Integrated Climate Governance (ICG) and Sustainable Development

J. David Tàbara

1 Introduction

The present paper introduces for the first time the concept of *Integrated Climate Governance* (ICG) and critically discusses its implications for EU research and policy on 'sustainable development'. ICG is understood as a transition-oriented appraisal approach focused on the creation of assessment tools, policy instruments, and agent-based capacities aimed at dealing in an integrated way with multiple scales and domains related both with mitigation and adaptation. The goal of ICG is to support agent transformation for sustainable development. ICG constitutes both a descriptive and normative synthesis of a large corpus of literature and research within the fields of Integrated Assessment (IA), Integrated Sustainability Assessment (ISA; Rotmans et al. 2008), Social and Sustainability Learning (Pahl-Wostl et al. 2008), and research on the institutional dimensions of global environmental change (Young 2008).

The reflections provided in the following pages derive mainly from the insights gained from my involvement in several EU funded research projects, most recently MATISSE (Methods and Tools for Integrated Sustainability Assessment; www.matisse-project.net), and ADAM (Adaptation and Mitigation Strategies – Supporting EU Climate Policy; www.adamproject.eu), as well as in the new IHDP project Integrated Risk Governance (Jaeger et al. see http://www.irg-project.org/) and Global Systems Dynamics and Policies (www.gsdp.eu). However, and for reasons of space, specific references to the empirical material of these projects have been omitted here and the following contribution concentrates only on the more analytical, operational and normative aspects of the concept. It is argued that ICG constitutes a powerful conceptual synthesis to reframe present EU research and policy making processes and outcomes on climate change in ways which increasingly become more relevant to

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meet pressing societal and policy needs and to support goals such as the ones stated in the EU Sustainable Development Strategy.

A main goal of this chapter is to stimulate a discussion on how and by what processes current EU research and policy on climate change could be reframed in a way which can best support the design and implementation of sustainable development at different levels of governance. However, I do not attempt to define what the ultimate meanings of governance or of sustainable development are (Jordan 2008), discuss the seriousness of the current climate change risks or evaluate the adequacy of the existing climate assessment processes (Jaeger et al. 2008). The focus here is to propose a heuristic device to help to integrate the science and policy of climate change into a common framework with the explicit goal of stimulating agents' transformations and institutional innovation. Progress in sustainability, rather than in 'sustainable development' as the concept in itself can be thought as a trap (see M. Midgley in this volume) is more likely to be made by addressing directly a specific number of urgent persistent problems -and their interrelationships- than by trying to agree on its ultimate semantic definition before it can be implemented. At the very end, what is needed is systems to move towards highly diverse sustainable patterns of social-ecological interactions, and not a single definition of sustainable development to be applied in all contexts. From this perspective, the starting point is that climate change not only poses one of the greatest challenges to humankind has to urgently respond but also constitutes one of the greatest opportunities for making real progress in sustainability.

2 Climate Change as a Large-Scale Persistent Problem

Persistent Problems can be defined as the class of problems for which ultimate causes have to be found in the previous application of inadequate solutions to deal with them. Persistent problems often emerge as a result of applying simple, singled-perspective and linear solutions to systemic processes of socioecological change. The intensity and scale of persistent problems increases when no institutional and social learning occurs. The choice of one-dimensional measures for problems and policies which are inextricably interlinked together – such as those related to water scarcity and pollution, energy, land-use management, or biodiversity/ecosystems functions conservation – often result in the accumulation of negative side effects and the worsening of the initial conditions of the systems of reference in which such problems originally emerged (Fig. 1).[1]

Unless properly framed and managed, climate change has the potential to enter into this class of problems, whereby recursive, cumulative and eventually intractable feedbacks express themselves in multiple ways and at different levels of

[1]In contrast to Young (2008:124) I understand that cumulative environmental problems are those which their feedback effects become forces of environmental change by themselves. In this regard, climate change is both a cumulative problem and a systemic one.

Fig. 1 The growth in scale and intensity of global environmental related risks is often the result of the accumulation of feedbacks derived from intricate environment-societal interactions and decisions

action. A usual way to deal with persistent problems and risks in the short term at the local and regional level is to try to shift their most visible negative effects and costs to other contexts, scales, or policy domains without actually eliminating their original causes. Adequate policies to deal with climate change need a holistic and integrated approach, which takes into account the systemic, random and multiple feedbacks – positive and negative – derived from both social and ecological systems and their interactions.

3 Power, Knowledge Management and Social-Ecological Transitions

Power is inextricably embedded in all the processes which concern the scientific definition of the potential impacts of climate change, the selection of policy measures, and the communication of the messages to be disseminated to the public. Power conflicts lay at the heart of the boundaries management which mark who can participate in the definition of the problem and of the possible alternatives of action. Decisions on risk assessment, policy instruments, as well as on communication and learning are always embedded in particular power structures. Transitions in the management of large scale risks such as global warming inevitably require modifications in the distribution of power, changes which in turn are materialised in new forms of institutions.

In addition, very often the costs and benefits of persistent problems and of their potential solutions are distributed unevenly across different sectors of the population. Inequality in the access and use of natural resources and in the processes of knowledge production limits the scope of agent and system transformations. The resistance by the incumbent regime to resolve such inequalities is often the main obstacle which impedes the type of transformations which would lead to a long-term structural improved situation. Dealing with large-scale complex risks requires empowering specific agents and to support niche developments in particular contexts of action – mainly at the local and regional level – in a way which enables them to break the existing lock-in situations and participate in the configuration of new regime institutions. In particular, the making of new local and regional institutions capable of dealing in a social-ecological robust way with large scale environmental risks demands the redistribution of power at different levels.

