



Action on Climate Change: Considerations for an Effective International Approach

Discussion Paper for the
Preparatory Meeting of Ministers for Montreal 2005:
United Nations Climate Change Conference

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1.0 Introduction

1. This paper discusses elements that could form a foundation for an effective future approach to climate change. Any such approach will need to build on and strengthen the current approaches under both the United Nations Framework Convention on Climate Change (UNFCCC or the Convention) and the Kyoto Protocol. This paper is neither an exhaustive treatment of the issue nor prescriptive in its approach. Its purpose is to stimulate thinking and discussion on how to continue to make progress.
2. The 189 Parties to the Convention have agreed to address climate change to prevent dangerous interference with the climate system. There are now 155 Parties to the subsequent Kyoto Protocol – a landmark instrument developed to achieve the objective of the Convention. It is imperative that Parties successfully implement the first commitment period under Kyoto, which is from 2008 to 2012.
3. The international community is now considering how to construct an approach to climate change for the years after 2012. The launch of this work is also imperative, as preparations for agreement on a future approach may take a number of years to complete.
4. The upcoming United Nations Climate Change Conference (UNCCC) in Montreal provides an opportunity for Parties to the UNFCCC to signal their commitment to continued action on climate change by setting the direction for a future agreement for the period after 2012. Parties to the Kyoto Protocol will also want to consider how to continue to improve its implementation. Both areas could be guided by the elements emerging internationally that are discussed below.

1.1 *The Challenge*

5. Agreement on and understanding of, the challenges posed by climate change has grown over time. In July 2005, the heads of the G8 governments called it a “serious and long-term challenge that has the potential to affect every part of the globe.” These governments committed to move forward the global discussion on longer-term climate change action within the UNFCCC forum. The group of five developing countries (Brazil, China, India, Mexico and South Africa) participating in the G8 Summit stated that “Climate change has, and for the foreseeable future will continue to have, a profound impact on the development prospects for our societies”. When Ministers and high-level representatives from 22 countries met in Greenland, in August, they agreed that “the scientific case has been made and there is a growing consensus on the need for action now.”
6. The World Economic Forum convened a meeting of leaders of 24 major global companies representing a broad range of industries in June 2005. Those leaders stated that “climate change poses one of the most significant challenges of the 21st century.” Most recently, the Asia-Pacific Partnership countries (Australia, China, India, Japan, South Korea and the United States) stated their intention to “...enhance cooperation to meet both our increased energy needs and associated challenges, including those related to air pollution, energy security, and greenhouse gas intensities.”

7. A changing climate will disrupt complex environmental, social and economic systems. Those systems have built up over centuries and cannot withstand rapid fundamental change. The 2001 Third Assessment Report of the Intergovernmental Panel on Climate Change (IPCC, 2001) warned that existing global warming had already affected important physical and biological systems. It predicted significant further impacts, including:
 - Increased risk of flooding for tens of millions of coastal dwellers worldwide;
 - Increased incidence of extreme weather events;
 - Reduced yields of the world's food crops; and
 - Decreased water availability in many water-scarce regions.
8. Members of the International Scientific Steering Committee (ISSC) meeting in Exeter, UK in February 2005 found that the evidence of threats had intensified. They explored scenarios that could trigger irreversible catastrophic events such as the melting of the Greenland icecap and the shutdown of the ocean current that warms North Atlantic countries. They cautioned that temperature rise above 3°C would likely have “serious risk of large scale, irreversible system disruption.” At that level, climate change clearly becomes a global security issue.
9. Regional impacts of climate change are already being observed. These changes will affect natural and human systems independently or in combination with other factors. They will alter the productivity, diversity and functions of many ecosystems, and affect the livelihoods and economic activities that have been built upon them.
10. The recently completed Arctic Climate Impact Assessment found that air temperatures in Alaska and western Canada have increased as much as 3-4°C in the past 50 years. This regional warming trend has led to an estimated eight per cent increase in precipitation across the Arctic. As most of it has fallen as rain during the winter this has increased snow melting and the danger of flash flooding. Other observations from this assessment include melting glaciers, reductions in the extent and thickness of sea ice, thawing permafrost, and rising sea levels. Arctic climate change presents serious challenges to the health and food security of some indigenous peoples, threatening the survival of whole cultures. Should the Arctic Ocean become ice-free in summer, it is likely that polar bears and other northern species would be driven toward extinction.

