



The European Union and the management of sustainable development: the role of the Nordics

Mans Lönnroth

Måns Lönnroth is the former managing director of Mistra, the Swedish foundation for strategic environmental research. This paper was the basis of his contribution to a seminar on the Politics of Climate Change: National Innovation, Leadership and Policy Approaches Within the EU's Framework for Action, held in London on 9 October 2008 as part of the ongoing work of the Politics of Climate Change project, organised by Policy Network in conjunction with the Centre for the Study of Global Governance at the London School of Economics.

A version of the paper was originally published under the title 'L'Union européenne et la gestion du développement durable: le rôle des pays nordiques' in the book *L'Europe et le développement durable*, published by CulturesFrance, Paris 2008.

Introduction

Today, any discussion of the European Union and sustainable development has to start with the role of enlargement. The EU's enlargement from 12 to 15 members added Austria, Finland and Sweden. All small countries, well developed and with a keen interest in the environment and also in social policy, for Europe they represented more of the same, only even more so. If anything, with this enlargement the Union became more rather than less homogenous.

The enlargements from 15 to 25 and then to 27 members were different, however. From a political perspective Europe at last decided to handle the legacy of the Versailles Treaty. From an environmental perspective, with these enlargements most, if not all, of Europe's major eco-systems are now the responsibility of the European Union. Therefore, in theory at least, the environmental challenges have become more manageable. But in reality the social and economic heterogeneity that accompanied the second and third rounds of enlargement have made the practice of environmental management much more complex.

This is where the institutional management of sustainable development enters. In 2005 the European Council formulated a definition of sustainable development building upon the Brundtland definition from 1987, which in turn is taken from the IUCN in 1980, already then a rhetorical compromise between economic development and the conservation of nature. The Council stated that the EU should strive for a protected environment on a global scale, social inclusion in Europe as well as solidarity with other countries, and the economic competitiveness of the Union in the global markets. Potential conflicts of priorities were not discussed.

In practice, of course, the EU has time and again acted as if these conflicts were sharp. The debates over climate change, chemicals, transport and pollution all testify to the concern that too stringent environmental policies would endanger the competitiveness of European industry with dire consequences for employment and social inclusion. Thus the conclusions at the Gothenburg summit of 2001 were rather rapidly sidelined in favour of the conclusions of the Lisbon summit, which de facto concentrate only on competitiveness.

Stringent environment regulations make existing production and products obsolete and thus add impetus to the ongoing Schumpeterian process of creative destruction. The aim of this paper is to look deeper into the institutional management of this creative destruction and the extent to which adequate instruments of social and employment policies can reduce or even eliminate the potential conflicts. The Nordic countries are used as test cases.

The institutionalisation of European environment policy

The Nordics and the Netherlands aside, the European countries were latecomers to environment policy. By and large European environment policies have developed in four stages, each stage driven by a peak in the waves of environmental awareness.

The first peak occurred in the late 1960s and lasted until the early 1970s. Country after country established environment protection agencies and also the necessary legislation for curbing industrial pollution. The US and Japan then led the rest of the world together with the Nordic countries. Japan started very early with air pollution control from industrial plants; the US and Japan with car emissions. Sweden started with waste water sewage plants from cities and paper/pulp industries and air pollution measures against industrial plants and acid rain. Other European countries by and large stalled, not the least when Sweden and Norway brought up the issue of trans-boundary acid rain. The 1972 Stockholm conference marked the high point of the peak; the oil crisis and the subsequent recession killed the wave.

The second peak arrived in the mid 1980s as the environment was visibly moving up the political agenda in several European countries, not least in the FRG. The first breakthrough came with the European convention of long range trans-boundary air pollution and its subsequent protocols. The role of the European Community was very limited, until the single European Act in 1986 gave the EC a direct role in environment regulation through the introduction of majority decisions on issues relating to the internal market. The first major application of this new rule was the directive on large scale combustion plants; pushed by the FRG and opposed by the UK until Margaret Thatcher decided to give in. Next came, after considerable acrimony, the directive on automobile emissions. Only in the late 1980s did Europe start to catch up with Japan and the US. The Nordics, of course, encouraged the EC in this, although only Denmark was a member at that time. The major European countries had finally accepted that pollution was trans-boundary. The FRG made a 180 degree turn and pushed for the best available technology (assumed to be German).