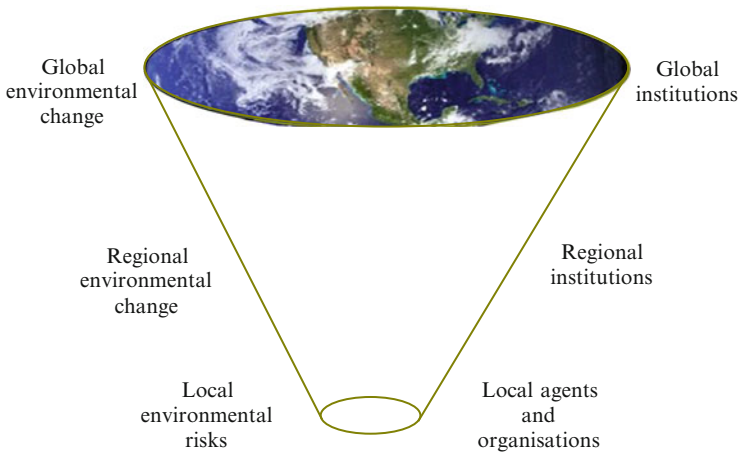

Fig. 2 Multi-level social-ecological dynamics and governance. The governance of large scale environmental risks such as climate change demands a clear definition of responsibilities as well as coordination between different levels of policy action to create incentives and conducive conditions for agent transformation

Transitions in climate change governance require *systems' learning,* although this cannot be achieved without empowering agents at lower levels. From the field of Integrated Sustainability Assessment (ISA Rotmans et al. 2008) it has been clear that unless new processes, tools and methods are developed which are specifically addressed to tackle issues of power and agent transformation, there is little change of progress toward a transition to sustainability. Policies aimed at supporting transitions, such as the one that would eventually lead to a progressively decarbonised global society, need conducive institutions which define clear responsibilities at different levels, while at the same time can provide adequate mechanisms for coordination between each of them (Fig. 2).

4 A Systems Perspective on Agents' Transformations and Complexity

Nevertheless, the possibilities and capacities of individual agents and organisations to cope with multiple risks and modify their behaviours accordingly depend on the particular interactions they maintain with the structures of the overall social-ecological system in which they operate. Such structures are composed by social governing rules but also by biophysical constraints which characterise their ecological base, and this provides the potential as well as the limitations for agents' transformation, learning and reconfiguration. And in this way, different patterns of social-ecological system' configuration may be more or less conducive to adapt or mitigate problems of unsustainability.

To underline these points we can use the integrated meta-modelling framework SEIC (Tàbara and Palh-Wostl 2008) – in which all socioecological systems and agents dynamics can be understood as resulting from the interactions between their structures (S), the use of energy and resources by these agents (E), the available information and knowledge (I) and the accumulated socio-ecological change (C) that their activities produce. According to this perspective, within a particular system level, a greater availability of resources, new access to knowledge and information, or new governing rules may create new degrees of freedom or new spaces for agent interaction which may facilitate agent transformation, social learning, and eventually, increase the potential for transition. In contrast, a situation in which there is an inflation of rules, an excess of physical interactions, or where information or the availability of resources becomes relatively scarce may lead to congestion, and in these conditions agents' transformations – and the overall transition – may become more difficult if not impossible to achieve if this process is not accompanied with an increased in the overall complexity of the system (Fig. 3).

World natural resources, information systems and institutions are increasingly interconnected with each other, thus increasing their interdependency and inter-configuration. However, when such structural connectivity does not follow a modular shape (e.g. where individual parts of the system cannot be 'disconnected' or allow for self-organisation or self-configuration) this may create new conditions for a higher vulnerability to small changes and shocks occurring in any other parts of the system. As a working hypothesis, we can say that the capacity of a society to

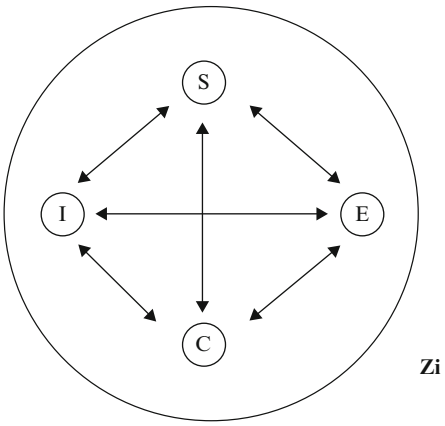

Fig. 3 The social-ecological system as characterised by the SEIC Model (Tàbara and Palh-Wostl 2008). Whereby S: Structure, E: Energy and resources; I: Information and knowledge; and C: accumulated socio-ecological change; zi relates to the size of the system of reference and depends on the selected unit for observation and analysis. Social-ecological systems are composed by agents that respond to these four types of subsystems constraints and dynamics. Transitions in climate governance and sustainable development demand profound changes in the configuration and dynamics of each of these four subsystems which affect agents' behaviours and interactions between them

cope with large-scale persistent risks, such as climate change, and of its agents to transform themselves accordingly, depends on the level of structural complexity achieved by S in ways that minimises the use of E, reduces negative C, and does so by the best use of I. This dynamic can be referred to as an increase in 'sustainability oriented system complexity'.

