Sub-National Climate-Friendly Governance Initiatives in the Developing World: a Case Study of the State of São Paulo, Brazil

Kamyla B. Cunha[1], Fernando Rei[2] and Arnaldo César Walter[3]

Institute for Energy and Environment, Av. Brig. Faria Lima, 1993, cj. 16, São Paulo, SP, Brazil, postal code 01452-001. Telephones: 55-11-3815-4580 or 55-11-3031-8102. Email contact: kamylaborges@gmail.com.

ABSTRACT

The divergence of interests between UN Climate Change Convention (UNFCCC) Parties is a crucial barrier to overcome, particularly in view of post-Kyoto negotiations and the growing understanding by the international community that the so-called key developing countries should accept any kind of commitments under the UNFCCC umbrella. Considering that most key developing countries -- inasmuch as they are national states -- are very reluctant to embark on the discussion of the principle of common but differentiated responsibility, it is imperative to envisage alternative environmental governance initiatives, particularly proactive local and regional policies. The objective of this paper is to present sub-national climate-friendly governance initiatives now arising in the developing world, taking as a case study the environmental policy implemented by the State of São Paulo, Brazil. This paper addresses the following aspects of this issue: [i] The inertia and reluctance of key developing countries in assuming specific commitments under the UNFCCC umbrella, focusing on the case of Brazil's federal government; [ii] the role of alternative environmental measures created under regional and local arenas, and [iii] the climate-friendly governance promoted by the state of São Paulo under its environmental policy.

Keywords: *climate change mitigation, developing countries contribution, environmental governance.*

---

[1] Ph.D. student at the Energy Planning Program of the Faculty of Mechanical Engineering of the University of Campinas -- UNICAMP, and researcher at the Institute of Energy and Environment.

[2] President of CETESB, the environmental agency of State of São Paulo. PhD Professor of Environmental Law of the SENAC.

[3] PhD. Professor of Energy Planning Program of the Faculty of Mechanical Engineering of the University of Campinas – UNICAMP.

1 Introduction

The acknowledgment of global environmental problems, such as climate change, as challenges calling for rapid and effective responses from human society has turned the attention of policy makers to the international spheres of political decision. More and more nation-state governments begin to incorporate the outlining of the so-called climate regime into their strategic decision making.

However, from the perspective of legitimacy and effectiveness, other challenges are added to the climate regime, in particular the complexity inherent to international law governing the adoption and implementation of effective measures to combat global warming, and the interaction that must prevail between international pro-climate policies and the other governance spheres.

The goal of this article is to discuss the extent to which these two challenges can be understood as a factor watering down the perception of the legitimacy and effectiveness of the climate regime, and how the introduction of the concept of environmental governance could minimize this impact. With this aim, the present study resorts to observing the experience of the state of São Paulo, Brazil.

Section 2 discusses the role of developing countries in the evolution of the climate regime, pointing out the reluctance of major emitters in assuming broader commitments in the international climate regime. It is also argued that, in view of the difficulty in developing the climate regime amid a lack of supportive climate-friendly positions from nation-states, thinking about alternative and complementary actions is probably a good initiative.

Section 3 highlights the emergence of alternative environmental policy structures, mainly governmental measures originating at local and regional levels. It shows that such initiatives could lead to important positive effects at the regional level, such as encouraging States to promote climate-friendly measures, acting as centers of environmental education and awareness to population, influencing the position of nation-states, and applying pressure at the international negotiations arena.

Section 4 shows that such structures can lead to important benefits to the developing world, and presents the experience of São Paulo state. The context of Brazil in the climate change negotiations is outlined, and some climate-friendly measures under implementation in the regional level are described in more detail. It is also highlighted

that the effectiveness of such initiatives are intrinsically conditioned to the way in which the interaction between global and local aspects of environmental problems is incorporated into their planning and implementation processes. Some concluding remarks are presented.

2 The challenge of consensus in the climate regime: towards policy and politics

The recognition that climate change is one of the most dramatic global environmental problems, and that it is intensified by anthropogenic emissions, has instigated the international community to find measures commensurate with the issue. The United Nations Framework Convention on Climate Change (UNFCCC), approved in 1992, inaugurated an international legal regime aiming to achieve the stabilization of the greenhouse gas (GHG) concentration in the atmosphere at a level that would prevent dangerous human interference with the climate system.

In order to define specific international strategies to face the global environmental problem, the Kyoto Protocol was approved in 1997. This treaty constitutes, along with the UNFCCC, the basis of the climate regime. It elaborates the principle of common but differentiated responsibilities, establishing quantified reduction targets for developed countries listed in Annex I of UNFCCC, to be accomplished in the period between 2008-2012 -- the so-called first commitment period -- after which new rules would be in force.

Almost 10 years have gone by since its approval, and the GHG emission reduction targets imposed by the Kyoto Protocol still seem difficult to achieve for most countries. Even having assumed a legal obligation to advance toward their quantified targets, only a handful of the Annex I countries that have ratified the Kyoto Protocol can claim effective reductions. Except for Germany (18.2% reduction) and the United Kingdom (13% reduction), most EU member countries had unconvincing results, and the EU itself could reduce its emissions by just 1.4% from 1990 to 2003 (UNFCCC, 2005). Among Annex I parties signatory to the Kyoto Protocol at the time of report preparation, the situation of Canada was the most preoccupying: it increased its GHG emissions by 24.2% from 1990 to 2003, and by 26.6% from 1990 to 2004. The situation is still more distressing if we look at the signatories of UNFCCC only: from 1990 and 2003, Australia increased its emissions by 23.3%, and the USA by 13.3% (UNFCCC, 2005). In the developing world, emission levels of the most populous and industrialized countries are cause for concern, particularly China, India and Brazil. According to the UNFCCC database (2006), China is

the second largest GHG emitter, ranking just below the USA; Brazil and India are in 5th and 6th places.

For these reasons, the climate regime in general -- and the Kyoto Protocol in particular -- have been harshly criticized. For most authors (Browne, 2004, p.20, Aldy et al., 2003a and 2003b, Brouns & Ott, 2005), both the targets stipulated by the regime and the measures implemented by the countries proved insufficient to combat global warming effectively. For others, the problem lies in the need to conceive long-range goals, more appropriate to address the problem (Aldy et al., 2003a). Some authors point out that the lack of environmental effectiveness of the regime is, to a large extent, the result of the inadequate application of the equity criteria in apportioning responsibilities among countries, as it stipulated differentiated targets only to a group of countries rather than to all (Cooper, 1998, French, 1998).

