the notions of alternative solutions.

The same holds true when seeking to **understand why people disagree about the “best” way forward.** It often stems from a different way of seeing what is at stake, such as different assumptions about cause and effect relations. In science, one uses the term “paradigm” to highlight these differences. Diverging assumptions that are epistemological (what can we know?), ontological (what can be said to exist and how do we group it?), and methodological (which guideline and framework for tackling a

problem is suitable?) will lead to very different interpretations of one and the same event: If I believe that humans are by nature selfish and greedy, for example, my interpretation will differ from one where my premise is that humans are very much capable of being altruistic and sharing but may simply not know about particular consequences of their actions.

Consequently, **this will also influence value judgments around what is deemed a just or appropriate solution.** For example, if I believe that markets allocate revenues in line with the contribution that someone made to society I want very different policies than someone who believes market prices are manipulated by the powerful players – even if we both subscribe to the values of fairness and want a just distribution of wealth. **In addition, there are a lot of different cultural norms and values** that would persist even if one agreed on the cause and effect relations (child labour, women's rights etc.).

In effect this means that changing the way we see the world also changes the way we imagine promising and desirable solutions and their sound governance.

In groups that want to work together, finding a joint picture of what is at stake and a joint language to speak about their plans is therefore a very important first step. And, according to Meadows (1999), it could well be the highest leverage point for change: Once the overarching ideas and goals around the primary function that should be served are changed, the adequacy of existing institutions and structures in total become relevant, including the established codes and currencies. **Many new solutions that were formerly unthinkable become possible alternatives.**

The great news is that this particular engagement is open to all of us: questioning the typical answers, providing other points of view on the same issue, presenting information about how things are done differently elsewhere. The invitation is to let go of the old ways of seeing and judging things and to open up to what could become imaginable, possible, desirable or even necessary if another perspective is adopted.

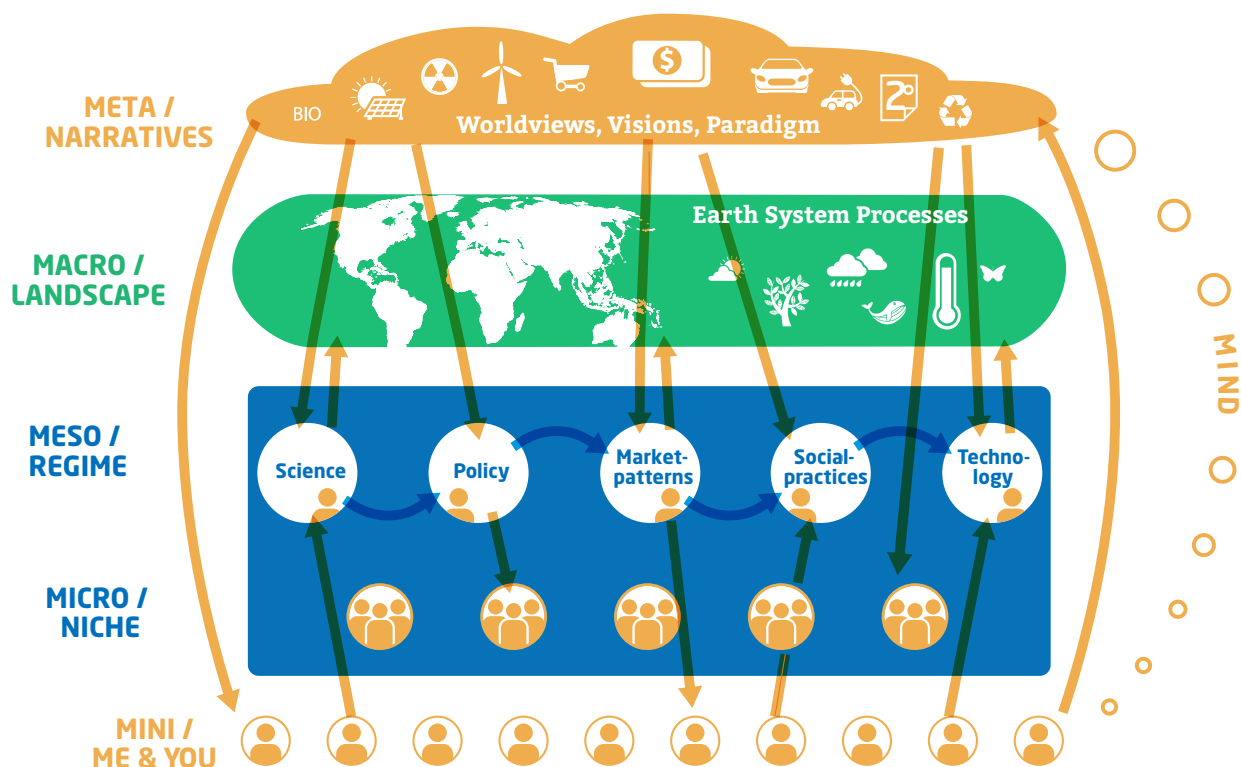
This does include simply re-affirming primary functions of existing subsystems and discussing which roles such designed institutions should therefore take on in steering a society: if businesses primarily pursue maximizing economic output and speak in profit and money terms, their primary role cannot be to identify and voluntarily implement best sustainability production standards. This will be the role of science (set out with the primary purpose to generate knowledge and express it in appropriate quantitative or qualitative terms) and policy (primary purpose to agree and protect the common good and to define and communicate taxes, subsidies, competitiveness and reporting benchmarks accordingly). Aligning the division of labour in society with the primary function or purpose that institutions were built for would be a highly transformational agenda.

