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## Resilience, Social Learning and Networks

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### 1. Resilience and Knowledge

Resilience is a concept, originally developed in ecosystem theory, primarily by C.S. Holling.<sup>1</sup> It describes the “capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks.”<sup>2</sup> For the amelioration of the theory, several authors developed the concept of socio-ecological system (SES) Adger defines SES as „the idea that human action and social structures are integral to nature and hence any distinction between social and natural systems is arbitrary.”<sup>3</sup> The paper will discuss other resilience definitions as well as basic problems of the SES concept.

Since recently, resilience theorists discover the importance of knowledge. Folke et al. highlight the importance of groups and linked institutions that accumulate knowledge, which can diminish the effects of external stimuli on resilience. This knowledge is fed by experiences of changes and crises. Therefore, it is irrelevant whether threats are real or just perceived. The acquisition of knowledge about adaptive ecosystems is no singular, static “incident”, but an ongoing dynamic process<sup>4</sup> and a basic condition for successful adaptation processes.<sup>5</sup> The “governance system must continuously learn and generate experience about ecosystem dynamics”<sup>6</sup> likewise.

Building on the findings of ecological memory Adger et al. use the term social memory, attributing importance for resilience to it. Former “is conferred by biological legacies that persist after disturbance, including mobile species and propagules that colonize and reorganize disturbed sites and refuges that support such legacies and mobile links.”<sup>7</sup> Social memory on the contrary “comes from the diversity of individuals and institutions that draw on reservoirs of practices, knowledge, values, and worldviews and is crucial for preparing the system for change, building resilience, and for coping with surprises.”<sup>8</sup> I.e. it represents the knowledge of the entirety of actors of a SES. It is build up by past disturbance and (governance-) mistakes. Successful adaptation than requires mobilization of social memory.<sup>9</sup> How to put this into practice is not specified any further.

Recently there also has been an increasing number of attempts to connect (social) learning to questions of climate change and sustainability and even to resilience, vulnerability or adaptation. A cased study of adaptive collaborative management for social learning by Khadka & Vacik<sup>10</sup>, a shadow network approach by Pelling & High<sup>11</sup> and the learning cycle by Berkhout, Hertin & Gann<sup>12</sup> will briefly be discussed. Still, concepts how to increase resilience

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<sup>1</sup> Holling 1973.

<sup>2</sup> Walker et al. 2004, no page number given in source.

<sup>3</sup> Adger 2006, 268.

<sup>4</sup> Folke et al. 2005.

<sup>5</sup> Walker et al. 2006.

<sup>6</sup> Folke et al. 2005, 452.

<sup>7</sup> Adger et al 2005, 1036.

<sup>8</sup> Ibid.

<sup>9</sup> Folke et al. 2005, 444.

<sup>10</sup> Khadka & Vacikb 2008.

<sup>11</sup> Pelling & High, 2005.

<sup>12</sup> Berkhout, Hertin & Gann 2006.

through learning are rare and in an early stage of development. Therefore, subsequent chapter will try to contribute to this discussion.

## 2. Social Learning

The aim of this paper will be a connection of resilience and learning theories. Learning goes beyond the accumulation of knowledge, even though the latter is a basic requirement. Nevertheless, the acquired knowledge shall be applied to the behaviour of the actor. Therefore, it does not necessarily be the aim or result in positive effects.

Social psychologists generally point out changes in behaviour and changes in the capacity to behave in a certain way. However, psychological and pedagogic theories focus on individual learning<sup>13</sup>. Other theories apply individual learning theories to collective entities. Thereby, collective learning is more than the sum of the individual contributions, since there are dynamics that go beyond the scope of individual learning.<sup>14</sup> Notwithstanding, individuals are still important in learning processes since they can play an important role by influencing a group's behaviour.<sup>15</sup> However, the paper will take over some interesting findings of organisational learning, since it concerns adaptation for more than forty years, albeit at first sight, it is rather a reaction to changes in the (not only ecological) environment than a preparation to future changes in this context.<sup>16 17</sup> Nevertheless, organisations, especially in the private sector are used to uncertainty: macroeconomic developments, market conditions, competitors, demands et al. can never be predicted accurately.