1.2 Scale of Action Required

11. The International Energy Agency (IEA) World Energy Outlook 2004 projects that world energy demand will increase by about 60 percent up to 2030. Fossil fuels will continue to meet more than 80 percent of the demand. The related implication is that annual energy-related carbon dioxide emissions will increase by 62 percent over that period if nothing is done. Two thirds of the growth is expected to come from developing countries. The IEA Outlook 2004 also predicts that US\$ 16 trillion in investment in the energy sector will be required to meet the increase in total energy demand up to 2030.
12. The IPCC (2001) estimated that global emission reductions of more than 60 percent would be necessary to stabilize atmospheric concentrations at 2001 levels. Meeting the long-term objective of the UNFCCC will require reducing net greenhouse gas (GHG) emissions to near zero. This will necessitate a significant transformation of the know-how

and technologies used to produce, distribute and consume energy, manufacture and dispose of goods, and enable transportation (both the mode and fuel).

13. Recognizing the IPCC's estimate that destructive forestry and agricultural practices in some regions of the world are releasing about 20 percent of all human-related emissions of GHGs to the atmosphere, a transformation of the way forests and food-producing soils are managed will be an important complement to reducing emissions from industrial sources. The recently agreed G8 Action Plan on Climate Change, Clean Energy and Sustainable Development reiterates the commitment by G8 countries to transform the way they use energy, promote R&D and finance the transition to cleaner energy. A similar strategic plan to address the emissions from deforestation and unsustainable agriculture has yet to emerge.
14. Not willing to accept the risks inherent in the 3°C scenario as discussed in Exeter in February, some have suggested the goal of limiting the global temperature increase to 2°C as a way to avoid dangerous interference. Such a limit likely means limiting atmospheric CO₂ concentrations to less than 550 parts per million (ppm). According to the World Business Council on Sustainable Development, and based on scenarios from the IPCC (2001), this would require reducing emissions by 22 Gigatonnes (Gts) of CO₂ per year by 2050, as compared to the reference case.
15. For perspective, according to Robert Socolow, eliminating 25 Gts of CO₂, by 2054 would require, for example, displacing 2 billion conventional cars by hydrogen vehicles, sequestering carbon from 800 GW coal-fired power plants, increasing the world's wind-power capacity by a factor of 70, re-powering 1400 GW of coal-fired power with gas, eliminating tropical deforestation and doubling reforestation, and increasing the world's current nuclear capacity by a factor of 10.
16. Action on climate change must be a collaborative responsibility of developed and developing countries if the worst impacts of climate changes are to be avoided. So far, developed countries have both generated the largest share of historical emissions and taken the lead in reducing them. However, in 1995, considering all global CO₂ emissions – including those associated with tropical deforestation (principally due to conversion of forest lands to agricultural uses) – annual emissions from developing countries were higher than those of developed countries. It is estimated that by 2030, the cumulative emissions of developing countries will exceed those of developed countries.
17. Climate change is compounding the current challenges faced by developing countries such as lack of food and water security, HIV/AIDS, poor human health, and environmental degradation. The damage and losses resulting from climate changes undermine the effectiveness of development assistance. They place increasing demands on humanitarian assistance and emergency response measures. The poor and marginalized bear a disproportionate share of impacts on the fragile ecosystems that are often essential to their livelihoods. In turn, this affects poverty levels, hunger, and human health. If left unaddressed, climate change poses a major obstacle to achieving the Millennium Development Goals (MDGs).
18. The above factors underscore the need for faster and greater socio-economic and technological transformations to avoid the risk of serious harm. The world faces a challenge that requires international cooperation on a scale with few, if any, precedents.

