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**Public enterprises and production of global public goods:  
the effectiveness of internalising public missions in relation to climate issues**

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Abstract

Starting from an analysis of radical uncertainty about the magnitude of global warming and the deployment of technological innovations, the paper explores the potential of a direct intervention by public enterprises as a complement to market systems applied to combating the greenhouse effect. It specifies in which sectors and under what conditions public enterprises could be the instruments for developing new technologies to prevent global warming by internalising missions in the public interest.

Keywords

Global warming; radical uncertainty; public enterprises; global public goods; public-interest policies.

**Introduction**

The concept of global public goods has emerged in recent years in the economic literature, under the impetus of international organizations such as the UNDP and the World Bank [Kaul, 2006]. This concept is the successor to the classic concept of public goods formalized by Samuelson [1954] to explain and justify collective production or public control of the production of goods which have two fundamental characteristics: non-rivalry in consumption (one individual's consumption does not reduce the consumption of others), non-exclusion (it is difficult or impossible to prevent an individual who does not pay from using a good). These characteristics prevent the production of public goods by the market (at least enough to satisfy the collective interest). It is therefore necessary for the public authority to intervene to develop positive externalities or to protect the community from negative externalities<sup>1</sup>.

By adding the adjective “global,” the UNDP has sought to restore currency to the concept of public goods. It also raised important issues for the collective welfare of the world's

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<sup>1</sup> This approach is part of the mainstream analysis. We can also refer to a political-economy approach, which considers public goods as social and political constructs, dependent on historical processes, and power relations [Hugon, 2003].

population: how to allow access to essential goods for all at a global level (and no longer just national); how to produce public goods useful for human and sustainable development? With globalization and the increasing interdependence of national economies, should public intervention not address the shortcomings of an increasingly global market, generate positive externalities and reduce negative externalities which increasingly cross borders and become global?

From this perspective, public goods become a means of preventing global warming, improving deteriorating air quality, preserving biodiversity, protecting the health of populations, providing access to water resources, contributing to economic, financial or international monetary stabilization, ensuring international security, promoting the development of knowledge, etc. [Stiglitz, 2006] Indeed, many goods (especially environmental, health-related and educational) are globally public in nature.

This concept of global public goods opens new perspectives for thinking about public policies on a global scale. The limits of national public policies are indeed obvious in dealing with issues that call for surpassing at the international level the current forms of implementing public action. This would lay the groundwork for a new paradigm of global economic regulation. The production of global public goods could give rise to a dynamic globalization of the public interest, i.e., to the international community's taking into account a global public interest [Bance, 2011].

More specifically, the purpose of this paper is to analyse how public policies could evolve to better preserve the climate. In this context, climate will be considered as mankind's common patrimony,<sup>2</sup> whose preservation requires a collective management taking into account the interests of future generations. This is to protect against what is called in the literature the tragedy of the commons, that is to say, the degradation of a common resource through free access to it by human populations. In this case, how to ensure that the individualistic behaviour of stakeholders (individuals, companies or states) does not result in the excessive and indiscriminate emission of greenhouse gases, which greatly worsen the collective welfare through global warming. With the Kyoto Protocol (1997), the international community responded by introducing incentives aimed at concerted, mutual limits on polluting emissions. The approach relies mainly on market mechanisms to promote the development of new technologies in the production of global public goods.

This paper examines the relevance of direct public action by public enterprises. What are the justifications for recourse to public enterprises? What might the scope of such an action be? What role could be assigned to public enterprises, particularly for the development of new technologies to produce global public goods? Which sectors could this action be applied to? Under what conditions and in what form would it be possible to carry out this intervention internationally?

To answer these questions, we first analyse the theoretical underpinnings of an intervention assigned to public enterprises. Then we will examine the effectiveness of such a mode of intervention because of current international institutional constraints.

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<sup>2</sup> We could expand this concept: theorists of environmental law, advocating a non-anthropocentric concept, take climate as the common heritage of all living species on the planet and not just of humanity [Gutwirth, 2001].

## **1. The theoretical underpinnings of intervention by public enterprises: internalising public missions in a context of double uncertainty**

Inasmuch as, since the Washington Consensus, states have largely relinquished direct intervention in economic activity, there have been mass privatisations in many countries, and public goods are increasingly being produced by private operators, why would we rely in the future on public enterprises to produce global public goods? Isn't the public enterprise a form of organization of the past that globalization has largely rendered obsolete? And in the case at hand, in what way could public enterprises be suitable tools for preventing global warming?