The 1980s also saw a number of regional agreements: the Rhine action plan (after the accident in 1986); the North Sea conferences, a re-started Helsinki convention for the protection of the Baltic Sea and so on. European countries got used to addressing environmental concerns through international conventions.

On the global level, only the UN Vienna convention for the protection of the ozone layer stands out: the US (after some considerable vacillation) led the way, supported by the Nordics and resisted by the major European governments; in the end, the latter gave up and the Montreal protocol was agreed upon.

The second wave peaked when the German unification occurred. The 1992 Rio conference occurred on borrowed time although the climate convention was signed

there. The German unification so overloaded the German political agenda that the environment inevitably was sidelined. The momentum slackened noticeably.

There is a lesson, however, from these two peak waves. The institutions that were established have continued their work even as high politics has turned to other issues. Progress grinds on, although at a slower rate. New initiatives may not be expected, but many small steps in existing areas nevertheless add up to considerable progress. The European Environment Agency, established in the early 1990s, marked yet another advancement in the institutionalisation. A gradually harmonised database for the environment is a huge step forward.

The third wave arrived in the mid 1990s. It was marked by a shift to the left in European politics including the role of green parties in some European governments. This was also a uniquely European wave. The US was characterised by a shift to a vehemently anti-state and anti-UN position which pre-empted a forceful environment policy.

Three aspects stand out from this predominantly European peak. First, global leadership in environment policy now shifted to Europe. Second, the EU embarked on a very ambitious review of chemicals policy which opened up a whole new way of looking at chemicals. Related to this, the EU widened substantially the obligations for product developers, with the producer responsible for waste. And thirdly, the EU started to take climate change seriously, an area where the US has continued to stall even now, 10 years later. And progress continued to be made in air and (to some extent) water pollution.

Then again this peak petered out in the early 2000s. As luck would have it, Sweden had the presidency of the EU when President Bush decided to ditch the Kyoto protocol (it is easy to imagine other EU presidencies that gladly would have followed the US). The Johannesburg summit in 2002 was clearly a disappointment from a global perspective ("disaster averted; opportunities lost" was a telling newspaper headline).

The subsequent trough was again very deep. It was marked in Europe by a loss of interest in the environment not least in the Commission, and also among several member state governments. Also, the enlargement from 15 to 25 required huge investments in time and resources for catching up with the existing EU legislation. The US continued to stall on climate change. And China and India started to worry European governments concerned about competitiveness.

It was a short-lived trough, however, and the triggering event for the fourth peak was climate change.

The fourth assessment of IPCC demonstrated that climate change is occurring at a more rapid rate than previously was thought. Nicolas Stern's report in the fall of 2006

symbolised a turning point. The opposition in the US weakened. Also, the experiences of the first phase of the European emission trading system showed that a modified system could have a real impact.

The EU has continued to lead on climate change. The January 2008 proposal by the European Commission on climate change will put the relations between environment policy, competitiveness and social/employment policy on its cusp. Climate change will give a whole new impetus to Schumpeter's creative destruction. Indeed, there is a well- rounded concern that climate change is the only issue worth worrying about.

There is more. Other issues are creeping up on the agenda. As globalisation proceeds, the environmental (and social) impacts of goods imported to Europe but produced elsewhere become increasingly visible. As do the various forms of exports of toxic waste from Europe to countries with lax regulations. The environmental management of trade raises its potentially ugly head.

What European environment policy has achieved

The environmental component of European sustainable development is difficult to assess compared with economic or social achievements. Data on the European environment do not lend themselves easily to analysis or even cross-country comparisons. Data sources differ and are frequently derived from scientific studies put together for particular reasons. Efforts to establish a coherent database have been weak. Comparative analyses are less than straightforward as are assessments of interdependencies between economic, social and environment policy.

Moreover, the environment policy area is highly fragmented and reflects the specialisation of the environmental sciences and thus professions. Learning between different specialities is limited. Successful experiences within one sector are not easily transferred to other sectors. Some conclusions are nevertheless obvious.

Acid rain mitigation is the outstanding success of European environment policy. According to the European Environment Agency sulphur emissions from the EU-25 will in 2010 be down to the same level of the year 1900. This is the combined effect of many small steps and one huge one: enlargement. Reducing city air pollution has been a moderate success; much remains to be done, but at least the direction is the right one.

