
Why an air pollution achiever lags on climate policy? The case of local policy implementation in Mie, Japan

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Abstract. Many localities that are politically committed to tackling the causes and consequences of climate change have faced obstacles in getting results, even though they were successful in implementing other environmental policies in the past. What makes implementation of climate policy different from other local environmental policies, such as air pollution control? This paper makes a comparison between the implementation of two environmental policies in Mie Prefecture in Japan. The first was the successful reduction in local air pollution (1960s–70s). The second was the more recent policy with mixed results to control the emissions of greenhouse gases (1990s–2000s). The research found several factors that can explain the differences between the implementation effectiveness of the two policies, such as immediacy and political legitimacy, the autonomy and capacity of local governments, the capacity of organized civil society and the role played by technology. Local governments still have a strong role to play, and some institutions built in the past are still effective. However, climate change asks for different approaches to local policy implementation and new institutions need to be built to fill the implementation gap.

1 Introduction

Local governments around the world have played a key role in promoting environmental policies to tackle pollution problems, particularly since the 1960s. A considerable amount of local effort has been put into enforcing environmental regulations, introducing economic incentives, building environmental infrastructure, and providing environmental information and education. Moreover, the development of knowledge and tools to cope with environmental issues increased significantly in the previous five decades. The result was a gradual improvement in the environmental quality of the air and water in many developed countries and parts of the developing world.

However, environmental problems have changed in the environmental agenda in the last twenty years, as well as the context in which environmental policies are implemented. Local environmental problems continue in many countries, but the current challenging environmental issues are global problems, such as climate change. In contrast to local industrial pollution, where there is a clear polluter (industries) and potential target of the policy, the polluters and victims of global problems are more dispersed around the globe. It is still unclear who is responsible for what and how to tackle those problems and their consequences effectively. This makes the process of policy implementation more complex because there are more actors and variables to deal with. At the same time, there is a need for an intense degree of collective action to solve these problems. The final results will depend not only on the actions of a group, locality, or even a country involved in the policy process, but also on the effective implementation of policies at a larger scale.

Many local governments that are committed to tackling the causes and consequences of climate change have faced new obstacles to get results, even though they were successful in implementing other environmental policies in the past.

What makes climate policy implementation, particularly mitigation, different from other environmental policies in the past? In order to answer this question, this paper analyzes the factors that explain why some committed local governments have not succeeded in achieving effective implementation results in terms of outcome for climate mitigation policies by using the lessons and experiences from past environmental policies.

The research aims to contribute to an understanding of the challenges that subnational and local governments⁽¹⁾ face in implementing policies dealing with global problems compared with the policies used to tackle past local pollution by using an empirical case study of Mie Prefecture in Japan. The text examines two sets of policies implemented in Mie in different periods with different degrees of success in the final local outcome, which is here defined as the total local emissions of certain pollutants.⁽²⁾ One case was the successful implementation of a policy targeting local air pollution in Yokkaichi City in the 1960s and 1970s. The second was the more recent policy targeting the reduction in the emission of greenhouse gases (GHGs) in the 1990s and 2000s. This second policy had mixed results, as the political commitment existed and several policy actions were introduced but overall emissions increased. My findings pointed to five main factors regarding why the two local policies had different results in their implementation: immediacy and political legitimacy due to cause–effect links, capacity and support from organized civil society groups, the autonomy and capacity of local government to deal with a new problem, the role played by technological development to foster change, and complexity of enforcement. These have policy implications which shed light on what should be changed in the design and implementation of environmental policies, particularly local policies, to implement climate policies by effectively learning lessons from previous environmental policies.

Japan is a good country in which to study local environmental policies. Like many other countries, Japan made important improvements in local environmental standards in the past with a fundamental role played by local governments, but it faces enormous obstacles in reducing its GHGs (MoEJ, 2009a; 2009b; 2010; Muramatsu, 1997; OECD, 2002; Reed, 1986; Tsuru, 1999), obstacles which have increased with the more ambitious targets set by the national government in 2009 (Hatoyama, 2009).⁽³⁾ Within Japan, Mie Prefecture is one of the most progressive governments with regard to policies to control climate change which have a relatively long history, making it an appealing case for carrying out empirical research. Moreover, Mie Prefecture lies outside the set of more famous subnational governments, such as the C40 group, which has been the focus of the literature, thus adding to an understanding of smaller less prominent regions. Finding obstacles to climate policy implementation at the subnational level can explain policy performance in Japan and possibly in other countries.

⁽¹⁾ The terms ‘local governments’ and ‘subnational governments’ may be used interchangeably, as local governments are a subset of subnational governments and it is not possible to distinguish them in some cases.

⁽²⁾ The definition of policy success can vary as the outcomes, such as emissions, can be influenced by other factors (eg economic crises or booms). But success in the effectiveness of reduction of final emissions is the most important and is the definition adopted in this paper. Thus every time I talk about policy success, it is related to the final outcomes (emissions).