In response to these questions, it is useful to put into perspective the need for direct public action in public goods production by public enterprises, with the phenomenon of double uncertainty that characterises both global warming and future technologies.

### **1.1 Uncertainties regarding the effects of climate change and strong public control strategy**

To define uncertainty, we use the classical distinction made by Knight [1921], who differentiates it from risk. Risk characterizes an event for which we can measure the likelihood that it will occur (e.g., ten-year or hundred-year floods, etc.). Instead, we do not have sufficient information and knowledge to calculate the occurrence of uncertainty. Nonetheless we can formulate a strategy for reducing uncertainty and construct hypothetical scenarios to better apprehend the future.

In the current state of scientific knowledge, we remain in a situation of uncertainty about the extent of climate change. There are still strong scientific disputes, with some attributing warming to natural factors, especially solar radiation. Many consequences of climate change remain uncertain: what is the magnitude of warming; is the phenomenon speeding up, and how quickly; do we risk reaching a critical threshold, and when; what will the local impact be of rising global temperatures? The Intergovernmental Panel on Climate Change (IPCC), responsible for summarizing global scientific works, shows that since the mid-2000s, a consensus has tended to emerge: global warming is largely due to mankind. However, in 2007 uncertainty about future trends led the IPCC to make forecasts for 2100, in reference to the period 1980-1999, indicating a range of temperature rise between 1.1 and 6.4°C. These estimates bear on the global rise in temperatures and cannot determine its local repercussions. Does uncertainty about the effects of global warming justify inertia and persistent opposition to implementing large-scale action? Citing uncertainties about global warming, some states have indeed focused on the status quo<sup>3</sup> or on minimal accords. They rely on the argument of the optimists who think that, in the future, we can always solve problems through innovation and investments that will replace environmental assets. To oppose the adoption of binding measures,<sup>4</sup> the recalcitrant states conduct a short-term analysis on limitations on growth caused by policies to reduce greenhouse gas emissions.

Faced with uncertainty, Knight's analysis pushes us rather to act to try to reduce it. More specifically, we should seize uncertainty and take it into consideration, anticipate in order to best adapt to potential events to come. This involves turning uncertainty into risk in order to

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<sup>3</sup> The United States has not signed the Kyoto Protocol, and Canada withdrew in 2012.

<sup>4</sup> These arguments were advanced in particular at the first meeting of the Asia-Pacific Partnership on Clean Development and Climate in Sydney on 11 and 12 January 2006, after the United States refused to ratify the Kyoto Protocol in 2001.

be better able to control the future [Bouvier-Patron, 1996], and in this case to better organize public action. It becomes crucial to take temporality into account in order to better anticipate, especially as the consequences of global warming are immeasurable. However, the IPCC's work shows the decisive impact on global warming of the measures that are taken over the next thirty years. In other words, uncertainty should lead to the deployment of a strong control strategy to combat the greenhouse effect. This is consistent with works by Wiltbank and al. [2006], which focus on corporate strategy but which can be applied here: if predictive capacity is weak, it makes sense to deploy a “transformative” approach to monitor future changes and mitigate the impact of surprises.<sup>5</sup>

The approach adopted by the international community to limit the greenhouse effect seems to fit into this logic. The rules of international negotiations, based on multilateralism, are however non-compulsory measures and ill-suited to the adoption of quick, forceful decisions in an extended community of countries. The approaches adopted have nevertheless been aimed at a gradual reduction in greenhouse gas emissions by focusing on both energy savings and the development of new, clean technologies. With the Kyoto Protocol, the international community equipped itself with various tools to reduce greenhouse gas emissions: tradable permits to pollute (which are intended to facilitate internalisation by companies of emissions reductions by facilitating a re-allocation of resources by purchase<sup>6</sup>); Clean Development Mechanism (CDM) and Joint Implementation (JI) to financially reward business investment by advanced countries in the South or in countries in transition by granting them tradable rights).

To facilitate the implementation of quota programs and programs for the gradual reduction of greenhouse gas emissions, market mechanisms had to be introduced, in particular financial incentives to companies.

However, a proactive approach should also lead to broadening the scope of intervention to bring about change: aren't radical innovations or a technological revolution in the production of public goods the most effective way to prevent the greenhouse effect? The Ehrlich equation ( $I = PAT$ ) in fact identifies three factors of possible impact by human pressure on the environment: population, average level of consumption, technology. And technology is the factor with the greatest impact in the short or medium term.

