

Institutions for Climate Change

A Method to assess the Inherent Characteristics of Institutions to enable the Adaptive Capacity of Society

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Abstract

Climate change calls for institutions that promote the adaptive capacity of society and allow society to modify its institutions at a rate commensurate with the rapid rate of environmental change. Climate change potentially brings continuous and unpredictable changes to local weather patterns, water supplies and sea levels. Institutions, traditionally conservative and reactive, will now have to be designed in a way that they support social actors to proactively respond through planned processes and deliberate steps but also through cherishing and encouraging spontaneous and autonomous change that is rapid enough to deal with the impacts, as well as allow for institutional redesign. This paper addresses the question: How can the inherent characteristics of institutions to stimulate the adaptive capacity of society to climate change from local through to national level be assessed? On the basis of a literature review and several brainstorm sessions, this paper presents six criteria: Variety, learning capacity, space for planned and innovative autonomous action, leadership, availability of resources and fair governance. Together these six criteria form the Scorecard for Adaptive Capacity. This card can help academics and social actors to assess the inherent characteristics of institutions to stimulate the adaptive capacity of society to respond to climate change; and to focus on whether and how institutions need to be redesigned.

Key words: climate change, governance, institutions, adaptive capacity, criteria

1. Introduction

There is increasing scientific evidence and political recognition of the problem of climate change (IPCC WG II 2007; European Commission 2007). In addition to reducing greenhouse gas emissions, societies worldwide have to cope with the potential impacts of climate change – rising sea levels, changing hydrological patterns, and extreme weather events (e.g. Stern et al. 2006). Such adaptation takes place within the social context or structure, referred to as institutions (see 2.2). It thus becomes necessary to understand the inherent characteristics of institutions to stimulate the adaptive capacity of society to deal with such continuous and yet uncertain and often unpredictable structural changes (IDGEC Scientific Planning Committee 1999). On the basis of such an understanding, institutional redesign based on social debate about what changes are necessary and how they can be achieved needs to be stimulated.

In fact, both the global climatic system and human society are continuously changing systems (see Figure 1.1). These systems sometimes evolve in response to impacts emerging from the other system and sometimes autonomously of each other (cf. Gilbert 2006). Throughout human history, social systems have reacted to changing circumstances (Delapenna & Gupta 2008, in press). Institutions evolve incrementally to deal with social problems, but tend to be reactive and conservative. Since the industrial revolution, human activities have led to a more rapid rate of environmental change. With the progress made in the natural sciences, society can predict, within limits, the potential environmental impacts of various human actions on society, such as climate change, that may take place in the future. While science can record and predict these changes, political systems are still caught in four to five year democratic cycles, societies are locked into long-term patterns of production and consumption through past and current infrastructural decisions, and lifestyle and ideological premises appear deep-rooted. Promoting change is often more difficult where institutions reflect deep social taboos (cf. Pollitt & Bouckaart 2000). Are our institutions capable of allowing society to deal with the new knowledge about future impacts and, more importantly, with the impacts themselves? Are our institutions capable of allowing society to deal with the inherent uncertainty of the predictions? In short, do the inherent characteristics of institutions enable the adaptive capacity of society to deal with climate change?

Against this background, this paper seeks to address the question: How can the inherent characteristics of institutions to stimulate the adaptive capacity of society from local through to national level be assessed and through what tools?

This question is not an easy one, as the literature on adaptation and adaptive capacity is of relatively recent origin and mostly deals with natural science and technology related issues, and has relatively few, dispersed and diffuse messages on institutional issues. From a social science perspective, it is critical to study whether institutions stimulate the adaptive capacity of society to deal with the potentially serious and irreversible impacts of climate change. Since the climate as well as society are continuously evolving systems and since these are interlocking processes with short and long-term impacts, the process of societal response will have to be accelerated to both cope with the impacts of climate change and rapidly reduce the rate of growth of emissions of greenhouse gases.

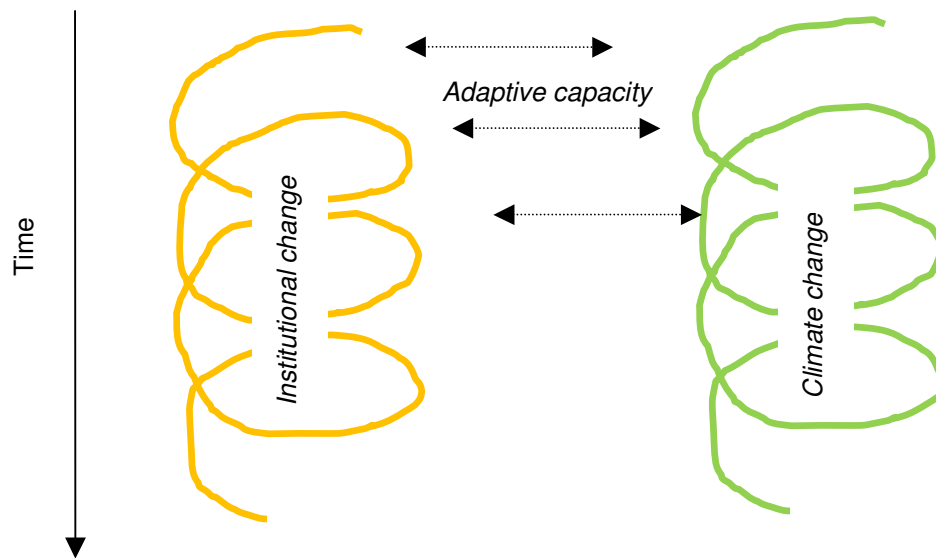


Figure 1.1 Institutional change and climate change as continuously evolving systems in interaction.

This conceptual paper discusses some of the key issues involved, drawing on an extensive literature review in different relevant disciplines and theories to develop a methodology to assess the inherent characteristics of institutions to enable or stimulate the adaptive capacity of society. It is based on discussions and brainstorm sessions between the authors including one in an electronic boardroom. Following a session to define adaptive capacity, the conceptual framework was expanded to include a set of six criteria with a number of sub-criteria for each of these main criteria. Of these six criteria, three dependent variables are considered as integral to adaptive capacity, or aspects that can be steered to improve adaptive capacity. The other three independent variables are considered to be more contextual influences on adaptive capacity to change. This paper presents the resulting Adaptive Capacity Score Card for measuring the inherent characteristics of institutions to stimulate the adaptive capacity of society that will be assessed in practice in later stages of the research work.