In this guise, the 'normal' evolution of all SESs leads to congestion and entropy once the degrees of freedom available to the agents that conform these systems are exhausted. The reasons for that can be manifold, and can derive from an excess in the use of resources and energy (E) based on existing technologies, the accumulation of its negative side effects (C), or even the lack of adequate rules (S; or the excess of them) that impede agents' transformation, increased number of biophysical interactions, and/or the possibility to develop or use new sources of knowledge and stocks of information (I; e.g. embedded in diversity). All in all, a central tenet is *that the sustainability of a social-ecological system depends essentially on the quality of the information and knowledge systems used by the agents who form the overall socio-ecological system, and in particular to the extent such information and knowledge support adaptive transformations of existing structures*. Therefore, sustainability transformations rely on the capacity of agents to develop and use information and knowledge systems to accurately in modes that describe existing dynamics and activate feasible options and alternative pathways of development and growth. This can only be done whenever such development also produces a sufficient number of degrees of freedom for the agents to be able to reorient their behaviour without limiting their possibilities of quality interactions (not necessarily physical) and learning.

Thus, in principle, the more complex a society is structured, the more capable may it be to deal with complex problems, but only if such complexity contributes to meeting the above criteria of progressively reducing the overall negative systemic change (C) by making the best use of its information and knowledge systems (I). Indeed, new persistent problems may derive from the development of an increased complexity, as a more complex society also tends to demand greater levels of information, energy, and resources and provoke greater environmental change to maintain its structure. So the key is *how* such complexity is used and for what purposes, in the sense that an increased structural complexity is a necessary condition, albeit not a sufficient one, to deal with the increased complexity of the current problems of unsustainability. In this sense, the level of structural global complexity is also closely related to the preservation of global diversities, that is, natural, institutional and cultural, as these constitute the repositories of alternative sources of knowledge as of rules which are needed for sustainability learning. If these assumptions hold true, the governance of highly complex problems such as climate change demands not only the management of complexity, but also explicit policies and measures to increase and reorient it in the right direction to confront the social-ecological systemic effects derived from it. Indeed, the success or failure of different pathways aimed at managing sustainability and risk transitions may therefore be dependent on the *level and type* of complexity achieved by different social-ecological systems, a set of properties which can only be developed from social learning (Fig. 4).

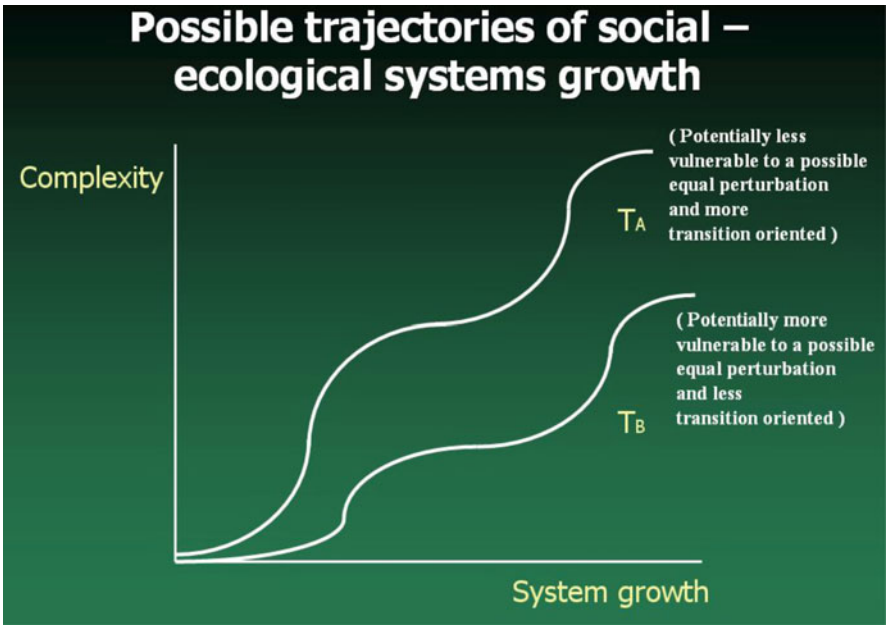

Fig. 4 Complexity growth and possible social-ecological adaptive trajectories within a particular system level, the long term management of large scale environmental risks such as climate change needs explicit policies aimed at increasing and reorienting complexity, a process which can only be achieved as a result of social learning, which is mostly an institutional challenge[2]

The existing power and governance structures also condition the type of policy choices which are generally favoured or discouraged by the existing regime, which in turn also affect the options and pathways for resource transitions. Overall, policies based on ecoefficiency tend to be encouraged by the existing regime because they allow for an increase in the options for resource use and social interactions – thus postponing system congestion – without questioning much the existing regime. At the same time, such policies and measures may have few negative distributional effects in the short term, hence lessening the potential for conflict. However, policies based on managing sufficiency, that is, setting limits to resource use, often entail new compromises between existing power forces. Setting maximum thresholds to resource use or pollution levels – such as reducing current GHG emissions to about 80% or more below 1990 levels by 2050 – would demand profound transformations in agents' practices and system reconfiguration. This may threaten the existing power regimes and would require the empowerment of new niche coalitions in order to achieve and reduce the impact of its potential

[2]This does not mean, however, that all societies need to follow the same structuration pattern, but on the contrary, that many different patterns and configurations and organisation are required – and not only one – in a more complex society which aims to cope with the challenge of growing unsustainability.

distributional costs. Needless to say, an integrated approach to climate adaptation and mitigation in tune with the predicament of sustainable development requires of both types of policies, dealing as much with ecoefficiency as much with sufficiency.