It is therefore worthwhile to clarify the potential of direct public intervention, through public enterprise, in order to exercise forceful control over technological changes. An analysis about the effects of uncertainty on technological development sheds light on the alternatives.

## **1.2 Uncertainties and internalisation of production missions by public enterprises**

Ellsberg [1961] showed that given a choice between risk and uncertainty, the human mind tends to eliminate situations of uncertainty in favour of risky solutions, even if that choice is inconsistent. This human behaviour of aversion to uncertainty is also at work in corporate strategy. For this purpose, we can cite two diametrically opposite corporate behaviours, induced by the search for maximum profit and the cost-benefit approach.

The “prudent market-economy investor” tends to shy away from innovation and research-development if the expected profit is low. In the event of radical uncertainty, where it is impossible to assess the benefits of innovation, the company tends not to be interested in new

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<sup>5</sup> See Philippe Silberzahn blog <http://philippesilberzahn.com/>

<sup>6</sup> Only the EU implemented it through the Community Exchange System (CES) or the European Union Emission Trading Scheme - EU ETS

projects. This phenomenon is similar to the uncertainty aversion described by Ellsberg. This in large part explains the frequent intervention in the past by the governments of many countries for the development of economy-driving technologies. A very high degree of uncertainty characterizes radical innovations or technological revolutions. Hence public institutions have played an essential role in making their emergence possible. This action has been exerted since the post-war period in funding for research and direct implementation of programs. Without public funding and the action of public companies or institutions, the emergence and development of major technologies today would not have occurred in key sectors: space, Internet, civilian nuclear, high-speed trains and, more recently, the human genome. Public initiative in this case is necessary to remedy the excessive cautiousness of private companies. It is, in order to overcome the “forced participation” frequently observable for the production of public goods. This is particularly the case when the uncertainties are such that the projects do not offer sufficient guarantees to private investors in terms of expected profitability. As has been frequently observed in the past, the involvement of public enterprises allows the implementation of innovative projects, and has a lever effect on private investment that is beneficial to the deployment of new technologies. The public company thus reduces uncertainty and provides guarantees on the permanence of projects. It encourages a dynamic and creates a ripple effect through the procurement of equipment needed to develop new technologies and produce public goods. It allows partnerships to be established, which create synergy, and which have meant success in the post-war mixed economy.

The search for maximum profit can instead lead private operators to rapidly deploy new technologies, with high efficiency and without public intervention. This is the case if the expected return is high. The provisions of the Kyoto Protocol to increase investment in the South or in countries in transition build on this momentum. In terms of the production of public goods, this often leads to granting companies contractual guarantees on the profitability of the operations, and hence revenues from their participation that are sometimes high. We should also take into account here the ascension of ontological uncertainties [Callon, 2012]. In situations of imperfect information and limited rationality, actors do not consider all solutions and are unable to carry through with their consequences. Commercial logic amplifies the phenomenon through the process of creative destruction that Schumpeter described. Highly innovative organizations, driven by the pursuit of profit and high recurring revenues obtained through innovation, then tend to ignore the uncertainties, even radical, if the anticipated benefits are very high. As was stated in the preceding paragraph, the inability to scientifically predict risks should however lead to an emphasis on caution. That is what technological-risk-prevention experts recommend in situations of uncertainty. In fact if there is a lack of information on the risks they often advocate so-called majorant solutions that offer the most guarantees by adopting unfavourable hypotheses [FonCSI, 2011]. However, the adoption of cautious strategies, based on the principle of precaution and prevention of major risks or even events that are unlikely but with immeasurable consequences, is deemed too restrictive, too limiting or too costly. They are therefore ignored in favour of opportunities for immediate profit. Companies tend to externalize the consequences of uncertainties onto society as a whole, in other words to turn into immediate private benefit that which may eventually prove to be a substantial social cost. A typical example in this regard is the financial sector in the 2000s. The hyper-speculative innovation strategies adopted by banks and other financial players had disastrous consequences for the public interest by causing a global crisis. Contrary to the claims of the rational-anticipation theorists, the frantic search for high profitability actors with limited rationality to ignore uncertainties. This is all the more noteworthy in that risk calculation is, in the finance industry, systematic and held up as a behavioral norm by the portfolio theory. The Fukushima nuclear accident is another illustration. Financial reasons largely explain the inadequacy of the investments in safety, and

more specifically to prevent major risks. The resulting social cost resulted was enormous. The private operator TEPCO showed its inability to understand the negative externalities resulting from an extraordinary situation. Major asymmetries of information between government and business, before the accident and during management of the crisis, as well as important deficiencies in public regulations, clearly contributed to this and exacerbated the consequences.