The paper first expands on the literature on institutions, adaptation and adaptive capacity (see 2), then elaborates the arguments underlying the choice of six criteria and sub-criteria (see 3), then operationalizes the conceptual framework through the design of the Score Card (see 4). Finally it discusses the possible uses of this Scorecard, its limitations and explains briefly what follow up research can be expected.¹

¹ Although based on the literature, this conceptual framework is still a hypothesis that has to be assessed. We plan to assess it in the next stages of our project. By publishing this at this early stage, we want to share this framework and scorecard with other scientists working on similar issues who may also wish to assess such a framework.

2. Literature review

2.1 Selection of literature

The fast growing literature on adaptation to climate change addresses questions such as: What will the impacts of climate change be? How can they be downscaled to local level? Who should adapt to these impacts? What are the generic proactive and reactive strategies, policy options and measures to encourage adaptation in different sectors? The vast majority of this literature is fed by natural scientific disciplines such as meteorology, hydrology and ecology; although increasingly social scientists have been entering the arena, dealing with the economics of adaptation and with designing policy instruments. However, there is very little research on the institutional dimensions of adaptation; and in particular on assessing institutions (e.g. WRR 2006). This paper attempts to bridge this gap by connecting the literature on institutions, governance and management with that on adaptation and adaptive capacity. This section briefly assesses the literature on the nature and design of institutions, the government-governance debate, and institutional change.

2.2 Institutions and governance

Institutions have been defined by many including Nobel laureate Douglas North (1994) and a consensus definition is provided by the International Human Dimensions Programme's Institutions project where institutions are defined as: "systems of rules, decision-making procedures, and programs that give rise to social practices, assign roles to the participants in these practices, and guide interactions among the occupants of the relevant roles" (IDGEC Scientific Planning Committee 1999: 14). The rules and roles can be formal and informal, visible and latent, and conscious and unconscious (Arts 2006). Institutions both enable and yet restrict the opportunities for actors to respond (Sharp 1997) to changes in the environment.

The term 'institutions' sometimes refers to 'organizations' since these can also be seen as formalised patterns of rules and decision making. In ordinary speech, the term 'institutions' has become synonymous with 'organizations'. However, the concept of institution is not equivalent to that of organization as institutions also refer to ideological values and norms that exceed organisational borders or formal structures (Zijderveld, 2000; Young 1989; IDGEC Scientific Planning Committee 1999). Institutions are not actors. To avoid this misunderstanding, this paper will not refer to 'organizations' with the term 'institutions'; the agents of change will be referred to as actors or organizations.

Institutions are not just the result of formal governmental processes but can reflect social patterns of engagement as well. Governments produce formal institutions and such institutions play an important role. However, the market as well as civil society can adopt formal rules, and more importantly, society encompasses many informal rules and social patterns of engagement.

This approach is consistent with the trend in the social sciences to move from discussing government to discussing governance approaches, to move from discussing hierarchical

and well-institutionalized forms of government towards less formalized forms of governance in which networks and horizontal relations between interdependent actors have grown in importance (Hanf & Sharpf 1978; Blatter 2003; Arts & Van Tatenhove 2005; Hajer & Wagenaar 2003; Rhodes 1997; Pierre 2000; Kooiman 1997). To approach persistent societal problems meaningfully, recent scientific studies focus on governance (Rhodes 1997; Pierre 2000), or related concepts like network management (Kickert *et al.* 1997; Koppenjan & Klijn 2004) or deliberative policy making (Hajer & Wagenaar 2003; Fischer 2003). They react to the limits of a hierarchical method of steering that is founded on instrumental reasoning. Governance bridges the gap between state and civil society and uses the interdependencies in a network society for decision making procedures instead (Van Gunsteren 1976; Castells 1996).

While government is visualised as a rigid, centralised, unitary, top-down process of providing rules in the public interest that have to be implemented at local level, governance (Commission on Global Governance 1995) is seen as a flexible, diffuse, bottom-up *and* top-down process which allows for close interactions not only between the different levels of government but also with social actors (both commercial and non commercial) with vastly different interests (Krahmann 2003). Governance and good governance (Botchway 2001) are often seen as key institutional settings for addressing problems.

If institutions are developed by humans, they can also be changed by humans. However, as stated earlier, institutions are inherently conservative. This is a weakness and yet a strength. Institutions are the end product of human debate on how to solve a certain problem. Institutions are agreements following long debate, and if these hard-won institutions would not survive until the next day, there would be little point in creating them. Therefore, all institutions embed a degree of robustness and resistance to change. This process is called institutionalization.

As such, the institutional literature has largely focused on explaining the stability and persistence of institutions (Garud *et al.* 2007). Institutions provide a source of stability to interactions of actors, without which every form of collective behaviour would be impossible (March & Olsen 1989; Hemerijck 2001; Sharpf 1998). They are difficult to change, because they carry the bias of previous interactions, views and power relations (Klijn & Koppenjan 2006). However, institutions do not determine human action. They shape social practices, but it is also social practices that constitute (and reproduce) institutions (e.g. Giddens 1984). And, if enough people act in innovative ways, their action may have the consequence of transforming the very structures that gave them the capacity to act. The same agency that sustains the reproduction of structures also makes possible their transformation. Drawing on this argument the inherent characteristics of institutions to stimulate the adaptive capacity of society involves both the possibilities that institutions give society to respond to climate change and the possibilities that institutions offer to be redesigned themselves by social actors.

Thus, the question – *can* institutions be changed is not so hard to answer (yes they can). The question – is it difficult to change institutions is not difficult either (yes it is difficult). It is, however, more interesting to ask: Do institutions allow society to adapt? How fast do they allow society to adapt and is this fast enough? Institutions generally evolve incrementally to deal with societal problems. Since science provides information about the potential impacts of climate change, it becomes necessary to understand

whether institutions allow society to deal with such structural changes. What is needed is a balance between absolute rigidity and total flexibility; where should this balance be if we look at the problem of climate change? Is the 'natural' turnover speed of institutions enough to keep up, or do we need an extra effort? And if we do, which institutions are the most inhibitive and should be redesigned as a matter of priority?

2.3 Adaptation

Human societies have always adapted to their environment; where they have failed to do so, they have been destroyed. The rise and fall of civilizations is witness to this, as has been studied in history, sociology and evolutionary biology (Ridley 1996, Diamond 2005). Usually a characteristic in a system or individual helps it to react to the events occurring in the course of time and the system or individual's behaviour is also changed by the events.