The common fisheries policy is perhaps the most blatant failure. Warning signals about depleting fish stocks in European waters have by and large gone unheeded.

The Rhine action programme is another success story while the protection of the marine environments (Baltic Sea, North Sea, the Mediterranean) has been much less of a success.

The protection of coastal zones is by and large a failure, ranking close to the common fisheries policy, but perhaps not with as dire near term consequences. The direction is the wrong one. EU efforts to protect ground water from agriculture have also not been very successful.

Chemicals pollution is a case on its own. While efforts to control industrial plant pollution is a success story; the risks from existing chemicals on the market has been stated as a near failure. It is too early to assess the success of the REACH programme as it is still under implementation.

Looking across the various sectors of environment policy, four generic characteristics can be observed. First, the type of dialogue—and, indeed, trust—between science, policymakers and industry goes a long way towards explaining the degree of success. Second, the structure of the industry in question is also a factor. Somewhat surprisingly, industries that compete on the global market have, obviously with some exceptions, by now established a pattern of cooperation. By contrast, home-based industries—agriculture comes to mind, but also the construction industry—are much less sophisticated. Third, the nature of scientific advice, and therefore the nature of the dialogue between science, policy and industry is also important. And fourth, the perverse effect of many subsidies, often introduced for social reasons.

The acid rain mitigation is the best example of a well structured dialogue. The roots of this dialogue go back to the convention for long range trans-boundary air-pollution, a convention established within the UNECE in 1979. The need for models for trans-boundary transport of pollution was obvious, as well as protocols for a common database and thus measurements. This in turn led to a set of methods for assessing mitigation methods in terms of both costs and trans-boundary impact, in turn based on a common definition of impact (which gradually became the so-called critical loads, differentiated according to soil characteristics). With these components in place contention between science, policy and industry have been reduced substantially and the debates on policy have become quite straightforward. Thus a tacit agreement between governments and industry emerged. The former told industry that emission levels have to come down step by step but in a dialogue with science and industry. Protocols were agreed on the basis of best available technologies, and as these progressed further protocols followed.

By contrast, the common fisheries policy is a case of a badly structured dialogue, leaving lots of space for contention and thus also for policy delay.

On the surface, the main problem lies in a lack of a dialogue between industry and science. The fishing industry by and large refuses to accept the scientific advice. Two further issues are visible below the surface.

The first issue is that the fishery industry is a marginalised industry, confined to coastal regions seen to lack other employment. The industry is therefore heavily subsidised. Second, the industry is marginal in terms of education and thus lacks the tradition of a dialogue between science and policy. Monitoring and enforcement is inadequate. Countries where the fishery industry occupies a more central role in the industrial landscape, as in Norway and Iceland, have taken a more serious approach to sustainable fishing.

Returning to the successes, the Rhine action programme established in 1986 has seen major improvements in the state of the Rhine river and its catchment area. Industrial pollution has decreased substantially and the number of fish species has increased. As in the case of acid rain mitigation, defined goals have been set and progress is well monitored. The present water framework directive is an attempt to repeat this on the European level.

The three European marine eco-systems—the North Sea, the Baltic Sea and the Mediterranean—are lower down on the success list compared to the Rhine action programme. Although some progress has been achieved primarily with chemical pollutants—in the case of the North Sea not least due to the Rhine action programme—over-fishing and eutrophication have not been addressed. In the case of the Baltic Sea huge problems of chemicals pollution remain.

It is rather instructive to compare the Baltic Sea programme with the acid rain programme. First, the nature of scientific advice differs. The marine sciences have traditionally been oriented towards monitoring rather than towards the type of modelling that has made the acid rain science so successful. Only within the last couple of years has a policy instrument for the Baltic Sea been developed that comes close to what the acid rain community had developed in the 1980's. Thus the policy dialogue is weaker.

Secondly, agriculture is one of the main sources of pollution to the Baltic Sea (and to other marine environments). Agriculture differs, to put it mildly, from the electric power industry which is central to acid rain mitigation. Agreements with the latter are easy to enforce, once agreed. Mitigation measures are well defined, costs are possible to determine and thus cost vs benefits possible to estimate.

This does not hold in the same way for agriculture. The industry is fragmented, the relationships between measures, costs and impact less clear-cut, and monitoring and enforcement less straightforward. The impact on the Baltic Sea of measures taken on individual farms is not easily assessed.