Given contemporary technological uncertainties and the constraints on participation in the production of public goods, public action is doubly beneficial. On one hand, it makes it possible to initiate, fund and develop projects, especially when their return on investment is very uncertain. On the other hand, the public authorities can ensure that uncertainty and risks concerning radical technological innovations do not have catastrophic effects on the collective welfare.

A high level of control on the production of public goods and for development of new technologies therefore calls for a wider use of public-policy instruments than those usually recommended in environmental economics to address the externalities. Indeed, the establishment of laws and regulations, taxes and pollution-rights markets are obviously necessary but must be supplemented by more direct instruments of intervention in the production of public goods. From this perspective, the alternative is: to mobilize regulated private operators or to mobilize public enterprises. To clarify this alternative, the terms of which are, here, too, in no way exclusive, it is worthwhile to think in terms of opportunity costs, as recommended by the theory of transaction costs.<sup>7</sup>

The first model, pushed by some neo-liberals since the Washington consensus, is to produce public goods and to deploy the technologies associated by private companies in a competitive market or through public-private partnerships. Its first justification is the dynamism of private operators, competing with one another and in synergy. The limitations of this model are the agency costs and the greater risks caused by insufficiently controlled innovations. The measures used in this context are necessarily incentives, and they lead to a prohibition against excessively restrictive measures against companies in order to avoid damaging their competitiveness or exposing national governments to relocation to less stringent countries. With enterprises seeking a high level of profitability and a quick return on investment, short-term strategies tend to be adopted, and incremental rather than radical innovations are often sought (Montalvo, 2008; Depret and Hamdouch, 2009). However, if the activities concerned only bring primarily incremental innovations, or if it is a matter of spreading existing technologies, the model can be effective. According to the new public economics of regulation, it is then a matter of putting in place effective contracts, to create incentives for companies. From this perspective, different stakeholders with strong skills can also be mobilized, and actors can be put in synergy through the creation of competitive clusters or centres, under the impulse of active environmental policies. It is the sense of the recommendations made in 2011 by the UN to promote a "green revolution" by promoting knowledge sharing, a "major modernization of production systems, technologies and infrastructure", and increasing public assistance to the development of private technologies.

The second scenario is the deployment of technologies through direct production of public goods by public enterprises. The comparative advantage of this model is that it facilitates the internalisation of public-interest missions by operators: of course this does not exclude any phenomenon of capture of the regulator, but the ownership link between the firm and the public authority allows control and monitoring of the action in real time, to get the company

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<sup>7</sup> One can refer to the neo-institutional analysis of Williamson [1985] or North [1990], which shows that institutions are put in place to reduce uncertainty and transaction costs.

to take into account the assigned missions. The argument here matches that of the transaction-costs theory, in particular the seminal work of Williamson. As uncertainty gives rise to opportunistic behaviour (also called strategic) by the actors, it is recommended that integrated structures be implemented to remedy this. In this case, the public company (the hierarchical link with the public authorities) is a relevant way to get operators to internalize binding public-interest missions. The establishment of public transnational enterprises can also be seen as a means of limiting the opportunistic behaviour of states themselves, generating an expansion of cooperative interstate strategies to develop new technologies. But the argument goes beyond this. The analysis should also take into account another dimension neglected by Williamson: uncertainty about natural events that are not strategic behaviours [Roussel]. This type of uncertainty can also justify the establishment of integrated structures through the public company, not because of the existence of transaction costs but because of the constraint of non-participation by private operators who have insufficient knowledge of costs<sup>8</sup> and of return on investment. The potential rejection by public enterprises of the profit-maximization motive makes it possible to explore possibilities for developing new technologies that a strict efficiency calculation would cause to be discarded, mainly because of uncertainty. High levels of investment by public enterprises in fact allow rapid development of innovative technologies. This has been observed in the past, particularly in Europe in the monopoly sectors.<sup>9</sup> This can be a major asset in boosting the development of radical innovations, and, from this perspective, for avoid consequences that might prove disastrous for the collective well-being. It can also allow a significant expansion of investment in future technologies.