Adaptation to the impacts of climate change is defined in different ways in the literature. Some definitions focus on the process of adaptation, while others refer to the end product (practices or structures) of such a process (Smit *et al.* 2000, Smithers & Smit 1997, Pielke 1998). Adaptation can be understood as 'human responses to the direct and indirect effects of climate change and variability for the purpose of lessening detrimental consequences or enhancing beneficial consequences' (Leary 1999: 307). Adger and Kelly (1999: 258) add to this definition that adaptation 'occurs through the actions of individuals facilitated or constrained by relevant institutions as well as through the actions of the institutions themselves' (note that in this citation the term 'institutions' means 'organizations'; in our definition, institutions cannot act). Overall, adaptation aims at three objectives: preventive risk and vulnerability reduction, coping with extreme events when they happen and utilizing the impacts of climate change when they offer new opportunities. The Intergovernmental Panel on Climate Change (IPCC) defines adaptation as: "Adjustment in natural or human systems in response to actual or expected climatic *stimuli* or their effects, which moderates harm or exploits beneficial opportunities. (IPCC 2001: 982).

Adaptation can occur locally, regionally, nationally, and at the European and global levels. It can occur individually or collectively. Adaptation has a remarkable time-scale, from micro, to short, medium and long term. It can be reactive or anticipatory, private or public, planned or autonomous (IPCC 2001). In short, anything, anywhere can be labelled as adaptation, which can make it a difficult phenomenon to research.

Olmos (2001) argues that planned, anticipatory adaptations are undertaken by governments or NGOs as a policy initiative and are to be distinguished from those that are autonomous and/or mainly reactive. Others argue that the distinction between autonomous and planned adaptation may not always be easy to make (Fankhauser *et al.* 1999). Reactive (or autonomous) adaptation includes coping strategies that actors make in response to a specific climatic impact (*ex-post*). This requires that the actors are aware of the impacts and are able to react appropriately. Both *ex-ante* and *ex-post* strategies have strengths and weaknesses. *Ex-ante* strategies are useful because they minimise potential impacts on society, but since such strategies are developed in an uncertain climatic context, they may be more expensive. *Ex-post* strategies react to an event and have to deal with the impacts after the fact – and this can also be more expensive than society antici-

pates. The costs of the Katrina disaster in New Orleans, for example, were estimated between USD 100 and 200 billion in 2005 and 2006, while a programme constructing levees as proposed in 1998 would have cost USD 14 billion (Frischetti 2005: A23). The key challenge here for decision makers is making decisions under uncertainty.

Precautionary or planned (ex-ante) adaptations to climate change should aim at capital intensive sectors and infrastructure. Planned approaches can take into account other considerations and lead to more robust, efficient and effective policy with possible spill-over benefits and the least disruption to society (Burton 1996; Smit & Pilifosova 2001; Bryant *et al.* 2000; Lewandrowski & Brazee 1993; Smith 1997; Pielke 1998; UNEP 1998). Planned adaptation can reduce the vulnerability of individuals and communities to the potential impacts of climate change (Smith 1997; Burton *et al.* 1998; Fankhauser *et al.* 1999).

Mainstream organizational change research suggest that organizations adapt to environmental change by taking deliberate and rational steps to regain equilibrium. It assumes that environmental change is temporary, a shift from one equilibrium to a new and different equilibrium. Some current approaches emphasize the unpredictability and continuous character of environmental change in which organizations have continuously to deal with uncertainty, volatility, and surprise. They argue that a more effective response may be for organizations to promote 'creative, innovative, continually changeable behaviour' and develop the capacity for spontaneous changeability (Lengnick-Hall & Beck 2005). Weick (1988: 70) and the political scientist Wildavsky (1988) have argued in favour of improving the general capacities of governmental institutions 'to investigate, to learn, and to act, without knowing in advance what one will be called to act upon'. Weick & Sutcliffe (2001) add that in dynamic, ambiguous and unpredictable environments, planning can weaken the ability to respond to the unexpected. In a stable context spontaneous adaptation is less necessary and not cost-efficient.

Cybernetics and complexity theories use the term "adaptation", in particular, in "complex adaptive systems" (CAS). Duit & Galaz (2008) operationalize this for the extremely complex system of the earth with its human governance system. They contend that societies need to govern a system that is actually a CAS, and understanding that reality may help to govern it.

In addition to the conceptual literature on climate adaptation, there is a considerable literature on practical adaptation strategies, instruments and measures in different social sectors (e.g. IPCC WGII 2007, EEA 2006, Walsum *et al.* 2005). Such literature generally applies climate scenarios to specific sectors and regions to find impacts for a sector; identifies a series of adaptive practices and structures and evaluates these through a cost-benefit, multi-criteria analysis, and/or participative dialogue processes. This literature is often in an exploratory stage and although it may discuss policies, it does not discuss institutions in much detail. Although institutional barriers are often covered especially as adaptive solutions are quite comparable to innovations, institutions can be expected to stand in the way of adaptation (Hargadon & Douglas 2001, McEvoy *et al.* 2008), the process of embedding the findings in institutions is scarcely attempted.

2.4 Vulnerability, resilience and adaptive capacity

The capacity of a system to react to external stimuli has been described in the literature (e.g. Smit *et al.* 2000) in terms of vulnerability, sensitivity, resilience, and adaptive capacity. The concept of adaptive capacity has been influenced by work done in the area of social-ecological systems (Holling 1986). Institutions are explicitly included in the analysis and this literature aims to provide integrated frameworks for analysis of social and physical aspects of a system, for example in a catchment area. The concepts have been used in different ways in the literature (Perrings 2006; Dalziell and McManus 2004) where sometimes the terms are used almost interchangeably, and at others they encompass each other in different ways.

IPCC (2001: 6) describes *vulnerability* as “The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity.” The IPCC definition for vulnerability explicitly names climate change, but the terminology is not limited to the impacts of climate change, or even climatic stress factors. Natural (e.g. earthquakes), political (e.g. wars) or social (e.g. economic) crises are equally relevant stressors that require adaptive capacity. In the IPCC definition, *exposure* refers to the chance that a system is actually exposed to a natural or anthropogenic disaster. For example, the chance that Amsterdam is exposed to a hurricane is zero, and the chance that this will happen in the Caribbean is considerable; still, Jamaica may or may not be exposed to a specific hurricane. *Sensitivity* is a characteristic of the community and the ecosystem in a certain area, describing the degree of harm that can occur when a disaster hits the area. The sensitivity to flooding of a densely populated city, for example, is higher than that of a dynamic estuarine nature park, and the sensitivity to flooding of land beneath sea level is higher than that of a hill. *Adaptive capacity* describes the ability of the community and the ecosystem to prepare for, or cope with such a natural or man-made disaster. A community that cooperates to prevent flooding or to agree on an evacuation plan has a higher adaptive capacity than a community in which conflicts and isolation are the rule. With this conceptualization, the different elements of a human or ecological system that together form its vulnerability can be assessed.