Such processes of large-scale transformation are by definition the cumulative result of multiple changes occurring at the same time. Sustainability transition or transformation research uses the so-called Multi-Level Perspective developed by Frank Geels to capture the interplay between sub-system change and societal development (*see key caption*). It differentiates three societal levels according to the resistance to change due to the multiple path dependencies that need to be overcome:

On the **niche or micro level** we find small-scale projects and initiatives, “pioneers” who do things differently. They do not have to deal with many existing path dependencies and can experiment freely. Yet, their development is also significantly influenced by the overarching systems that reside on the **regime or meso-level**. Here, the resistance to change is much stronger because of multifarious interconnections and players involved. On the **landscape or macro-level** we find all those aspects that change rather slowly and are difficult to tackle directly for individual actors. In the original version this level includes hard infrastructure, and the environmental matters and paradigms or worldviews. This graph highlights that increasing amounts of pioneering alternatives are likely to shake the regime structures enough to cause changes in them as well. So the dynamic interplay between the layers resembles the process idea of the multi-phase concept: **A build-up is needed until changes happen.**

When talking to individuals and their capacity as innovators or change makers, however, this graph’s levels are still too encompassing. So we amended it by adding two more levels: mini for each person and meta for the mind-sets that inform every person’s decision, be they member of a niche or regime system.

KEY CAPTION: MINDSETS CONNECT SMALL AND BIG SYSTEM INNOVATIONS



(Source: Göpel 2016, amending Geels’ Multi-Level Perspective)

Through this amendment we can see that changing mindsets in effect connects small contributions for small system innovations with the large-scale change that transformation theory foresees. The orange arrows illustrate how beliefs and mindsets function as the glue that holds societies together. Paradigms serve as a reference framework for individual strategies and narratives. They are embedded in the regime level as well as in niche projects. At the same time, individual mindsets might carry alternative paradigms that influence pioneering strategies and regime practices. You and me can develop pioneering initiatives based on a new mindset but also engage in general paradigm-busting work that challenges the dominant paradigm and thus also the solutions and structures based on it or justified by it.

A shift in mindsets therefore plays two important roles in system innovations: first, it accelerates positive feedback deviating from the established way of doing things (*see first two steps in multi-phase concept on factsheet 3.2*); when tipping points are reached, however, it serves as the glue or narrative that helps to bind multiple possible solutions into a new coalition and institutional structure.

CHALLENGE: CHANGING MINDSETS IS UNCOMFORTABLE

Changing mindsets is the biggest leverage point when trying to change a system – and it is, at the same time, one of the most difficult undertakings. It is important to consider the following aspects when tackling the meta-level (mindsets and narratives) of a socio-technical system:

Changing mindsets as one of the hardest tasks

Researchers have pointed to the “Worldview Backfire Effect” by showing how some people are so firmly settled in their views that being confronted with counter-arguments can cause their views to be strengthened. So be cautious about who to invite into your innovation team and how you present your information: if you frame it carefully or combine its delivery with self-affirmation exercises it can be easier. The latter tend to motivate people to open up by inviting them to think about times when they felt good about themselves because they acted on their deeper values (Cook & Lewandowski, 2011).