2.0 The Current Approach

2.1 *The Convention*

19. The objective of the Convention and the Kyoto Protocol, is to stabilize greenhouse gas (GHG) concentrations in the atmosphere at a level that prevents dangerous human interference with the climate system.
20. Overarching principles agreed in Article 3 of the Convention (and the preamble of the Protocol), establish the foundation for international cooperation on climate change, such as the need for:
 - action based on common but differentiated responsibilities;
 - special attention to the needs of developing countries particularly vulnerable to the adverse effects of climate change;
 - action based on the precautionary principle that lack of scientific certainty should not be a reason to postpone such action;
 - cost-effective measures to ensure global benefits at the lowest possible cost;
 - all countries to promote sustainable development and thus to take action based on specific national circumstances;
 - policies and measures to be integrated into development programs taking into account that economic development is essential; and
 - cooperation to promote an open international economic system.
21. The Convention also calls for developed countries to promote, facilitate and finance the transfer of technology to developing countries.
22. The Convention commits all countries to promote sustainable management, conservation and enhancement of sinks and reservoirs of greenhouse gases, including biomass and forests.
23. Under the Convention, Parties commit to share information regarding their policies and measures to address climate change as well as their emissions inventories and projections.
24. The Convention and Protocol both contain provisions for reviewing their implementation and examining the adequacy of commitments contained. Provisions in both call for their review provisions to be read in conjunction with one another.

2.2 *The Kyoto Protocol as an Important First Step*

25. The Protocol is a significant and innovative instrument, built on the principles enshrined in the Convention, and focussed on implementing its objective. Its successful implementation will move the world forward in addressing the threat of climate change.
26. There are many ground-breaking important features of the Kyoto Protocol. It is the first agreement of its kind in which most of the world's developed countries have pledged to meet national commitments to reduce their GHG emissions on an absolute basis.

27. The Protocol creates innovative international mechanisms (i.e., the Clean Development Mechanism (CDM), Joint Implementation (JI) and international emissions trading), to provide avenues for cost-effective GHG reductions and promoting sustainable development. The CDM and JI are also instruments for technology deployment.
28. At the UNCCC in Montreal, in the first Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (COP/MOP1), Kyoto Parties will adopt rules that provide the framework needed to implement its first commitment period. The framework includes the establishment of a system for tracking emissions reductions, and the framework for international emissions trading. It also includes a unique compliance regime designed to encourage Parties to make every effort to meet their obligations.
29. Article 3.9 of the Kyoto Protocol calls for Parties to initiate the consideration of Annex I Party commitments for subsequent periods at least seven years before the end of the first commitment period (2012). This important discussion will begin at the UNCCC in Montreal. The UNCCC will also provide Parties with the opportunity to begin to consider future cooperation under the Convention.

2.3 Improving the Operation of the Current Approach

30. Effective implementation of the current approach is key to making progress on addressing climate change. Most developed country Kyoto Parties set out their commitment to doing so in their plans to meet their Kyoto commitments. Canada's plan *Moving Forward with Climate Change: A Plan for Honouring our Kyoto Commitment* brings together an innovative mix of policy, financial and market instruments to transform our economy; boost our economic competitiveness; and enable Canada to achieve its short term and longer term climate change goals. The plan will also contribute significantly to cleaner air; enhance biodiversity; encourage innovation and the development of environmental technology to provide Canadians with the ability to reduce GHG and other harmful emissions while enjoying the benefits of a competitive economy.
31. While experience with the Kyoto Protocol has been valuable, the current approach will need to be strengthened over time in order to implement Convention obligations effectively and work toward realizing its objective. The international community could use the opportunities provided on an ongoing basis both by meetings of the Conference of the Parties to the UNFCCC (COPs) and meetings of COP/MOPs, to do so. Improving the current approach will ease the transition to the future.
32. Several opportunities for strengthening Protocol implementation arise in the near-term, and could be undertaken at the UNCCC. Chief among these is the opportunity at the upcoming MOP in Montreal to strengthen the CDM. With some adjustments to its operation, the mechanism could better deliver sustainable development benefits for developing country Parties and assist Annex I Parties in meeting their commitments cost-effectively. Areas of focus include streamlining the administrative structure, expediting reviews and registration of methodologies and projects, reinforcing sustainable development objectives, and securing sufficient financial resources in support of these goals. It will also be important to continue efforts to improve and extend the reach of this market mechanism in the meetings following Montreal.