Adaptive capacity has also been defined by the Millennium Ecosystem Assessment (2006: Glossary, 599) as: “The general ability of institutions, systems, and individuals to adjust to potential damage, to take advantage of opportunities, or to cope with the consequences”. IPCC (2001: 6, IPCC WGI 2007) defines it as “The ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences”.

Adaptive capacity and resilience are sometimes used interchangeably, signifying the ability of a system to cope with stress. Although there is some overlap between the concepts there are clear distinctive elements to each term. *Resilience* has been used mostly in relation to natural systems (see Holling 1986). In evolutionary studies, resilience has two different types of definitions. According to Pimm (1984) resilience is “A measure of stability that assumes system stability increases as time required to return to equilibrium decreases after a perturbation. A rapid response means that a system recoils rapidly back to its equilibrium state.” According to Holling (1986), a system’s resilience is measured

by the amount of disturbance that is needed to push it out of its equilibrium state. Adaptive capacity is sometimes seen as one of two aspects of resilience, the other one being robustness. Perrings (2006: page) defines robustness as ‘the properties of a system that allow it to accommodate perturbations without additional adaptation’, while adaptive capacity is ‘broadly equivalent to the diversity amongst the institutions and assets available in social systems’ Others (e.g. Dalziel & McManus 2004) see resilience as the overarching concept, encompassing both vulnerability and adaptive capacity.

This paper focuses on adaptive capacity because this term seems most applicable to institutions as inherently changeable phenomena. The other terms such as resilience and vulnerability all encompass both changeable and unchangeable characteristics of a system. In our definition, adaptive capacity refers to a continuously evolving system. Adaptive capacity is a characteristic that institutions should enhance in society and allow society to redesign those very institutions.

2.5 Assessing Adaptive Capacity

This leads to the next question is: what does adaptive capacity mean, when it is applied to institutions? Assessing adaptive capacity calls for understanding the extent to which institutions enable society to respond in time to moderate potential damages or benefit from opportunities of climate change. Do institutions provide room for adopting the “best” adaptation options from one point of view, but also what adaptations “fit best” in various settings and cultural contexts? In identifying criteria for assessing adaptive capacity the literature provides some hints.

Within the notion of earth system governance, four criteria are seen as applying to governance. These include credibility including the commitment of resources, stability of the governance framework, responsiveness to new situations and social learning, and inclusiveness or participatory governance (Biermann 2007).

The effectiveness of autonomous, reactive adaptation measures depends on institutional support, manpower, financial and technological resources (Ausubel 1991, Yohe *et al.* 1996, Mendelsohn & Nordhaus 1999; Mendelsohn & Neumann 1999). Autonomous adaptation is not easy to assess since humans react for a large part unpredictably and while they may be able to react to some types of impacts, they may not be able to react to other impacts (Barnett 2001). Sectors that have a history of adapting to changing circumstances may be better able to react to a changing climate (Mendelsohn *et al.* 1999).

Folke *et al.* (2003: 355) argue that adaptive capacity has four dimensions: (a) learning to live with uncertainty (learning from crises, expecting the unexpected, evoking disturbance, recognizing the relationship between diversity and disturbance); (b) nurturing diversity for reorganisation and renewal (nurturing ecological memory, sustaining social memory and enhancing socio-ecological memory) (c) combining different types of knowledge for learning (combining experiential and experimental knowledge, integrating knowledge of structure and function, incorporating process knowledge into institutions, and encouraging complementarity of knowledge systems) and (d) creating opportunities for organization (dealing with cross-scale dynamics, matching scales of ecosystems and governance, and accounting for external drivers).

Smit *et al.* (2001) identify six determinants of adaptive capacity – economic resources, information and skills, infrastructure, technology, *institutions (possibly implying organizations)*, and equity. Smit & Pilifosova (2001) focus on measures that reduce the vulnerability of the system and build in the potential to anticipate and to act during future climatic changes. These measures must be congruent with local environmental conditions and the social needs of the local population; and the responses and measures must be ‘mainstreamed’ into economic development and poverty eradication processes.

In assessing adaptation options to reduce flooding along the Rhine River Yohe and Tol (2002) use criteria such as the range of technological options; availability of resources and their distribution; the structure of critical institutions, allocation of decision making authority and decision criteria; human capital, education and personal security; social capital, property rights and independency of judiciary; access to risk spreading processes; information management by decision makers; and awareness, attribution and significance of climate change.

Marlin *et al.* (2007) present a “Measuring Adaptive Capacity Tool” which, *inter alia*, focuses on institutional issues and includes criteria such as (a) the ability of elected leaders in the community to make choices related to climate change; (b) the ability of community leaders to manage information ahead of time to decrease risks such as collecting information on flood plains; (c) the ability of community leaders to share the information they have about climate change and possible adaptation strategies; (d) the availability of a plan that is adaptive, forward thinking, and addressing the risk of sea level rise; and (e) the presence of environmental action groups or similar groups in the community.

This brief overview of the literature on adaptive capacity confirms that it is a useful concept to use for the assessment of institutions, because it has at least partly been applied to the social system by other authors. The literature also offers a lot of starting points to build an assessment framework. A systematic conceptualization of adaptive capacity for institutions, however, was not found; instead there is quite a lot of confusion in the literature on adaptive capacity about what institutions are and how they are to be studied.

2.6 Inferences

Institutions are phenomena that guide social processes in society, including adaptation processes. Institutions can be changed when necessary, and the literature shows that they are regularly changed. In the past, institutional change was dominated by governments but increasingly in many parts of the world, such change is now stimulated by more horizontal processes of governance. This raises the question whether participative processes are fast and effective enough to accommodate adaptation to the potential impacts of climate change.

Although the literature on adaptation is growing fast, adaptation to climate change in itself is a rather young phenomenon. An assessment of the adaptive capacity of institutions calls for an *ex ante* assessment of existing institutions particularly also because the literature on innovations shows that some institutional resistance can be expected.

Adaptive capacity is a useful concept for this assessment of institutions. Some clues of what adaptive capacity of institutions could look like have already been described; however, a systematic framework focussing on institutions is not yet available. In studying

this, we are looking at both the ability of society to change its institutions and the space that institutions give society to respond to climate change. It implies that we are looking at certain and uncertain changes and short-term and long-term changes. Furthermore, we are looking at the capacity to adjust ex ante and ex post to changed circumstances in order to minimise the damage and, if possible, to profit from the changes that occur.

3. A conceptual framework for adaptive capacity

3.1 Constructing the conceptual framework

This section elaborates on our definition of adaptive capacity and the criteria for assessing the inherent characteristics of institutions to stimulate society to adapt.