Opening up to different perspectives

One demand that has become mainstream by now is to ensure sufficient knowledge about the perspectives of people affected by changes. At times, this can imply sincere participation processes, sometimes it means touching upon opinions to gauge acceptance. One exercise (of many possible ones) that can quickly fulfil this demand and opens up to other worldviews is the following: Ask the person (or the persons) to describe the issue from four perspectives: first person (their own point of view); person with a very different view (antagonist); children or grandchildren (future-oriented); a non-human being that is affected (animal, plant) (Macy & Brown, 2004).

Co-creating change

When humans are permanently fed information about what is happening to people and the planet we start blocking out this type of information, especially once we realize how our own ways of doing things are part of the problems. This can lead to apathy instead of commitment to create something new. Working on the analysis of the problem and possible solutions together can circumvent such reactions and mapping exercises surface different perceptions of what is at stake. Putting the focus on identifying problematic structures rather than individual failures adds to the feeling of being co-stewards in overcoming joint obstacles rather than living on different planets.

REFERENCES

- World Social Sciences Report** (2013). OECD Publishing and UNESCO Publishing, Paris. Online at: <http://www.worldsocialscience.org/documents/wss-report-2013-full-text.pdf>
- Meadows, D. H.** (1999). Leverage points. Hartland: The Sustainability Institute. Online at: http://donellameadows.org/wp-content/userfiles/Leverage_Points.pdf
- Göpel, M.** (2016). The Great Mindshift. Why we need a new economic aradigm for sustainability transformations. Springer (forthcoming)
- Geels, F. W. & Schot, S.** (2007). Typology of sociotechnical transition pathways. Research Policy, Vol. 36, Nr. 3, p. 399-417.
- Macy, J. & Brown, M.** (2004). Teaching sustainability: Whole systems learning, in: Business Sustainability. Sheffield: Greenleaf Publishing. Online at: <http://www.joannamacy.net/livingsystems/teaching-business-sustainability.html>
- Cook, J. & Lewandowsky, S.** (2011). The Debunking Handbook. University of Queensland. Online at: https://www.skepticalscience.com/docs/Debunking_Handbook.pdf

3.5

Factsheet: The Bull's Eye of system innovation: you

We know that our own mental models frame reality, so we seek to keep them open to change.

BACKGROUND IN BRIEF

In transition or system innovation research as well as lab initiatives we often observe that thinking and training about how to drive system change is conflated with the assumption that this will lead to more sustainable outcomes. This is probably due to the fact that most outspoken people offering such descriptive insights about how to lead complex change want improved outcomes. Yet, from an analytical point of view, it is important to point out that **knowing how to change something effectively does not necessarily mean this change will result in more sustainability**. The question of what the result should be and why is equally important and should not be disregarded. The same holds true for judgments around what are the adequate steps towards this goal. This is highly normative terrain and directly coupled with the mental models that we all individually hold: **What is social justice? Where does individual freedom end if community wellbeing is threatened? What is wellbeing? What is sustainability?**

“Each man should frame life so that at some future hour fact and his dreaming meet.”

VICTOR HUGO

When conducting change processes and if the situation or setting allows, it is helpful to encourage all stakeholders to not only argue their opinion and best solutions, but to also express the normative motivations or why they chose which scientific evidence. All computer models that spit out numerical equations of cost-benefit, for example, have been fed by people that made judgments about how they value certain aspects (ecosystem services, a human life, survival of whales etc.) and assumptions about human preferences and cause and effect relations. **There is always a story behind the figures**, and experts might well be invited to share it. This works best in settings with an atmosphere of mutual learning, appreciative inquiry and respect for multiple perspectives.

This is what change leaders like Otto Scharmer refer to this when speaking of transforming the fields of conversation from downloading information and debate to dialogue and collective creativity (Scharmer, 2009). If creating such a setting for all stakeholders seems unfeasible, **one's personal leadership journey can still put integrity at the top of its mission**: seeking quiet clarity about both, the intentionality behind ones proposals and the – unavoidable – biases in one's selection of relevant information and styles of communication.

