

CAN THE G-20 SAVE THE ENVIRONMENT?

Potential Impact of the G-20 on International Environmental Policy

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ISSN

1919-112x SPP Research Papers (Print)
1919-1138 SPP Research Papers (Online)

DATE OF ISSUE

April 2011

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1. INTRODUCTION

The G-20 was created to deal with the global financial and economic crisis of 2008. G-20 leaders were successful – the crisis was contained. Should the G-20 leaders move on to deal with the most difficult and hitherto intractable global environmental policy issues? The United Nations has not been up to the task; can the G-20 fill the vacuum?

This paper reviews the criteria for issues to be included on the G-20 leaders' agenda and provides a *tour d'horizon* appraising the state of the global environment. It also includes some "Global Footprint" statistics demonstrating the current global unsustainable rates of consumption. Based on the G-20 agenda criteria, of ten global environmental issues, only climate change qualifies for consideration. Annex I canvasses the status of nine other specific dimensions of the global environment – Water, Forests, Biodiversity and Land Use Management, Air Pollution, Waste Management, Ozone Layer Depletion, Oceans, Fisheries and Population. The paper describes the inadequacy and fragmentation of present institutional arrangements.

The concluding section provides conjectures and recommendations on a pragmatic approach for G-20 engagement with climate change and outlines a package of initiatives, with each element arguably being in every G-20 country's national interest. Elements of the package include "no regrets" actions, eliminating fossil fuel subsidies, standards, R&D collaboration and security of supply arrangements. The G-20 could also help rationalize the jumbled melange of international environmental organizations and catalyze the creation of effective governance institutions and mechanisms.

2. CRITERIA FOR THE G-20 AGENDA

The G-20 first referred to the Finance Ministers and central bank governors of 19 countries: Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Mexico, Russia, Saudi Arabia, South Africa, Republic of Korea, Turkey, the United Kingdom and the United States of America. The European Union, which is represented by the Presidents of the European Council and the European Commission, is the 20th member of the G-20.

The first G-20 at leaders' level was called by former US president George W. Bush in the fall of 2008 to deal with the global financial crisis. G-20 summits, bringing together heads of governments, have taken place in London and Pittsburgh in 2009 and Toronto and Seoul in 2010. There were 33 seats at the table in Seoul in November 2010 as Korea issued invitations to four countries as heads of regional groups: Ethiopia (NEPAD), Malawi (African Union), Singapore (3G), and Vietnam (ASEAN). The Koreans also invited Spain and the heads of seven international organizations – the UN, the International Monetary Fund (IMF), the World Bank, the World Trade Organization (WTO), the Organization for Economic Cooperation and Development (OECD), the International Labour Organization (ILO) and the Financial Stability Board (FSB). The next meeting will be in November 2011 under France's presidency. In 2012, the G-20 will be hosted by Mexico. In 2013, either Turkey or Russia will preside. Australia is campaigning for the 2014 G-20 presidency.¹

¹ The G-20 is following the "bucket system" set up by the G-20 Finance Ministers. See <http://www.cigionline.org/publications/2010/11/future-g20-process>
Regarding Australia see <http://www.theage.com.au/national/pitch-to-host-g20-summit-in-2014-20110316-1bxbv.html>

Proponents of the G-20 argue that the need for global leadership and coherence can only be provided by some sort of flexible leaders' council². A forum at the leaders' level is the most likely means whereby cross-cutting package deals can be crafted, permitting leaders to strike deals that transcend the traditional silos of government ministries and international institutions. Leaders have the ability to mobilize their governments through top-down political direction, ensuring that their global promises translate into national action. Leaders can rise above domestic politics and adopt policies that provide global collective benefits while applying peer pressure and clarifying enlightened national self-interest as they coordinate actions on deadlocked global crises.

There are several general criteria to assess whether an issue is suitable for inclusion on the G-20 agenda given the need to maintain concentration on a limited number of issues and not let “agenda creep” overload the work program. There are already an excessive number of summit meetings (UN General Assembly every September, Asia-Pacific Economic Cooperation (APEC), NATO, Asia–EU, the Organization of American States (OAS), the Commonwealth and the Francophonie). There is a limit to the length of summits – usually about two days. There is also an inherited agenda of legacy issues, with a great deal of public attention on progress made on commitments. The incentive facing the host of a G-20 summit is to minimize the number of items on the agenda.

The criteria include:

1. Major implications for both advanced and emerging economies;
2. The G-20's concern should be crisis management. There must be a real need for immediate action, as well as leadership on issues with significant long term consequences. There must be a shared sense that action cannot be postponed.
3. The G-20 should get involved in an issue only as a last resort when existing machinery proves unequal to the task. The G-20 should avoid issues that can be effectively dealt with by existing international organizations.
4. The G-20 must not “waste its bullets.” It should focus on issues where there are prospects for success. Even if the G-20 is the last resort, there must be hope for a workable solution – a forward looking, focused suite of immediate deliveries, actions and promises that offered a win-win-win outcome for G-20 countries

The first criterion is clear – most of the international environmental issues described in this paper do have major implications for both advanced and emerging economies. The second emergency criterion, the need for immediate action, is less clear. On the one hand, one can argue that we must await a dire emergency before expecting action; on the other hand, there is a moral imperative with respect to responsibility to future generations. The second criterion should be that immediate action by the G-20 can slow the onset of a crisis where we anticipate an inevitable “train wreck.”