33. The international community can also strengthen other aspects of the current approach at the COP in Montreal, such as in the areas of adaptation and technology transfer. Finalizing the Programme of Work on adaptation will be instrumental in moving the efforts in that area forward. The UNCCC also provides an opportunity to enhance the efficacy of technology development and deployment efforts, perhaps by exploring ways of building on existing technology initiatives outside the UNFCCC.

2.4 Building on the Current Approach

34. As noted above, the Kyoto Protocol is landmark first step. It has already provided the international community with important experience in both its negotiation and early implementation. Experience to date, as well as international research, analysis and discussion point to the need for a truly global and long-term approach that creates incentives for the broad participation of a wide range of major emitters, including developed and developing countries if we are to ever meet the goals of the Convention.
35. While climate change is increasingly understood as a collective challenge, nations are only likely to address climate change if they believe it to be in their interest and if it sufficiently addresses their individual priorities and circumstances. It is therefore important to consider a range of possibilities – in the nature of commitments and in approaches to meeting those and other climate change goals.
36. The Protocol only allows for one approach to commitments – national reduction targets taken on by developed countries on an absolute basis over five year periods. Some countries have chosen not to take on these commitments - the Protocol is now estimated to encompass only approximately 35 percent of global GHG emissions. Moreover, a number of countries have made it clear that they will not participate in the future if the approach to commitments taken in the Protocol remains the only choice. Since the Protocol's current design does not provide the incentives for broader participation, it is unlikely to bring about the deep reductions necessary into the future.
37. The five-year focus for activities under the Protocol means that countries may not allocate sufficient resources to actions with longer-term benefits, such as technology development. That focus may also lead to less cost-effective choices because of a lack of incentives for longer-term investment planning. This is likely to have the effect of hampering sustainable economic growth and development, while limiting the scope of environmental benefits.
38. The path forward should make an effort to better address environmental and economic goals as well as development and adaptation objectives. It also needs to ensure that opportunities for cost-effectiveness can be optimized – while driving the development and deployment of both the existing and transformative technologies needed to address the challenge. The international community needs to continue to consider ways of improving these aspects going forward.
39. Six key elements have emerged that could form the basis for effective, coherent global cooperation:
- Environmental effectiveness;
 - Advancing development goals in a sustainable manner;

- Broadening participation;
 - Building a strong global market;
 - Realizing the full potential of technology; and
 - Tackling adaptation.
40. Future cooperation on climate change should recognize the interrelated nature of the various elements if it is to be sustainable and effective in achieving its goal "...within a timeframe sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner", as laid out in Article 2 of the UNFCCC.

3.0 Elements of an Effective International Approach

41. A successful future approach also involves building on and improving the strength of the current one – but not waiting until 2012 to act. The Convention principles remain a sound basis for international cooperation on climate change.
42. There is also emerging consensus that specific key components of the current approach should be retained. Many of these elements could be strengthened and/or expanded both now and in the post-2012 environment. As noted in the previous sections, strengthening the CDM, adaptation and technology transfer efforts and access to funding will help ensure that the current system is stronger and more effective as a basis for future cooperation.

3.1 Environmental Effectiveness

43. Preventing dangerous interference with the climate system requires that the current trend of increasing global emissions be slowed and then reversed to a decreasing trend. Many predictions call for a level of GHG emissions of less than half the current level in the long-run. Future cooperation must set in motion the broad and deep reductions to global emissions needed to achieve this dramatic change.
44. It will require a technological revolution that results in a fundamental transformation in the way the world produces, consumes and uses energy – effectively “decarbonizing” economic growth through technological improvements. Policies and actions must be able to take into account developments in science and technology.
45. International cooperation will need to build in a mechanism for continuous improvement toward deep global reductions over the next few decades to remain effective. Some approaches to setting climate goals, such as those based on using the best available technology, automatically build in the concept of continuous improvement as know-how and technology continually evolve.
46. Periodic reviews to ensure the effectiveness of commitments undertaken and to examine their implementation are important. It will be important to move forward with all of the review provisions in the Convention and the Protocol, including those currently “stalled”.
47. Environmental effectiveness is the cornerstone of any cooperative approach to climate change. Broad participation is the key to achieving it. However, broad participation in the absence of effective goals will not drive the massive needed emissions reductions.