Another part of the art to lead system innovation processes is to find the balance between staying true to your own values and principles but also open to experiences and information that might alter them. We are lacking a role model for sustainable outcomes. Thus, we cannot get there with what we have here, at this moment in time. **We need something untried.** This is why people dealing with complex systems speak of emerging futures and reject claims of there being no alternatives: one never knows what is possible when certain dynamics in the system start changing.

To grow an awareness of when these moments arise, and to be able to express what seems to emerge depends a lot on one's own mental models. They filter how we see and interpret reality, how our personality structures and identity evolve and influence our habits and routines. Leadership researchers with a systems view therefore reject single-hero leadership ideas in which one person knows all the answers and fights all the obstacles. Instead they speak of “transcending paradigms” (Meadows, 1999), “collectively listening to what is wanting to emerge in the world and then having the courage to do what is required” (Jaworski, 1998, p. 182) or “acting from the presence of what is wanting to emerge” (Presencing Institute, 2009).

In other words: **opening up and having the courage to let go of old ways of seeing and being is the key.** Check where the voice of judgment closes your mind, the voice of cynicism closes your heart or the voice of fear closes your will: an open mind helps suspend old thinking patterns; an open heart allows to empathize and see a situation through someone else's eyes; an open heart and mind will help to let go and let (the new) come (Presencing Institute 2016). This is the recommendation after decade-long investigations by MIT researchers around Peter Senge on how systems change and why: the same tools and models seemed to work perfectly fine in one context and not in others. The difference lay in the participating people.

“The quality of results produced by any system depends on the quality of awareness from which people in the system operate”

(Scharmer/Kaufer 2013, p. 18)

Such leadership skills comprise characteristics that the lone heroic fighter only holds secretly (if at all): to like diversity, learn to have trust in others and be kind to yourself. You are only a very small part of a much larger process no one can control or anticipate. **If your intentions and actions are good, celebrate even what seems to be a failure.** It might well have led to unanticipated and far-reaching ripple effects that pave the way of future successes. Believe no one who claims to have the answer and draw out the strength in others by acknowledging them and their contributions. Be ready to change yourself.

KEY CAPTION – SYSTEM INNOVATION AND I



(Source: Québec meme, <http://quebecme.me/ZGtjZGL>)

CHALLENGE: SEEING MYSELF AS PART OF THE PROCESS

Having arrived at the Bull's Eye of System Innovation, the focus shifts from the outside to the inside. You can never be a neutral facilitator or objective observer and being aware of your own intentions, principles and knowledge limitations allows you to stay open to evolve in line with what emerges. This does not mean compromising on your vision or ideals. You could see it as a poise of heroic humbleness.

Setting up your core team

Setting up your change initiative (how you think change can happen and which people or institutions will be crucial to have on board) will be influenced by your challenge (what should change or what should the outcome be, and why do I think this is valuable). Combining the two will require targeted research, talking to people and also trial and error when proposing ideas, formats, projects and programmes. Your change initiative can be your private undertaking but will likely need to expand. Typically, even if starting with a bigger group, a committed team of three to five people emerges.

Making your assumptions explicit

If you want to lead systemic change, you need to be clear about your assumptions: how does my own mind-set or mental model frame what I consider to be “good” or “sustainable” outcomes and adequate steps? Which evidence am I using for my judgments? Which value judgments inform this view? How do my ideas and beliefs differ from others and why is this ok? Often it helps to find a coach or someone who can be a neutral, trusted sounding board.

Being aware of your own learning journey

Adapting your own strategies to emerging changes in your system will often see you confronted with questions like: How can I strike the balance between being open to work with what emerges and staying true to the values and ideas that I am deeply convinced of? What are the boundaries where I feel I lose authenticity or belief in what I do and should rather step back, try again a different time or in a different setting? Keeping a personal journal for regular reflection throughout the change initiative can be very helpful in documenting this process.

REFERENCES

Jaworski, J. (1998). Synchronicity. The inner patch of leadership. Berrett-Koehler Publishers.

Meadows, D. (1999). Leverage Points. Online at: <http://donellameadows.org/archives/leverage-points-places-to-intervene-in-a-system>

Presencing Institute (2016). Principles of Presencing. Online at: <https://www.presencing.com/principles>

Scharmer, O. & Kaufer, K. (2013). Leading from the emerging future. From ego-system to eco-system economies. Berrett-Koehler Publishers.

3.6

Final take-away messages

Be clear.

