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RESEARCH ARTICLE

Climate change: a ‘glocal’ problem requiring ‘glocal’ action

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Abstract

It is generally assumed that global problems like climate change call for global solutions, which are then implemented at different administrative levels. This paper attempts to deconstruct climate change in physical terms to assess its global through to local characteristics, presents existing policy frameworks at different levels, and then discusses some theoretical and practical aspects of policymaking. It investigates the policy space at different administrative levels to see if it is possible to complement the slow global action with local action that goes beyond that strictly speaking needed for implementation. The paper argues that climate change is a problem that is both global and local in nature, that policy responses are possible at multiple administrative levels, and that there is considerable politics in the way responsibilities are assigned to different levels.

Keywords: *Climate change, administrative levels, policy measures*

1. Introduction

With substantial attention paid to climate change at the 2007 G-7 Summit, the publication of the 2007 Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), the recent Stern Report (2006) and the Al Gore book (2006), climate change is firmly on the international agenda. There is clear consensus on the need to accelerate action considerably over the next few years if we are to reduce emissions consistent with a maximum of a 2°C warming by the end of the century (IPCC 2007).

Despite all the attention paid to the issue, the actual policy steps fall considerably short of trying to stabilize greenhouse gas (GHG) concentrations in the atmosphere. This leads to the identification of the following questions: At what administrative level(s) should climate change policy be designed? What are the possible types of complementary and mutually consistent policies and measures that need to be adopted at different levels? And, how can one mobilize all administrative levels to focus on the issue of climate change? This paper analyses the scale of the physical dimensions of climate change and provides a brief history of the policy process at different policy levels (section 2). Furthermore, the politics of framing climate

change policy at specific levels is examined, and a framework for allocating different tasks to different levels is presented, exploring the role and potential contribution of local authorities in addressing the problem (section 3). Finally, some conclusions are drawn (section 4).

2. Impacts, emissions and governance at different levels

2.1. Introduction

Over the course of its history, the earth's climate has varied between extreme cold (Hoffman et al. 1998) and extreme warm conditions (Herman & Spicer 1996), mainly forced by plate tectonics and orbital variations (Zachos et al. 2001). Over the last two hundred years, land-use changes and anthropogenic emissions of GHGs became new factors influencing the global climate system (IPCC 2007). This section looks at climate change impacts and emissions on different levels and how governance is presently organized at these levels.

2.2. The global level

The key climate impact at the global scale is the increasing mean atmospheric temperature. This temperature rise leads to increasing sea surface temperatures and melting of glaciers and ice sheets, causing the water bodies to expand, and thus to rising sea levels worldwide (IPCC 2007). Increased atmospheric CO₂ also acidifies the oceans (Wolf-Gladrow et al. 1999), influencing marine ecosystems. The projected magnitude and pace of this acidification is alarming (Caldeira & Wickett 2003) and the effects largely unknown.

The global emission problem results from the cumulative increase in global concentrations of GHGs and its systemic impacts (IPCC 2007). While international aviation, shipping and rail transport have a distinct global dimension, emissions are emitted primarily locally in energy, agricultural, industrial and waste management systems. However, the policy processes that impact on these systems may extend from local to global level.

The early political discussions saw climate change as essentially a global level issue (RIVM 1989; VROM 1989), since it was irrelevant where the GHG emissions came from; once they accumulated in the atmosphere they could potentially lead to global warming. The problem could not be addressed if some countries stayed out of the system and, hence, to prevent the free-rider problem, all countries would have to take measures to reduce (the rate of growth of) their emissions. The initial political declarations on climate change – the Toronto Declaration (1988), the Noordwijk Declaration (1989), the Second World Climate Conference Declaration (1990) and the UN General Assembly Declaration of 1990 – emphasized this. The first IPCC report reiterated the global nature of the problem and the need for global policymaking (IPCC 1990).