The climate regime, and the Kyoto Protocol in particular, have nevertheless been regarded as a first step toward effective and more efficient climate change combat actions (Annan, 2004, Ashton & Wang, 2003, Aldy et al., 2003a, Browne, 2004, Buchner & Carraro, 2005, Vaillancourt & Waab, 2004). There is a consensus that the regime, as established, is not sufficient to tackle climate change, and that reforms are necessary, but at least mankind has a path to follow (Baumert & Kete, 2002). Effectively, in addition to the revision of targets of Annex I Parties, both the UNFCCC text (Art. 4.2 d) and the Kyoto Protocol (Art.9) foresee periodic revision of measures and rules inserted into the climate regime. As previously mentioned, this treaty advocated reduction targets for Annex I countries valid only in the so-called first commitment period -- from 2008 to 2012.

Official discussions about the future climate regime were started during COP 11, in Montreal, Canada in 2005. As a result of the COP work, it was agreed that the negotiation should proceed simultaneously along two tracks: the Kyoto track, and the so-called "Dialogue on long-term cooperative action to address climate change by enhancing implementation of the Convention" (Witteneben et al., 2005).

Although on one hand the decision to conduct international negotiations of the post-2012 period in two tracks reinforces the role of international institutions as the most adequate arena for international cooperative actions of nation-states to combat global environmental problems, on the other it is indicative of the possible fragility of this regime in dealing with the problem in a convincing way. The message brought by COP 11 is clear in the sense of recognizing the urgent need to implement measures that effectively address climate change (Müller, 2006), which implies the challenge of engaging all the world's major emitters, notably the USA and the so-called key

developing countries (China, India and Brazil) in a long-term effort that fairly and effectively mobilizes resources needed to protect the global climate (Diringer, 2003).

From the environmental perspective, a broader participation of the developing countries in international mitigation efforts is an important condition to make the climate regime an effective way to address climate change. This statement was reinforced after the announcement, in February 2007, of the Summary for Policymakers prepared by IPCC's Working Group I (IPCC 2007). The IPCC's message clearly states that continued greenhouse gas emissions at or above current rates would cause further warming and induce many changes in the global climate system during the 21st century, with average global temperatures ranging from 1.1 to 6.4 °C above 20th century levels, and calls for an urgent widening and deepening of efforts to control anthropogenic GHG emissions.

Even though it may take decades until the historical accumulated emissions from developing countries reach the levels of developed countries, from a long-term perspective the contribution to the greenhouse effect from developing countries will significantly increase (NAE, 2005). According to IPCC (2001) and OECD/IEA (2002) among other sources, countries such as China, India and Brazil would, at some future point, have emission levels higher than Annex I countries, particularly in view of their economic development needs.

The importance of the key developing countries in developing the climate regime is not restricted to their role as emitters; their participation with broader commitments is in the essence of economic competitiveness between countries (NAE, 2005). Developed countries hold that they will suffer greater and more drastic economic restrictions and will lose competitiveness if different goals are imposed on them, sparing the developing countries from the mitigation efforts -- thus establishing an unfair relationship between the two groups.

It must be recognized that the economic aspect of the participation of the developing countries in the international regime is at the very basis of the position taken by one of the main actors in the negotiations: the United States (Müller, 2006). Suffice it to say that the American refusal to ratify the Kyoto Protocol was expressly founded on the fact that the entry of the USA into the regime of that treaty would have to be conditional on assigning mitigation goals to countries such as Brazil, China and India (Bang et al, 2005). After almost 10 years, a greater engagement of the key developing countries in the mitigation commitments continues to be seen as a factor that would put pressure on the USA to return to the Kyoto Protocol discussions, and thus lead to a better balance in the mitigation efforts among countries (Ashton and Wang, 2003).

In spite of growing pressure from Annex I countries, the developing countries, united around the G-77 and China, have almost unanimously held the position of refusing to discuss any specific mitigation commitments. In general terms, they argue that their historic and current emissions are still much lower than those of developed countries (NAE, 2005, and Rosa et al, 2003). Furthermore, because of the vast diversity among them, and the socio-economic disparities which imply differences in their mitigation and adaptation capacity, there would be no way of assigning equitable reduction goals to each (IEA, no date).

Developing countries try to make their participation in the climatic regime conditional on the discussion about vulnerability, adaptation, promotion of sustainable development, resource and technology transfers, and capacity building (Girardin and Bouille, 2003). It should be recognized that because of their different adaptive abilities and geographic conditions, these countries are effectively more vulnerable to the impact of climate change. Thus, Najam et al. (2003) sustain that, before talking about mandatory mitigation commitments, it is necessary to reinforce the instruments for transfer of technology and financial resources, and increase the efforts of developed countries to provide support and promote capacity building. Another strong argument is the claim that developing countries have in fact implemented, to the best of their internal abilities, policies and programs with positive mitigation results (Girardin and Bouille, 2003, Baumert and Kete, 2001, Goldemberg and Reid, 1999).

Thus, the main challenge facing the international climate regime lies in reconciling the effectiveness of its measures with the assurance that equity is the presiding parameter in apportioning responsibilities among countries for the implementation of these measures. In practical terms, what matters most is distributing responsibilities for the major emitters, including the USA and the key developing countries, notably China, India and Brazil.

Furthermore, the need for immediate action to prevent possible irreversible damage from climate change, on the one hand, and scientific uncertainties on the other, have the effect that decisions are permeated with value judgments, since they reflect the degree to which each society is prepared to deal with the problem. This, in turn, is influenced by several factors, such as the perception of climate change risk, the level of adaptive and mitigating capacity of countries (which depends on national circumstances), and even very specific interests of power groups (GEC-CEC, 2004, p.41). In other words, in order to achieve an agreement able to embrace all these often conflicting factors, a complex political negotiation process is inevitable (Ott et al., 2004, p.57). The result does not always translate into policies really aiming at addressing the anthropogenic causes of

climate change; instead, it is more often directed to establishing policies to meet specific interests of the States (Bodansky, 2003).