The last resort criterion argues that we should not undermine existing institutions currently grappling with the issues. Countries that are not members believe the G-20 has no legitimacy to make decisions on any issues that in effect bind the rest of the world. They argue that only the universal membership, treaty-based UN should deal with major global issues.

² Summit analysts have argued that the personal relationships developed among leaders, free from scripted remarks, allow them to build empathy and trust, permitting unrestricted discussion which results in agreements unreachable in formal negotiations. However, the conventional wisdom of leaders meeting together for a free-wheeling discussion is foreign to some cultures, the Chinese and Japanese in particular.

Given the large number of issues that are candidates for the G-20 agenda, the host country has considerable influence. By tradition, the presidency of the G-20, which rotates on an annual basis, is given the courtesy of framing the agenda. The prospects for G-20 leadership are problematic, given the priorities of France, the G-20 president³ in 2011. In August 2010, French President Nicolas Sarkozy made clear his intention to add more items to the G-20 agenda – international monetary system reform, commodity markets’ volatility, and global governance (reform of the UN Security Council).⁴ This is in addition to the standing items – economic recovery, the Framework for Balanced Growth and financial sector regulation, along with reports on development and a financial safety net, the issues introduced by Korea in November.

This is an already overburdened agenda, mostly unconnected to environmental issues. Proponents of adding an international environmental issue to the future G-20 agenda therefore face serious hurdles⁵. With respect to concerns about overloading the G-20 summit agenda, the Koreans warned against allowing “heavyweight issues” like climate change to dilute the focus.⁶ A dispassionate analysis of the prospects for success criterion leads to the conclusion that G-20 consideration of climate change should focus on the less contentious building blocks such as a global “Manhattan Project” on energy R&D, standards and border tax adjustments and security of supply cooperation while postponing discussion of national emission targets or financial transfers. Action may have to await Mexico’s presidency in 2012.

3. THE STATE OF THE GLOBAL ENVIRONMENT

“Human actions are depleting Earth’s natural capital, putting such strain on the environment that the ability of the planet’s ecosystems to sustain future generations can no longer be taken for granted.” – *United Nations Millennium Ecosystem Assessment*

3.1 Overview

It is a daunting challenge to attempt an appraisal of the global environment, given its many complexities. It is particularly difficult to clearly communicate the results of a large number of measures and the sensitivity of results to the many assumptions. Three of the best efforts are the UN’s “Millennium Ecosystem Assessment,” the OECD’s “Environmental Outlook to 2030” and the Global Footprint Network (GFN).⁷

³ See <http://www.sherpatimes.com/summits/44-g20/355-so-what-is-it-french-g20-presidency-changes-priorities-to-suit-audience.html> But last August, Sarkozy suggested that the G-20 discuss climate funding in view of a global agreement at the November summit, ahead of the climate change conference in Cancun in December and that Europe and other developed nations must “deliver on the commitments taken” regarding aid to developing countries to fight climate change, innovative funding methods and the protection of forests. In any case, the G-20 is not a panacea – presidential agendas and short-term thinking significantly hinder the G-20’s effectiveness.

⁴ <http://www.franceonu.org/spip.php?article5123> Security Council reform has since been dropped

⁵ It is also unlikely that a separate dedicated meeting would be called. In Seoul, the decision was made to have just one G-20 leaders’ meeting a year.

⁶ <http://asiafoundation.org/resources/pdfs/CUSKPNewsletter485x11.pdf>

⁷ http://www.iisd.org/generata/?page_id=1262

The United Nations' "Millennium Ecosystem Assessment" (MA), published in 2005, is "the first comprehensive audit of the status of Earth's natural capital."⁸ The assessment identified a number of "emergent" findings, conclusions that can only be reached when a large body of existing information is examined together:

- 60 percent of a group of 24 ecosystem services (e.g., clean water, food, forest products, flood control and natural resources) examined by the MEA are being degraded.
- The likelihood of nonlinear changes is increasing; the risks include disease emergence, abrupt alterations in water quality, the creation of "dead zones" in coastal waters, the collapse of fisheries and shifts in regional climate.
- While major problems exist with tropical forests and coral reefs, the most significant challenges involve dry land ecosystems.
- Excessive nutrient loading of ecosystems is one of the major drivers today and will grow significantly worse in the coming decades unless action is taken.⁹

The conclusion is that "with appropriate actions it is possible to reverse the degradation of many ecosystem services over the next 50 years, but the changes in policy and practice required are substantial and not currently underway."¹⁰

The OECD's "Environmental Outlook to 2030"¹¹ confirmed the UN's assessment. The OECD reviewed the drivers of environmental change and focused on the challenges of climate change, air pollution, biodiversity, freshwater and waste, and material flows. Its synthesis displayed findings by presenting the challenges according to a traffic light system. Environmental issues which are not well managed – defined as areas in a bad or worsening state, and which require urgent attention – are classified as **Red Lights**. In addition to the well-known challenges of climate change such as increasing greenhouse gas emissions (GHGs) and urban air quality, "red lights" were assigned to biodiversity, renewable natural resources, ecosystem quality, species loss, invasive alien species, tropical forests, illegal logging, ecosystem fragmentation, water (water scarcity, groundwater quality, and agricultural water use and pollution) and waste and hazardous chemicals (hazardous waste management and transportation and chemicals in the environment and in products).