This second model has its limits. Public funding should be sufficient to ensure the development of advanced technologies. Some restrictions on competition may be necessary to effectively internalize binding tasks of general interest. Competition should not lead public companies to abandon their unique features under the powerful effects of behavioural trivialisation. An alignment of the behaviours of public firms with that of private competitors usually occurs in a situation of competition: the skimming off of clients by private enterprises and challenges to public funding deemed discriminatory affect the ability to conduct missions of public interest [Bance and Monnier, 2000]. The action of public companies in developing radical innovations therefore calls for special and exclusive rights to be established.

It is now appropriate to consider how those strengths and inherent limitations of the model of the public company could lead in future to the production of public goods and of effective technologies against global warming.

## **2. The effectiveness of intervention by public enterprises: the dual question of scope and conditionality**

The foregoing analyses require some clarification. How can intervention by public enterprises be exercised within the framework of a reactive adaptation strategy for mitigation of the greenhouse effect? This raises two questions. The first is the scope of intervention that would

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<sup>8</sup> This analysis matches MacGrath's [1997], which states that input cost uncertainty leads the enterprise to delay its investments.

<sup>9</sup> The rate of investment by large monopolistic enterprises in France has been 1.6 to 3.5 times higher than that of other companies in the country from the Post War period to the 1980s (and the phenomenon is not specifically French but observable in the EU). In France it made it possible to develop new technologies in the 1970s in telecommunications, nuclear, high-speed trains. Public enterprises in competing sectors have also played a role in developing investment but to a lesser extent and without lasting as long [Bance and Monnier, 2000].



be relevant in order for the action of public companies to be effective. The second relates to the institutional constraints inherent in the international context, specifically the conditionality of deployment of public enterprises.

**2.1 The scope of public-enterprise involvement**

Which activities should involve public companies in limiting the greenhouse effect? The answer to this question depends on technical and economic parameters. This involves gauging, with regard to the technological characteristics of certain activities, the capacity of public enterprises to internalize public tasks, in order to have adequate tools for preventing the greenhouse effect. Adaptation strategies against climate degradation affect all economic activities. However, given the above analysis, public companies may be involved in sectors where their behavioural specificities enable them to boost projects, to facilitate the safe and efficient deployment of future technologies. Two criteria contribute to ensuring that, in certain sectors, public enterprises can be effective instruments in preventing the greenhouse effect: a strong presence in sectors of high environmental impact, and the sector’s strong potential for deploying new technologies, particularly of radical innovations. The first criterion allows companies to produce appropriate actions by massive environmental externalities. It is in any case a sufficient condition for a high level of control to be exerted on operators in carrying out environmental policy. The second criterion mobilizes public investment to implement projects and innovative new technologies, while seeking to avoid unpleasant surprises caused by radical uncertainty.

**Industry characteristics and organizational systems to be recommended in preventing the greenhouse effect**

Negative externalities Potential of radical innovations	Low	High
Low	Non-binding policy: incentives	Proactive, cumulative incentive policy: regulatory and contractual
High	Binding policy: regulatory and contractual	Proactive policy: multidimensional and based on public enterprises

As in standard economic analysis,<sup>10</sup> the intervention of public enterprises is justified by sectorial specificities. But this justification does not apply generally and is not based on growing sectorial output. Business sectors are those that, at a minimum, should mobilize public enterprises to reduce negative externalities to prevent the greenhouse effect. It is not, as in the “Allaisian” model, a matter of making the public enterprise a tool for establishing a first-class Pareto optimum. Public companies are seen here as policy tools that can be mobilized by public authorities to safeguard the welfare of future generations. From this

<sup>10</sup> See in particular on that question the theorem of the maximum social surplus by Maurice Allais.

perspective, public companies are subject to restrictive public-interest missions because of high environmental benefits and high potential for technological improvement.

The sectors concerned are responsible for significant emissions of greenhouse gas. A survey of total global emissions of greenhouse gases<sup>11</sup> from human activities shows, for 2004 and by sector, the following distribution: 29% for industry, 23% for residential and tertiary sector, 17% for deforestation, 15% for transport and 13% for agriculture.<sup>12</sup> The levels and the distribution by sector of course differ greatly from one country to another, which justifies adjusting the analysis by type of country. General lessons emerge, however. The energy sector (including electricity) is attributed to consumption by other sectors. Its role is essential in explaining the industrial consumption of housing and transport. In these conditions, two sectors, energy and transport, are particularly conducive to intervention by public enterprises. They do not just represent a significant share of greenhouse gases emissions. These sectors have also many large firms around the world which, while not public, are in many cases public services. Their public missions can be extended to take into account the objectives of a binding environmental policy. But the technologies at work can justify the deployment of public enterprises.