⁽³⁾ In the change of government in 2009 the former Japanese Prime Minister, Yukio Hatoyama, who resigned in June 2010, set a target of 25% reduction below 1990s levels by 2020, much more ambitious than the 4% or 6% target of the previous government. Even though he resigned recently, his environmental policies seem set to continue, but the Kan government, which is from the same party, has been less assertive in applying the target, waiting to see what other countries are doing before setting targets from 2012. Nevertheless, such goals, whatever they may be, can only affect policies in the medium and long term (Lester and Neuhoff, 2009).

2 Local governments and climate change

Local (subnational) governments play a crucial role in implementing climate policies. In many countries they are responsible for some important areas which affect climate change mitigation and adaptation, such as waste management, transportation, land use, and building design (Brown and Southworth, 2008; Collier and Löfstedt, 1997; Juhola and Westerhoff, 2011). In large cities in developing countries like China, whose thirty-five largest cities contribute 40% of the emissions but have only 18% of the population, per capita emissions have grown several-fold in the last few decades (Dhakai, 2009), and local policies could be key to reducing them. Moreover, even though international agreements, such as the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol, are signed by national governments (the parties to the agreements), most of their implementation rests on the capacity of local governments, as national policies are often rolled out to be implemented by subnational governments.

Indeed, regional and local governments have played important roles in climate change policies, but analyses in the literature and media have been scarce (Bulkeley, 2010; Schreurs, 2010), as authors prefer to focus on international negotiations and national debates. Many subnational governments long ago set policies to reduce emissions of GHGs. The first government to establish a target to tackle emissions (by 20%) was a local government—the Canadian City of Toronto—in 1990 (Kousky and Schneider, 2003). Organizations like the International Council for Local Environmental Initiatives (ICLEI) and the Clinton Foundation (<http://www.clintonfoundation.org>) have launched initiatives to encourage local governments around the world to take action against climate change. For example, more than 1000 local governments have joined ICLEI's program "Cities for Climate Protection" (<http://www.iclei.org>). In the UNFCCC Conferences of the Parties (COP) in Copenhagen (December 2009) and Cancun (December 2010) subnational governments had a strong presence. Several important mayors and governors participated actively in the conference, or in side events or directly in the negotiations through their national governments.

Local governments have led particularly in countries with poor national support for international agreements (Kousky and Schneider, 2003; Peterson and Rose, 2006). More than 170 cities and twenty-nine states in the USA had some action plan to manage greenhouse emissions by 2008 (Wheeler, 2008). In Europe, even though the European Union has put forward internal policies for controlling greenhouse emissions (Barker et al, 2001), many local governments have set their own climate policies since the 1990s in countries such as England and Sweden (Collier and Löfstedt, 1997; Gustavsson et al, 2009). In Japan some local governments, such as Nagoya City, have produced a road map to reduce emissions by 75% in 2050 compared with 1990 levels (Sugiyama and Takeuchi, 2008).

Most of the research on local governments and climate change (more specifically on cities) has been done in developed countries (Betsill and Bulkeley, 2007). However, even in developing countries that do not have international commitments to reduce emissions, there are local initiatives on climate policy, creating an opportunity to foster development within the clean development mechanism, such as Chiapas in Mexico (Nelson and Jong, 2003) and São Paulo in Brazil (Puppim de Oliveira, 2009), though some obstacles are still common, such as a lack of institutional capacity in the case of Mexico City (Romero Lankao, 2007).

There are several policy drivers that can lead to the active involvement of some local governments in trying to combat climate change. Firstly, there is the leadership factor. Many active local governments are controlled by environmentally progressive politicians or are under pressure from local environmentalists. They support climate

policies for ideological reasons or due to pressure from their constituencies, as in some US cities (Betsill and Bulkeley, 2007). Secondly, some local administrations are trying to create the institutional capacity to manage climate change issues and anticipate future national policies on climate change. By taking the lead, they will have a head start and will adapt more easily to future measures and incentives from the top, which could come in the form of national regulations or opportunities to tap into financing. Thirdly, there is a win–win situation in many climate policies. When local governments introduce policies to reduce energy consumption, for example, they may be controlling energy inefficiencies and saving money for other uses. They can also get cobenefits as carbon emissions can reduce local air pollution, particularly in places suffering from high levels of certain pollutants, which could be reduced by cleaner practices. Fourthly, some localities are particularly vulnerable to natural disasters and have suffered their impacts recently, so they tend to be more engaged in climate policies (Zahran et al, 2008). Finally, local authorities are implementing climate policies to be able to gain political legitimacy to shape regional, national or international debates about climate change, such as the ICLEI initiatives.