The GFN methodology is sophisticated, accounting for five distinct land-use types (crops, grazing, fishing, forests, and built-up) plus indirect demand for biocapacity in the form of absorptive capacity for CO₂ emissions and the footprints embodied in both the imports and exports of commodity flows.¹²

⁸ <http://www.maweb.org/en/About.aspx>

⁹ <http://www.maweb.org/en/About.aspx#2>

¹⁰ <http://www.maweb.org/en/About.aspx#2>

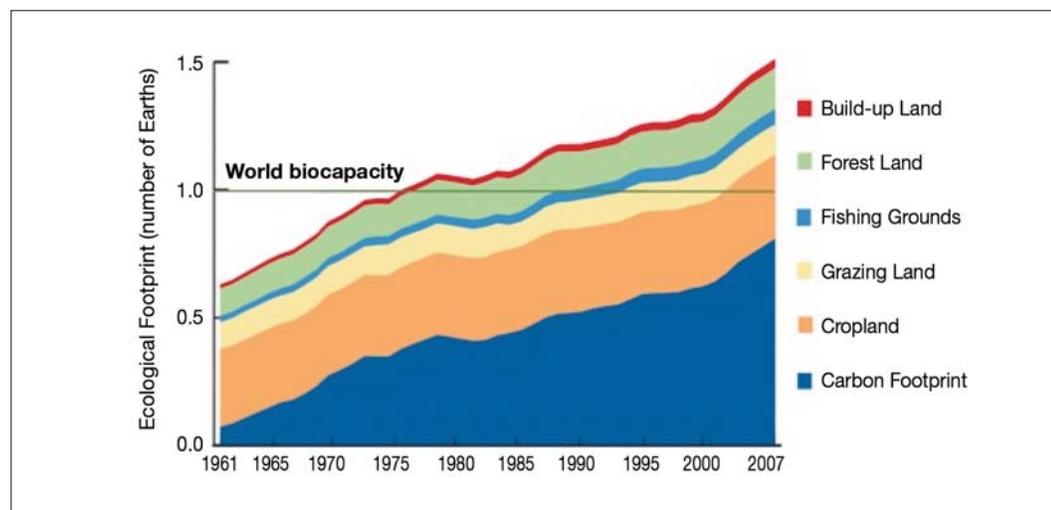
¹¹ OECD, 2008 <http://www.oecd.org/dataoecd/29/33/40200582.pdf>

¹² Ibid.

The GFN tracks the human demand on ecosystem services. The National Footprint Accounts (NFA) quantify the “annual supply of and demand for ecosystem products and services.”¹³ The Ecological Footprint is our demand on nature – the annual demand of populations and activities on the earth. Biological capacity is the annual supply of the earth in the amount of biologically productive land and sea area available to provide the ecosystem services that humanity consumes.¹⁴ The NFA use over 5,000 data points for each country and year to “determine the area required to produce the biological resources a country uses to absorb its wastes, and to compare this with the area available.”¹⁵ The NFA utilize international data sets published by the UN Food and Agriculture Organization (FAO), the UN Statistics Division and the International Energy Agency (IEA) as well as data from peer-reviewed science journals and thematic collections. They use this data to calculate the ecological footprint and biocapacity of more than 200 countries and territories as well as global totals.

Ecological footprint-accounting quantifies and tracks resources consumed and waste generated. Resource and waste flows are measured in terms of the biologically productive area necessary to maintain flows. Flows that cannot be measured are excluded from the assessment, leading to an underestimate of humanity’s true ecological footprint. Weighting each area in proportion to its bioproductivity, different types of areas are converted into the common unit of global hectares, hectares with world-average bioproductivity, which are totalled to obtain an aggregate indicator of ecological footprint or biocapacity. The ecological footprint can be directly compared to nature’s supply, biocapacity, both expressed in global hectares. Area demanded can exceed area supplied if demand on an ecosystem exceeds that ecosystem’s regenerative capacity.¹⁶

FIGURE 1. World Overshoot – 2010 Edition of the National Footprint Accounts¹⁷



¹³ Ewing B., A. Reed, A. Galli, J. Kitzes, and M. Wackernagel. 2010. Calculation Methodology for the National Footprint Accounts, 2010 Edition. Oakland: Global Footprint Network.

http://www.footprintnetwork.org/images/uploads/National_Footprint_Accounts_Method_Paper_2010.pdf

¹⁴ http://www.footprintnetwork.org/en/index.php/GFN/page/footprint_basics_overview/

¹⁵ <http://www.footprintnetwork.org/en/index.php/GFN/page/methodology/>

¹⁶ Ibid.

¹⁷ Source: Ewing et al, 2010.

3.2. Rationale for consideration by the G-20

The table below assesses climate change and the nine other global environmental issues (discussed in Annex 1) by the criteria described in Section 2, above.

TABLE 1. Criteria for G-20 Agenda Items

| ISSUES | Universal Global Implications/ Consequences | Need for Immediate Action | G-20 as Last Resort | Prospects for Success |
|-----------------------|---|---------------------------|---------------------|-----------------------|
| Climate Change | Yes | YES | YES | ??? |
| Biodiversity | NO | NO | NO | NO |
| Forests | YES | NO | NO | GOOD |
| Waste Management | NO | NO | NO | NO |
| Water | NO | NO | NO | NO |
| Ozone Layer Depletion | YES | NO | NO | GOOD |
| Fisheries | NO | YES | MAYBE | NO |
| Oceans | NO | YES | MAYBE | NO |
| Air Pollution | NO | NO | NO | YES |
| Population | YES | YES | YES | ??? |

The conclusion is that only climate change is an unambiguously serious candidate for the G-20 agenda. Biodiversity, waste management, water, fisheries¹⁸ and ocean and air pollution issues do not appear to meet the criterion of having serious implications for both developed and developing G-20 countries. Forests¹⁹ and ozone depletion miss the mark on the apparent need for immediate action. While some may argue that climate change action can be delayed, albeit requiring more aggressive action at a later date, the scientific consensus is that tipping points will soon be reached that lead to irreversible consequences. The population issue is just too politically contentious, so it fails the prospect for success criterion.