In the energy sector, particularly electricity production, the exposure of some traditional technologies (such as nuclear) to major risks justifies, for safety reasons - if the choice is that the industry remains operative for the long term or only transiently - the existence of public service and a high level of control by public authorities through public ownership. In addition, the promotion of new technologies, in this particular sector or in renewable energy sources, can be greatly stimulated by massive investments by public enterprises.

Similarly, the development of mass transit, rail or local, could benefit from significant investment by public enterprises, as was also the case in the past in many countries. Of course, this does not exclude the implementation of supporting measures for private-investment programs through partnerships and by contracting through public-service delegations. A strong growth worldwide high-speed-train and mass-transit networks in urban areas would have a significant environmental impact. The public-private partnerships developed between public and private companies before the 1980s, as part of what was called the mixed economy, proved they can be a valuable asset in combating the forced participation of private investors and in boosting economic activity.

Beyond these considerations, the potential of action by public enterprises in the energy and transport sectors to contribute to climate stability is very real. The development of public transport could rely on the action of public enterprises whose primary missions would be to develop innovations to make this mode of transportation much more attractive by focusing on high speed, safety and improving the quality of service delivery, to have an integrated approach focusing on intermodality. The same would be true for electricity production, which weighs heavily on comparisons of national assessments of greenhouse gas emissions.<sup>13</sup> In the renewable-energy sector, strong mobilization of public enterprises (multinational, national, local) could help to promote profound technological changes and implement them locally

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<sup>11</sup> The main greenhouse gases of human activity are carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (or N<sub>2</sub>O) and, to a lesser extent, chlorofluorocarbons (CFCs), which also affect the ozone layer and CFC substitutes (HFCs, PFCs and SF<sub>6</sub>).

<sup>12</sup> See Jean-Marc Jankowich

[http://www.manicore.com/anglais/documentation\\_a/greenhouse/evolution.html](http://www.manicore.com/anglais/documentation_a/greenhouse/evolution.html), extracted data from BP Statistical Review 2009 et IPCC AR4 WG 3 (2007)

<sup>13</sup> Often extolled for its ecological sensibility, Germany has a bad ranking for per capita emissions of greenhouse gases (especially using coal-fired electricity and gas) while France has one of the best in the world, raising the balance for the European Union.

through a drastic reduction in production costs, especially in geothermal, particularly magmatic, in operations in the marine environment, the development of solar thermal energy, etc.

It is generally considered that climate stability is an added public good. In other words, to preserve the public good, we should take cumulative and varied actions in a maximum number of countries, and hence make use, as recommended by the UN, of all possible means for sustainable development. The difficulty is then to involve all members of the international community: cooperation runs up against free-rider states and the prisoner's dilemma, which may lead to what is called the curse of common goods. Apart from the relative efficiency in use of the tools utilised, in order to obtain a strong cumulative effect, it is important to mobilize all tools available in all countries. To escape the tragedy of the common good that is “climate stability” by effectively reducing greenhouse gas emissions, it seems necessary to apply incentive measures to all actors in all countries in the international community. It is useful in this context to be able to reply on the energy and transport sectors for mobilizing a large number of public enterprises. Such economic-policy approaches do not exclude – quite the opposite – subjecting private enterprises performing public services in these sectors to the most intense environmental missions possible, considering the characteristics of the actors in question.

But, as we have seen, with technology playing a key role in reducing the greenhouse gas emissions, climate stability must also be considered a “best shot” global public good. The best technologies are indeed mobilized by the best-performing countries (i.e., the most advanced), which compete to produce them. International cooperation could nevertheless improve the efficiency of public action to develop the best technologies and combat global warming. In this regard, several reasons can be cited: facilitating the financing and development of efficient technologies, exploring new paths and avoiding competition on similar or very close technologies; reducing losses resulting from failures or errors of choice, thus limiting the deterrent effects of uncertainty in project management; vigorously stimulating radical innovations.

But, how can concerted action and international cooperation be promoted so that public companies become part of this dynamic? To answer this question, it is useful to conduct a positive and prospective analysis on the conditions necessary for instrumenting public enterprises, taking into account international institutional constraints.