3.2 Definition of adaptive capacity

Based on the literature, we see adaptive capacity as the inherent characteristics of institutions that empower social actors to respond to short and long-term measures either through planned measures or through allowing and encouraging creative responses from society both *ex ante* and *ex post*. It encompasses:

- The characteristics of institutions (formal and informal; rules, norms and beliefs) that enables society (individuals, organizations and networks) to cope with climate change, and
- The degree to which such institutions allow and encourage actors to change these institutions to cope with climate change.
- This implies that institutions should allow actors to learn from new insights and experiences in order to flexibly and creatively ‘manage’ the expected and the unexpected, while maintaining a degree of identity. Adaptive capacity is not a static concept, but one which calls on society to continuously respond; however, the adaptive capacity for short-term climatic events will be different from the adaptive capacity for medium-to long term climatic events.

3.3 Qualities integral to adaptive capacity

On the basis of the literature, three basic qualities - Variety, Learning capacity and the Ability to adjust to change - can be seen as integral to adaptive capacity:

3.3.1 Variety

Unstructured problems like climate change embedding diverse interests and perspectives can only be dealt with within a framework of multiple discourses and solutions, where multiple actors try to create a series of interventions at multiple levels of governance (Hisschemöller & Hoppe 1998). “Only variety can beat variety” (Buckley 1968: 495)

Variety implies the capability of a system to envisage future expected and unexpected climate impacts through having a range of adaptive or proactive strategies, measures and instruments at its disposition, “limiting lock-in into a development that precludes future adaptations” (e.g. Nooteboom 2006: 2-3). The ‘law’ of requisite variety states that the variety within the system must be at least as great as the environmental variety against which it is attempting to adjust itself (Conant & Ashby 1970). This suggests an optimum level of variety; however this is very difficult to operationalise in practice.

Requisite variety calls for fostering diversity, understanding complication, resisting the tendency towards simplification, reductionism and redundancy. Redundancy is a term re-

lated to variety, but it refers to ‘more of the same’, for example, a back up system for energy production or more than one emergency exit, while variety refers to a broad diversity of options.

Variety challenges mainstream policy science approaches that focus on clarity, rationality, reductionism, efficiency and simplistic solutions. Such approaches often refer to institutional shortcomings such as a lack of rules to prevent free riding, too many administrative levels, too many policy domains, different senses of urgency, fragmented and inert budgets, and so on; arguing instead in favour of linear analysis and optimal, cost-effective solutions. Requisite variety reacts against ‘performance oriented management’ (Pollitt & Bouckaert 2004), and the rise of the ‘audit society’ (Power 1999), because unstructured problems don’t fit to a world of one-dimensional measurement (Noordegraaf & Abma 2003).

The concept of variety implies that there is no single appropriate ideological framework, no unique optimal policy strategy or set of mutually consistent solutions, but that there are many. The fittest will prevail, but it is not known in advance which one will be the fittest. This is very much in line also with the notion that we need “clumsy solutions” (Verweij & Thomson 2006). It is based on the belief that we do not have the wherewithal to address complex problems yet. Only by encouraging social ingenuity from a large variety of people will society be able to continuously generate the tailor-made solutions for a complex array of problems in different economic, cultural and political settings.

However, complexity, redundancy and variety can also paralyze action (Weick 1979). Possibly the level of variety has an optimum. Variety is not only about the variety itself but also about the willingness and opportunity to organize in an environment that helps actors deal with complex problems.

Variety also includes the notion of multi-level governance (Winter 2006; Marks *et al.* 1996) which emphasises the diffuse and decentralised nature of governance as well as the need for links between all levels. However, governance approaches also face problems like inertia, syrupiness, suffocating consensus, and negotiated nonsense (Termeer 2007). Furthermore, multiple trade-offs may be made by multiple actors, leading to inconsistent decisions that may or may not be desirable outcomes (Gupta 2004).

3.3.2 Learning capacity

Social learning by human beings is an age-old phenomenon (Wenger 1998). The concepts of human learning (Ormond 1999), social learning and learning capacity are integral to adaptive capacity (Pahl-Wostl 2007). Some see adaptive capacity as learning and the ability to experiment (Walker *et al.* 2002); as coping with change while still maintaining all critical functions and feedback mechanisms (Olsson *et al.* 2004) or accommodating perturbations (Adger 2003). In some definitions, social learning is an overarching concept that is almost synonymous to adaptive capacity as we have defined it. In our framework, learning capacity is one quality of adaptive capacity, a process that leads to enhanced trust between social actors and greater understanding of the situation.

Learning generally results from observing changes in the environment, that does not necessarily lead to a change in behaviour. Learning capacities can be studied at the individual, organizational and societal level. Behaviourist learning theories (how people

learn) and cognitive learning theories (how cognition influences learning) merge in social learning theories. Clinical psychology theory states that people learn through close contact, imitation of superiors, understanding of concepts and role model behaviour. Such learning focuses on the role of actors.

This research focuses on how institutions encourage actors to learn or discourage actors from learning; how institutions permit society to question the underlying assumptions, ideologies and frames that dominate current modes of governing or problem solving. It is about the flexibility of institutions to allow actors to critically investigate socially embedded meanings, assumptions, knowledge, claims, roles, rules, procedures and identities that are normally taken for granted. This is also often referred to as double loop learning, which takes place when the basic assumptions are examined by social actors leading to new patterns of problem solving that are part of the changing institutional context (Argyris & Schon 1978).

Besides learning we are also interested in not-learning. Organizational defensive routines are any actions, policies or practices that prevent organizational participants from experiencing embarrassment or threat, that inhibit genuine learning and that overprotect the current frames (Argyris 1990). Redesigning institutions often calls for 'unlearning' past insights, routines, fears and reflexes.

3.3.3 Ability to adjust to change (autonomous and planned)

Another critical quality of adaptive capacity is the ability of an institution to permit social actors to explicitly or implicitly adjust their behaviour in response to an existing or potential stimulus. While learning calls for an institution to create a sphere within which social actors can learn and which has inbuilt mechanisms that accommodate adjustments and amendments, it does not actually include changes. There may be contextual limitations or there may be occasions where the learning cannot be translated into action. In other words, we are not focusing on the actual adjustments; but on the ability of institutions to enable social actors to adjust to changing circumstances. Of course, any actual institutional adjustments can be a measurement of whether this ability exists.