This led to the adoption of the United Nations Framework Convention on Climate Change in 1992 (UNFCCC 1992) and the Kyoto Protocol in 1997 (KP 1997). These agreements bind 189 and 168 countries, respectively, and list a number of policies and measures that all countries should consider taking and should report on and include quantitative targets for the developed countries.

Although many countries are involved and there is a continuous learning process taking place, the results in terms of actual impact are quite low. In 2003, global CO₂ emissions were at 25,938.3 MtCO₂ per year; while 1990 levels were at 21,427.9 MtCO₂ per year (CAIT 2007). After 13 years of policy, the environmental impact was marginal (IPCC 2007).

The slowdown in global activity can be partly attributed to the US decision not to ratify the Kyoto Protocol, which reflects the US withdrawal from multilateralism in many fields

(Newman et al. 2006). This forced the European Union to take on the leadership role; while nevertheless reducing the motivation of other developed countries to take action, since unilateral action is perceived to negatively impact on their competitiveness at the international level. The climate negotiations are going far too slowly to have any significant impact on the problem, given that the Stern report (2006) demonstrates that the costs of taking action now are only 1/20th the costs of the potential impacts worldwide and that global adaptation methods including geo-engineering (e.g. injecting sulphate aerosols to block incoming sunlight [Wigley 2006]), are hypothetical and extremely expensive.

2.3. The subcontinental level

In this paper, we use the term subcontinental, instead of regional, to indicate the level between global and national to avoid confusion with the subnational meaning of regional used in the other papers in this issue. At this level, the relatively high rise in temperature at high latitudes causes permafrost to degrade and sea-ice to melt leading, *inter alia*, to seaways opening up in the Arctic. The degradation of permafrost has major consequences for the stability of constructions and infrastructure (Nelson et al. 2002). At more moderate latitudes, climate change affects rainfall patterns and, hence, land use, water and food security. At low latitudes, arid and semiarid conditions seem to be expanding northward as well, making agriculture more difficult.

There are few emission sources with a distinct subcontinental character. International transport can be considered one and sometimes energy supply is arranged at a subcontinental level. At this subcontinental level, there are some agreements promoted by the USA, including the International Partnership on the Hydrogen Economy and the Asia Pacific Partnership on Clean Development (APPCD) (Gupta 2007a,b). The EU has a climate change programme (ECCP 2007) and several directives on emissions trading, the promotion of biofuels and combined heat and power, as well as the voluntary agreement with the European car industry are being implemented. A follow-up programme (ECCP II) develops policies on impacts. These policies have to be transposed into national policies of EU member states. Although few other regions of the world have climate policies, regional banks like the Asian Development Bank do have relevant measures.

2.4. The national level

Climate change has severe potential implications at the national level. Changing precipitation patterns can affect agricultural potential and thus food and water security. In addition, changing weather patterns and increased extreme event frequency could cause more large scale flooding (Milly et al. 2002) and possibly droughts and storms (Emanuel 2005) with national consequences. Rising sea levels threaten low-lying coastal zones, which are the most densely inhabited and developed areas.

GHG emissions at national level are mostly from national industry and energy production facilities, waste disposal systems, transport and land use change. The top emitters of GHGs at national level are the United States, China, the Russian Federation, India, Japan, Germany, Brazil, Canada, United Kingdom and Italy (CAIT 2007). At a per capita level, however, the figures differ significantly.

Most developed countries have adopted policies in the energy, transport, agricultural and waste management sectors. Although the USA and Australia did not ratify the Kyoto Protocol, they too have some policies in place. For example, the USA aims to reduce its GHG intensity by 18% in 2012 and promotes technologies on hydrogen, zero emission coal plants and fusion energy (<http://www.state.gov/g/oes/rls/fs/2004/38641.htm>).

Between 1990 and 2000, total aggregated GHG emissions of the developed countries decreased by 3% (UNFCCC 2003). However, most of the decrease can be attributed to decreases in 'economies in transition' (EIT) countries. Although there are many policies in place, the existing and planned portfolio of measures may be inadequate to achieve the Kyoto targets, especially because of a large projected increase in emissions in the transport sector. Hence, additional measures are needed (UNFCCC 2003).