Environmental effectiveness calls for effective global measures to substantially reduce emissions over the longer term, and the participation of all major emitting countries, both developed and developing, that generate the lion's share of global emissions.

48. Ensuring environmental effectiveness can also have environmental and economic co-benefits. For example, policies to reduce emissions frequently reduce other types of pollutants resulting in both improved air quality and health. Other environmental co-benefits include preserving biodiversity as well as conserving ecosystem services. Economic co-benefits can include reduced costs from improved technologies and energy efficiency measures, as well as the creation of new economic opportunities in emerging industries.
49. For the most vulnerable developing countries, environmental effectiveness ensures a drive to deeper cuts while providing some measure of assurance that the devastating effects predicted may be avoided or their impacts lessened. Investments in development, particularly in infrastructure sectors, must be made both "climate-proof" to the risks posed by climate change and "climate-friendly" in terms of reducing GHG emissions. An integrated approach will be most effective at exploiting the synergies between climate change and other development priorities.

3.2 Advancing Development Goals in a Sustainable Manner

50. The Convention recognizes the growing energy demands of developing countries to meet development and social needs and the overriding priorities of sustainable development and poverty reduction. Sustainable development provides the context for a future approach that seeks to ensure that economic and development goals are met in a climate-friendly manner.
51. Emerging economies are generating more GHG emissions as their energy demands increase. Current patterns of energy production and consumption threaten the environment on local and global scales. Deforestation and land degradation increase the vulnerability of developing countries, their local communities and indigenous people to the impacts of climate change. The burning of fossil fuels and tropical deforestation are contributing to a higher concentration of GHGs.
52. Reliable energy services are essential to growth and development. Access to technologies, energy efficient goods and investment in energy infrastructure are required to ensure sustainable economic development, particularly in those countries that could become some of the largest GHG emitters otherwise. Sustainable management of forests and agricultural lands is critical to reducing emissions from deforestation, the achievement of sustainable development and food security, as well as for addressing vulnerability to climate change in an effective way.
53. Successful future action will involve strengthening the linkages between mitigation and adaptation efforts and the achievement of related development goals such as poverty alleviation, energy security and protecting human health.
54. Many of the needed changes are fundamental to advancing broad development and environment goals in a manner that provides co-benefits and supports economic development. For example, greening the transportation and energy sectors should help to

reduce local air pollution and provide massive human health benefits. Providing clean energy to the poor achieves mitigation, increases their capacity for adaptation, and directly addresses central development goals as expressed in the MDGs, Poverty Reduction Strategy Papers and in national development planning frameworks. Providing access to needed technologies sooner in the development path (leap-frogging) increases the ability of developing countries to achieve sustainable economic development.

55. Development agencies, development banks and international financial institutions have an important leadership role to play by integrating climate change considerations into their project-development and lending practices. Investments in development, particularly in infrastructure sectors must be both “climate-proof” and “climate-friendly” as noted in paragraph 49 above.
56. A deliberately integrated approach will be most effective at exploiting the synergies between climate change and other development priorities.

3.3 *Broad Participation*

57. From an environmental perspective, climate change goals can be attained only with broad and effective participation of significant emitters. From an economic perspective, broader participation provides greater opportunities for cost-effectiveness.
58. Approaches that differ from, but can be complementary to, the absolute national targets of the Protocol are now widely discussed internationally. These approaches allow for many types of differentiated commitments that could be adopted by countries consistent with their respective capacities.
59. Commitments can be action-based. One example would be technology agreements that enhance the development and deployment of needed technologies, and improve access to those technologies for all countries. Another would be the use of policies and measures undertaken on the basis of national circumstances. Still another could be global sectoral goals, set in a variety of ways such as emissions intensity, based on best available technology or portfolio standards such as exist in the power generation sector in some jurisdictions. Commitments can also be taken on a regional basis or by countries on a graduated basis, easing the transition and allowing for other priorities to be simultaneously addressed.
60. Broad participation would need to respect the established principle of common but differentiated responsibilities. Building on the UNFCCC provisions, commitments may be differentiated on the basis of type (e.g., absolute versus relative or intensity based, mandatory versus voluntary) and also on the basis of other criteria (e.g., emissions per unit of output, emissions per unit of GDP, per capita emissions). They may also be differentiated on the basis of timing, and thresholds at which they are adopted. They may be set across transnational sectors or linked to policy.
61. Broad participation in an approach would be driven by its ability to satisfy a number of competing priorities that address individual national interests. A cooperative global approach may need to allow for a mix of approaches that can satisfy individual priorities and provide co-benefits that contribute to other economic and environmental objectives. Developing countries will also need to see an approach to adaptation that truly addresses