Such ability can be prefixed by the term 'autonomous' to take into account that an institution should allow actors at all levels of governance, particularly lower levels of governance (e.g. community, regional, and / or household) the opportunity to change behaviour. This is to distinguish it from the overall object of research, namely adaptive capacity in general. The most obvious situation in which autonomous adjustment to change is necessary, is during a crisis or disaster. Studies on human behaviour during disasters show that most of the immediate relief efforts are undertaken by the other 'victims' and not by the government or aid organizations (Tierney et al. 2006). An important aspect of adaptive capacity is that it enhances this self-help function of individuals and communities. Autonomous ability to adjust to change occurs through experimenting with and responding to everyday contingencies, breakdowns, exceptions, opportunities and unintended consequences (Orlikowski 1996). This creates a continuous set of adjustments at the micro level through improvisation. Short feedback loops promote a continual update of social practices (Weick and Quinn 1999). Yet, in a complex multi-actor, multi-level, multi-sector and multi-domain setting, short feedback loops between all interdependent units may make cooperation difficult.

While preparation for climate change may call for reactive autonomous adaptation, it also calls for long term prediction and prevention. This calls for institutions to enable social actors to anticipate possible futures, to take planned preventive measures against important threats and to seize opportunities when they present themselves.

3.4 Contextual variables enhancing adaptive capacity

In addition, we have three contextual variables that contribute to adaptive capacity indirectly and can be seen as key features of institutions in general. These variables are Leadership, Resources, and Fair governance.

3.4.1 Leadership

Without leadership society is often unable to respond to the long-term, large scale challenges that affect humanity and institutions stagnate. Leadership is a driver for change, showing a direction, motivating others to follow voluntarily and/or using coercive measures to promote conformity to a certain development path. Leadership may sometimes conflict with variety. Different types of leadership can be distinguished. The management literature refers to autonomous leaders (Wallis & Dollery 1997); entrepreneurial leadership (Andersson & Mol 2002); reformist leadership (Goldfinch & 't Hart, 2003); institutional entrepreneurs (DiMaggio 1988) or policy entrepreneurs (Kingdon 1984). The institutions literature refers to structural, entrepreneurial and intellectual leadership (Young 1991), coercive, instrumental and unilateral leadership (Underdal 1994), sticks and carrots, problem solving and directional leadership (Malnes 1995) and structural, instrumental and directional leadership (Grubb & Gupta 2000).

While much of the leadership refers to actors in society, our focus is on how institutions encourage leaders to emerge and reshape the very institutions themselves. Since institutions are contextual in nature, they need to promote appropriate forms of leadership to deal with different social problems. For unstructured problems, institutions need to encourage leadership that promotes variety and creativity; dialogue and understanding. Such leadership should be willing to confront uncertainty and be willing to deal with it.

3.4.2 Resources

The effectiveness of institutions often depends on its ability to generate resources (Ausubel 1991, Yohe *et al.* 1996 Mendelsohn & Nordhaus 1999, Mendelsohn & Neumann 1999). Institutional norms and rules should call for the generation of resources in order for that social actors implementing these rules are able to do so. Clearly, the context within which institutions exist will also have a major influence on whether such institutions are able to raise resources and the success of institutions in being able to do so will be relative. Such resources can include financial, social, human, legal, and technological resources.

3.4.3 Fair governance

A last critical variable is the nature of governance within a society. The nature of governance will determine the room given to social actors to participate creatively in the problem solving process and thereby establish institutions. People need a governance

framework that allows creativity, innovative behaviour, and the ability to take entrepreneurial risks. Such governance may have differing levels of legality, legitimacy and accountability. Justice, equity, the rule of law and general social stability are also important preconditions for the trust and mutual respect, that are necessary for social learning, the criteria at the heart of adaptive capacity. Such fair systems of governance will give rise to institutions that support autonomous responses to climate change.

We have chosen fair governance to good governance, since the latter is a concept rooted in the rational actor, neo-liberal theory, which also focuses on attributes like efficiency and cost-effectiveness. We argue that where society is focused more on efficiency and less on effectiveness, creativity and redundancy, adaptive capacity will be stifled. Therefore, we prefer the term 'fair governance' over 'good governance'. Of course, fairness also implies that resources should not be squandered indiscriminately and that an appropriate balance needs to be found between effectiveness and efficiency. On the other hand, innovation processes are notoriously inefficient (Mintzberg 1989) and should be allowed to be inefficient in order to take place at all. Maximum efficiency is only possible in a stable and certain environment and, therefore, it cannot be a first priority when dealing with climate change.

The above set of criteria is comprehensive and well-documented in the literature. However, it also has some weaknesses. First, there is a danger of overlap between the different criteria and may pose challenges in actual implementation. Second, the framework includes some paradoxes, for example, between variety and leadership. Such paradoxes are reflective of social reality itself and understanding adaptive capacity may call for expert judgements regarding how to deal with the overlaps and seeming contradictions. Third, the criteria are broad, vague and complicated reflecting complex systems. However, if the conceptual framework is to be used as a measurement instrument, this framework needs simplification which is attempted here below.

4. Operationalising the framework for Adaptive Capacity

4.1 Operationalising the framework

In making the conceptual framework more practical, we identify sub-criteria for each criteria that can be used in a qualitative assessment process.

A key question is: What is the object that is to be analysed. Given that institutions include formal and informal rules and processes as well as the underlying worldviews and a complete sub-culture, our simplified objects of research, in the following order of priority given the growing degree of uncertainty associated with each, are:

- a. The formal strategies, measures and instruments (through content analysis);
- b. The formal rules regarding rules of procedure (through content analysis);
- c. The informal strategies, measures and social practices (through stakeholder interviews);
- d. The informal rules of procedure (through stakeholder interviews); and
- e. The underlying world-views as reflected in the documents (through content analysis and stakeholder interviews).

In other words, a content analysis of formal policy documents can give an idea of the adaptive capacity of those institutions. However, only a complete analysis of all the different objects of study within institutions is likely to give an understanding of whether institutions have the inherent characteristics to stimulate adaptive capacity in society. In order to make such an assessment process practical, each criteria has been subdivided into 'measurable' sub-criteria. The following section briefly expands on these sub-criteria.

Although we are assessing the adaptive capacity and not adaptation measures, we have decided that it can be useful to work with some assumptions. For example, we will assume that:

- Adaptive measures show adaptive capacity;
- If there are more adaptive measures available, adaptive capacity will be greater. The bigger the toolbox of adaptive measures, the greater the chance is that adaptive measures will be taken, when necessary; and
- If there are more non-governmental organizations which have the right to make an appeal to independent judges, we can assume on the one hand that adaptive measures with a huge spatial impact can be hindered; on the other hand: those NGO's can keep the governmental climate conscience "sharp".