Although they have no binding targets, the majority of the developing countries have adopted, or are considering adopting, policies on halting deforestation, energy demand side management, energy supply technologies and possibly fuel switching. Individual countries have specific programmes, such as Brazil's national alcohol programme for transport, China's green light programme and India's renewable energy programme (UNFCCC 2002). Nevertheless, their emissions are still rising.

2.5. The local level

It is, however, at the local level that the effects of climate change are mostly experienced. Changes in climate cause weather patterns to change affecting local agriculture, household practices and vector borne diseases. Global warming also causes extreme events like floods, droughts and tropical storms to become more frequent. These impacts are already devastating in developed countries, as the impact of hurricane Katrina in the USA has demonstrated. On top of that, in developing countries, such impacts tend to have multiplier effects, adding to their long list of existing problems.

At the same time, all emissions come from the local level (Angel et al. 1998), though not always governed at that scale as many sources are often linked to sectors working on a national or higher scale. However, in some countries these have been decentralized and should thus be considered local sources (see e.g. Abler 2003).

As mentioned, governments often delegate policies to lower levels or individual sectors. The question—how are these policy processes further regulated—becomes increasingly important as national governments are often politically unable to adopt far-reaching and long-term measures on global change issues because of economic, political and practical reasons (Hurrell 1994). At the domestic level, the distribution of powers is often a black box in relation to climate change (Bulkeley & Betsill 2003; p. 15). Different countries have different domestic systems and power is shared accordingly (see Editorial, this issue).

Yet, initiatives to reduce emissions can come from the local level (Abler 2003). Besides generating the social support for national policy, the cumulative effects of such initiatives can be substantial. The motivation of such local action may include the need to implement national policy, but may also be driven by local concerns with respect to climate change. Very often though, co-benefits like cost savings or local environmental benefits are important drivers (Kousky & Schneider 2003). These initiatives provide insight into the potential policy space for climate action. The International Coalition of Local Environmental Initiatives (ICLEI), for instance, has over 500 cities worldwide participating in its programme and developing local policies on sustainable development and climate change (ICLEI 2007).

Some lower governments are adopting far-reaching policies. In the USA, New York State aims to reduce its GHG emissions by 5% by 2010 and 10% by 2020 with respect to 1990 levels. In 2001, the New England Governors and Eastern Canadian Premiers adopted a climate change plan for Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont, Newfoundland, New Brunswick, Nova Scotia, Prince Edward Island and Quebec to reduce their emissions by 10% by 2020 with respect to 1990 levels. California aims to

reduce its GHG emissions to 80% below 1990 levels by 2050.¹ There are many other examples in the developed world.

Besides mitigation, there are many local adaptation practices, for instance to cope with extreme heat (e.g. air-conditioning in sanatoriums), droughts (e.g. water harvesting), extreme rainfall (e.g. storing water) and flood risks. Thirty such practices have been developed and evaluated in the European urban environment within the AMICA project (AMICA 2007).

Many cities and lower governments are taking policies because of the structure of national policymaking in these countries. This special issue discusses policy initiatives in Italy, France, the Netherlands and China.

2.6. Inferences

We can conclude that in the area of impacts, climate change has different, although interrelated effects that manifest themselves at all levels of administration. GHG emissions are essentially local in nature, but it is their cumulative concentration level that is a critical factor in causing climate change. While emissions are locally emitted, they are often the result of local through to global processes and policies.

As illustrated in this section, policies are being taken from global through to the local level. These policies are not necessarily the result of top-down translation of measures to local level, but are also often the result of external influences from epistemic communities or networks, through which local communities are galvanized into developing possible policy options. Where national governments are reluctant to take action, provincial and local governments have stepped into the vacuum to develop policies (e.g. Australia and the USA; ICLEI 2007).

3. The politics of scaling

3.1. Introduction

This section analyses what is the optimal level to manage policy, if at all, and why social actors are motivated to scale up/down the problem and, hence, the response strategies. In addition, possible frameworks for policy responses with respect to climate change are discussed.