## **2.2 Socioeconomic conditionality and institutional patterns of instrumental action by public enterprises**

Is it appropriate to assume that public enterprises could be important instruments of international cooperation in preventing global warming? After the Washington Consensus, globalization led to the development of a global logic of market regulation of the economy. Massive waves of privatization occurred which greatly reduced the weight of the public sector in the world, and especially in the most advanced economies [Christiansen, 2011]. Public ownership is often seen as an obstacle to the growth of domestic companies in international markets. The main arguments are the following: the company's close ties with the national authorities generate opposition in foreign countries to the control of local firms; financing for the growth of public enterprise is hampered, or at least limited, by the lack of capital contributions by private shareholders. In addition, histories, philosophies and ideological positions differ from country to country with regard to public ownership. Therefore, public enterprises are absent in from energy and transport in a large number of countries. Nationalizations or start-ups of public enterprises still arouse strong resistance, which limits

the instrumental use of public enterprises. In this context, can public enterprises act against the greenhouse effect jointly and additionally in many countries? Moreover, is it not unrealistic to imagine that enhanced international cooperation can lead to the creation of transnational public companies, when these are very rare exceptions?

However, what seems unrealistic or pointless on the basis of a short retrospective may seem possible as part of a long-term and prospective analysis. National conventions, as well as international commitments, can be suddenly terminated [Bance, 2012b]. The Washington consensus illustrates the phenomenon: it broke with a paradigm, itself the product of a break begun in the 1930s (in which public enterprises had been tools of economic policy in many countries). Could the current economic and environmental crises be the cause of the emergence of a new paradigm of global regulation, in which SOEs would be instruments to prevent the greenhouse effect? Several arguments lead to think that this might be the case.

As shown by cognitive analysis, public policy is a social construct: public policies are the product of social norms, mental maps, and of social data repositories that legitimize them, through cognitive matrices [Muller and Surel, 1998; Muller, 2005]. The societal perception of the economic place and role of public enterprises is an integral part of these mental maps and data repositories. The same is true for global public goods, as Inge Kaul [2006] states, are social constructs. If the preservation of “climate stability” became a top priority for many countries public-policy data repositories, both national and international, would likely be deeply transformed. A new mode of global regulation might emerge, in which companies, whether public or private enterprises in charge of transport and energy, would be subject to binding public-interest missions. The reasons for such an instrumentation would go back to the reasons cited above: benefiting from high cumulative effects to reduce gases emissions and stimulate the development of highly efficient new technologies to combat the greenhouse effect. It would also be explained by the insufficient capability of public action<sup>14</sup> [Sen, 2008; Bance, 2012a] to meet the challenges with the current incentive tools of environmental policy.

From this perspective, two deployment patterns of supranational public-interest policies are possible. The first pattern is so demanding that it may seem unlikely: the emergence of a “world state,” which is to say a state of supranational institutions representing the public interest (whose purpose is to prevent climate warming), placing public action beyond mere considerations of national or regional interest and of opening up markets. Such a dynamic of globalization might call for a global policy of sustainable development. This would occur through an extensive coordination of national and regional economic policies but also through the creation of economic policy instruments for carrying out global public action. The supranational institutions could strongly encourage states to mobilize their own instruments to reduce emissions of greenhouse gases, in order to maximize cumulative effects. This could also lead to the creation of supranational government organizations in charge of the fight against global warming. In the energy sector (particularly electricity), the establishment of transnational enterprises governed by binding public-interest missions would seek the reduction of gases emissions. In a context of increasing financial difficulties for states, it would reduce the cost of developing new technologies and mitigate the negative impact of potential failures due to the uncertainties of scientific research. These transnational enterprises could be made responsible for R&D on a large scale in order to generate radical innovations and reduce the costs of producing “clean” energy. Public-interest or public-service missions would then be spelled out differently. They would no longer be configured, as in the past, at the

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<sup>14</sup> According to Sen, the capability is an effective opportunity for an individual to choose among various actions, thus reflecting the freedom he has to carry out one type of action or another. Out of this concept we will note that authorities can lead public policies that stem from voluntary choices and can use economic, social and environmental actions and allocate public goods.

country level to serve national interests. They would take on specifications established on the basis of compromises institutionalized internationally. In order for transnational public enterprises to be fully involved in the production of global public goods, they could also be given financial resources and extended leeway to effectively internalize their missions to develop new technologies. In this regard, it might be useful to allow certain exceptions to the principles of free and undistorted competition, including by providing exclusive and special rights, if necessary for efficiency. The adoption of such institutionalized compromises would occur only in the event of major upheavals, especially climate-related that are deeply felt by a large portion of the world's population.