¹⁸ With respect to overfishing, the G-20 could design an approach to effectively implement existing commitments, promote compliance and reduce overcapacity. The G-20 could invite the FAO, OECD, and UN Environment Programme (UNEP) to report on inefficient fishing subsidies and policies to reduce overcapacity in fishing fleets. It could request the WTO and the Marine Stewardship Council to report on options to improve enforcement and promote compliance, such as “white lists” and eco-labelling. It could set up a formal G-20 working group to examine the possibility of establishing an International Oceans Authority, responsible for Regional Fisheries Management Organizations (RFMOs).

¹⁹ Regarding forests, the G-20 could support the Reduced Emissions from Deforestation and Forest Degradation (REDD) initiative, which could make an important contribution to combating climate change and reducing poverty. REDD offers financial incentives to preserve tropical forests and keep them growing. http://unfccc.int/methods_and_science/lulucf/items/4123.php

3.3. Climate Change

Global warming is perhaps the best publicized global environmental issue. The general scientific consensus is that it would be prudent to limit future global temperature increase to an average of two degrees centigrade by 2050. The two-degree target, accepted internationally,²⁰ translates into an atmospheric CO₂ concentration level of about 450 parts per million. We were at 391.76 ppm in February 2011.²¹

FIGURE 2. Atmospheric CO₂ December 1958 - 2010²²

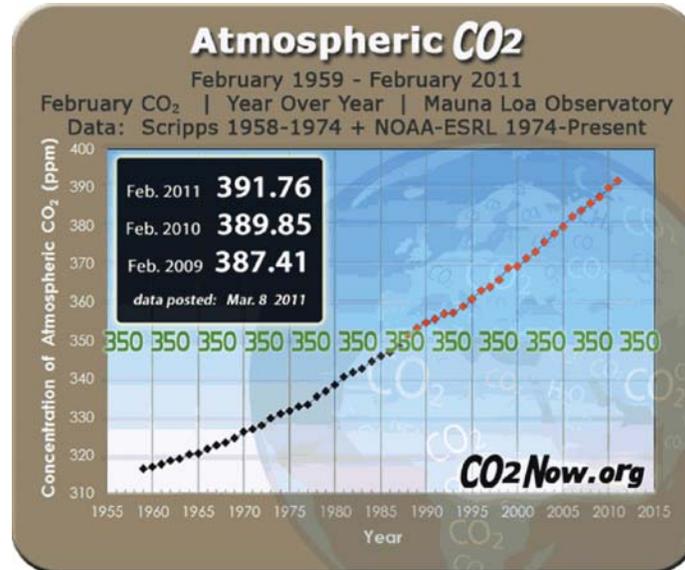


Figure 3 below presents the Intergovernmental Panel on Climate Change's (IPCC) estimates of annual gross world CO₂ emissions and the impact of the resulting increase of atmospheric concentration on future temperature increases. Today's gross global emissions are about 30 billion tonnes. The estimates are that to restrain temperature increases to two degrees, we will have to cut global CO₂ emissions to about 18 billion tonnes by 2050 and to zero by 2100. If emissions continue to grow to 40 billion tonnes and stabilize at that level, then the concentration level would be in the 800 ppm range, with global average temperatures rising between three and seven degrees centigrade.

Can the G-20 leaders take decisions that will catalyse action to begin to alter the "business as usual" path, in a world of growing populations and demands for economic development? The figures below show the scale of the problem. To stabilize concentrations at 450 ppm in 2050 (18 billion tonnes per year), per capita emissions must fall to about two tonnes per capita in 2050 for the world's estimated nine billion people. Figure 3 illustrates that a two degree increase above pre-industrial equilibrium temperatures translates into gross global emissions levelling off at 30 billion tonnes by 2020 and decreasing to zero by 2100.

²⁰ L'Aquila Chair's summary, page 4, first paragraph on climate change:
http://www.g8italia2009.it/G8/Home/Summit/G8-G8_Layout_locale-1199882116809_Atti.htm
Copenhagen accord, pg 5, pt 1.
<http://unfccc.int/documentation/decisions/items/3597.php?such=j&volltext=/CP.15#beg> (second document on list)

²¹ <http://co2now.org/>

²² Source Earth Systems Research Laboratory (ESRL) / National Oceanic and Atmospheric Administration (NOAA), image located at <http://co2now.org/>

FIGURE 3. CO₂ Emissions and Equilibrium Temperature Increases for a Range of Stabilization Levels²³