- their needs. This will be true, both in terms of funding and in terms of practical actions, and would need to recognize other overarching priorities such as sustainable development.
62. Because the Kyoto Protocol only provides for participation at the country level, it does not cast as wide a net as possible. That could be achieved by allowing for participation of inclined sub-national governments and/or companies, if their national governments agree, but have themselves chosen not to participate. A future approach could be more of an open system, incorporating many levels of participation, such as country, sub-national governments, and companies.
 63. All countries are driven by a need to develop their economies in a manner that is sustainable. Access to much-needed technologies for doing so while addressing climate change, as well the availability of cost-effective reductions encourage this trend.
 64. A future approach that provides adequate access to technology for all participants would increase the probability of effecting large scale emissions reductions. Providing real access to technologies sooner in the development path (leap-frogging) increases the ability of developing countries to achieve sustainable economic development. For developing countries the promise of such access has provided a key incentive for participation. It will continue to do so. A new approach that provides a mechanism for effectively enhancing technology transfer by promoting increased development and deployment of new and existing technologies and providing stronger vehicles for access to the needed technology could be more attractive to developing and developed countries alike.
 65. Approaches can include a range of mechanisms for meeting obligations that allow for emission reductions to be achieved in a cost-effective way, including market based policy frameworks that support improvements to capital stock turnover, remove barriers to direct investments, and leverage private capital for clean development. Access to innovative mechanisms, such as emissions trading, can provide key incentives for participation. A future approach that allows for participation at many levels could provide for a deeper carbon market and greater opportunities for cost-effectiveness.
 66. An international system could incorporate elements of any number of approaches, and could allow for differentiation of commitments based on numerous circumstances. For example, a future approach based on global sectoral targets could achieve broad participation and potentially cover the largest global sources of emissions across sectors. Sectoral participants, who know their businesses well, would be in the best position to advise on setting meaningful and ambitious, yet economically achievable targets. Such an approach could attract the broadest possible participation by building effective mechanisms for providing access to technology and addressing adaptation needs directly into the system, and by providing access to the carbon market.

3.4 Building a Strong Global Market

67. It is difficult to address climate change in the absence of a strong economy. An effective approach must be consistent with the attainment of sustainable economic growth, reflecting economic realities such as capital stock investment cycles and best available technologies. It will also need to allow for a mix of policy and program approaches to meet emission reduction objectives, within a framework based on global trade principles.

68. There is broad agreement that fully exploiting the opportunities provided by market forces is critical to achieving large GHG reductions on a global scale, and will be a key element of successful post-2012 global climate change cooperation. Market-based approaches can mobilize substantial private investment in low-carbon energy technologies and promote technology transfer to less developed countries, involving the private sector in a precedent setting fashion in the achievement of global environmental goals.
69. The Kyoto Protocol has laid the foundation for cost-effective reductions with the creation of its market mechanisms (CDM, JI and international emissions trading). However, the CDM is not yet achieving its potential to provide sustainable development benefits or bring about substantial technology transfer to developing countries. It is not at all clear that it will provide the needed emissions reduction credits for developed countries. A future approach needs to build on the innovative mechanisms of the Protocol and ensure their efficient operation to enhance their effectiveness. Strengthening the operation of the CDM now is key.
70. Other sorts of crediting mechanisms, such as sectoral crediting and policy-based or technology crediting have been discussed in various fora. These could also be considered as a complement to the project-based crediting in developing countries currently in place under the CDM and JI.
71. Market-based mechanisms, and emissions trading in particular, have been singled out for support by political and business leaders because they have the potential to significantly reduce costs and increase the feasibility of achieving the deep long-term reductions required to address the risks of climate change. They do this in part by broadening the base of low-cost options available to domestic actors in meeting their commitments, but also by harnessing the innovative energies of businesses and individuals in the pursuit of solutions.
72. Currently, there are a number of unconnected regional, national, and sub-national trading markets at different stages of development. Some are in Kyoto-signatory states, while others are in non-signatories. The result is segmented markets that do not yet achieve the potential of a large and liquid global trading market. Discussions on linking these markets are underway but may be constrained by the framework of national obligations. Ideally, a future approach would link these systems and expand the market.
73. Approaches to climate change can include a range of mechanisms for meeting obligations that allow for emission reductions to be achieved in cost-effective ways that consider the economic realities of affected sectors. For example, forcing an early turnover of capital stock can be costly, particularly in the energy sector where investments are typically long-lived and high-cost. The approach will need to take account of such sector and country-specific considerations as the capital stock investment cycles, and barriers to direct investments, as well as the state of available and installed technology and potential for improvement.
74. A framework more consistent with the global trade marketplace which is structured horizontally and includes national, sub-national and transnational actors, may better accomplish this goal. A sectoral approach that provides a variety of avenues for participation and access to the global carbon market for all participants also could increase the number of actors in the market. This could work to ensure a well-functioning, deep and liquid market with broad access to cost-effective reduction opportunities.