The second pattern is characterized by a strengthening of the role of regional areas in the development and implementation of a comprehensive policy of general interest. Thus in international negotiations the EU has set for itself restrictive objectives in terms of greenhouse gas emissions. It wanted to set an example to encourage other continents to take action. It has established a market for the right to pollute, which has become operational only within European. A regional dynamic is less effective than a global dynamic, but it could facilitate the adoption of worldwide public policies. Spill-over effects are real if the region has a significant economic weight and a high environmental impact. However, proactive compromises must be established between the member states of the regional space. Such compromises do not necessarily lead to the establishment of regional public policies of direct intervention. The EU currently has no regional public enterprises and does not intend to create them.<sup>15</sup> This would break the paradigm embodied by the Washington Consensus. While this scenario cannot be ruled out for the future, it is however institutionally demanding. For its implementation, it is necessary that, through institutionalized compromises, member states accept the transfer of competencies and the creation of public instruments to support an interventionist regional policy in a vast regional union. However; one encounters difficulties similar to those that exist worldwide: one is confronted with different views, both doctrinal and of national interests, giving rise to free-rider behaviour by states. This is why regional areas, including the EU, are mainly built on a teleology of market rather than on a political dynamic (on common economic policies) [Bance and Monnier, 2000]. Enhanced and proactive cooperation led by some of the member countries of the regional space could however overcome the difficulties by creating a new dynamic around a common perception of the public interest [Bance, 2011]. By thus removing obstacles, it would be possible to more effectively coordinate national policies and especially develop regional instruments, such as supranational public enterprises. This could improve the effectiveness of national approaches and allow massive investment in radical innovation, particularly in the areas of energy and transport. The regional union, or at least some of its members, could find the opportunity to become world leaders in key technologies for the fight against the greenhouse effect. If successful, this would also have significant economic benefits for these countries.

## **Conclusion**

The preservation of climate, as the common heritage of mankind, justifies the adoption of global public policies. Uncertainties about global warming and its potential immeasurable impacts should bring public authorities to adopt proactive policies to exert a high degree of control on pollutant emissions. The incentive mechanisms, put in place since the Kyoto Protocol, must be fleshed out in this perspective. One should try to promote economic policies

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<sup>15</sup> It seeks to control many public-interest services, but in a completely different problematic: public-service missions defined by the national authorities must not distort free competition.

to develop new technologies and radical innovations, especially to make the production of global public goods with high environmental impact more efficient.

Public enterprises could actively contribute to the implementation of this policy in the areas of energy and transport. By assigning them high levels of public-interest missions, encouraging them to invest heavily in innovation, public authorities could promote a drastic reduction in greenhouse gas emissions. The specific behaviours of public enterprises, their ability to free themselves from a fast return on investment to internalize binding public-interest missions are indeed potentially suitable instruments for applying a proactive policy to prevent the greenhouse effect. This is particularly the case if their behaviors are not trivialized under the influence of competition or lack of public funding. Their action can then be used to overcome the lack of private investment in activities where technological uncertainty is deep-rooted and return on investment riskier. Proactive public policies could be based on the joint action of national public enterprises of many countries. The cumulative effects of the actions of these companies would obviously have a strong global impact. But the creation of transnational enterprises would bring an extra dynamic, due to economies of scale and the pooling of resources from different countries to explore original technology approaches. This could also be the starting point for new collaboration, international, regional or more broadly supranational, as part of proactive cooperative strategies.

In the current international context, the occurrence of this scenario seems unlikely at first glance. Adoption of a proactive policy based on public enterprises would lead to a break with the Washington Consensus. This would also lay the groundwork for a new paradigm of global macro-regulation, in which public companies would have global public-interest missions. But regional spaces, or within these spaces a strong willingness in countries pursuing a strengthened policy of cooperation, could stimulate this dynamic. The observation of climatic changes could raise international awareness to the critical need to implement comprehensive public-interest policies.

It would however be relevant to try to rebuild public policies, public-interest missions and the ways in which public enterprises intervene, not by aiming solely at effectiveness in preventing the greenhouse effect. We should also seek to develop consistent public policies in a new institutional framework, allowing citizens of the world to express themselves democratically, and allowing the emergence of new governance in the management of common goods (Orange and Vatteville, 2013; Ostrom, 2010).

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