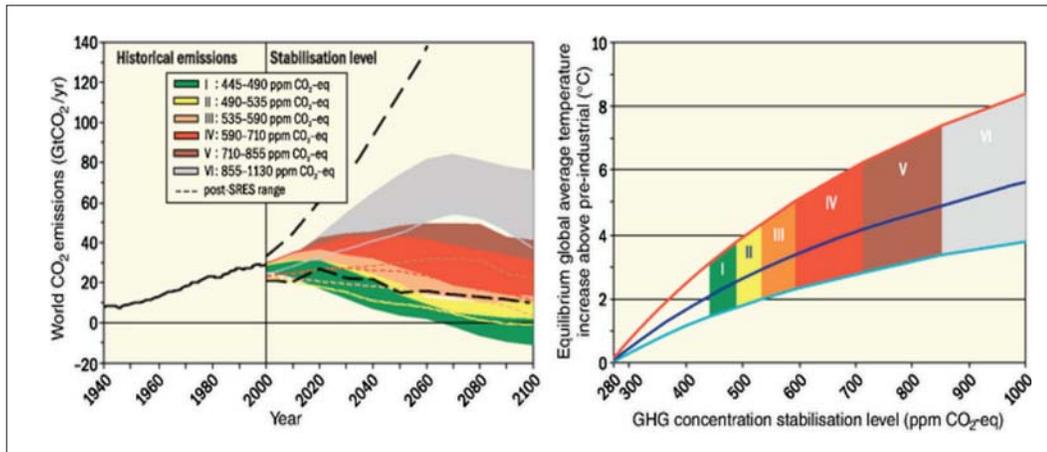


Figure 4 shows the probability ranges of exceeding two degrees for different levels of CO₂ concentration.²⁴

FIGURE 4. Probability of Future Temperature Changes

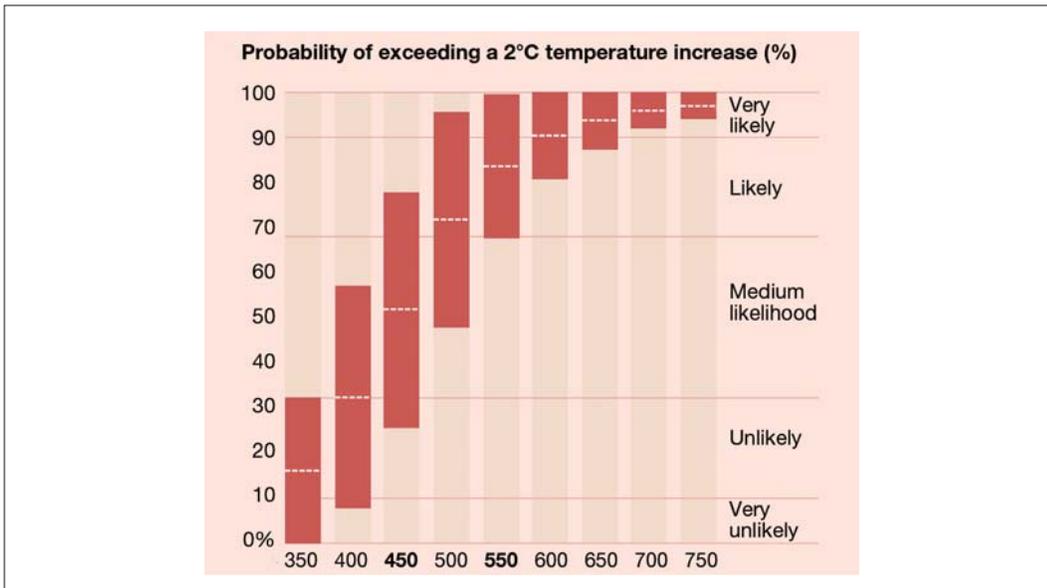


Figure 5 shows the per-capita trajectory to stabilize concentrations at 450 ppm. In 2050, to stay at 450 ppm CO₂ (an increase of two degrees), annual emissions must be limited to 18 billion tonnes.

²³ Source: IPCC AR4, 2007. Figure 5.4 Emission Trajectories for Stabilization, http://www.ipcc.ch/publications_and_data/ar4/syr/en/mains5-4.html

²⁴ Critics warn that 450 ppm represents a 26-78% probability of exceeding two degrees. <http://www.securegreenfuture.org/content/ipcc-targets-lead-least-54-odds-catastrophic-climate-change>

FIGURE 5. Emissions Per Capita for Stabilizing Concentrations at 450 PPM CO₂ Equivalent (in tonnes of CO₂ equivalent per capita)²⁵

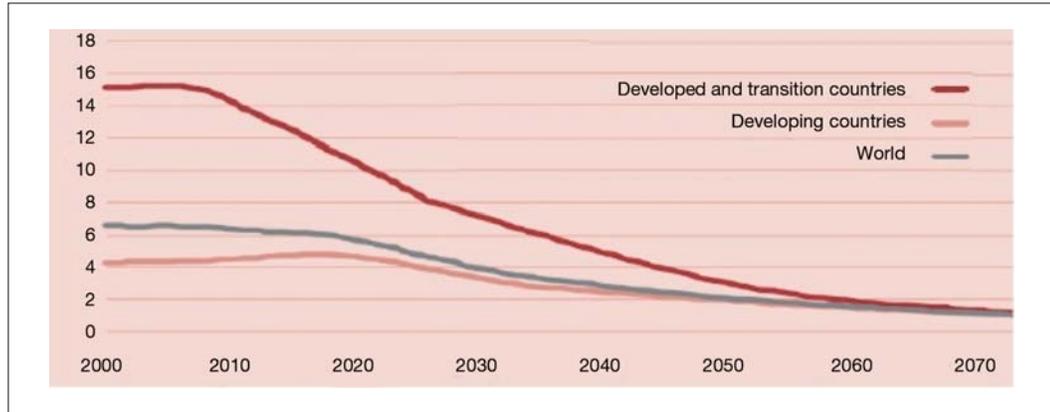
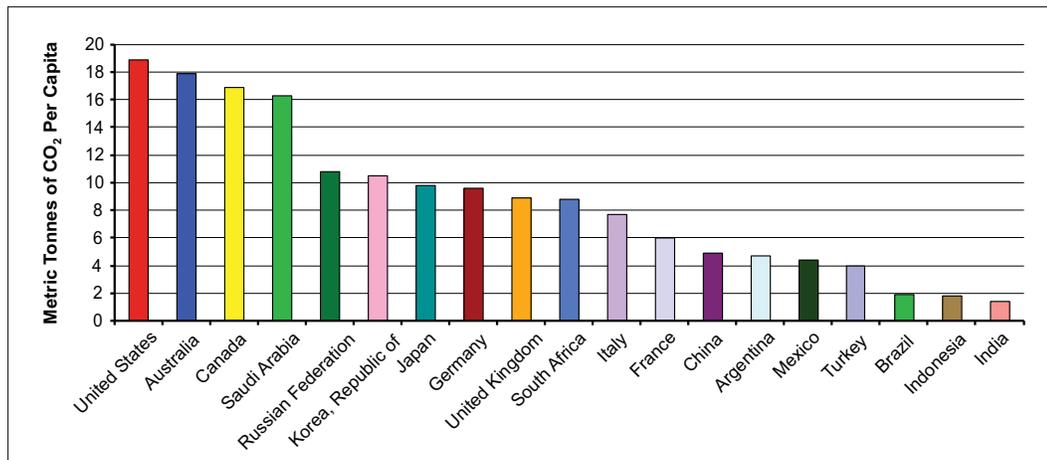