5 Towards Integrated Climate Governance. Concept and Applications

A common reaction by regime agents when confronted with the increasing effects and interdependency of multiple systemic constraints in the fields of energy, land use, food production, water, and climate change is to respond with non-systemic and non-integrated responses, thus trying to look for single indicators of success or failure (Fig. 5). However, simple solutions to the complex problems of unsustainability are no longer a possible answer. Such widely shared cultural attitude impedes not only dealing effectively with climate mitigation and adaptation but also reaching a much broader system transition to a more secure and sustainable development based future.

However, and with regard to climate change, it is increasingly clear that policies dealing with the type of Green house Gases (GHG) reductions which are needed to prevent catastrophic losses in the relative short term cannot be assessed or managed in isolation. To prevent problem shifting and rebound effects, what is needed is the development of a set of integrated multi-domain, multi-scale approaches, each one able to take into account these multiple constraints and ecosystem limits and to support transition and transformation processes at different system governance levels.

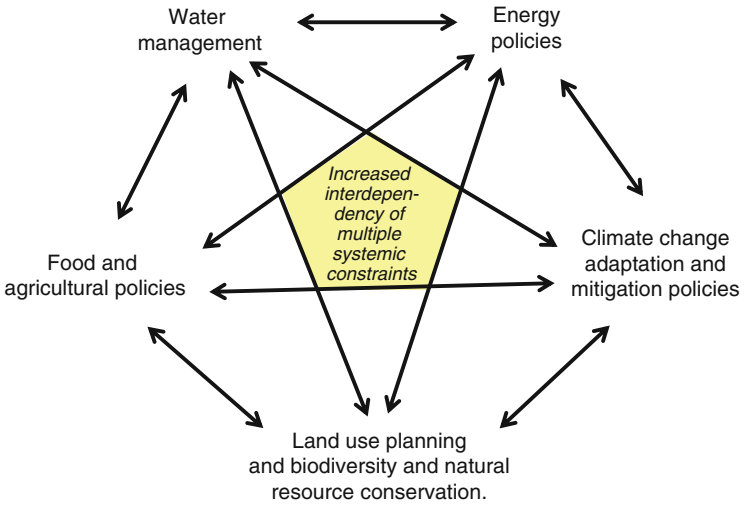

Fig. 5 The growing interaction between multiple constraints and policies, demands a multi-domain, multi-scale integrated science-policy-communication approach both in science as in policy with interaction with the public. New policy domains and new ecological threats are being acknowledged and added to this complex 'treadmill of social-ecological constraints'

A possible and feasible way to start doing so is by promoting basic innovations in the organisation of time, space and resource use – e.g. using different tools and mechanisms for learning and behavioural change to reorient agents' interactions and structural social-ecological configurations. These procedures should be able to support the setting of voluntary quantitative limits to natural resource use so to avoid rebound effects which emerge from policies which solely focus on improving ecoefficiency. In our democratic liberal societies, such 'voluntary management of austerity' – which in itself can be a source of sustainability innovation – needs necessarily to be carried out in a collective and participatory way. Therefore, an integrated governance approach which acknowledges and anticipates ecological limits should not only be interested in learning about 'what to do' but most notably also 'what not to do' – some of the most difficult things to learn in our opulent liberal societies. Similarly, this approach would need to reframe the current socio-ecological challenges not as problems about what to do with 'the environment out there' but mostly as a challenge about what to do with our interactions with the total socioecological system – hence overcoming some of the persistent cultural dualisms that dominate our perception of the total environment and which are so much ingrained in the obsolete distinction between the 'social', 'ecological' and 'economic' realms. In this regard, not only changes in power are needed and have to be promoted, but ultimately in culture. It is through the lens of culture which we define the basic dimensions of time, space, and happiness and which determine our interactions with the natural world in more or less sustainable ways.

At present there is no such set of integrated appraisal approaches able to assess climate risks from this integrative holistic perspective and to support societal transitions and agents' transformations in different governance contexts (for a conceptual attempt, see Weaver et al. 2006). In policy, the recursive negative effects between different policy goals and measures, which often follow contradictory purposes framed at different time and spatial scales, are generally assessed or dealt with separately. This situation leads to a continuous practice of problem shifting rather than problem reframing, which transposes, rather than solves, the different externalities either to different scales or to different domains.