3.2. Climate—global or local problem; global or local governance?

Is climate change a global or local problem? Kates and Wilbanks (2003; p. 21) point out that: "Climate change is a global phenomenon, but global or even national 'thinking' averages together too many distinctive local trajectories of greenhouse gas emissions and making local actions less specific. But local 'thinking' is also insufficient for action because, for the most part, decisions about major emission reducing actions are made far from the local community". In 1985, Clark advised, with respect to the geo-bio-physical aspects, that "the challenge is not to establish the pre-eminence of any particular scale, but rather to match scales of explanations, processes, and patterns in a realistic and effective way" (Clark 1985; p. 2).

While many have claimed that the appropriate level of governance for climate is the global arena (as reflected in IPCC 1990), Adger (2001; p. 924) argues that "the appropriate governance scale is at the level of the resource user and their management of the climate-impacted natural resource or livelihood source, rather than a global commons".

The literature (Zaelke & Cameron 1990; Pachauri 2006; Yamin et al. 2006; Barrett 2006) reveals that problems are essentially politically framed and defined; and the political framing process defines problems to suit the political interests of national entities or of the actors

engaged in the framing process. For example, Timmerman and White (1997) argue that scaling up is necessary, since vulnerable coastal cities worldwide will never be able to adapt to the problem all by themselves. Other reasons for scaling up are to enhance understanding of the problem, to improve governance, to promote domestic interests, and the desire to promote extraterritorial interests (Gupta 2007c; forthcoming).

Reasons for scaling down problems include the need to enhance understanding of local causes and impacts, nested sets of explanations (Turner et al. 1990; Wilbanks & Kates 1999), the local cultural aspects (Collier and Löfstedt (1997) and also sometimes to avoid liability (Gupta 2007c; forthcoming; see Table I).

We conclude that climate change occurs at multiple levels, the driving forces are to be found at multiple levels, the authority to deal with the problem occurs at multiple levels and, hence, the governance debate should not be about which is the most appropriate level, but about how can policies be developed and initiatives be taken simultaneously at different levels effectively.

3.3. Models of policy interaction

Since climate change is a glocal phenomenon combining global with local characteristics, we argue that the only appropriate response is a multilevel governance response in which concurrent policy processes at all levels identify policy space and foster initiatives as well as put pressure on the other governance levels.

Three ideal typical models of policy interaction can be envisaged. In the first, prescriptive model, policy making is highly top down, with global threshold values determining global targets, which are then divided into subcontinental and national targets, which are then divided into sectoral and/or provincial and local targets. In the second bottom-up model, local policy potential determines what national governments are willing to do, and global policy-making is hostage to national willingness to take action. In the third exploratory model, policy processes at each level seek their own space and equilibrium. Global policies are a function of global politics and small political windows of opportunity can shape the nature of the policies. National politics are shaped by national level politics and bargaining, while still trying to balance local with global pressures. Local policies may be determined by national ones but may also evolve according to specific local dynamics that occur in a particular context influenced by many transnational influences.

With respect to the top-down model, although there are 'global', subcontinental and national targets, targets for local government are more or less nonexistent. The bottom-up model is also limited in that in many cases, countries have not developed national policy on

Table I. Reasons for scaling up and down.

Reasons	
Scaling up	To enhance understanding of the cumulative and systemic nature of a problem accounting for all externalities, and to understand global threshold levels and driving forces including ideologies To improve governance for the global good and achieve sustainable development To promote domestic interests at the international level by, e.g. postponing decision at national level till international consensus is reached To promote extraterritorial interests by, e.g. gaining control over policies over foreign resources
Scaling down	To enhance understanding of the contextual details of the problem To improve the effectiveness of implementation To meet strategic interests such as avoiding liability for extraterritorial impacts

Source: Based on Gupta 2007 (forthcoming).

the basis of what is locally feasible nor has international policy always resulted from what is nationally feasible. The exploratory model is perhaps more relevant in the 21st century, since at each level, different dynamics are visible and mechanisms often develop to compensate for shortcomings at other levels. Thus, while the USA and Australia have not ratified the Kyoto Protocol, lower governments are exploring the potential for further action (see also papers in this Special Issue). Furthermore, many organisations are compensating their own emissions by planting trees.