Figure 6 displays the current per-capita emissions for major emitting countries. This demonstrates the scale of the challenge. India and China will inevitably face inexorable pressures to increase emissions, with continued economic and population growth. Developed countries will have to transform their economies or lifestyles to approach two tonnes per capita by 2050.

FIGURE 6. 2007 Carbon Dioxide Emissions, Metric Tonnes of CO₂ Per Capita²⁶



As configured and implemented, the UN process is not working. The UN Framework Convention on Climate Change (UNFCCC) 2009 Copenhagen conference failed to agree to a comprehensive and legally binding global treaty to supplement or replace the Kyoto Protocol. Governments tried to put the best face on the Cancun talks. For example, the UK Dept. of Energy and Climate Change website:

“The talks marked a turning point in the global negotiations to agree on a global deal to tackle dangerous climate change.”²⁷ The UK pointed to agreements at the summit reiterating the

²⁵ Source: UNDP (2007) based on Meinshausen, http://content.undp.org/go/cms-service/stream/asset/?asset_id=159_0911

²⁶ Source: UN Data www.data.un.org

²⁷ http://www.decc.gov.uk/en/content/cms/what_we_do/change_energy/tackling_clima/int_climate/cancun/cancun.aspx

two-degree target to limit temperature rise and to begin work on the building blocks of a future agreement, including national reports on emissions, a system for monitoring, reporting and verification, a Green Climate Fund, deforestation, and technology/adaptation mechanisms. But a typical headline following the 2010 conference was *“Cancun Climate Talks a Failure in Disguise.”*²⁸

The United States, China and Japan agreed only to a toothless clause that they would “aim” at either an extension of the Kyoto Protocol or a new agreement “as early as possible.” No decision was made on where the money would come from for the Climate Fund (US\$100 billion a year by 2020) to assist developing nations with climate change adaptation and green technology. There is an Alice-in-Wonderland quality to the UN process, whereby developing countries ignore the constraints of the American political system and the low probability of congressional appropriation of tens of billions of dollars to a Green Climate Fund for foreigners. The political realities facing the leaders of developing countries and emerging economies demand that they provide more growth and higher living standards. To reach an effective global agreement in the UN, we will have to restructure the UNFCCC process – a contentious and impractical venture.

4. INEFFECTIVENESS OF INTERNATIONAL ENVIRONMENTAL INSTITUTIONS

“Scholars and practitioners alike cite fragmentation, overlap and duplication among the main reasons for reforming the UN’s system of international environmental governance... In addressing threats to food, energy and water security and grappling with the impacts of climate change, states are currently dealing with an array of United Nations agencies, financial institutions and mechanisms, private sector interests and civil society organizations... According to information on 18 MEAs between 1992 and 2007, there were 540 meetings, which resulted in more than 5000 resolutions or decisions... Institutional overlap and fragmentation are widely regarded as detrimental to efficient and effective governance... Incoherence and complexity in the international environmental governance system can lead to high transaction costs, discouraging in some cases participation in the system by developing countries and countries with economies in transition.”