Agriculture is important also in other areas of European policy for sustainable development, and with similar consequences. European groundwater is a huge concern; the quality to a large degree dependent on agricultural pollution. Over-use of

groundwater is a concern in some parts of Europe; again agriculture is a main user. Environmental regulation, monitoring and enforcement have proven more difficult in agriculture compared to internationally competitive industries such as the automobile industry.

Agriculture also illustrates another concern in the European environment policy: the difficulties in protecting European eco-systems.

Eco-systems are by definition part of geography, land and water. Eco-systems are complex systems; not easily reduced to the type of analysis that is deemed to be necessary when costs are supposed to be compared with benefits. The straightforward science of putting a societal value on a specific eco-system does not exist. Thus ad-hoc decisions tend to favour those who want to exploit this or that eco-system.

The answer has been protected areas. This works to the extent that it is economically marginal land or if the state is the owner. Problems arise when the once marginal land for one reason or another acquires an economic value: for instance as a possible corridor for roads or railways (cheaper on marginal land) or as a possible location for property development. The European coastal zones are cases in point: exploitation is continuing at a rapid pace and land with important eco-system functions is being lost. Property development is by definition piecemeal and thus so is the impact. Each and every step could be defended; the sums cannot.

Thus, the achievement of European environment policy is mixed at best. Notable successes have been reached; but the failures are also notable. The lessons from the successes are not easily transferred to the failures. None the less, five lessons can be drawn:

- The structure of scientific advice. The more adapted to the dialogue between policy and industry, the better.
- The structure of the industry. Industries that operate on the global market appear to be more open to sophisticated dialogue with science and policy.
- The structure of policymaking and monitoring and enforcement.
- The role of subsidies in certain sectors.
- The difference between pollution from industry or products and the impact on eco-systems from agriculture, fishery and land use.

These lessons are important also on the global level.

Has environment policy been a constraint on economic development or on social justice?

This section takes up the interplay between environment policy, economic development and social justice policy in Europe.

The analysis of the interplay between environment, social and economic policy has to be carried out on the national level, since the responsibilities between the Union and member states differ between these areas. The environment is—apart from nature conservation—largely an EU matter; economic policy—apart from monetary policy for the eurozone—is a national matter and social policy is solely a national matter. The academic literature on the interplay is, furthermore, uneven. While there is a huge literature on comparative economic and social policy, including how the two interact, there is no equivalent comprehensive literature on comparative environmental policy (although there are studies of various sectors of environmental policy).

Nevertheless, two positions can be identified in the debate on the impact of stringent environmental policies on economic development and on the competitiveness of different industries.

The so-called “pollution haven hypothesis” states that stringent environmental regulations are, all other aspects being equal, a competitive disadvantage and should lead to the gradual migration of polluting industries to countries with less stringent environment regulations. The alternative hypothesis is called the “Porter hypothesis” (see eg Michael Porter and Daniel Esty) which, in the strong version, states that stringent environmental regulations drive technological change which in turn increases competitiveness.

The first hypothesis is rooted in economic theory and a heavy dose of econometrics. The second hypothesis is based in business administration (and the Harvard Business School). The adherents of the former hypothesis are very sceptical of the latter.

A vast number of academic studies have been carried out primarily on the first hypothesis. The conclusions are, at best, inconclusive. No definitive effects of pollution havens have been verified. Nor has the Porter hypothesis been verified. These inconclusive results are to some extent due to methodological difficulties. Lack of comparative data on the quantitative role of environment regulations is a major impediment. Thus only sulphur dioxide emissions have been used as estimates. The assumption of “all other aspects being equal” is so restrictive as to be almost meaningless. Stringent environment regulations are but one aspect of societal development; higher education levels, high rates of research and development and so on co-vary with stringent environmental regulation. It is in practice not possible to separate the one from the other.

The “pollution haven hypothesis” nevertheless has a key role in the political debate preceding a regulatory decision. Examples are numerous; predictions of disaster abundant. It must be assumed that these arguments have an effect; in practice governments strive to find a reasonable level of agreement with industry on regulation. The role of trade organisations is important since these tend to express the least common denominator within the industry. The real debate is frequently within the industry in question. There are numerous examples of advanced industries that do not mind having strict regulations since these give them a comparative advantage. This empirical observation lends some credence to the Porter hypothesis. Also, it illustrates the role of environmental regulation in the Schumpeterian process of forced obsolescence.