Within the paper, the single-/ double-loop learning approach of Argyris and Schön will provide the starting point for creating a resilience learning concept. Single-loop learning occurs when expected outcomes do not match with reality. Actions are modified through inclusion of new knowledge but values remain unaffected. By contrast, in double-loop learning processes, values and basic assumptions for actions are being challenged and possibly changed. Besides the simple feedback loop between expectations and outcome, a second loop linking outcomes with beliefs, norms and objectives occurs. When organisations influence their learning processes themselves, this is called deutero learning.<sup>18 19</sup> Within the paper it is assumed, that organisational learning is also transferable to public actors<sup>20 21 22</sup>, although it does not omit critique to such an approach.<sup>23 24 25</sup>

Furthermore, the distinction of explicit and tacit knowledge and learning as well as the differentiation of local and scientific knowledge will be addressed. The resilience learning approach argues for an inclusion of all modes and forms of learning. Afterwards the major questions of this approach will be tried to answer.

- How to transfer the single-double-loop concept to resilience learning?  
To transfer the single- double loop concept, the following definitions are suggested:

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<sup>13</sup> Siebenhüner & Müller 2003.

<sup>14</sup> Siebenhüner 2005.

<sup>15</sup> Arnold & Siebenhüner 2008.

<sup>16</sup> Daft & Huber 1987.

<sup>17</sup> Nonaka, Toyama & Byosière 2001.

<sup>18</sup> Siebenhüner 2005, 94-95.

<sup>19</sup> Argyris & Schön 1996.

<sup>20</sup> Huber 1991.

<sup>21</sup> Siebenhüner 2008.

<sup>22</sup> Bauer, Busch & Siebenhüner, 2007.

<sup>23</sup> Swanson et al. 2006, 26.

<sup>24</sup> LaPalombara 2001b.

<sup>25</sup> LaPalombara 2001a.

#### *Adaptive Learning*

The process in which actions are modified due to actual or perceived climate change related threats through inclusion of new knowledge without modification of norms and values

#### *Resilience Learning*

The processes of change on the level of individual or collective actors or even in a society that is based on newly acquired knowledge, a change in predominant value structures, or of social norms, with the objective of improvements in the field of resilience and adaptation, which results in practically sizeable outcomes

- How to define increased resilience and how is increased resilience measured?  
SES resilience is measured based on the most important system services. However, this entails the question of how to identify these services and above all, who identifies them.
- Who are the actors within an SES?  
There are different actors within an SES. Nevertheless, which ones are important for social learning? Who detects the problems and who has the authority to set them on the agenda? Who accelerates and who decelerates the process of learning? Are there change agents? In a world of governance systems, the state as one of the most influential players should not be forgotten. Learning furthermore does not only occur on SES but also on subsystem levels. A system is characterised by emergent properties, i.e. properties that can be identified as belonging to the entity by an observer. Systems furthermore have layered structures, i.e. they have sub- or hyperentities that can be identified as system as well. In addition, lasting systems need to have processes of communication and control, either automatically or set up by human beings.<sup>26</sup>
- Who is resilient?  
It will be shown that SES resilience is not the sum of subsystemic resilience and therefore conflicts evolve.
- How is knowledge transferred/transformed to action?  
Knowledge acquisition cannot be equated with learning, since the latter requires change of behaviour.
- How / Why does learning occur

These questions bring up some basic findings about important features of resilience learning, which will be discussed in detail.

- Interdisciplinarity
- Complexity
- Diversity/ Parallelism
- Uncertainty
- Discourse
- Power
- Legitimacy
- Long term orientation

### 3. Network Theories

Social learning also has been addressed to within network literature. Prell et al. (2008) view social learning as something more than group learning, “it is a process of social change that occurs as people learn from each other through their social networks.”<sup>27</sup>

Network theorists have emphasized the role of different relation between actors. If actors are connected via strong ties, there is an intensive communication, trust. However, there is a

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<sup>26</sup> Checkland 1999.