Identify and specify which problem you are tackling and why. Speak to others if this makes sense to them, how they would see problems and possible answers and why. Sit down and write up your pitch why you think xyz is a good thing to do.

Be rigorous.

Analysing your system thoroughly is important for any change that deserves the tag system innovation. You do not want to fix a symptom. You want to take steps towards treating the root causes. These lie in the structural patterns and relational dynamics behind the problem you seek to tackle.

Be pragmatic.

Working for a system innovation does not mean changing an entire society. The boundaries of your system come from your problem analysis. Revise them after you checked for resources, capacities and potential allies: start with the “right” size and shape. You might well redraw them again later in the process.

Be creative.

What seems totally obvious for you and your peers might be outlandish for people in other institutions or cultures. Be aware of these differences when building bridges from your idea to their reality. Try different frames and methods but respect comfort zones and back off if there is no spark.

Be bold.

The vision with which you start working on a transformation project needs to be just that. The successive changes to get there can and often will be small. But system innovations are defined as “radical” because the incremental steps in sum have led to a different system dynamic where elements and architecture both have changed.

Be persistent.

Complex system change takes time, learning and adaptive governance. It may seem tedious in this fast-paced world but only iterative evaluations that consider all aspects of the system and search its fundamental relationships and patterns create the transformative literacy that system innovators need. Try to involve others, and be it only through interviews or one-off system mapping workshops - until they catch fire.

4

Lessons Learnt from the Prototype Lab

The first run of this Lab took place between February and June 2016 with twenty-two truly committed professionals from eleven European countries participating. Feedback from the group was fantastic, detailed and honest. We would like to highlight the following takeaways:

- **Learning about systems is best done by doing.** We received helpful advice on this matter from our esteemed Advisory Board members¹. This led us to working together with the Centre for Systems Solutions in order to develop a role-play simulation of an energy system transformation. It was the day rated highest by Lab participants, and the gaming experience foreshadowed what **the concepts in the factsheets** explained:
 1. Keep all of the important elements in the system in mind or you might be surprised by the change of dynamics or behaviour of actors.
 2. Living systems host stocks and feedbacks that result in delays between cause and effect. This often makes early responses to changes more effective, or it can also mean that a lot has to change on the input side before output changes become visible.
 3. What seems like a great idea and strategy or technology at a particular time might not work at an earlier or later time or in a different context.
 4. There are many different rationales about best solutions, depending on the perspectives, interests and structural embedding of actors in the system.
- **Cooperation** is crucial when dealing with complex systems and their intentional changing and might require altering one's own behaviour or point of view.
- **Blending experiential and cognitive learning** is an art that will have to be adapted to the actual group, depending on its composition as well as openness to different methods. We tried to fit in a bit too much and have now shortened the factsheets to reflect this.
- **Including the personal level** feels unfamiliar for professional contexts and at the same time it can be liberating. Clear contracting by all participants that the Lab is a safe and honest learning space helps, and the best conversations happen once it is "the human" who speaks.

1 Generously sharing their expertise were:
Mark Drewell, Gillian Martin-Mehers,
Max Schön, Marcel Nowicki, and Kora Kristof.

- **Five days of training** is difficult for professionals. Yet, it seems necessary in order to establish and develop trust, familiarity and group dynamics that create a sense of community and allow diving into socio-cultural narratives and personal challenges. This made the Lab special. Still, **being a single participant** is tricky, and early on we encouraged people to find a “sponsor” (who can guarantee some resources or at least space and time) as well as a few like-minded people with complementary skills in their work environment.
- **Discussing the effect of impact measures** on the attention and conduct of project implementation was an eye-opener regarding the blind spots or barriers emerging from too much quantitative, short-term output orientation. Qualitative effects like finding a common language, relationship building and learning have lasting impacts but are not typically part of the picture during the planning stage.
- **Speaking about system innovations** or systemic strategies often leads to the idea that one has to change the entire society or world at once. Highlighting that complex system thinking is a particular theory about how the world works and that it can inform change strategies at high as well as low levels was an important message to counter frustrations in the attempt to capture how ‘everything is connected.’
- We feel that the **blend between personal and structural elements** in system innovation capacity building worked well: reflection and mindfulness are very helpful in breaking out of silos, opening up common sense and assessing deeper purposes, but system change is also a highly political process that needs proper advocacy and negotiation skills as well as endurance and support when things get difficult.

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