However, many local governments that are committed to and have introduced climate policies confront severe obstacles in the effective implementation of those policies and the achievement of good outcomes in the reduction of global pollutants. Many local governments still have common barriers to implementation of climate policies, ranging from a lack of funding to difficulties in establishing inventories (Larsen and Hertwich, 2009; Wheeler, 2008). *Thus, by using lessons from past experience, the objective of this research is to identify the main problems local governments face in implementing climate policies after they have decided to go ahead politically as compared with problems faced by past environmental policies.* The capacity of local governments and the way they are engaged in environmental policy implementation might be different from past approaches, when they were successful in implementing policies to combat local environmental pollution, particularly in developed countries. The ‘classical environmentalism’ of the past has limits in dealing with the new global problems (Lee, 2006), as the context and nature of global environmental issues are distinct from those of local environmental pollution. Moreover, financial crises and political challenges, such as the creation of EU policies in Europe or the emergence of global environmental funds, can affect the capacity of local governments, with consequences in the medium and long term (Bulkeley and Kern, 2006; Pinto and Puppim de Oliveira, 2008). Governments, especially local governments, have to design and implement policies differently in order to tackle global environmental problems effectively, but lessons can be learned from the past. The case of climate change in Mie Prefecture in Japan illustrates the different challenges local governments face in implementing climate policies and identifies areas to be changed in policy making and implementation to make local climate policies more effective in their implementation.

3 The case of Mie Prefecture⁽⁴⁾

The prefecture had serious environmental problems in the past (1960s–1970s), especially around the industrial City of Yokkaichi (Mie Prefecture, 2006). Through the implementation of a series of pollution-control initiatives, there was considerable improvement in environmental quality. Later on, in the 1990s, the prefecture began an ambitious plan to cope with climate change, one of the first prefectures in Japan to

⁽⁴⁾ Mie Prefecture is part of the Kinki region (Japan), close to the cities of Nagoya and Osaka. It has 1.87 million inhabitants. Its main cities are Yokkaichi, Tsu, and Suzuka. Mie is one of the major industrial centers in Japan, especially in the sectors of petrochemicals, machinery, and food processing (Mie Prefecture, 2011).

deal with it (Mie Prefecture, 2006). This time, however, policy implementation had not been as effective, though there had been progress in some sectors. This research aims at explaining why the implementation responses of the two policies (local pollution and climate change) were different in Mie. The research used the case-study method to analyze the problem (Yin, 1994). Thus, the objective is not to generalize from all cases, but to recognize some key policy lessons from the implementation of local climate policies that can help researchers analyze the obstacles to the implementation of local policies for tackling global environmental issues, particularly climate change.

Mie Prefecture was selected because climate policies had existed for a relatively long period (since the 1990s). Information was collected from central and prefectural agencies.⁽⁵⁾ Seven field trips and twenty-seven in-depth semistructured interviews with government officials, members of civil society, academics, and firm employees were carried out in person, by telephone, or e-mail between 2004 and 2010.

3.1 Policies to tackle air pollution in the 1960s and 1970s

The City of Yokkaichi in Mie Prefecture hosts one of the main petrochemical complexes in Japan. It also had some of the worst cases of air pollution in the country, and maybe in the world. In the 1960s, after the construction and expansion of the petrochemical plants, many critical environmental problems emerged, including several cases of the (infamous “Yokkaichi Asthma”, caused by high concentrations of sulfur dioxide from the combustion of petroleum and crude oil. Local policy makers and society in general reacted and were able to improve the once calamitous environmental situation (ICETT, 1994). Starting in the last half of the 1960s, the environmental quality of Yokkaichi improved significantly over the years (see figure 1 for the case of SO_2), as a result of stricter local environmental regulation, monitoring, technological development, and civic participation.

As the pollution problems got worse, civil society and government reacted. Community associations all over the city and region organized themselves to engage in pollution issues (these organizations rose from the ashes of the prewar town councils). Community groups and individual citizens also made their way to the courts. They demanded compensation for their material losses and illnesses, motivated by other environmental lawsuits in the country (Kato, 2004).

Environmental regulations also played an important role in reducing pollution in Yokkaichi. In 1962 Mie Prefecture established the Environmental Pollution Control

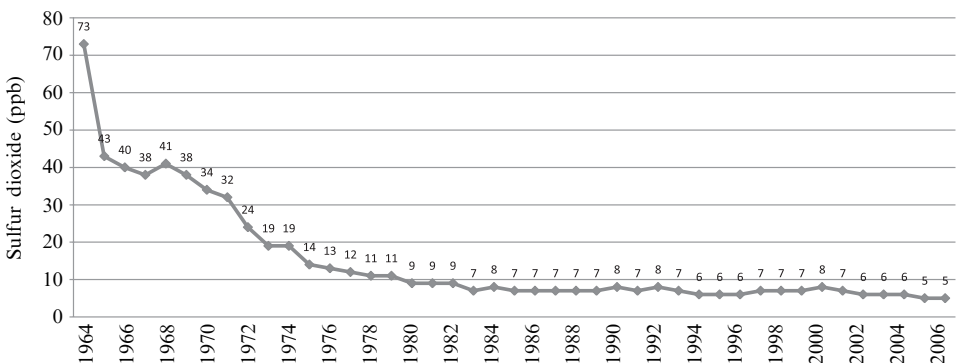


Figure 1. Sulfur dioxide in Yokkaichi City.