http://www.unep.org/yearbook/2010/PDF/year_book_2010.pdf

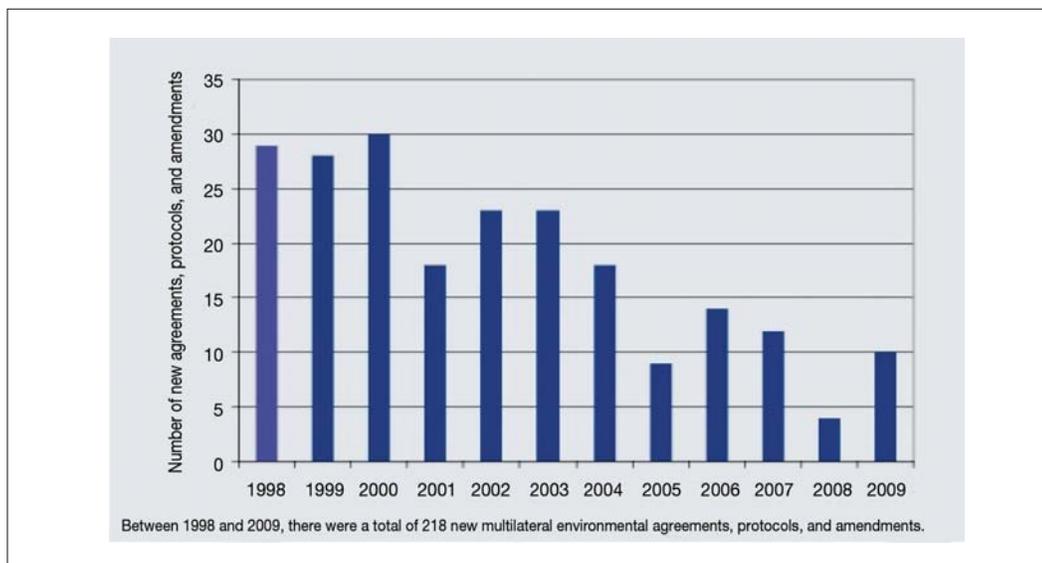
This section reviews the international efforts to manage the issues described in the ten environmental issues. A Martian observing the institutions, mechanisms and arrangements “governing” international affairs today would likely compare the current situation to a large opera company, composed of both divas and amateurs but without a director, a symphony orchestra of talented soloists without a conductor (playing the same music but on different pages), or a ballet company of prima donnas without a choreographer. The mandates, the resources and decision-making rules of the many different international environmental institutions are accidents of history. There is no means to orchestrate or choreograph activities to ensure coordination, coherence and/or timely updating of mandates.

²⁷ http://www.decc.gov.uk/en/content/cms/what_we_do/change_energy/tackling_clima/int_climate/cancun/cancun.aspx

²⁸ http://www.asiasentinel.com/index.php?option=com_content&task=view&id=2871&Itemid=391

“International environmental protection is a classic public good that tends to be underprovided...The current structure, centred on UNEP, is chronically underfunded, lacks broad-based political support and continues to fall short of expectations.”
 – Secretariat of the International Task Force on Global Public Goods, *Sustainable Management of the Global Natural Commons, Expert Paper 2, Global Commons, Chapter 4*

FIGURE 8. Number of New Multilateral Environmental Agreements, Protocols, and Amendments 1998-2009³²



5. MOST PROMISING ROUTES TO G-20 ENGAGEMENT

5.1. What Do Leaders Do?

There is considerable scepticism about the prospects of G-20 action on climate change. Non-governmental organizations’ (NGOs) verdict on the Seoul G-20 summit was not a happy one. The assessment on the Seoul summit from Greenpeace was “The G-20 has once again failed to take the path of green development that the world economy and the environment desperately needs...The G-20 can use flowery words to plaster over deep differences in economic policy, but that will do nothing to alleviate poverty or save the climate.”³³ Tck Tck Tck “was very disappointed that the G-20 only discussed climate over lunch, having added the issue to the agenda at the last minute and only at the request of the Europeans... the G-20 dropped a reaffirmation of the commitment to keep global warming below two degrees in the final version of the communiqué and failed to take action on fossil fuel subsidies.”³⁴

³² Source Mitchell 2009. www.unep.org/pdf/year_book_2010.pdf

³³ Daniel Mittler, Greenpeace International Political Director <http://www.greenpeace.org/africa/en/News/news/G20-fails-to-commit-to-an-energy-revolution/>

³⁴ The Sherpa Times <http://www.sherpatimes.com/g20/280-ngos-verdict-on-seoul-qyes-butq.html>

What are reasonable expectations for an ambitious G-20 agenda? With respect to global environmental issues, what expectations are in the politically feasible set? Bear in mind the complexity of the topics, leaders' lack of technical expertise, the facts of different languages and different cultural approaches to decision-making and the relatively short meeting time. The G-20 meetings are informal, without any provisions for compliance and enforcement. The G-20 is a self-appointed group of countries. Non-members hotly contest the legitimacy of any G-20 decisions purporting to extend to other countries and the G-20 cannot make binding decisions. However, from past summits such as the G-8, the G-20 and others, there are many examples of the kinds of decisions leaders can make. Leaders can:

- Commit themselves to specific actions.
- Agree to instruct their Ministers and officials to work toward specific ends.
- Agree to have their representatives in international organizations work together to reach some objective.
- Establish expert groups to make recommendations.
- Invite international organizations to prepare reports on specified questions.
- Create new networks or international organizations and invite other countries to join.

Then what are the prospects for effective G-20 engagement with environmental issues?

5.2. Climate Change and Past G-20 Meetings

Climate change has made a brief appearance at each of the past five G-20 leaders' meetings:

- The Washington G-20 communiqué was anodyne with respect to international environmental issues, mentioning in passing with other global issues: "We remain committed to addressing other critical challenges such as energy security and climate change, food security, the rule of law and the fight against terrorism, poverty and disease."³⁵
- London touted the agreement "to make the best possible use of investment funded by fiscal stimulus programmes towards the goal of building a resilient, sustainable and green recovery. We will make the transition towards clean, innovative, resource-efficient, low carbon technologies and infrastructure." It also reaffirmed commitments "to address the threat of irreversible climate change, based on the principle of common but differentiated responsibilities and to reach agreement at the UN Climate Change conference in Copenhagen in December 2009."³⁶
- Pittsburgh focused on inefficient fossil fuel subsidies and the stimulation of investment in clean energy, renewables and energy efficiency and the diffusion or transfer of clean energy technology, as well as climate-change financing.³⁷
- The Toronto declaration reiterated commitments to the UNFCCC process, reaffirmed support for the Copenhagen accord and accepted (passively) the report on energy subsidies. It recognized the need to act to prevent marine oil spills.³⁸