The argument is more complex on the European scene, however, since the more advanced industries are not distributed equally across Europe. Some less advanced industries tend to be located more frequently in some countries than in others. In practice environmental regulations on the EU scene tend to pit member governments against each other; not infrequently along a north-south axis. Germany and Sweden have institutionalised the Porter hypothesis in their emphasis on Best Available Technology (“Stand der Technik”). This is not without exceptions, however, as the German resistance to stringent CO₂ emission standards for large automobiles illustrate.

The role of social policy in managing Schumpeterian destruction therefore becomes crucial. Here there are major differences between the European countries. Also, the role of the European Union is rather limited—with the notable exception of subsidies.

There is a huge literature on the interplay between social policy and economic development. Again two hypotheses can be identified, in one sense equivalent to the pollution haven and the Porter hypothesis of the impact of environment regulation on competitiveness. The first, based again, perhaps, in economic theory argues that social policy is always a distortion of the market and therefore inherently a drag on economic growth, compared to no social policy at all.

The second hypothesis could be called the social welfare hypothesis and states that social policy is there for a reason, and if it is not publicly organised it will be privately organised. And, goes the argument, when private solutions are compared with public ones the decisive factor will be the actual design of the public sector policy.

A number of academic studies conclude that there is one rather distinct European social model when seen from the outside and three or four when seen from the inside. The most successful ones are the Nordic models—again differing from country to country—which put heavy emphasis on a combination of education, employment policy and social policy. The key to maintaining economic growth—and in particular maintaining a high productivity per hour—is to stimulate the shift from low to high

productivity jobs through active employment policies, continuous education together with a general welfare policy that avoids provisions of health insurance or pension schemes that are locked in to existing jobs.

Thus it has been observed that the Nordic countries have a higher level of fertility, a lower level of childhood poverty, higher level of labour market participation, and a lower level of old age poverty than other European countries, while at the same time maintaining a high level of productivity per hour. The ensuing high taxation level is no barrier; the World Economic Forum's 2007/2008 global competitiveness list puts Denmark and Sweden among the top four.

The question then remains: could other European countries learn from the Nordics? Obviously yes, but history does play a role. The Nordic social model is, on the surface, a model which is less family-centric and more oriented towards the individual; it is in a way more resonant with a Protestant ethic than with a Catholic (at least as these concepts are traditionally understood). The paradox is, of course, that fertility appears to be positively influenced by the Nordic model when compared to more family-centric ones.

There has been almost no debate on whether there is any noticeable interface between social policy on the European level and the environment. Two observations are worth making.

First, transport policy. Transport will be heavily influenced by a stringent climate change policy. Transport policy is not seen to be an element of social policy (with some exception for public transport) although the actual design of the transport system will have major implications for access to labour markets. Few aspects of social policy have such a strong lock-in effect as a transport system that does not adequately serve households with lower incomes. This is observable both in rural areas and in large urban areas. A European policy for urban public transport could have a major impact on enlarged access to labour markets and thus for productivity and social mobility.

The second aspect of European social policy that has a major interface with environment policy is the whole system of subsidies; most notably in agriculture and fishery but also for infrastructure.

Both the common agricultural policy and the common fisheries policy are, from the political perspective, best seen as social policies for maintaining vulnerable communities: small farms on marginal land in the case of agriculture and coastal communities in the case of fishery.

The impact of the CAP and CFP on eco-systems has been massive and destructive. Although not on the marginal agricultural land; there the impact has by and large

been positive. But the actual design of the CAP has stimulated massive expansion on high productivity land with accompanying massive ecological side-effects on groundwater and on the disruption of eco-systems. Thus the case for a radical redesign of both the agricultural subsidies and the fishery subsidies is strong. It remains to be seen whether the increasing prices of agricultural commodities will make a redesign of the CAP politically feasible.

A somewhat similar case can be made for the fund for infrastructure. New roads and railroads are frequently established where land is cheap—for reasons of regional policy—and, not infrequently, directly on land that is marginal from an economic point of view but valuable from an ecological point of view.