The concept of Integrated Climate Governance (ICG) aims to fill this gap. ICG constitutes a theoretical and epistemological synthesis of a large corpus of scientific literature on Integrated Assessment, Integrated Sustainability Assessment, Social Learning, Risk Analysis, and research on institutions of Global Environmental change as well as climate change appraisal. It is intended to set up a research programme and to help analyse existing practices and to provide guidance for scientists and policy makers, as well as practitioners working in the interface between the two (media, knowledge brokers, civic society organisations) regarding climate action. Therefore, the present framework of analysis does not consider or focuses only on the improvement of the tools and methods for the scientific assessment of climate risks, nor only on the possible policy architectures and instruments, or solely on the processes of public communication and outreaching. *The emphasis of ICG lies precisely in the learning and transformation processes which result from the interaction and integration between the three spheres,* and not

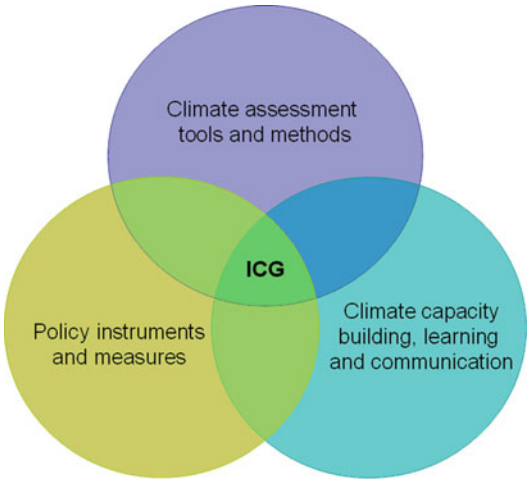

Fig. 6 Integrated climate governance

in any one of them alone (Fig. 6). Future research on ICG may concentrate on examining what type of mechanisms foster new forms of interaction and reconfiguration of agents and institutions working within and between these three spheres. The normative goal being to support the design and implementation of efficient, equitable and social-ecologically robust climate strategies in multiple contexts of application in synergy with other strategies such as the implementation of the EU Sustainable Development Strategy.

In short, Integrated Climate Governance (ICG) can be defined as:

> The structured generation and use of tools and methods that combine a plurality of legitimate but divergent interests and sources of knowledge and judgement for: (i) the comprehensive assessment of climate risks and opportunities, (ii) the design and implementation of policy instruments, and (iii) the creation of communication, engagement and transformative learning capacities, all aimed at producing long-term efficient, equitable and socially and ecologically robust climate strategies. ICG deals both with adaptation and mitigation, and does so from a multi-scale, multi-level, multi-domain and transition-oriented perspective.

Therefore, ICG is as much a process of transformative assessment (appraisal) as it is a process of governance and public communication and learning. The goals and strategies of ICG will never be predetermined but will result as an outcome of a social learning process derived from the interaction between: (1) The actual assessment procedures on risks and opportunities (2) The development of policy instruments and their implementation and (3) Communication and capacity building. ICG needs to integrate multiple sources of local and universal knowledge and judgement, not only to deal with uncertainty but also because the necessary engagement of agents and the understanding of the systemic conditions which determine their potential transformations can not be achieved only by top-down strategies. The emphasis on communication and public awareness is crucial, given that at present most

dominant information systems (including the media and the market price systems) are still largely oblivious to the reality of climate and unsustainability threats, while these conform the basis for agents' and system transformations. ICG could be particularly useful to orient current research on climate change in a way which becomes more relevant to support policy decisions.

In particular, a context-based local and regional approach to Integrated Climate Governance would:

- Emphasise the spatial dimension in the appraisal of climate mitigation and adaptation options and strategies. It should apply a multi-scale approach to the design of climate strategies, hence looking at global and local processes as well as taking into account the long-term needs and present opportunities for institutional and agent transformation. The role played by land use planning is central in local and regional ICG.
- Integrate and combine the assessment of vulnerabilities with the development of opportunities for business and regional sustainable development. Regional ICG may not only be concerned with creating capacities to reduce the potential impacts upon the most potentially vulnerable populations, but above all with developing an adequate set of incentives, social networks and policy instruments mix capable of stimulating transformations and turning potential risks into opportunities. Thus, a central aspect of ICG is its special focus on the development of a portfolio of incentives and feasible options which take into account trade-offs as well as synergies between multiple domains, while considering the particularities of different agents and sectors demands and needs.
- Be based on the continuous identification and empowerment of local niche developments and successful experiments both in adaptation and mitigation, with the goal of being up-scaled and mainstreamed into larger regional or international programmes.
- Develop efficient mechanisms and capacities to help vertical and horizontal institutional coordination. An important task in this regard is to increase the complexity of the institutional climate arrangements and to support the development of new cross-cutting learning networks which facilitate the integration of assessment tools, policy instruments and knowledge transfer between the climate domain and other policy domains.
- Fully apply the precautionary and subsidiary principles to guide climate decisions at the local and regional levels. In this sense, ICG would aim at developing mechanisms which take into account the uncertainties about the local and regional climate impacts and of the effectiveness of possible measures to cope with them, in line with approaches close to adaptive management. ICG research and policy at these lower levels would encourage and support adaptation and mitigation initiatives which go beyond the mere compliance with national and international GHG reduction targets thus opening up new spaces for interaction, experimentation and learning among local and regional agents.
- Aim at integrating equity, efficiency and diversity in the design and selection of climate policy options and strategies. ICG would not only look at the potential

results of decisions but also at the processes and initial conditions in which the decision making processes are carried out. It would also consider not only the contribution of distinct policy options to specific targets of climate mitigation and adaptation but especially how the attendant costs and benefits are distributed among the affected populations. ICG designs need to be flexible enough as to accommodate new distributional and efficiency criteria on the basis of new policy values and scientific knowledge.