4.2 Variety

An institution embeds variety when it allows for:

- A variety of problem frames and solutions. This includes (i) different problem definitions, (ii) a process which allows discussion of different inputs leading to

- (iii) the generation of multiple solutions; or solutions that allow assessing and amendment.
- A variety of actors (multi-actor), levels (multi-level) and stakeholders (multi-sector) during policy formulation process. This includes (i) Procedural openness allowing new actors to enter at the start as well as during the process; (ii) Participation rules such as how many actors have voting power, how many veto power; how many have influence on the content of the decisions; how many actors are present, how many have been invited; and how many were informed of the process; (iii) involvement of state, market and civil society actors, from local, regional, national and supra-national actors and sectors, if relevant.
- Promotes diversity and differentiation of policy to reach tailor-made policies by (i) prescribing goals but not comprehensively prescribing procedures, measures or direction; (ii) avoiding monopoly positions (including governmental monopolies); (iii) leaving decisionmaking to the lowest relevant level (subsidiarity).
- Promotes redundancy by discouraging (i) cost effectiveness and (ii) optimal solutions and thereby allowing overlapping responsibilities and solutions.

4.3 Learning capacity

The ability of an institution to demonstrate learning capacity by allowing and encouraging actors:

- To trust and mutually respect each other and to be willing to learn from each other by studying whether institutions allow (i) actors to listen to each other and enrich analysis; (ii) mutual trust between the state and society as demonstrated by interviews and action; (iv) inter-sectoral cooperation and coalition building, multisectoral and multilevel agreements formal and informal cooperation?
- To engage in double loop learning via learning across boundaries by (i) cooperating between disciplines, administrative, national, sectoral, social groups; and (ii) challenging dominant frames; different problem definitions and methods (using innovative methods including greenfields approaches);
- To explicitly consider doubts and uncertainties which can be evaluated by checking if (i) such uncertainties are mentioned / not mentioned; (ii) such uncertainties are also categorized into statistical uncertainty (already some quantitative indications of causal mechanisms), scenario uncertainty (already some qualitative information on causal mechanisms), recognized ignorance (already some qualitative information but no causal clues); total ignorance (not knowing what you don't know); and (iii) such uncertainty is also dealt with through more research, keeping options open, developing future scenario's, spreading risk, etc.
- To continuously learn through an organized process which (i) facilitates learning networks by providing resources to promote scientific research and education; (ii) promotes learning through the internet, media, debate sessions and workshops; (iii) supports structured monitoring, evaluation and feedback; and (iv) provides opportunity for thinking and taking distance from the issues.
- Stimulates institutional memory through the creation and maintenance of (i) database, publications, education materials and archives; and (ii) the willingness of society to study these documents and using past experiences in current policy.

4.4 Ability to adjust to change

An institution encourages social actors to adapt to the potential impacts of climate change when it creates mechanisms that ensure that actors have:

- Access to information through (i) continuous monitoring of potential impacts; and (ii) the different sources of media;
- Are capable of acting according to plan. Such capability includes (i) physical ability, (ii) cognitive preparedness, (iii) access to technological and other support systems to deal with such crises, and (iv) have tested out such plans to ensure their effectiveness.
- The capability to improvise: Such capability includes (i) physical ability; (ii) cognitive preparedness and entrepreneurship; (iii) crisis expertise (i.e. what sort of responses are needed and can be organized); (iv) regional memory, historic experience and familiarity with surroundings; (v) access to technical and other solutions; (vi) access to relevant resources and support from other sectors and services such as transport, health, communication, etc., (vii) without risk of being subsequently prosecuted and (viii) without being hampered by institutional constraints.

4.5 Leadership

An institution should encourage the rise of three types of leaders at different levels of governance, sectors and bodies. It should create mechanisms that allow for:

- Visionary (or intellectual, directional) leadership. Institutions should not be so rigid that they hamper the rise of creative, visionary leaders, with the cognitive skills, rhetoric and charm to convince society to respond to climate change in different ways; This can be done through (i) promoting free speech; (ii) encouraging leadership training; and (iii) including all kinds of perspectives into social debate.
- Entrepreneurial leadership. Institutions should include mechanisms that allow for actors to demonstrate entrepreneurial leadership through permitting (i) the creation of public/ private initiatives focused at meeting public goals, (ii) and encouraging rapid access to resources.
- Collaborative (instrumental) leadership: Institutions should include mechanisms that allow for (i) the development of coalitions and networks; (ii) providing training that optimises coalition and network participation; and (iii) providing access to resources and support to implement ideas.

4.6 Resources

Effective institutions must be able to generate a wide variety of resources. These include:

- Authority (mandate), involvement of actors with decision power: Institutions should authorise (i) cooperation of authorities at different policy levels, (ii) Cooperation of authorities from different sectors, (iii) acceptance of decisions by stakeholders and other actors; (iv) integration of decisions in the policy framework; (v) allow for appeal processes and yet provide opportunities to counter opposition through expropriation and arbitration services.

- Human resources: Institutions should encourage the development of human resources through (i) education and training; (ii) public awareness programmes; (iii) promoting cognitive development and encouraging creativity.
- Economic resources: Institutions should include mechanisms that (i) generate financial resources both public and private, (ii) can generate land resources if necessary, and (iii) technological and other resources that may be necessary.

4.7 Fair governance

Effective adaptive institutions emerge from and promote systems of fair governance.

This implies that institutions should promote:

- Legitimate policy processes: This can be done through (i) promoting good quality democratic procedures; (ii) acceptance of the rule of law; (iii) clear decision making procedures, and (iv) encouraging participatory public policy processes.
- Protection of basic rights and equity: This can be achieved through (i) guaranteeing basic rights such as the freedom of speech, religion, association and organization, (ii) explicit policies to include disadvantaged peoples, and (iii) inclusion of redistribution mechanisms to promote equity in society/
- Responsiveness and transparency: This can be achieved by ensuring (i) transparency in decision making processes, and (ii) ability to incrementally improve policy and responsiveness to policy processes.
- Accountability: This can be achieved by (i) dividing responsibilities between the legislature, executive and judiciary; (ii) independent organizations to evaluate state policy and (iii) low corruption levels.

4.8 The adaptive capacity score card

Based on the different criteria specified above, an adaptive capacity score card has been generated which would allow for communication with social actors (see Figure 2). The Score Card presents the criteria and sub-criteria in a clock-wise manner. Using three colours to distinguish between high (green), medium (orange) and poor (yellow) adaptive capacity, this card may be used as a simple communication means. The purpose of identifying these criteria and the Score Card for Adaptive Capacity is to both assess and inform social actors about how their institutions score on adaptive capacity and where there may be room for reform.