The following conclusions can be drawn on the interplay between environment, social and economic policy:

- On the impact of environment policy and economic growth: so far, no academic studies point to a negative link.
- On competitiveness and environmental regulation: the argument that there is a negative link is massively used in the run-up to environment regulations. Wise governments see through this.
- Environment regulations should be seen as a designed element in Schumpeter's "creative destruction".
- On social policy—widely understood—and economic development: The Nordic experience shows that a stringently designed social policy will in fact assist Schumpeterian "creative destruction" and thus add to productivity and thus economic growth.
- Social policy has a potentially positive relation with the environment: a stringent policy for transport, and in particular urban transport, which provides low income households access to enlarged labour markets will be positive both for social justice and for the environment.

The subsidies element of European social policy that is directed towards fishery and large-scale agriculture has had massively detrimental effects on the environment.

The European policy for sustainable development—the global scale

The Gothenburg summit 2001 on sustainable development dealt primarily with the European environment—with the notable exception of climate. Since then a European policy on sustainable development has, although somewhat hesitantly, turned global. The Commission staff working document (October 2007) acknowledges that the European impact on the global environment apart from climate has to be taken into account. The 2005 report from the European Environment Agency on the state and outlook of the European environment also covers Europe's impact on the global environment.

The main trigger was the Millennium Ecosystem Assessment, completed for Johannesburg, which clearly stated the overwhelming influence human activities on global eco-systems and in particular on biological resources. It is as if the 1970s Club of Rome discussion on limits to growth is returning. Not so much on non-renewable resources—minerals and the like—but on so-called renewable resources. Understanding has also grown of the limits to the resilience of biological systems. For a long time resources can be exploited—and then suddenly a tipping point is reached and the eco-system is rapidly and irreversibly transformed into a much less productive system. The global fishing stocks are cases in point, as are grass-lands and certain forests.

Put another way: the Gothenburg summit dealt primarily with the consequences of European production on the European environment (again: excepting climate change). Any new summit will have to turn attention to the ecological consequences of European consumption, regardless of where the production for this consumption takes place. Product chains and product chain management then come into focus.

The ecological impact of a product chain depends on the product in question—but also on the institutional quality of regulation, monitoring and enforcement of the different links in the product chain. To take a couple of examples:

- Marine fishing: the problems of over-fishing in European waters are magnified many times over in, for example, the south Atlantic. Fishing is by and large unmonitored and landings frequently take place in countries with extremely lax enforcement.
- Logging bans are unevenly enforced around the world. According to some estimates one half of all logging in Indonesia is illegal. A similar situation exists in Siberia.
- Palm-oil as biofuel: again, plantations are frequently established on forest land cleared through illegal logging.

Sustainable development in general and environmental protection in particular cannot be seen in isolation from the quality of its institutions. Where inadequate institutions exist, neither the environment nor people are protected. Human rights abuses and over-exploitation of resources go hand in hand with inadequate or defunct legal systems.

Thus there are clear limitations to the utility of multilateral environmental agreements as a useful instrument going forward for sustainable development. Multilateral agreements are agreements between states while enforcement is left to the individual states. Thus the overall effectiveness of an MEA is determined by the enforcement capability of the participating states. That is why both the LRTAP and the Helsinki conventions really became effective only after the collapse of the Warsaw Pact and the

Soviet Union. The global convention on the protection of the ozone layer is the exception to this general observation.

Where nation-state enforcement fails, multilateral agreements tend to become dysfunctional. Product chain management then becomes the second best approach. Product chain management works through the market mechanisms and through private contractual agreements along the product chain. The fear of consumer boycotts in developed countries is one driver of product chain management. Green labels and green certifications are useful instruments.

The limitations are obvious. Product chain management and legislation makes an uneasy couple; the WTO treaty frowns upon what could be seen as protectionist measures.

Bio-fuels are a case in point. The rapidly increasing interest in and subsidies of bio-fuels have illustrated that the net climate effect of bio-fuels depends on how crops are grown and products processed. A ton of ethanol from country A may be chemically equivalent to a ton from country B but the net climate effect could be completely different. Thus, countries with stringent climate change policies will somehow also have to regulate how bio-fuels are produced. Some kind of legally enforced certification of production methods will be necessary.

However, climate change is likely to hasten the re-definition of what is legitimate in terms of trade measures.