⁽⁵⁾ The case study covers developments in Mie until the end of 2008. The data in the tables are the most recent released by official sources. The case-study method does not imply generalizations from the case(s), but it is an important method to draw patterns or policy lessons on the basis of empirical evidence from practical cases that can be used in other situations, bearing in mind the specificities of each case that can vary over locations and over time.

Department, one of the first in Japan (even before the National Environmental Agency, which was established only in 1971). Local politicians under pressure from the local population asked central government to include Yokkaichi in the Smoke and Soot Regulation Law in 1962, which designated priority regions to cope urgently with air pollution. As in other parts of the country, local governments also made agreements with local companies to get them to take ‘voluntary’ action to manage their environmental problems.⁽⁶⁾

Companies responded to the increasing pressure for better environmental quality with several technological and management tools. They first increased the height of their smokestacks at the beginning of the 1960s (ICETT, 2007). Then they moved to change the kinds of fuel and water treatment plants, and to adopt the typical end-of-pipe technologies that were emerging at that time, such as desulfurization (and later denitrification). In the construction of the new industrial complex, a greenbelt was built to separate the complex from the city. There was also close collaboration between companies and governments, such as the joint construction of a wastewater treatment plant which was completed in 1969.

Thus, the case of air pollution control in Mie, particularly Yokkaichi City in the 1960s and 1970s, shows how local governments played an important role in driving policy implementation with strong participation by civil society and collaboration among the different levels of governments.

3.2 Climate change policies in the 1990s and 2000s

Japan achieved impressive improvements in domestic environmental quality from the 1960s to the 1980s (Choy, 2000; World Bank, 1996). In the international arena, the country has tried to show some leadership, especially because of its highly efficient/low-emission energy performance, but has suffered severe criticisms from environmentalists and other countries thanks to issues such as fishing for blue-fin tuna and whale hunting (Taylor, 1999; *The Guardian* 2010; Wong, 2001). The national government ratified the Kyoto Treaty in 2002 after a long period of hesitancy. However, the country has lagged behind in climate policy implementation. As an Annex-1 country, it had commitments to reduce emissions by 6% below 1990 levels between 2008 and 2012, but its greenhouse gas emissions increased by 8% between 1990 and 2004 (MoEJ, 2009a). In 2002 the national law was revised and new climate change laws and policies are being undertaken by the new government.⁽⁷⁾ For a long time the national government has been introducing a series of policies, such as the promotion of awareness and energy-efficient technology (see the main policies in table 1), but with little effect. In this context, local governments have stepped in and introduced their own policies, sometimes anticipating national initiatives.

Mie Prefecture has been one of the governments to take the lead in adopting climate policies. A progressive governor⁽⁸⁾ introduced a series of measures to mitigate climate change in different sectors (table 2), well ahead of political decisions at the

⁽⁶⁾ Many of those ‘voluntary’ agreements were signed over the years all over Japan (Tsutsumi, 2001). They basically relaxed some of the standards to be adopted, but received the commitment of the companies to mitigate pollution over the years when the standards were gradually raised.

⁽⁷⁾ The bill of the “Basic Act on Global Warming Countermeasures” was approved by the Japanese cabinet on 12 March 2010 and sent to the Diet. It sets goals for reduction of greenhouse gas emissions as 25% below 1990 level by 2020 and 80% below 1990 level by 2050 (MoEJ, 2010).

⁽⁸⁾ Governor Masayasu Kitagawa was well known for his progressive initiatives in environmental issues. Mr Kitagawa granted more decision-making power to municipalities to make decisions about solid waste management and made Mie the first prefecture to establish a tax on industrial waste. Also, he decided, against the central government’s will, to cancel the construction of a major nuclear plant in Mie.

Table 1. Some actions for dealing with global warming in the different levels of government in Japan (source: Mie Prefecture, 2006).

Level	
Central government	Ratification of Kyoto Protocol (June, 2002). Revision of the Law to Promote Measures to Cope with Global Warming (May, 2002).
Mie Prefecture	Mie Global Warming Prevention Plan—Challenge 6 (March, 2000). Acquisition of ISO 14001 certification by offices (February, 2000). Global Warming Prevention Initiative Implementation Plan (March, 2001).
Municipalities in Mie	Acquisition of ISO 14001. Municipal global warming prevention implementation plans.

Table 2. Actions in different sectors to cope with climate change in Mie Prefecture (source: Mie Prefecture, 2006).