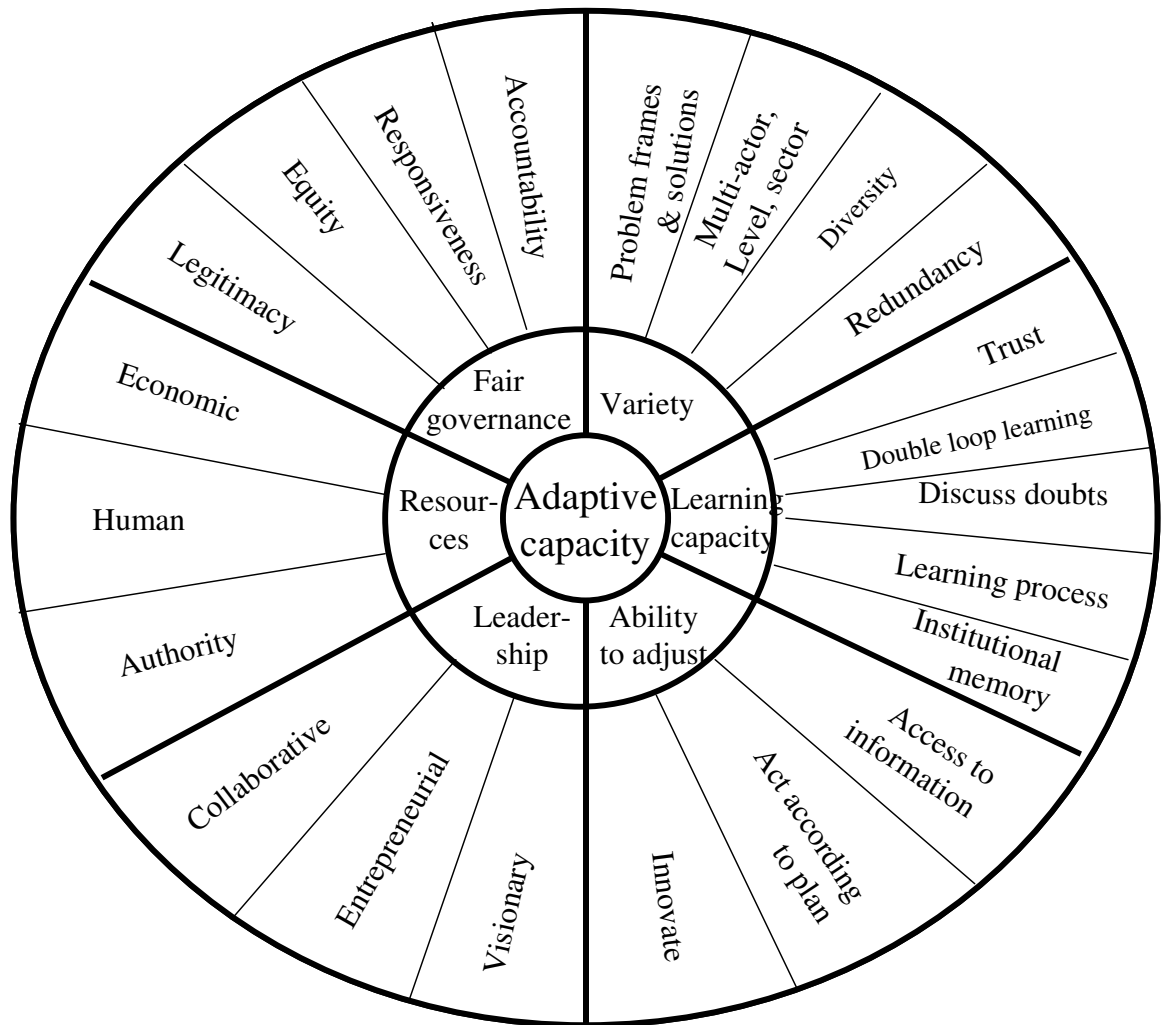


Figure 4.1 The Adaptive Capacity Score Card.

5. Conclusion

This paper set out to elaborate on a method to assess the inherent characteristics of institutions to promote the adaptive capacity of society to climate change. Institutions are not actors; but they both constrain and empower social actors. They are both the result of human interaction and they in turn shape human action.

Social actors have always gradually adapted their institutions to changing circumstances. The question is do our institutions constrain social actors from modifying their institutions fast enough to cope with the rapidly changing environmental conditions that emerge as a consequence of climate change; given also that social infrastructural investments and related planning tend to be large-scale and long-term in nature and tend to lock society into specific types of production and consumption patterns. Although the institutions and adaptation literature is, in itself, rich and provides considerable information regarding how societies can adapt there is very little information about how one can assess the inherent characteristics of institutions to cherish the adaptive capacity of actors.

Based on the literature, field experiences and brainstorming, this paper has generated a list of six criteria, each with its own sub criteria to assess the inherent capacity of institutions to stimulate the adaptive capacity of society. However, there are three tensions in the proposal - the first is the emphasis on variety and multiple solutions at multiple levels which may not in the long term be able to rapidly cope with such a complex, challenging problem such as climate change, which may in the final analysis call for a dictatorial approach. This is something we hope to test out through follow-up content analysis and case studies.

Second, it is very difficult to actually quantify the results. These criteria are not easily measurable such as criteria like GDP per capita; and they may also appear fuzzy and naïve to those from the rational actor school. Nevertheless, the literature in vastly different fields tends to suggest similar criteria and we believe that there is potential in assessing these criteria. We played with the notion of using fixed criteria, i.e. that the variety of solutions should match the variety in the problem (i.e. the notion of requisite variety) but ultimately concluded that at this stage we should keep an open mind and focus mostly on whether solutions are being shut out since they do not fit into existing dominant paradigms. We believe the criteria will give room for qualitative assessments and expert judgment.

Third, the simple colour range of the score card (red, yellow, green) may not be universally applicability. If it is to be universally applicable, we may need to develop a more complex colouring system. For the present, this score card will be tested out for the Dutch context, before further development for use in a global context.

In the actual assessment process, we believe that three levels of assessment will be needed. First, we need social actors to grapple with these concepts and to try and apply them to the institutions in their context and make their best possible assessments. Second, we will engage with social actors to understand what the challenges are in applying such criteria. Third, we will try to assess whether they agree or disagree with the use of

such criteria for assessing the inherent characteristics of institutions to promote the adaptive capacity of society. In doing so, we will assess if there is any causal relationship between the individual criteria – i.e. does variety stimulate learning? Does learning stimulate adjustments to change? Do leadership, resources and good governance stimulate variety, learning and adjustments to change? Such assessments will help refine the criteria and sub-criteria.

These criteria are integrated into a Score Card for Adaptive Capacity which aims to both assess and inform social actors about how their institutions score on adaptive capacity and where there may be room for reform. This Score Card is a modest contribution to the growing literature on adaptive capacity.

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² www.climatechangesspatialplanning.nl

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