Just as any system governed by international law, the climate regime and its measures are defined by consensus deliberated by the states, which are thus understood to be the sole formal subjects of international law. According to Bodansky (1999), the international environmental law in general has developed through a consensual process: states realize that they cannot solve some global or transnational environmental problems through individual action, and so agree to collective action by means of reciprocal exchange of promises; thus, they negotiate and adopt international rules that they believe are in their self-interest.

From this perspective, the State emerges as the entity holding political and legal authority to sovereignly discuss and agree to international measures to face global environmental problems, and this takes place through international law. Its role now is that of implementing policies and actions, previously agreed on in cooperation with other States, generally under the coordination of an international institution such as the UN (Frickel & Davidson, 2004). In other words, the global environmental problem ends up forcing on international institutions and States the challenge of creating institutions and putting in place measures to ensure the effective combat of the causes and the adequate adaptation to the effects (Bodansky, 1999).

However, in a context of complex and divergent positions of States regarding which measures to adopt to address global warming, the requirement of a consensus can be seen as a threat to the full legitimacy and effectiveness of the whole international climate regime. Attempting to achieve consensus is time-consuming and difficult, and runs against the urgency in implementing effective pro-active climate protection measures. Moreover, in many respects, particularly in the distribution of responsibilities among major emitters, reaching an agreement at all is nearly impossible; so, a consensus requirement in effect precludes collective action, or allows little room for progress in determining deep mitigation efforts (Bodansky, 1999).

The process of international negotiation, having as its principle the respect for the sovereignty of States, inevitably depends on the voluntary cooperation among countries, and there are no mechanisms of positive law to compel a country to participate in a negotiation process, nor to accept or ratify a treaty. In the context of the post-2012 regime negotiations, this means that the possibility cannot be dismissed that important countries refuse to cooperate, or impose conditions to their adherence to the regime, or even participate in an ineffectual way (Höhne, 2003).

Effectiveness ultimately has to do with the ability of international regimes to solve the problems that prompted their establishment (Andresen and Hey, 2005). According to Bodansky (1999), effectiveness of a regime is a factor that may contribute to a regime being perceived as legitimate. As shown, the difficulty of States in agreeing to ample measures to combat climate change, and the consequent adoption of minimal actions which do not always translate into practical results as expected, reduces the effectiveness required in the international regime. For these reasons among others, the unanimity rule is recognized as incompatible with effective government (Bodansky, 1999). In this sense, the climate regime is perceived as weak, incapable to effectively face global warming.

Just as the effectiveness of a regime is a parameter by which to evaluate its legitimacy, the reverse is also true. A regime regarded as legitimate is more likely to be effective, due to, among other things, the compliance pull that it is likely to exert (Andresen and Hey, 2005). However, the international path, based as it is on agreements by consensus by sovereign States through international institutions, is subject to the direct influence of particular interests of States. In general, these interests are not consonant with the efforts required to face global environmental problems, since they have a short-term horizon or arise from predominantly economic or strategic perspectives, whereas environmental problems require long-range actions and a broad vision (Pershing & Tudela, 2003). That is what Bodansky (2003) calls the contradiction between *policy* and *politics*.

By ignoring that climate balance is a common good, and by prioritizing short-term interests often corresponding to specific economic interests, the position of States in international negotiations fail to reflect that of the societies they represent, resulting in a loss of authority. As Litfin (2000) clarifies, political authority is generally conceived as the recognized right to make rules or to wield power legitimately. A state's authority depends on its citizens believing in the legitimacy of its institutions, which involves a close association with state-society relations. Thus, crucial to authority is the social perception of legitimacy.

As a key component to authority, legitimacy of a nation-state is dependent upon the perception among its citizen that the state is performing its ascribed roles (Frickel and Davidson, 2004). Thus, legitimacy requires a reflective subject capable of judging whether an action, rule, or proposal is in accordance either with its interests or else with established rules or principles (Litfin, 2000). Legitimation largely represents state responses to rapidly fluctuating pressures and priorities defined by interest groups in civil society (Frickel and Davidson, 2004). Legitimacy reflects a focus on ongoing systems of

governance -- on the institutions that issue directives and the processes by which they do so, rather than on the legitimacy of particular directives (Bodansky, 1999).

Thus, in a context of inherently complex political decisions requiring consensus, and of prevalence of diverging interests of the States, implementation of the climate regime raises issues of legitimacy and effectiveness. It is to be expected that alternative and complementary mechanisms will emerge as more legitimate ways to effectively address the global environmental problem.

Indeed, these mechanisms have been arising in the inter-state sphere through the formation of networks among non-governmental organizations and among regional and local government agents, and in the infra-state sphere by the initiative of regional and local agents, or still as purely domestic initiatives. As formulated by Jacobi (2000), this characterizes the emergence of the so-called environmental governance.

3 Environmental governance and new forms of addressing climate change

By ignoring state barriers, global environmental problems such as climate change give rise to the need for effective cooperation, leading to the understanding that such problems are ultimately those of a global common (Bulkeley, 2005), concretely felt in infra-state levels (Bodansky, 1999). When contrasted with the complexity of a response through the action of States within the framework of international law, the idea of global commons inculcates a sense of intergenerational responsibility at all levels of social organization (Litfin, 2000), signifying the emergence of new and complementary structures to face global environmental problems.

These new structures originate from the recognition that facing global environmental issues requires the cooperative and coordinated action of governance systems based on several levels (state, supra-state, infra-state and inter-state) and comprising state and infra-state (regional and local) actors, as well as non-governmental actors, each performing a variety of roles (Bulkeley, 2005). According to Dedeurwaerdere (2005), a network governance can be characterized by an attempt to take into account the increasing importance of NGOs, the private sector, scientific networks, and international institutions in the performance of various governance functions. This author says that there is a combination of the voluntary legitimacy of the civil society sector with the financial power of the business sector and the political authority of States and international organizations.

In this way, the networks become embedded in a logic that demands coordination, solidarity, definition of common objectives, and reduction of friction and conflicts, making the integration of demands a horizontal process (Jacobi, 2000).

When established within the structure of States whose environmental actions are ineffective or lack flexibility, these initiatives, when taking proactive steps in infra-state spheres (even if such steps have been driven by demands from abroad), become a means to press against the inertia of States, as well as an alternative path to face environmental problems. In the first case, according to Bulkeley (2005), the significance of non-state actors lies in the extent to which they shape, facilitate or change the behaviour of nation-states within international regimes. In the second, regional initiatives are deemed more responsive to pressures of inter-locality economic competition and continuous policy innovation, on the one hand, and citizen demands for pro-active measures, on the other (Jonas and Pincetl, 2006).