The efforts necessary to avoid major changes to the earth's climate will be daunting. The latest assessments of the IPCC indicate that climate change could be more rapid than previously thought. In order to avoid a potentially disruptive temperature increase, Stern and Tubiana recommend seven steps:

- Setting a global target: global greenhouse gas emissions need to be cut by 50 % by 2050 and the OECD countries need to cut their emissions by 80%.
- Build a global carbon market.
- Reform the present clean development mechanisms.
- Develop sectoral agreements.
- Funding development of new technologies—major commitments nationally and internationally.
- Funding forests.
- Funding adaptation.

This list alone can illustrate the complexity of the task. But there is more. Establishing a global carbon market is itself a daunting task and is likely to take years if not decades. The experiences so far of the EU emissions trading system show that a comprehensive, transparent and legally enforceable administrative system will have to be established.

The strength of the legal system is the key to check temptations of corruption and of cheating. It is not likely that China or other developing countries will have sufficiently strong institutions for some time to come.

At the same time, the rich countries have to proceed without waiting for the developing countries. For years to come, the world will see a multiple tiered system of climate change policies, hopefully within an overall UN umbrella.

So the EU and the US will have to develop their own carbon markets that in effect establish emission prices at a level that would be sufficient for technological development. Other countries should be invited to join the schemes once their institutions are strong enough and their policies in line with the overall objectives.

An EU-US scheme may, however, lead to serious risk of carbon leakage, ie GHG intensive production capacity might migrate to other countries without similar emission prices. There is no point in allowing this to happen, since the aim of the scheme is to drive technological change within carbon intensive industries.

At the heart of the issue is greenhouse gases embedded in products, as the following statistics illustrate:

- A first order estimate shows that some 23% of China's CO₂ emissions are embedded in net exports, due to trade surplus and to the low energy efficiency of Chinese industry (2004 figures). This is the same order of magnitude as total emissions from Japan or Germany. However, Chinese exports are not particularly energy-intensive. In fact, China is a net importer of energy-intensive goods (Tyndall).
- For the period 1997–2003 China's exports to the US required some 7–14% of total Chinese CO₂ emissions. The US CO₂ emissions would be some 3–6% higher if these imports had been produced in the US (Shui and Harris).
- The Carbon Trust (UK) has recently completed a detailed analysis of the sensitivity to CO₂ prices for UK manufacturing. While the impact is negligible on the bulk of manufacturing, it is far from trivial on a limited number of manufacturing activities such as cement, steel, aluminium, paper and pulp, basic chemicals etc. These latter activities comprise at most 1% of UK GDP with 0.5% of total employment. On the other hand, these activities make up 50% of total CO₂ emissions from UK manufacturing and 17% of total UK emissions.
- In Europe, a 30 Euro/ton CO₂eq price would increase costs for energy-intensive products such as steel, paper and pulp and aluminium by between some 2 and 10% (report to the European Parliament).

These statistics, crude as they are, demonstrate that the pollution haven hypothesis is unlikely to be true for the overwhelming part of the economies of developed

countries. In fact, the Porter hypothesis is the more likely one, given the need for product research and development for new climate efficient cars, refrigerators, TVs, buildings and the like. The pollution haven hypothesis will, however, quite likely be true for the energy intensive parts such as processing of ores and metals, cement, petroleum refining, paper and pulp etc. It could be argued that developed economies could do away with these sectors without any major dislocations on the macro level. It could equally well be argued that these sectors are important enough in the global GHG budget and therefore need to be exposed to strong pressures for technological innovation as other sectors. This, however, will need some kind of protection against competition from countries that do not have carbon taxes or ETS. The consolation is that such a protection would only cover a small share of global trade. It is not very likely that an international agreement could be reached that would render these issues irrelevant—some kind of sectoral agreements or understanding will be necessary.

A joint EU-US initiative would also need to allow for parts of the emission reductions to be met through substantially expanded CDM projects in China and other countries. Adequate monitoring and enforcement mechanisms of the CDM projects would have to be put into place. As a first step (and condition) energy prices in CDM receiving countries have to be deregulated.

The main conclusion is that the complexity of climate change is such that any policy designed to have a material impact on greenhouse gas emissions will have to involve trade in goods with substantial amounts of embedded carbon.

There is more. Strong reductions of emissions will require massive industrial restructuring and forced obsolescence. This means on the one hand massive investments; on the other hand massive social adjustments as existing plants are phased out.

Thus a climate change policy will force not only a break with the paradigm of the multilateral agreements between states. It will also force a break with existing traditions of social and employment policy in Europe—at least in the non-Nordic states.

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