The above general framework proved useful to identify, analyse and understand what is still missing and what has already been achieved with regard to the development of transformative and robust appraisal capacities in the ADAM selected case studies[3]. New capacities in the three main spheres of ICG – that is, in risk/opportunity assessment, policy implementation, and social learning and communication – were observed and developed in the three regions. Nevertheless, and given that the social, ecological and institutional contexts in these contexts are so diverse, these capacities and how they were integrated into the making of a regional strategy differ greatly. A prominent result of the comparative analysis of the ADAM regional case studies is that the level of integration between these three domains was on the whole very low, even though there are venues and opportunities to make such integration possible. Furthermore, the type of science used for assessing risks and opportunities is not sufficiently well-equipped. At present prevailing science practice is largely unable to provide integrated narratives on such interconnected and systemic problems of human-induced climate change and unsustainability in ways that are relevant for policy.

6 Making ICG Operational at Local and Regional Levels

The concept of Integrated Climate Governance has been introduced as a heuristic devise which can be used to identify the gaps and potentialities of existing climate appraisal practices from a multi-scale, multi-domain and comprehensive transition-oriented perspective. It can also be used to support large EU sustainability policy processes such as the implementation of the EU Sustainable Development Strategy. This is so, because ICG can also be used not only to reframe climate policy making but also policies oriented at provided new forms of science practices in line with the transformative approaches defended in this book. Such broad perspective, however, requires operationalisation. One option to do so is to provide an initial set of questions which can trigger the necessary discussion on how to develop a more coherent and consistent development of climate appraisals tools, policy processes and communication strategies whenever required. To link ICG to local and regional sustainable development goals, the following questions may apply:

[3]Which are the Tisza floodplain in Hungary, the Guadiana river basin in Iberia and the Inner Mongolia region in China; (www.adamproject.eu; Tàbara 2010; Tàbara et al. 2010).

1. Risk assessment:

   - To what extent do existing assessment tools and methods deal with feasible options for social-ecological system transition, agent transformation and institutional collaboration?
   - To what extent do climate assessment procedures look at both positive and negative effects derived from changing institutional arrangements and distribution of responsibilities?
   - What type of knowledge is needed to improve both adaptation and mitigation capacities of agents at the local and regional level, beyond the representation of potential impacts? (e.g. on incentives, options and institutional reforms)
   - To what extent do existing tools and methods used in the assessment of climate risks take into account the local and regional institutional constraints and potentialities which impede or facilitate both adaptation and mitigation?
   - To what degree do the criteria for the selection of tools and procedures for assessing local and regional climate risks and opportunities take into account multiple scales, domains and the potential role of multiple governance levels?
   - How do different appraisal tools and methods used by regional agencies employed to devise their climate strategies differ, produce synergies or contradictions from those used at the national or European level?
   - To what extent and how do regional appraisal agencies downscale and integrate global scientific knowledge about climate impacts to design and implement their own adaptation and mitigation strategies? And in particular, what is the level of plurality in the use of tools, methods and procedures used by local and regional agents to downscale global assessments and insights?
   - To what extent and how are local and regional perceptions, experiences, needs and opportunities regarding adaptation and mitigation up-scaled to the international appraisals and governance processes?

2. Policy practice and implementation:

   - To what extent local and regional measures on mitigation and adaptation are mainstreamed within and broader strategies regarding sustainable development? And to what degree is such climate mainstreaming understood as an indicator of progress in sustainable development?
   - What changes can and are being carried out within the local and regional institutional arrangements in order to integrate climate change and sustainable development strategies in their present organizational structures?
   - To what extent the design and implementation of new climate policy instruments and strategies not only include the best knowledge about the climate dynamics and impacts but also address issues of inequality, different power distributions and processes of policy reframing and learning?
   - What is the potential contribution of local and regional agencies in devising climate strategies that go beyond the compulsory compliance of international commitments?

- What is needed for local and regional governments to develop and implement long-term climate policies which integrate and create synergies between adaptation and mitigation strategies?
- What is the influence of the existing national governance structure in constraining or enhancing the development of local and regional capacity of agents to intervene in climate policy? And in particular, what is the influence of decentralised and polycentric governance structures in this regard?
- What type of synergies and trade-offs can be observed with the implementation of climate policies and measures and the implementation of policies and measures in other domains?
- Do current climate and sustainable development strategies consider structural systemic issues to reduce vulnerabilities and enhance ecological resilience such as to promote modular connectivity, setting voluntary limits, or avoiding congestion of social-ecological systems?

3. Communication, social learning and transformative capacity building:

- What new networks and new spaces for interaction and collaboration between science, policy, and the public can be developed to stimulate learning, transformation and long-lasting integrated capacities on climate and sustainable development?
- To what extent does communication on climate change adaptation and mitigation need to be carried out in different ways and languages among different audiences to exert the expected influence (Mitchel et al. 2006)?
- How can system feedbacks and processes – rather that solely 'impacts', 'problems' and 'solutions' – best be communicated to wider audiences and by what means to encourage societal change and engagement?.
- How can 'communication' and 'participation' be turned into durable agent engagement and transformation?
- How and to what extent such public engagement can become part of the assessment and knowledge production processes to increase their salience, credibility and legitimacy (Jäger and Farell 2006)?
- What are the particular knowledge needs and required assessment capacities of agents to make ICG relevant at the local and regional level?
- How new scientific insights on the current state of the climate and of the institutional and social system are incorporated in local and regional climate appraisals and strategies?
- To what extent do current communication processes address issues of cultural reframing, in a way that aim to overcome the prevalent dualisms between biophysical and human systems? (including the obsolete distinction between 'social', 'ecological' and 'economic' realms)