The idea of environmental governance has been initially fostered by the call in Agenda 21 (Bulkeley, 2005). In the domain of climatic change, infra-national governance initiatives began to gain strength as international negotiations, performed under the coordination of the UN and carried out by national States, became increasingly complex, leading to ineffective practical results and falling short of the requirements for a real combat of climatic change. In addition to the emergence of essentially scientific networks, which yield a strong influence over international decisions, and to the expansion of the activities of non-governmental organizations, regional and local governance initiatives have emerged as new forms of reinforcing the legitimation and effectiveness of climate-friendly measures.

The common aspect about these local and regional actions is to rescale climate change as an issue with local causes and consequences, while at the same time reframing issues which are institutionalized and imagined as local and regional when in fact they also have global dimensions. In doing so, these initiatives increase the importance of regional and local institutions and practices as an arena of influence, and reduce the role of international and national scales of governance, which gives them the opportunity to highlight the role of local and regional authorities in addressing climate change (Bulkeley, 2005).

From the perspective of the developing world, these initiatives could be viewed as an alternative way to address climate change challenges where the official position of nation-states is still one of reluctance to take early action. As previously mentioned, these initiatives could bring important positive effects at the regional level: encouraging states to promote climate-friendly measures, influencing the position of nation-states,

and putting pressure at the international negotiations arena, particularly on the developing world.

However, the legitimacy and effectiveness of infra-national initiatives in tackling climate change depends, to a large extent, on how the interaction between the global problem of climate change and the regional and local problems and environmental impacts is dealt with. Assuming that the main anthropogenic sources of GHG are also at the basis of important regional and local environmental problems, mitigation measures that acknowledge global-local relationship have better chances of succeeding, not only because they lead to real global and regional/local environmental benefits, but also because they place the issue of global warming on a level closer to the everyday reality of people. The common citizen begins to see more easily the correlation between his or her direct actions and the global environmental problems (Bulkeley and Betsill, 2003). Environmental governance, in this sense, means to conjugate the causes and consequences of environmental problems, and their construction as such, with practices and politics taking place at a multitude of sites and scales of governance (Bulkeley, 2005).

If, on the contrary, actions to combat global environmental problems, such as climate change, focus exclusively on the state/global perspective, ignoring regional/local effects of such measures, then other economic, environmental and social problems may arise on these levels. A conflict between global-local solutions can bring about a lack of effectiveness and a diminished perception of the legitimacy of those measures.

The experience of the state of São Paulo, Brazil, is a case in point. Considering the reluctant position of Brazil's federal government in taking early action to protect the climate, it contemplated many possible proactive measures in the state sphere. The positive results of such measures, and their ensuing legitimacy and effectiveness, depend on whether they will be implemented as part of an environmental governance focus.

4 Climate-friendly governance initiatives in the state of São Paulo

4.1 Federal inertia versus regional proactive action

In order to contextualize the position of the state of São Paulo regarding climate change issues, particularly its role in facing this problem, it is helpful to clarify the evolution of Brazil's position as a nation-state in this matter. Brazil has been playing a decisive role in international negotiations, putting forward important proposals for the Kyoto Protocol design and further regulations, as well as acting in favour of the interests

of developing countries. During the Kyoto Protocol discussion, the country's delegation presented two proposals: the Clean Development Fund, later transformed into the Clean Development Mechanism, and a quantification method to determine the common but differentiated responsibilities, which came to be known as the "Brazilian Proposal".

This idea, advocated at all UNFCCC meetings and COPs, illustrates that Brazil's government shares the main arguments of other developing countries: that incentives are necessary and should encompass the provision of new and additional financial resources and transfer of technology, as well as capacity building. As expressed in the Brazilian Paper Submission to UNFCCC "Dialogue" work (UNFCCC, 2006), "*the Government of Brazil believes that efforts undertaken by developing countries to reduce emissions in different sectors within their territories can only be characterized as voluntary and, therefore, cannot be linked or associated to goals, targets or timeframes*".

The reluctance in assuming more specific commitments under the climate regime may be due to the fact that Brazil is currently one of the major emitters in the world. The country lies in the 19th position in CO_2 emissions from the energy sector. However, considering that the main emission source in the country is deforestation, which accounts for 75% of all domestic emissions (MCT, 2004), the country's position in a total emission ranking is much higher: it occupies the fifth place (UNFCCC, 2006).

Although the Federal Government is still resistant to advancing in the international discussion, the challenge to act internally to reduce climate change persists. Even considering domestic actions against deforestation and the reinforcement of existing energy efficiency and renewable energy programs (such as PROCEL and PROINFA), domestic emissions are expected to keep growing.

Some relevant sectors of Brazilian society, mostly NGOs[4] and academics, regard the government's position as intransigent, and are pressing it to show more flexibility and move forward in the international discussions. In the absence of the desired reaction from the government, these groups have organized events and informal meetings to discuss alternatives, and written reports and submitted them to the government.

As pointed out, although on one hand the reluctance of the federal government is seen as an obstacle to taking early action against climate change, on the other it has spurred a reaction from the society at local and regional levels. Such is the case of the state of São Paulo.

---

[4] The activities of the FBMOS (Brazilian Forum of NGOs and Social Movements) and Observatório do Clima can be mentioned here.

4.2 State of São Paulo: GHG emission profile and interaction with regional/local environmental problems

Located at the Southeast of Brazil (Figure 1), the state of São Paulo is the most populous and urban in the country, with 41 million inhabitants, or 21% of Brazil's entire population. The state has the largest economy of Brazil, representing 32% of the national economic productivity, with a GDP of US$ 235 billion in 2003, most of it resulting from the industrial and service sectors. Between 1995 and 2004, Brazil's GDP and São Paulo's GSP grew at annual rates of 4.9 and 4.8 percent respectively. By 2004, São Paulo's economic growth had accelerated to 7.6 percent.

Because of its economic profile, the energy consumption of São Paulo state in 2000 amounted to 27% of the national mix (SMA, 2002). In 2004, the industrial and transportation sectors were the most significant energy consumers, with 39% and 26% of the total state respectively. Most of the energy consumed in the industrial sector was produced from biomass (44%), particularly sugarcane bagasse (36%). In contrast, the major energy sources of the transport sector are fossil fuels, particularly diesel (44%) (BEESP, 2005).