<sup>27</sup> Prell et al. 2008, 444.

lack of diversity of thinking. Weak ties on the contrary are bridging many diverse actors; there is flow of new information. Nevertheless, there is a lack of trust, and connections are easy to destroy.<sup>28</sup> Newig, Günther & Pahl-Wostl argue for modular networks consisting of “several cohesive subgroups with strong ties and several weak tie relations within the broader network.”<sup>29</sup> Other important characteristics are size, homophily, multiplexity, centralisation density and cohesion.<sup>30</sup>

Network theories furthermore stress the role of social capital, which can be defined as “forms of relations and social structures that give a wider scope of actions, wins or alleviates coordination of their intents to act on collective level”<sup>31</sup> Since resilience theorists have mentioned the role of social capital as well, it seems to be a useful link to merge both theories to a new approach. Newig, Günther & Pahl-Wostl just recently presented a rich contribution to learning in governance networks, which will be discussed in the paper as well. They among others investigate network characteristics’ influence on double-loop learning processes.<sup>32</sup> Manring delivered a profound view into the creation and management of learning networks. To be successful such networks need to initiate the “creation of a community of commitment with a growing spiral of trust (...); the gradual evolution of a unifying purpose and a transcendent vision (...) and a sustained culture of decision making through consensus.”<sup>33</sup>

The learning region is another useful concept. It focuses on features of region that increase their competitiveness. Learning is the essential process in this context. Some of the results are useful for resilience learning since SES also have spatial borders due to the natural landscapes and/or political borders, although the systems are not cut off from the outside world. The learning region concept focuses on acquirement and preservation of economic competitiveness. It assumes that regional actors form a collective entity. There is also a necessity to unlearn, since this remove “formerly significant institutions which now act as a hindrance to further development.”<sup>34</sup> However, this concept was criticised for the lack of empirical foundation.<sup>35</sup> In addition, it does not make a clear distinction between learning and innovation. Still, some elements might be useful to understand actor networks within regional systems and the emergence of functional or political lock-in.<sup>36</sup>

#### 4. Contribution of Network to Resilience Learning

In the next step, the contribution of networks will be summarised. Networks seem to be an interesting alternative to regulation, since external pressure does not automatically lead to double-loop learning processes. Therefore, the following cases will be made:

- Networks can advance exchange of explicit local and scientific knowledge.
- Networks can advance exchange of implicit local and scientific knowledge.

Hence, networks can increase capacity of learning, a subcategory of resilience.<sup>37</sup> Knowledge does not automatically lead to learning and learning does not always result in improvement, but without knowledge, there is no learning and not chance of improvement at all.

- Networks can help share risks for trial-and-error based knowledge creation.
- Networks can decrease costs for search based knowledge creation.

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<sup>28</sup> Prell et al. 2008.

<sup>29</sup> Newig, Günther & Pahl-Wostl 2009, no page number given in source.

<sup>30</sup> Newig, Günther & Pahl-Wostl 2009.

<sup>31</sup> Jansen & Wald 2007.

<sup>32</sup> Newig, Günther & Pahl-Wostl 2009, no page number given in source.

<sup>33</sup> Manring 2007, 341.

<sup>34</sup> Hassink 2004, no page number given in source.

<sup>35</sup> Fürst 2001.

<sup>36</sup> Hassink 2004.

<sup>37</sup> Folke 2006.

While policy networks are more costly in terms of policy formulation there are less costs in policy implementation.<sup>38</sup> It will be argued that resilience in general is a SES feature to easily agree on, since it is in the interest of most actors though there might be controversial (e.g. permafrost in Siberia) and even non-controversial (e.g. desserts) exceptions will be discussed). However, SES services and the way of maintaining them might be highly controversial. Therefore, the first step of a resilience learning network should be an agreement on the former. Referring to Crona & Bodin<sup>39</sup> a common understanding of resilience would increase the likelihood of an agreement on common rules to respond to inadequateness within the system. Exchange of information and knowledge are the basic conditions to start a successful process. Thus, the structure and ties of the network are of fundamental importance. Nevertheless, actors need incentives and knowledge to start action. This might be an interesting point for governmental organisations, which seem to be forgotten sometimes. Within regional governance theories, it can serve as animator, who identifies strengths and weaknesses of the regions actors, and pays special attention to skills formation.<sup>40</sup>

Of course, networks bear risks. There is no administrative top level that can control opportunism. Thus, characteristics like size, homophily, multiplexity, centralisation density, cohesion and the relation of weak to strong ties re of high importance.

## 5. Literature

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<sup>38</sup> Kenis & Schneider 1991.

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