3.5 Realizing the Full Potential of Technology

75. Article 4.5 of the UNFCCC requires developed countries to take all practicable steps to promote, facilitate and finance the transfer of, or access to, environmentally sound technologies and know-how to other Parties, particularly developing country Parties. Thus far, UNFCCC discussions of technology transfer have focused on issues such as information exchange, capacity building, putting in place the right environment to enable the uptake of technology, and providing ways to identify technology needs in developing countries. It has been largely facilitative and arguably has resulted in little if any effective transfer. In addition, the CDM has not generated transfers of clean technologies to developing countries on a large scale. In short, the current approach has not achieved the levels hoped for in terms of the development and deployment of clean technologies.
76. Massive reductions in global GHGs can be realized and economic growth maintained, only by transforming the way in which we produce and consume energy. The necessary large cuts call for a sweeping transformation – in effect, a technological revolution.
77. Effective access to technology is key to that revolution. Commercially available technologies are potentially able to meet the short-term goals of the Kyoto Protocol, in order to meet the long-term goals of combating climate change, it is urgent to develop, deploy and disseminate a wide variety of new zero-emission and low-carbon emission technologies to developed and developing and/or emerging economies alike.
78. Price signals offered by the carbon market are likely to encourage important new process and product improvements. However, no reasonable scenario suggests that the market alone can deliver the needed technology soon enough to avert irreversible climate change. While a number of existing technologies will come into play in meeting short-term commitments, the deep cuts needed in the longer term will only be achieved by fundamental new developments requiring large, lengthy and high-risk research and development (R&D) investments. Those are unlikely to attract the needed levels of investment that will bring them on stream in time without the active collaborative support of the international community. This suggests a role for government in making policy to provide the push to markets necessary for technological transformation.
79. Global, national and sub-national technology standards, perhaps on a sectoral basis for example, can also be important drivers for development, deployment and diffusion of new technologies, and can act as a complement to more market-based approaches. A sectoral approach could allow for a closer link between technology and climate change goals, and may allow for faster progress in sectors where advanced technology is readily available or under development.
80. Technology development and deployment can be further enhanced through research and development as well as deployment agreements. These can help reduce the costs of R&D and deployment efforts by sharing the risks of uncertain investments and preventing duplication of efforts. The international community has already collaborated on technology agreements, all of which have been negotiated outside the UNFCCC (e.g., Carbon Sequestration Leadership Forum, Methane to Markets; Renewable Energy and Energy Efficiency Partnership (REEEP); Asia-Pacific Partnership on Clean Development and Climate).