Figure 1 Location of the State of São Paulo in Brazil.

Source: IBGE, 2000.

This energy information is important to understand the GHG emission profile of São Paulo state. As shown in Figure 2, the transport and industrial sectors are the most important sources of CO2 emissions in the state, amounting to 83 million metric tons in 2003, or nearly one-quarter of Brazil's total. Ranked alongside entire nations on the basis

of CO_2 emissions (excluding land use change), the state would be the 39th-largest emitter in the world (SMA, 2004).

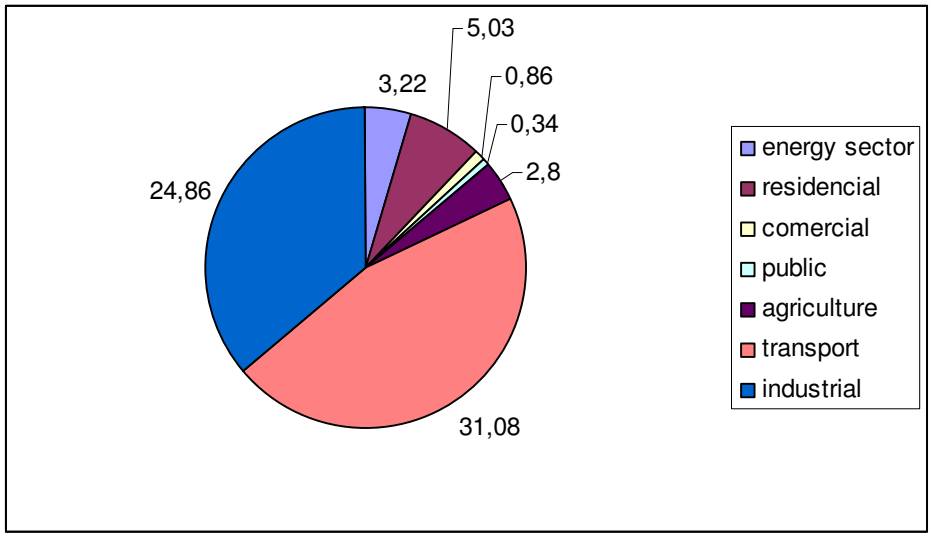

Figure 2 CO2 emissions by sector - 2004 (MtCO2)

Source: BEESP, 2005.

A considerable part of the emissions from the industrial sector is reincorporated into the biomass cycle, since it originates mostly from biomass -- the sugarcane products. The main problem comes from the transport sector: road transportation prevails, and uses mainly diesel and gasohol powered vehicles (SMA, 2002).

In addition to being the largest source of CO_2 emissions in the state of São Paulo, the transport sector is also the main emission source of atmospheric pollutants, accounting for 97% of CO and HC emissions, 96% of NO_x, 40% of MP and 42% of SO_x. Gasoline vehicles were responsible for the emission of 44% of CO, 23% of HC, 12% of NO_x, 21% of SO_x and 10% of MP_{10}. Vehicles powered exclusively by alcohol and flex fuel vehicles were responsible for 12%, 5% and 3% of CO, HC and NO_x emissions respectively; no significant emissions of SO_x and particulates were observed (CETESB, 2005).

According to a recent report of the World Health Organization, *"[..] clean air is considered a basic requirement for human health and well-being. However, atmospheric pollution continues to be a big public health problem around the world. More than millions of premature deaths are caused by air pollution each year. More than half of these occur in developing countries"* (WHO, 2006).

The importance of the state of São Paulo in the context of climate change also comes from the fact that it is Brazil's main ethanol producer -- and Brazil, by its turn, is the world's largest ethanol producer. More than 60% of all the sugarcane grown in Brazil is in São Paulo, and from the 15.93 million m³ of ethanol produced in the 2005-2006 harvest, 9.95 million m³ were produced in the state (ÚNICA, 2007).

Because ethanol is a renewable fuel, it has been regarded as an ally in combating climate change. A study by Macedo (2005), examining the energy balance of the ethanol production cycle and its contribution as a replacement for fossil fuels, estimated that GHG emissions avoided by the use of anhydrous ethanol amount to 2.7 kg CO_2e per liter of ethanol.

This fact is behind the growing interest for the use of liquid biofuels in the transport sector, ethanol and biodiesel being the best short-term alternatives worldwide. Among other factors, concerns regarding emissions of GHG have driven countries to look into biofuel production, especially ethanol, as a potential solution (BP, 2006)[5].

For Brazil in general, and for the state of São Paulo in particular, the increase in international demand for ethanol opens prospects of growth of its production. In order to expand its production capacity to 26-31 billion liters in 2010, as needed to supply the domestic and international markets, it is estimated that 160 new industrial plants must be built, and that the cultivated area must be increased by 2 million hectares (Piacente & Walter, 2005).

However, the sugarcane production in Brazil and in the state of São Paulo conceals serious environmental problems of a regional or local nature, the most important being the emission of atmospheric pollutants by the burning of tops and leaves, and the resulting aggravation of public health conditions in the surrounding cities. The practice of burning tops and leaves before harvesting is traditional in the sugar and alcohol production worldwide. In Brazil, data from 2002 for the Center-South region (Macedo, 2005) indicate that 65% of the sugarcane harvest is manual, and 35% mechanized, meaning that about 80% of the produced sugarcane is still burned. In São Paulo, in 2006, only 25% of the sugarcane harvest was done without burning.

---

[5] It must be highlighted that the fastest growing source of CO2 emissions is the transport sector. In 2000, GHG emissions of the transport sector corresponded to 28% of total emissions (estimated as 6.3 GtCO2 on a well to wheels basis). About two-thirds of the GHG emissions are associated to passenger transport, while the rest is from freight transport (IPCC, 2001). In 2003 end-use emissions in the transport sector were 5.1 GtCO2, i.e., 21% of the total energy use emissions (IEA, 2006).

The burning of sugarcane, as of any biomass, is regarded as an important source of pollution, including particulate material and polycyclic aromatic hydrocarbons (PAH), considered to be carcinogens. A correlation between emission of these pollutants and the increase in hospital admissions for respiratory diseases has been verified in published studies (Santos et al. 2002, Cançado 2003, CETESB 2002, Arbex et al. 2004). In general, these studies point to a coincidence between, on one hand, the occurrence of emission peaks of fine particulate materials ($PM_{2,5}$), dioxins and PAH, and the increase in the levels of tropospheric ozone (O_3) in sugarcane growing regions, and on the other, an increase in hospital admissions due to respiratory problems, mainly among children and the elderly during the sugarcane harvesting season, when burning is practiced.