Table II. Examples of different impacts and policy options for different scales.

Level	Impacts	Emissions	Authorities and networks	Reasons	Policies
Global	Temperature rise; sea level rise; ocean acidification	Global concentrations of GHGs; aviation and shipping	UN agencies and treaties; G7 and G77; Bi and plurilateral agreements; Int. NGOs	Prevent free-riding; share information/experiences; transfer technologies and resources	International targets, policies and measures; flexibility mechanisms
Subcontinental	Sea ice melting; opening of sea routes; permafrost melting; species migration	International energy and transport systems	UN regional agreements; European Union; subcontinental NGOs	To create a level playing field	Subcontinental policies and measures; subcontinental policies, regulations and directives; flexibility mechanisms
National	Loss in coastal zone and offshore islands; impacts on food, water and, human security	Energy transport; agriculture; animal husbandry; land-use and waste management	National governments; National NGOs	State is the negotiating unit in international relations; regulatory functions rest with the state	Sectoral policies on mitigation and adaptation; nuclear power; regulatory, economic and suasive instruments; spatial planning
Local	Impacts on local access to water and food; impacts on local income; vector borne diseases	Consumption patterns; local spatial planning; local infrastructure and housing design	Local governments; local communities; local and transnational NGOs (ICLEI)	Laboratories of policymaking; capable of own initiative; building constructions, reducing the emissions of municipal services, promoting renewables	Spatial design infrastructure, housing and transport policy; management of local government services; municipal taxes; influence of consumption patterns

At different levels, different types of policies are possible (Table II). Global and national level policies are enumerated in the UNFCCC (1992) Kyoto Protocol (1997) and in the IPCC reports (including IPCC 2007), but the potential at the local level is less clear. The literature reveals that it is precisely at the local level that consumption patterns at homes can be influenced (Mullaly 1998 on Australia), that small-scale energy production systems can be influenced through local incentives and spatial rules (Balint 2006; Bolinger & Wiser 2006), that participatory planning can help design new sustainable localities (Neudoerffer et al. 2001), and that the ability of local authority to provide a forum for change is often a function of statutory obligation and power (Rezessy et al. 2006). Action can far better be taken at the local level, simply because it may be easier to mobilize people more effectively when issues are designed closer to their own interests (Bulkeley 2005).

4. Conclusions

This chapter has argued first that climate change is a problem that is caused locally, but cumulates into a global problem; a problem with global impacts that are experienced locally. Hence, it is a glocal problem calling for a multilevel governance solution.

Second, for a comprehensive understanding of climate policy, it is vital to understand the policy processes at all levels and to understand how these feed into each other. To see policies as occurring within ‘nested territorial containers’ would be missing the point. The political dynamics and influences at each level are very different and the windows of opportunity may open up at different moments of time.

Third, while national and international policies often have a symbiotic relationship, local policies have a different driving force and often take different dimensions. They are not merely aiming to implement national policy, they may go beyond; they may complement or contradict national policy! Local and provincial policies are ‘laboratories of democracy’ and can incrementally influence national policy through their own exploration of what is possible.

Fourth, where countries are reluctant to participate in the process, whether developed or developing, exploring possible measures at local and provincial level may be very useful. Fifth, the policy instruments that are available at the different levels are different; and the policy mandate is also accordingly different.

This overview paper has thus shown that much is possible at different levels of policy to address a global problem such as climate change.

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Note

1. On 1 June 2005, Governor Schwarzenegger of California signed Executive Order # S-3-05 which lists these targets; see for more details the website of the government in California on the issue of climate change – http://www.climatechange.ca.gov/climate_action_team/

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