81. Technology protocols such as these can finance collaborative R&D, develop common technology standards and support deployment of new and existing technologies. Agreements can be developed between a variety of stakeholders, including developed and developing countries, the private sector, research institutions and development agencies. Any future approach will need a mechanism that provides a secure and consolidated source of funding for technology development and deployment as well as access to intellectual property developed under such agreements. Both will be important in providing incentives for the broad participation of developing countries as providing access to technologies sooner increases their ability to proceed along a sustainable development path. A new approach could also build on the existing initiatives described above, enhancing their value by providing structure, additional funding and strategic direction.
82. Existing and new technologies will also be important in improving the capacity of developing and industrialized countries to adapt and reduce their vulnerability to climate change impacts. Support for the development, deployment and diffusion of technologies for adaptation can and should be included under the broader technology agreements and in technology transfer efforts, while recognizing that the uptake of these technologies is affected by the socio-economic circumstances in which they are introduced.

3.6 *Tackling Adaptation*

83. There is an immediate need for the world to enhance its capacity to adapt to climate change. Human vulnerability to climate-related risks is becoming increasingly apparent. The 1991/92 drought in Malawi resulted in a loss of US\$1 billion in cereal losses. Damage caused by the severe ice storm in 1998 in Eastern Canada totalled CAD\$5.4 billion. In 1999, Hurricane Mitch resulted in losses in Nicaragua and Honduras equalling their combined GDPs, and setting back the development of Honduras by an estimated 20 years.
84. The poorest developing countries are particularly vulnerable given their dependence on natural resources for their livelihoods, coupled with existing stresses on health and well-being, and limited financial, institutional, and human resources to deal with the risks associated with climate change.
85. While adaptation is acknowledged in the Convention, negotiations under the UNFCCC have traditionally focused on mitigation efforts. Adaptation has emerged over the past five years as an urgent policy priority, prompting action both within and outside the Convention process.
86. Given the scale of financial, human, institutional and technological resources needed to support adaptation in developing and developed countries, adaptation will need to be addressed not only within the UNFCCC process but also by bilateral and multilateral development agencies, humanitarian organizations, non-governmental organizations, the private sector and international financial institutions.
87. An integrated approach to adaptation in the future should reflect the current understanding of a vulnerability-based or risk management approach that assesses exposure to climate change risks and adaptive capacity at the local level. Such an approach should also aim to mainstream adaptation into development efforts of

international financial institutions and development agencies; national policy and planning processes; and community-level initiatives in natural resource management, disaster preparedness, and sustainable livelihoods. There is a growing need for collaboration and partnership among Parties to share information and lessons learned, build capacity, and promote research and training on climate change adaptation.

88. A future approach that includes a consolidated, predictable and adequate source of funds that provides long-term and regular support for adaptation efforts in developing countries could help to ease administrative burdens on the Global Environment Facility (the financial mechanism of the Convention), increase appeal to donors, and provide greater dependability to developing countries. It should also explicitly affirm adaptation as a goal along with mitigation.

4.0 Conclusion

89. This paper recognizes that there is a significant challenge facing the international community. There is important work to be accomplished during the first commitment period of the Kyoto Protocol. Parties need to continue efforts to implement Kyoto, strengthen the current approach embodied in the Protocol and Convention, and begin the process of shaping a future international approach to climate change.
90. The paper has sought to stimulate thinking about the six elements that are emerging as key ingredients of future cooperation on climate change, and their interrelated nature. Taken together, these six elements build on the experience of Kyoto by broadening participation, enhancing the options on target setting to more fully engage sectors, more fully maximizing market forces through increased support and incentives for technology and several points of participation, and providing a consolidated mechanism for tackling adaptation.
91. These elements present a cohesive approach that ensures that the future effort addresses economic realities and environmental effectiveness. Furthermore, climate change goals and objectives would be further advanced by a more concerted effort at integrating adaptation and climate change goals into broader development goals. Development goals would also be furthered as developing countries receive more support to make the changes necessary to bypass outmoded technologies for more climate-friendly options, and gain needed investment.
92. The paper is neither intended to be an exhaustive treatment of the issue nor to be prescriptive in its approach. Rather, the elements outlined above could serve as a 'launching pad' for future discussions on the future climate change approach, as well as provide a guide for continual strengthening of the Protocol in the interim.
93. The upcoming UNCCC in Montreal provides an opportunity for Parties to the UNFCCC to solidify their commitment to address climate change by agreeing to begin a process to design a new agreement, and plan for continual improvement of the current approach – guided by the six elements described in this paper.