The recognition of a link between sugarcane burning and health aggravation of the population of adjacent areas led to the institution of legal regulations to address the problem. In the state of São Paulo (State Law 11241, 19-Sep-2002), a schedule has been established to phase out the practice of sugarcane burning, which implies the replacement of manual by mechanized harvesting. Despite this, advances in the process of mechanizing harvesting are considered modest, and the practice of burning still prevails (Piacenti, 2005).

If the prospects of increased ethanol production materialize, driven by the contribution of biofuels to the mitigation of global climate change, then an intensification of atmospheric pollution caused by sugarcane burning is to be expected in Brazil and in the state of São Paulo, even taking into account the mechanization schedule established by state legislation. In the absence of good evaluation and planning, ethanol production expansion as an alternative to the use of fossil fuels can in fact aggravate the negative impacts on air quality in the local and regional spheres.

4.3 Climate-friendly initiatives and challenges

Aware of its role as the main contributor to Brazil's energy emissions, the state of São Paulo began to have concerns about climate change as far back as 1995, when the state government enacted its Climate Change Prevention Program -- PROCLIMA. Under this program, the state created a special administrative department, called Global Issues Division, with the attributions of producing information for the public regarding climate change, promoting seminars and conferences to present the problem and discuss mitigation alternatives, promoting capacity development, and cooperating with federal climate change activities. The most important work by PROCLIMA was the collaboration with the federal government in the preparation of the National Emissions Inventory (SMA, 2006).

In 2002 the state published its Agenda 21, in which climate change figures prominently. In the same year, the state government and other regional authorities launched the Network of Regional Governments for Sustainable Development (NRG4SD), with the aim of being an arena to share climate mitigation and other sustainable development experiences, and being the main vehicle of representative participation at international negotiations, as explained in Section 3. Thus, São Paulo, along with ABEMA, the Brazilian association congregating state environmental agencies, is now one of the members of the NRG4SD Steering Committee.

São Paulo state issued a decree in 2002 establishing a 5-year renewable licensing process for stationary sources of air pollutants. This corrected the previous "right to pollute" situation of older enterprises, some of which had been licensed nearly 30 years previously. Such companies are now required to gradually reduce their emissions, either by updating technologies or shutting down facilities. This program to reduce air pollution from industrial sources was significantly expanded in 2004 with the passage of legislation (Decree 48.523) allowing new industrial licenses in areas that have not met air quality standards only if sufficient abatement credits are first obtained from the government. Emissions currently regulated under this legislation are NO_x, SO_2, PM_{10}, CO, and nonmethane volatile organic compounds. In the future, indicative air-quality targets will be applied, allowing better management of sources during license renewal, and providing an incentive for cleaner production and fuels. The government is also discussing the inclusion of CO_2 and other GHG in this scheme. This program is also expected to bring benefits to the transport sector, considering that emission reductions of regulated pollutants from vehicle fleets can be used for compensation.

Two other government actions in the transport sector deserve mention. The São Paulo Metropolitan Region has in place an Integrated Transport Plan designed to increase mobility and increase the share of public transportation (buses, train, and subway). Besides, the government has a program to promote riding groups called Transporte Solidário. As an incentive to this practice, the Secretariat for the Environment of the state of São Paulo developed a freely available software allowing people from the same community to enroll in riding groups. The software attempts to identify potentially compatible people for the purpose of riding the same car by cross-checking data about route (by means of the postal code) and schedule, and personal data such as smokers/nonsmokers, favorite hobby, etc. Participants receives a listing with this information about people on similar routes, and on that basis can initiate one or more riding groups (SMA, 2007).

In spite of their still modest scope, pollution reduction and climate change mitigation measures carried out on the regional level can be regarded as examples of attempts to implement, on a regional level, environmental governance actions. In the process of formulation and implementation of these programs there has been and there still is a direct participation of third sector actors and other social actors. Whether as a strategy to gain wider adherence and social acceptance among the population (legitimacy), or as a way of making such programs economically viable, the fact is that the partnership between public authority and other social sectors is already an established reality.

Indeed, it is through such partnerships that the creation of a task force between CETESB (the environmental agency of the state of São Paulo) and EMTU (the metropolitan transport company) is being contemplated, in order to identify possible actions to reconcile the promotion of public transport and the joint reduction of GHG and atmospheric pollutants in the transport sector.

Although the institution of a schedule for phasing out sugarcane burning by State Law 11241 resulted in a broad discussion among the main agents involved in the sugar-alcohol sector in the state of São Paulo (mill owners, municipalities, workers' unions), it does not obviate the need to find other ways of dealing with related environmental and social problems, mainly against a background of expansion of the importance of ethanol in the regional (economic) and international (climate change) levels.

The role of the third sector should be highlighted here as a representative of the interests involved, and as an agent for social pressure. Here, not only local and regional agents are strengthened, but above all those with an international scope. According to Hunt (2006), the way in which potential international consumers will enter the biofuel market is a very important factor to assure the sustainability of its production.

Thus, the course of action open to governments -- both national and regional such as that of São Paulo -- is to evaluate the points of convergence between mitigation measures of global environment problems and their impacts on the regional and local level and, on that basis, to identify opportunities for proactive actions both on the global and on the local level.

Conclusions

The facts and plans compiled in this paper suggest that, even though nation-states may remain reluctant to assume early climate change mitigation measures, thus making

the international arena a complex and difficult path for the convergence of climate-friendly initiatives, there is enough space for alternative structures and approaches in both developing and developed countries.

Local and regional initiatives, though praiseworthy, could hardly gain space in the international agenda of the climate change regime in order to present their contributions, because international relations are still between sovereign States. However, the spread of environmental networks at local and regional levels is an interesting governance example that legitimates regional climate-friendly actions, enhancing closer inter-regional cooperation and acting as a nuclear voice able to make positive impacts at national and international levels. The implementation of climate-friendly measures and the demonstration of their benefits can be used as instruments to pressure nation-states to change their positions.