Sector	Action in each sector
Industry	Voluntary plan to reduce greenhouse gases. Draft of global warming prevention plan. Lectures and seminars. Simulation of emissions trading system.
Transport	Promotion of low-emission cars. Environmental education of citizens to reduce emissions.
Commercial	Promotion of energy saving to large shops. Promotion of the municipal global warming plans.
Household	Ecopoint participation project. Environmental education.

national level. In 2000 the prefecture released the “Challenge 6—Mie Prefecture Global Warming Countermeasures Promotion Plan”, which set a goal of reducing GHG emissions by 6% in 2010 as compared with 1990 levels.

The plan asked certain industries to prepare their “Global Warming Countermeasures Plan”. Carbon dioxide is the major GHG in Mie, constituting 95% of the global warming impact (Mie Prefecture, 2007). The prefecture also created the “Greenhouse Gas Emission Trading System” to simulate a carbon-trading system with thirty local companies (Mie Prefecture, 2006), as industrial emissions are relatively high in Mie, constituting 60% of the total (see table 3) compared with 40% in Japan. This could serve as an example for a country-wide trading scheme. Companies were also encouraged to get ISO 14001 (environmental management system certification), sometimes with incentives, and most of the major companies in the prefecture got it.

The prefecture also engaged the public sector in the fight against climate change through a series of policies. The ‘informal dressing’ policy in the summer, allowing employees to dress more causally, reduced the use of air conditioning in public buildings. The municipalities were also asked to design their own “Municipal Global Warming Prevention Implementation Plans” and encouraged to get ISO 14001 certification, which 80% of them got by 2003 (Sugiyama, 2004).

Regarding the commercial sector, shops were encouraged to reduce the use of energy in general. For households, Mie Prefecture disseminated information about climate change and ways to contribute to a reduction in emissions. An awareness center, called the Center for Global Warming, provided training and information

Table 3. Emissions by sectors in Mie Prefecture (source: Mie Prefecture, 2006; MoEJ, 2008).

Sector	1990		2003		Variation of the emissions between 1990 and 2003 (%)
	emission	%	emissions	%	
Industry	15 050 000	60.5	15 398 000	56.6	2.3
Transport	4 154 000	16.7	4 620 000	17.0	11.2
Household	1 846 000	7.4	2 398 000	8.8	29.9
Commercial	1 686 000	6.8	2 773 000	10.2	64.5
Others	2 152 000	8.6	2 026 000	7.4	-5.9
Total	24 888 000	100.0	27 215 000	100.0	9.3

Note. Emissions are in tonnes of CO₂ equivalent. Percentages are percentage of total.

about climate change to citizens. For example, Mie provided information in such way that each household could know their own emission contribution from their bills by multiplying their electricity and fuel consumption by a certain index. It also created an economic incentive to reduce use of electricity called an Eco-point, as neighborhood associations provided an amount of up to Y300 (~US\$3) for households that reduced their electricity use by 6%. Finally, the prefecture campaigned for the use of efficient cars and education to halt idling when cars have stopped, which is common in Japan. There was also the Afforestation Fundamental Plan of Mie, which had a component for mitigating greenhouse emissions (Mie Prefecture, 2006).

However, CO₂ emissions were up 9.3% from 1990 levels in 2003, even greater than the national increase (Mie Prefecture, 2006). Because the goals of the “Challenge 6” plan for the year 2000 had not been achieved, the prefecture reduced the 2010 target from 6% to 3% of GHG reductions compared with 1990.

Positive results came in the public sector, with reductions in the use of electricity for air conditioning reaching 30% between 1996 and 2000. Industry also had a certain degree of cooperation over voluntary actions to tackle climate change. Nevertheless, despite the prefectural efforts, the policy results in the commercial, transport, and housing sectors lagged behind initial expectations and, indeed, emissions increased sharply until the mid-2000s.

4 Factors that explain the differences in policy implementation

The two cases of environmental policy in Mie Prefecture show two distinct realities of policy implementation. In the first case, with regard to local air pollution, the policy was implemented quite effectively. Local governments played an important role as policy drivers and enforcers of local and national regulation and policies. On the other hand, despite the prefectural government’s efforts to establish an ambitious policy to cut GHGs, the results in different sectors were not positively consistent. This section examines why those two policies had distinct outcomes in terms of effectiveness in policy implementation. The research identified five factors that influenced the effectiveness of local environmental policies and can explain their differences. For each factor, it also suggests ways to improve the effectiveness of local climate policies. The factors are described below.

4.1 Political legitimacy and immediacy due to cause – effect links

The way environmental pollution impacts local groups can bring legitimacy to governments to make quick immediate changes and implement policies (Keeley and Scoones, 1999; Kruitwagen et al, 2009). When the cause–effect of pollution, the polluters and the victims are consensual, policy makers can more easily get broad political support for policy making and implementation (Eden, 1996). The two cases in this research

show distinct degrees of clarity between polluter and victims, which led to different responses in timing and form from policy makers and other stakeholders.