The concept of ICG derives from the realisation that an important gap exists between the processes of knowledge building and risk/opportunities assessment, the design and implementation of policy instruments and the communication and

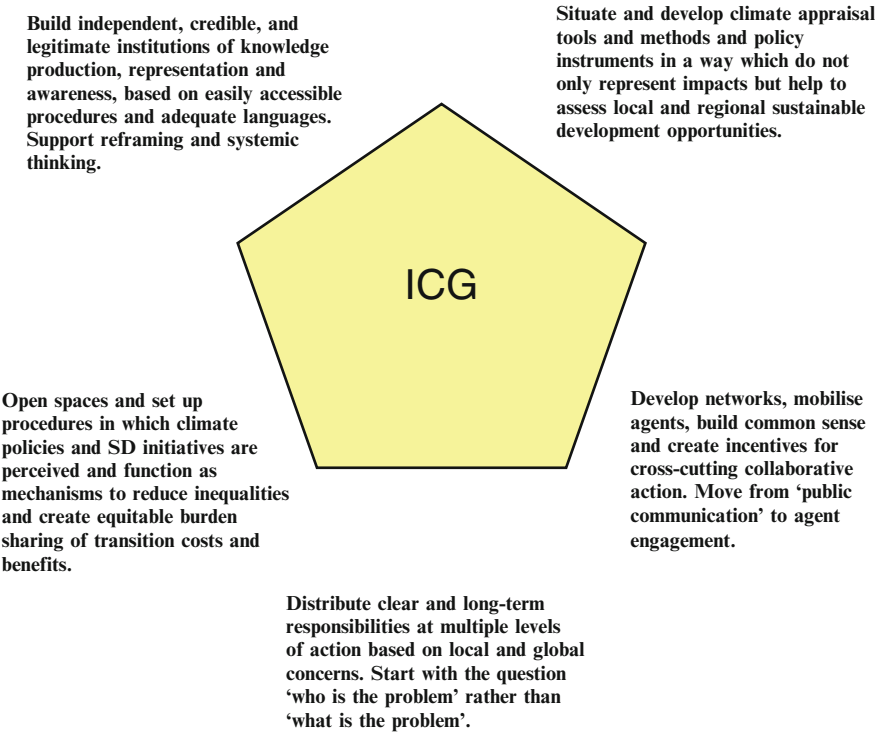

Fig. 7 Five basic interlinked tasks to support Integrated Climate Governance

societal responses regarding climate change. New institutional integrated mechanisms need to be created capable of linking these processes which occur at the global level with those that are undertaken by local and regional agents and vice versa. In order to do so, and from the insights gained within the MATISSE and ADAM projects, a series of key basic tasks have been identified which could help to move current regional appraisal practices towards a more ICG approach, as represented in Fig. 7.

Therefore, an approach based on governance, rather than only on 'government', or that moves beyond solely producing 'more' knowledge, expert tools and methods, would emphasise the need for articulating long-term institutional mechanisms to enhance the quality of *the interaction, the type of knowledge exchanges and the learning processes* between climate scientists, policy makers and the general public – eventually in charge to take the necessary adaptation and mitigation actions. Questions such as who participates, through what institutional mechanisms, or what tools and methods are being used to create climate knowledge and for what purposes, take a different dimension when framed through the relational socioecological perspective of Integrated Climate Governance. This is an institutional challenge that demands new and more complex forms of system configuration as well as of spaces for transformation in a way that the negative

systemic effects of the actual growth of socio-ecological systems are also taken into account.

In the future, the scope and normative goals of ICG could be extended to include broader issues of sustainable development in general, thus becoming a plausible 'Integrated Sustainability Governance' approach. However, while such an overarching approach could be a new source for science and policy innovation, at present, one can only imagine almost insurmountable difficulties to undertake such endeavour in the short term. Given the difficulties to delimit the discussions both on sustainability and on governance as well as the lack of tools and methods to do so, in the meantime, concentrating our attention on climate transformative targets and capacities may be a safer route to meet such a challenge.

7 Conclusions and Propositions

The present paper has attempted to define and begin to make operational a new concept, *Integrated Climate Governance*. In particular, I have argued that ICG can be potentially very useful to reframe and reorient future practices occurring in the intersection of science, policy making, and communication by providing a more coherent analytical and policy-relevant perspective. The ICG concept is based on a particular understanding of the key challenges which regard the adequate governance of environmental change. Mostly, that we need to move from thinking in terms of 'problem-solution' towards a new mode of science and policy practice based on assessing, managing and communicating cumulative feedbacks and interlinked processes of total socioecological change.

This concept is also based on the acknowledgment that actions aimed at developing adaptive capacities at the individual or local level may have negative impacts on mitigation. Whenever responses are not conceived in a holistic way, these are likely to create new problems in new situations, at different scales or domains. Flexible, context-based, and multi-level adaptive processes, as well as new tools and methods are required (Tàbara et al. 2010). Such new global approach to climate appraisal and action should be able to appraise both climate risks and opportunities, deal in an integrated way with mitigation and adaptation, and support the making of robust climate strategies at different governance levels by taking into account multiple synergies and trade-offs between various policy domains, sectors and scales. ICG is set up as a research programme that recognise the need to prevent problem shifting from one policy domain to another. If implemented, ICG should also be conducive to triggering fast transformations in individual practices and institutions, and the building of new partnerships, and the emergence of new framings, new mindsets, and of new spaces for interaction between science, policy making and the public. This is precisely what distinguishes this approach, based on *appraising* from those based on 'assessment': it attempts to go beyond simple representation (e.g. of impacts and trends) and explicitly to support system transition and agents' transformations.