These alternative environmental instruments are particularly important to the developing world. It was presented that countries like Brazil, among others such as China and India, are already included in the list of the major GHG emitters and thus, their broader participation on the international climate regime is necessary to get more effective results in combating climate change. However, the reluctance from these nation-states, including Brazil, in assuming formal international mitigation obligations may be viewed as a factor to reduce the effectiveness of the international environmental law. In such a context, infra-national and regional proactive initiatives inside these countries can add not only effective results against global warming but also can be considered legitimated alternatives to face this global environmental problem.

The experience of São Paulo state is illustrative of the fact that early action in climate mitigation can bring about good results -- and this is particularly meaningful with regard to developing countries. It also demonstrates that without appropriate planning, i.e., if global and local aspects of mitigation measures are not taken into account, benefits might be limited, particularly in relation to its legitimacy and effectiveness.

In spite of their still modest scope, pollution reduction and climate change mitigation measures carried out on state level can be regarded as examples of attempts to implement, on a regional level, environmental governance actions, particularly in the case of transport sector.

One of the main challenges to an adequate environmental governance to be implemented by the State of São Paulo concerns to the necessity to envisage both global and local environmental aspects of ethanol production and use as an alternative to fossil fuels. In order to guarantee both global mitigation benefits and local environmental

quality, it is indispensable that the government incentive a broad and participative discussion among all sectors and stakeholders involved.

References

ALDY, Joseph, BARRET, Scott, STAVINS, Robert N. Thirtheen plus one: a comparison of global climate architectures. **Climate Policy**, vol.3, p.373-397, 2003a.

ALDY, Joseph, ASHTON, John, BARON, Richard, BODANSKY, Daniel, CHARNOVITZ, Steve, DIRINGER, Elliot, HELLER, Thomas, PERSHING, Jonathan, SHUKLA, P.R., TUBIANA, Lawrence, TUDELA, Fernando, WANG, Xueman. **Beyond Kyoto: advancing the international effort against climate change**. Pew Center on Global Climate Change: dez 2003b.

ANNAN, Kofi. Messafe of the Secretary-General of the United Nations. In **UNFCC – The first ten years**. Bonn: UNFCCC, 2004.

ANDRESEN, Steinar, HEY, Ellen. The effectiveness and legitimacy of international environmental institutions. **International Environmental Agreements**, v.5, 2005, p.211-226.

ARBEX, Marcos A., CANÇADO, José E.D., PEREIRA, Luiz A.A., BRAGA, Alfésio L.F., SALDIVA, Paulo H.N. Queima da biomassa e efeitos sobre a saúde. **Jornal Brasileiro de Pneumologia**, vol. 30, n.2, p.158-165, 2004.

ASHTON, John, WANG, Xuemon. Equity and Climate: in principle and practice. *In* ALDY, Joseph, ASHTON, John, BARON, Richard, BODANSKY, Daniel, CHARNOVITZ, Steve, DIRINGER, Elliot, HELLER, Thomas, PERSHING, Jonathan, SHUKLA, P.R., TUBIANA, Lawrence, TUDELA, Fernando, WANG, Xueman. **Beyond Kyoto: advancing the international effort against climate change**. Pew Center on Global Climate Change: Dec 2003.

BANG, Guri, HEGGELUND, Goerild, VEVATNE, Jonas. **Shifting strategies in the global climate negotiations: a strategic cooperation project, alternatives to the Kyoto Protocol**. The Fridtjof Nansen Institut – FNI, 30p., Nov 2005.

BAUMERT, Kevin A., KETE, Nancy. Introduction: an arquiteture for climate protection. *In* BAUMERT, Kevin A. (edit.). **Building on the Kyoto Protocol: options for protecting the climate**. Washington DC: World Resources Institute, oct 2002.

BEESP. **Balanço Energético do Estado de São Paulo 2005 – ano base 2004.** São Paulo: Secretaria de Energia, 2005.

BODANSKY, Daniel. Climate commitments: assessing the options. *In* ALDY, Joseph, ASHTON, John, BARON, Richard, BODANSKY, Daniel, CHARNOVITZ, Steve, DIRINGER, Elliot, HELLER, Thomas, PERSHING, Jonathan, SHUKLA, P.R., TUBIANA, Lawrence, TUDELA, Fernando, WANG, Xueman. **Beyond Kyoto: advancing the international effort against climate change**. Pew Center on Global Climate Change: dez 2003.

BODANSKY, Daniel. The legitimacy of international governance: a coming challenge for international environmental law? **The American Journal of International Law** - vol.93, n. 03, pp.596-624, Jul 1999.

BP. **The global ethanol industry is going through a period of rapid growth.** British Petroleum, 2006.

BROUNS, Bernd, OTT, Hermann. **Taking the lead: post 2012 climate targets for the North – towards adequate and equitable future climate commitments for industrialized countries**. Wuppertal Institute for Climate, Environment and Energy, Discussion paper 155, Nov 2005.

BROWNE, John. Beyond Kyoto. **Foreign Affairs**, vol.83, issue 4, p.20, jul-ago 2004.

BUCHNER, Bárbara; CARRARO, Carlo. Modeling climate policy perspectives on future negotiations. In: **Journal of Policy Modeling**. Nova York: 2005. p. 711-732.

BULKELEY, Harriet. Reconfiguring environmental governance: towards a politics of scales and networks. **Political Geography**, n. 24, p.875-902, 2005.

BULKELEY, Harriet, BETSILL, Michele. **Cities and climate change – urban sustainability and global environmental governance**. Routledge: 2003.

CANÇADO, José E.D. **A poluição atmosférica e sua relação com a saúde humana na região canavieira de Piracicaba – SP.** Tese de doutoramento apresentada à Faculdade de Medicina da Universidade de São Paulo. São Paulo: USP, 2003.

CETESB. **Avaliação dos compostos orgânicos provenientes da queima da palha da cana-de-açúcar na região de Araraquara e comparação com medições efetuadas em São Paulo e Cubatão – Relatório final**. São Paulo: CETESB, 2002.

COOPER, Richard N. Toward a real global warming treaty. **Foreign Affairs**, March-April 1998.

DEDEURWAERDERE, Tom. **The contribution of network governance to sustainable development**. Belgique: Université Catholique de Louvain Fonds National de la Recherche Scientifique, Feb 2005.