In the case of air pollution in the 1960s and 1970s, although at the beginning of the crisis there were debates about the nature of the asthma problems, soon afterwards it became clear the problems were due to the high levels of air pollution caused by the industries in the petrochemical complexes. Polluters (industrial plants), victims (the fishermen, the asthma patients, and the surrounding population in general), and the cause–effect links were evidently determined, so immediate actions from governments were requested. The issue garnered great public attention through the media, and governments had broad political support to quickly introduce and implement strict environmental policies on companies.

Although there is increasing media attention and evidence of the effects of climate change, most of the consequences of global warming will come in the future and their exact effects on local population are still unpredictable. The polluter, the victim, and the cause–effect are not as clear as in the industrial pollution case. The emission of GHGs is also caused by the whole population which uses fossil fuels for its daily activities, not only by industrial plants as in the first case. Moreover, local governments have difficulties in justifying tough policies that contribute to the sustainability of other regions (McGranahan and Satterthwaite, 2003).

The Mie government established its climate policies pretty much by the individual decision of a progressive governor in power and without much legitimacy, political support, and sense of immediacy from the population. Thus, in the 1990s to 2000s, climate policies received much implementation support in the local public sector and a certain degree of cooperation from industrial companies,⁽⁹⁾ but very little attention from the general population until recently. Indeed, citizens have come to rely more on cars for transportation and air conditioning for cooling at home and in shops. Moreover, though population growth between 2000 and 2005 was only 0.5% in total, the number of households grew by 6.0% in the same period, which can also explain the increase in residential emissions (Mie Prefecture, 2007). Thus, even though the population has been almost stable, emissions from the transportation, residential, and commercial sectors increased sharply between 1990 and 2003 (see table 3). There were incentives and many voluntary policies in place, but these only if individuals and communities give them spontaneous support through changes in behavior, which depend on the policy legitimacy. As one community group leader said:

“People, even more informed people, really do not know how and why climate policies were passed, as they were a decision of a small group of people in government in 1990s. So why would we support those policies?”

Therefore, in order to gain legitimacy for climate policies, local governments should be actively promoting the need for urgent action and awareness to the local population about the causes and effects of climate change on their lives in the present and in the future, but not only through traditional environmental education. Detailed local vulnerability studies on the consequences of climate change and its causes could catch the media’s attention⁽¹⁰⁾ and help governments obtain legitimacy and support for implementation.

⁽⁹⁾ In contrast to reactions towards environmental policies in the 1960s–1970s, many companies around the world are involved in climate policy in the 1990s–2000s. Besides the threat of regulation and the eventual existence of incentives, companies are also more interested in keeping a good image concerning social and environmental issues these days. Many of them have corporate policies towards global warming, such as Shell in Yokkaichi. As a result, industrial emissions in Mie have not increased much in this sector, but have actually decreased since 1996 (Mie Prefecture, 2006).

⁽¹⁰⁾ The appearance of climate change in the mass media has influenced public awareness in Japan, especially since 2007 (Sampei and Aoyagi-Usui, 2009).

4.2 Capacity and support from organized civil society groups

When environmental groups are well organized and networked and have the capacity to mobilize and act they can influence policies, particularly at the local level. Environmental groups interact with society and policy makers and can be important in determining policy outcomes, as has been shown in Japan in the past at both the national and the local levels (Broadbent, 1998; Fujikura, 2001; Schreurs, 2002).

There has been a stark contrast in the support given by Mie's organized civil society and by companies implementing environmental policies in the 1960s–1970s compared with that given in the 1990s–2000s. In the 1960s–1970s, local civil society groups were more organized and were important in mobilizing the local population to take action. They also supported and pressed for implementation of pollution control policies while industrial firms were having a hard time accepting the policies and changing their behavior. On the other hand, environmental groups lacked the capacity and interest in climate policy in Mie Prefecture. Public officials even mentioned that they had a hard time getting support for climate policies from NGOs and civil society in general. “We could get more support from the companies than from the NGOs”, one official said.

The environmental NGOs in Mie, and in Japan in general, are mostly composed of small local community-based groups and have limited political power. Their interest is in local environmental issues, such as air and water pollution, environmental hazards, environmental conservation, and solid waste. In Mie, some of them were formed in the 1960s and 1970s to fight against pollution. They were much less mobilized and organized in the 2000s. No NGOs working effectively in climate change were found in Mie during the fieldwork. Even though they were informed about climate change they had no organizational capacity or interest to act. The more active environmental NGOs in the area of climate change are located in the large cities (eg Tokyo) and are comprised mostly of international groups (eg Greenpeace).

Thus, besides awareness, there is a need for a strong process of mobilization and capacity building of organized civil society groups to support the implementation of local climate policies (Aylett, 2010). In the case of Mie this could be done through more funding for locally based NGOs to work on climate change or strengthening the links between local NGOs and more powerful national or international NGOs.