In this sense, the practice of ICG could contribute to changing some of the dominant mindsets and cultural frameworks which are now being used to conceptualise the climate problem, e.g. from a cost/benefit calculation to a problem of governance that requires transition and new forms of global cooperation. Furthermore, ICG offers one of the best chances to reframe international relations, and in this sense to contribute to both scientific and political innovation globally, and in Europe, to ensure meeting its sustainable development goals in the long term. Such reframing entails moving away from the present market-based global competition towards a more sustainable development/climate global cooperation. And in turn, in such global cooperation may lay the best changes for global development and new forms of growth.

From this standpoint, conclusions are presented in the form of four basic normative propositions which future research will need to further elaborate:

1. *Integrated Climate Governance demands above all, institutional innovation, not only more 'tools' and methods*. In order to mainstream climate concerns in sustainable development strategies, new institutions which deal in an integrated manner with risk/opportunities assessment, policy-making, communication and capacity building are needed. Simply 'more tools', 'more instruments' or 'more public communication' alone (following business as usual frameworks and practices) may have little effect on improving climate adaptation and mitigation and contributing to sustainable development. The three spheres of ICG need to be integrated and coordinated into a common facility. The new ICG institutions could help frame more adequately the design of climate assessment tools and methods, the type of policy goals which are being pursued, and to provide accountable procedures for the incorporation of scientific knowledge and public demands in the development of new policy instruments and measures.
2. *Institutional innovation regarding climate change entails enhancing and reorienting the overall complexity of the international and regional systems of climate risk/opportunities assessment, governance and communication while at the same time ensuring global coordination and local engagement*. A more complex but also different institutional landscape is required to meet the type of transitional changes which would deal in a systemic way both with adaptation and mitigation. A broader participation and engagement of regional and local actors in the global challenge of climate change demands the development of new capacities, tools and methods for assessing regional impacts of climate change, of more locally and regionally adapted policy instruments, as well as regionally suited mechanisms for communication and learning. But at the same time, overarching coordination mechanisms are also required within the three spheres of ICG. Institutional innovation is needed regarding the sharing of scientific knowledge as well as in relation to policy architectures and incentives which facilitate public engagement. Robust strategies for climate change demand taking into account the socio-ecological and political specificities of local and regional contexts in a way that explore and enhance the possibilities for a growing social and institutional complexity and coordination.

3. *Meeting significant transformative climate mitigation targets and building adaptive capacities may constitute some of the most decisive ways to support and account for progress on sustainable development and avoid relativism.* Many practices in science, policy and communication are excessively dominated by a strand of social-constructivist, non-integrated and relativistic discourses of sustainability. Such relativistic approaches are often understood as a sign of impartiality, objectivity or scientism while in fact what they are is often precisely the opposite: they unveil the lack of robust knowledge – or the strength of vested interests to use this pretended lack of knowledge and instrumental uncertainty – to provide well-grounded, falsifiable, and transferable insights about what actually works or does not work regarding sustainability. The relevance of science to support decision making on sustainable development largely depends on the capacity of achieving a minimum consensual agreement on how to quantify – and qualify-the contested concept of sustainability[4]. Setting long-term transformative targets for the reduction of GHG emissions at multiple governance levels and monitoring their implications for the short term – e.g. regarding technological and societal innovation-, may avoid some excessive social-constructivist discourses which make the measure, design and implementation of adequate tools and methods to support progress in sustainable development almost unattainable.
4. *The development of new ICG policy instruments needs to incorporate socially and ecologically robust systems of knowledge in the development of long-term transition goals.* The integration of existing scientific knowledge should not only be oriented to support one-shot decisions about the implications of implementing particular regulations but be oriented to help devise processes which already incorporate combinations of policy instruments with coherent transformative system goals. Knowledge about the stocks and flows of ecological systems as well as their dynamics needs to be incorporated into the development of new policy measures. New instruments and processes for climate appraisal should be developed not only to address aspects which regard the administrative boundaries of a single policy domain or scale but should be included in a broader transition framework able to trigger a cascade of innovations and decisions in multiple domains. If the principles of ICG are perceived robust enough as to inform and improve current climate appraisal and policy making process, new instruments need to be oriented to support the transformation of routines and practices in a way which make them more in tune with the current biophysical trends and societal needs. This demands taking a more systemic, adaptive and relational approach to climate appraisal and climate capacity building, able to deal with diversity as well as with the new opportunities for social and institutional innovation. Particular climate instruments ought to be

[4]The recent experience at the EU level – with the Impact Assessment procedures and the EU SDS – shows that to a large extent, the failure to produce a robust and systematic procedure as well as a set of convincing tools and methods to assess sustainability progress relates to a large extent to the difficulty of finding an alternative – and equally powerful-measure to that of GNP.

devised and new independent and credible institutions need to be created for generating new patterns of societal – ecological interaction synergetic with the predicament of sustainable development.

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