DIRINGER, Eliot. Overview. *In* ALDY, Joseph, ASHTON, John, BARON, Richard, BODANSKY, Daniel, CHARNOVITZ, Steve, DIRINGER, Elliot, HELLER, Thomas, PERSHING, Jonathan, SHUKLA, P.R., TUBIANA, Lawrence, TUDELA, Fernando, WANG, Xueman. **Beyond Kyoto: advancing the international effort against climate change**. Pew Center on Global Climate Change: Dec 2003.

FRENCH, Duncan. 1997 Kyoto Protocol to the 1992 UN Framework Convention on Climate Change. **Journal of Environmental Law**, vol.10, n.2., p. 227-39, 1998.

FRICKEL, Scott, DAVIDSON, Debra J. Building environmental states: legitimacy and rationalization in sustainability governance. **International Sociology** – vol 19 (1), p.89-100, March 2004.

GEC-CEC. **Climate regime beyond 2012 – key perspectives: Interim report**. Global Environmental Committee, Central Environmental Council, 2004.

GIRARDIN, Leonidas Osvaldo, BOUILLE, Daniel. **Conditions for greater commitment of developing countries in the mitigation of climate change**. Canada: International Institute for Sustainable Development – IISD, 2003.

HÖHNE, Niklas, GALLEGUILOS, Carolina, BLOK, Kornelis, HARNISH, Jochen, PHYLIPSEN, Dian. **Evolution of commitments under the UNFCCC: involving newly industrialized economies and developing countries.** Berlin: Federal Environmental Agency (Umwltbundesamt), Feb 2003.

Hunt, S. Potential challenges and risks of bio-energy production for developing countries.

Renewable Energy World 2006, July. Available at www.renewable-energyworld.com.

IEA. **Beyond Kyoto: ideas for the future**. IEA – International Energy Agency. No date.

IPCC. **Climate change 2007: the physical science – Summary for Policymakers: contribution of the Working Group I to the Forth Assessment Report of the Intergovernmental Panel on Climate Change**. IPCC, 2007.

IPCC. **Climate change 2001: impacts, adaptation and vulnerability. A report of Working Group II of the Intergovernmental Panel on Climate Change**. Bonn: IPCC, 2001.

JACOBI, Pedro. Meio ambiente e redes sociais : dimensões intersetoriais e complexidade na articulação de práticas coletivas. **Revista de Administração Publica**- FGV- vol. 34- numero 6- pp. 131-158, 2000.

JONAS, Andrew E.G., PINCETL, Stephanie. Rescaling regions in the State: the new regionalism in California. **Political Geography.** Article in press, 2006.

LITFIN, Karen T. Environment, Wealth and Authority: global climate change and emerging modes of legitimation. **International Studies Review**, vol.2, n. 2, pp.119-148, 2000.

MACEDO, Isaias de Carvalho. **E energia da cana-de-açúcar: dozes estudos sobre a agroindústria da cana-de-açúcar no Brasil e a sua sustentabilidade**. São Paulo: Berlendis & Vertecchia, ÚNICA, 2005.

MCT. **Comunicacao Inicial do Brasil a Convencao-Quadro das Nacoes Unidas sobre Mudanca do Clima.** Ministerio de Minas e Energia, 2004.

MÜLLER, Benito. **Montreal 2005 – what happens and what it means**. Oxford Institute for Energy Studies, Feb 2006.

NAE. **Cadernos NAE: Mudança do Clima vol.1**. Brasília: Núcleo de Assuntos Estratégicos da Presidência da República, Secretaria de Comunicação de Governo e Gestão Estratégica, 2005.

NAJAM, Adil, HUQ, Saleemul, SOKONA, Youba. Climate negotiations beyond Kyoto: developing countries concerns and interests. **Climate Policy**, n.3, p.221-31, 2003.

OECD/IEA. **Beyond Kyoto: energy dynamics and climate stabilization**. OECD/IEA: 2002.

OTT, Konrad, KLEPPER, Gernot, LINGNER, Stephan, SCHÄFER, Achim, SCHEFFRAN, Jürgen, SPRING, Detlef. **Reasoning goals of climate protection – specification of Article 2 UNFCCC**. Berlin: Federal Environmental Agency (Umweltbundesant), 2004.

PERSHING, Jonathan, TUDELA, Fernando. A long-term target: framing the climate effort. *In* BAUMERT, Kevin A. (edit.). **Building on the Kyoto Protocol: options for protecting the climate**. Washington DC: World Resources Institute, Oct 2002.

PIACENTE, Erik, WALTER, Arnaldo C. Bio-ethanol trade: opportunities and challenges for Brazil. **14th European Biomass Conference and Exhibition: Biomass for Energy, Industry and Climate Protection.** Paris: 17-21 out 2005.

SANTOS, Celeste Y.M., AZEVEDO, Débora A., AQUINO NETO, Francisco R. Selected organic compounds from biomass burning found in the atmospheric particulate matter over sugarcane plantation areas. **Atmospheric Environment** n.36, p. 3009-3019, 2002.

SMA. Homepage of Environmental Secretariat of State of Sao Paulo Government. **http://www.ambiente.gov.br**. Accessed on May 2006 to March 2007..

SMA. **No reason to wait: the benefits of greenhouse gas reduction in São Paulo and California.** Hewlett Foundation: 2005.

SMA. **Agenda 21 in São Paulo 1992-2002.** São Paulo: Secretaria de Estado do Meio Ambiente, 2002.

UNFCCC. **Working paper 7: Submission from Brazil.** UNFCCC: April 18th 2006a.

UNFCCC. **Key GHG data 2006 – Highlights from greenhouse gas (GHG) emissions data for 1990-2004 for Annex I Parties**. Bonn: UNFCCC, 2006b.

UNFCCC. **Key GHG data**. Bonn: UNFCCC, 2005.

VAILLANCOURT, Kathleen, WAAB, Jean-Philippe. Equity in international greenhouse abatement scenarios: a multicriteria approach. *In* **European Journal of Operational Research,** n.153, p.489-505, 2004.

WITTNEBEN, Betina, STERK, Wolfgang, OTT, Herman E., BROUNS, Bernd. **In from the Cold: the Climate conference in Montreal breathes new life into the Kyoto Protocol.** Wuppertal Institute for Climate, Environment and Energy, 2005.

WHO. **WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulfur dioxide - Global update 2005 - Summary of risk assessment**. World Health Organization, 2006.