4.3 The autonomy and capacity of local government to deal with the problem

The level of effectiveness in policy implementation depends on the degree of autonomy of local governments. Local governments have played an important role in making and implementing policies for combating air and water pollution in Mie and other places around the world. Those policies include actions mostly under the jurisdiction of local governments (city and prefecture). They had the authority to implement policies and depended only on themselves. For example, implementing local air pollution standards for local plants could involve only the introduction of the local regulations and the enforcement of those regulations on firms.

On the other hand, although local governments have important responsibilities for actions that cause climate change (eg energy and public transportation), implementation of climate change policies may also need actions that go beyond their jurisdictions, such as control of consumer behavior or energy standards, which are not the responsibility of local governments in many countries. In Mie, for example, a fuel tax might be able to curb the excessive use of individual vehicles, but this is beyond prefectural responsibility, or may be ineffective as drivers could fill their tanks in another prefecture. In this case, local governments have to rely on voluntary actions, as one Mie official mentioned, “voluntary standards are the way to go, as we cannot

enforce control in many sources of emissions.” Moreover, governments would need different capabilities to implement those policies, as they ask for different organizational and individual expertise. For example, controlling vehicle carbon emissions per year may go beyond the capacity of many local governments. Thus, we may explain the poor results of climate policies in Mie in some sectors (residential, commercial, and transportation), and good results in public administration, where the prefecture had jurisdiction and more control.

Therefore, local climate policies require a stronger link with higher levels of government to achieve effective implementation. The latter may have more resources and authority to support implementation, as well as capacity to coordinate with other governments at the same level. Mie has taken its own initiatives, but has not created synergy and mobilization with other prefectures in Japan, or with the national governments to promote its climate change policies. For example, the national government could help to build local public awareness and NGO capacity to support local climate implementation (see subsections 4.1 and 4.2). Larger autonomy for local governments could also allow them to implement policies more effectively.

In sum, the capabilities of local governments are different and more limited in implementing local climate policies compared with policies for the more traditional local air pollution (SO_x and NO_x). Institutional capacity is still a major issue in climate policy implementation (Betsill and Bulkeley, 2007). Local governments should be allowed to use more instruments to implement climate policies. Depending on the case, authority could be given by local parliaments, but in many cases actions from higher level governments (eg national) are necessary to equip local governments with the organizational capacity and instruments for implementation.

4.4 The role of technology development in fostering change

In this research the two cases show the different roles played by technological development. In the Yokkaichi case of environmental pollution in the 1960s and 1970s, technological development had a decisive role in reducing contamination and improving environmental quality. Once a new technology had been developed, companies were quick to adopt it. First came the increase in the height of the smokestacks, followed by change in the oil type, the development of the desulfurization process, and other technological developments that led to a significant improvement in environmental quality. The governments and companies successfully established partnerships between themselves and with universities and research centers to develop and adopt new technologies. In this case, technology played a major role mostly because the environmental problems involved had straightforward technological solutions, such as the development of end-of-pipe technologies or change in fuel types, many of which became rapidly and economically accessible.

In climate change, Japan has developed fuel-saving technologies (such as hybrid cars) and low-energy appliances. It has one of the world's highest energy efficiencies in the economy, but this has not been enough to counterbalance the increase in consumption. For example, the “Mie Prefecture New Energy Vision” has introduced several initiatives to boost the production of renewable energy, such as introduction of solar power panels in public buildings, wind energy generation, and biomass use. However, planned total reduction in CO_2 emissions by 2010 was 524 515 metric tonnes of CO_2 , or less than 1.8% of the total (Mie Prefecture, 2005). Thus, technology has played only a marginal role in reducing greenhouse emissions, as consumption increased more than the efficiency gains. Most of the necessary changes are behavioral, organizational, and managerial. Those changes include modification in consumer behavior by using

less polluting cars, and the checking and maintenance of the level of energy efficiency in facilities. Thus far, there is no 'end-of-pipe' technology that can be adopted to solve the problem of climate change.

Technology still has an important role in the reduction of GHG emissions, as local governments can, for example, improve energy efficiency with incentives to use the right technologies and promote information about technological solutions. However, local governments can rely much less on technological solutions to climate change problems compared with the local contamination issues they faced in the 1960s and 1970s. In the near future, the solutions may lie more in the realms of changes in behavior of individuals and organizations (Hourcade and Crassous, 2008).

4.5 Enforcement complexity

The complexity of the implementation mechanisms of a certain policy can determine its effectiveness. Simple implementation tends to lead to more effective outcomes. In the case of local industrial pollution in the 1960s, there was a relatively uncomplicated institutional environment for policy implementation. The polluters were clear point sources. There was a simple way to reduce pollution: adoption of end-of-pipe technologies. Standards and regulations were established and easy to monitor. The policy solution was the introduction of command-and-control regulations and the enforcement of those regulations. Therefore, policy implementers basically had to make sure that regulations were not too expensive to be complied with, that companies were following the regulations, and that results were monitored. Moreover, there were a small number of regulated organizations (the polluting companies).

The climate change policies in Mie Prefecture involved a series of actions with nonpoint sources that cannot be implemented simply. First, the implementation of the policy requires a large number of initiatives in many different sectors. Second, there are a large number of nonpoint polluters and target groups (consumers, shops, etc). Third, the implementation mechanisms are not simple command-and-control. They include voluntary changes in behavior by environmental education and the introduction of management tools. The monitoring and enforcement tasks are difficult and costly, which may explain some of the limited results of the policy.

However, command-and-control may be ineffectual in controlling the many nonpoint sources, and purely voluntary individual actions may not achieve the necessary reductions (Paterson and Stripple, 2010). Local governments need to assess the societal response to their policies to have an idea of the results (Tompkins and Adger, 2005). They should also be encouraged to use other policy instruments, such as economic mechanisms for nonpoint solutions, as they can be more efficient and effective. Mie used incentives to reduce electricity bills, but those were too low to have any major effect.

5 Final remarks

The comparison of the environmental policies in Mie Prefecture in the 1960s–1970s and the 1990s–2000s can provide some interesting lessons for implementation. In the problems of industrial environmental pollution in Yokkaichi (1960s–1970s), local governments played a fundamental role and were able to improve environmental standards gradually. Civil society groups were mobilized to press governments and companies to respond to their environmental demands. In the 1990s and 2000s, local governments faced a different problem: climate change. Mie Prefecture made a lot of effort to try to implement its emission reduction plans. In contrast to the case of industrial pollution, this time Mie Prefecture could not succeed in reducing emissions.

It had some participation from industrial companies, which voluntarily adhered to some of the governmental initiatives, but had difficulty mobilizing civil society and individuals.

However, some of the institutions from the air pollution case have been used to tackle climate change. For example, the voluntary agreements with the industrial sector, in which Japan has some experience, have worked to a certain extent, as companies have cooperated with government in its climate policies (industries are the second-best performers by sector in table 3: though they increased emissions after 1990, emissions have reduced since 1996). Another institution that was active in the two cases was local government which had the capacity to coordinate different sectors and mobilize the public administration to implement actions under their control, such as in the climate change case's reduction in the use of air conditioning and heating in public buildings.

Many governments have had a hard time implementing climate policy at the local level, as the policy results may need much stronger implementation capacity and coordination, compared with past environmental policies. The links between governments at different levels may strengthen the implementation capacity. In the past, pollution policies from national governments came a bit after local policies began and reinforced implementation capacity at local level in Mie. This is not the case for climate policies. Mie Prefecture began its climate policies without much support from the national government, which still remains ambivalent in setting targets (see footnote 3).

In Japan, there is also little horizontal coordination among governments at the same level. For example, Tokyo Metropolitan Government has begun its cap-and-trade program for GHG for buildings, which is said to be the first in the world (TMG, 2010), but other prefectures or cities in the Greater Tokyo area, such as Kawasaki, have no similar plans.

Climate policies also require a stronger governance structure, linking governments with civil society. Civil groups helped to boost implementation in the past by going to court, particularly with regard to civil losses in health and property from air pollution. In the case of climate policies, this is still not possible, as civil losses are difficult to assess. Government and civil society have done some work to promote education and awareness, but with limited evaluable results.

The two environmental problems certainly have different features, as shown in section 4, and these can explain differences in implementation performance. However, the paper has also shown some opportunities and limitations of local governments to tackle climate change. Some institutions are still effective, but new ones need to be built, particularly regarding the capacity and autonomy of local authorities and their coordination with higher levels of government. For example, adoption of new technologies continues to be important, but should be followed by changes in organizational and individual behaviors, with which the prefecture did not have prior experience and which depend largely on the involvement of higher levels of government, such as for energy taxes. Moreover, tough command-and-control mechanisms were not in place in climate policies. These are difficult to establish at the local level, as they can lead to unpopular or uneconomical decisions, such as controlling people's behavior. This was key to the implementation of the local environmental policies in the 1960s and 1970s. New policy instruments, like economic incentives and negotiation, can help these new challenges to implementation, but local governments may also need more support from a higher level of government than before, both in capacity and in autonomy.

Thus, strengthening the gaps in implementation capabilities at the local level by certain institutional changes, such as more autonomy in certain areas like the

capacity to impose green taxes, could help to extend the implementation capacity to tackle climate change. As in the past, local governments still have a crucial role in environmental policy implementation, but the way they act should vary, as the policy context and the problems have certain key differences, and we need to understand those differences in order to overcome obstacles and strengthen the capacity of local governments to accelerate climate policy implementation.

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