³⁵ <http://www.pittsburghsummit.gov/resources/125136.htm>

³⁶ http://www.europa-eu-un.org/articles/en/article_8622_en.htm

³⁷ <http://www.pittsburghsummit.gov/mediacenter/129639.htm>

³⁸ <http://www.g20.utoronto.ca/2010/to-communique.html>

- The G-20 Seoul summit Leader Declaration reaffirmed the commitment to fight climate change. The 74-paragraph Seoul summit document devoted three paragraphs to climate change. It reaffirmed past commitments, introduced the on-going loss of biodiversity linked to climate change and listed initiatives for country-led green growth policies and clean energy.³⁹

The next section suggests an approach to address climate change in the G-20.

6. A G-20 APPROACH TO CLIMATE CHANGE: FIVE ELEMENTS

With respect to climate change, the UN negotiation process will not succeed in the future; the prospects are for continuing deadlock within the UNFCCC. China, India and Brazil will continue to resist any binding commitments that would compromise their economic development and insist that only the developed countries, historically responsible for the increase in atmospheric CO₂, should be held to legally enforceable reductions. Smaller developing countries will continue to insist on massive financial transfers to assist them with green technology and adaptation to inevitable climate change.

The harsh political reality is that there is no prospect for a global agreement on national emissions reductions, nor any prospects for Congressional appropriation of tens of billions of dollars of hoped-for climate change financing. Progress on the Copenhagen commitment for fast-start funds is cause for pessimism. The Copenhagen Accord fast-start funds⁴⁰ were to be “new and additional,” amounting to \$30 billion USD in 2010-2012 and rising to \$100 billion USD a year by 2020. While close to \$30 billion has been pledged, delivery is uncertain. Only \$6.8 billion USD has been requested and/or budgeted by the executive bodies of the countries in 2010-2011.⁴¹ In some cases, legislative bodies have also approved these requests. Some countries have budgeted funds while others have yet to complete national budget appropriations processes. This is despite the Seoul G-20 meeting’s commitment of support: “We also support and encourage the delivery of fast-start finance commitments.”⁴²

“New and additional” funding means an increase relative to previous years’ pledges or allocations. In fact, a number of pledges are renamed commitments already made in the past. For example, Japan’s Hatoyama Initiative is a restructuring of the previously announced Japanese Cool Earth Partnership, with some new resources included in the Initiative. (Imagine the impact of the March tsunami and nuclear disaster on the likelihood of future large Japanese contributions). Countries such as the UK and the US are counting previous commitments to the Climate Investment Funds (CIFs) as part of their fast-start finance pledge. Historically, there is a striking discrepancy between financial pledges and disbursements from developed to developing countries.⁴³ In any case, what are the prospects of Canada providing \$4 billion USD a year (Canada’s traditional share is four percent) in 2020 and beyond?

³⁹ http://media.seoulsummit.kr/contents/dlobo/E1_Seoul_Summit_Leaders_Declaration.pdf

⁴⁰ The Copenhagen financial commitments are found at <http://www.wri.org/publication/summary-of-developed-country-fast-start-climate-finance-pledges>

⁴¹ Ibid. See also faststartfinance.org (initiated by the Dutch government).

⁴² Para 66 of the G-20 Seoul summit leaders’ declaration http://canadainternational.gc.ca/g20/summit-sommet/2010/g20_seoul_declaration.aspx?lang=eng&menu_id=41&menu=L

⁴³ South Centre, Developed Country Climate Financing Initiatives Weaken the UNFCCC http://www.southcentre.org/index.php?option=com_content&task=view&id=909&Itemid=1

Any effective deal requires full participation by China and the US. Major Chinese and American concerns (perceived threats to national competitiveness, the costs of alternative technology development and energy security) need to be resolved before any agreement on climate change can be negotiated in multilateral fora. These concerns can be addressed by negotiating distinct agreements, preceding any discussion of binding targets on emission reductions or financial transfers. A grand bargain could be devised combining a series of distinct agreements – action on inefficient fossil fuel subsidies, future standards and border tax adjustments, R&D cooperation and investments in energy security of supply.

The G-20 offers a more propitious route to an ultimate global agreement than the 192-member United Nations. Imagine an incremental process. First, prior to any serious negotiation on emission targets or financial transfers for climate change, the G-20 could negotiate amongst themselves six elements of a grand bargain, six essential confidence-building prerequisites to an eventual deal on binding targets. Then, after the G-20 successfully concluded the grand bargain, they could subsequently agree amongst themselves on the elements of a binding deal on targets. The G-20 could then champion a deal on targets in the UNFCCC process. If China and the US can agree on an approach to climate change, other G-20 countries could be persuaded to sign on. The French team organizing the 2011 G-20 summit, or the Mexicans in 2012, could design an informal process that would bring China and the US together to negotiate the prerequisite agreements, building on the existing bilateral US-China Strategic and Economic Dialogue. The prospects for French or Mexican shuttle diplomacy are better than previous diplomatic efforts like the 1978 Camp David accord⁴⁴ mediated by Jimmy Carter in 1978 or the 1995 Dayton peace agreement, mediated by Richard Holbrooke.

Six elements of a grand bargain could be:

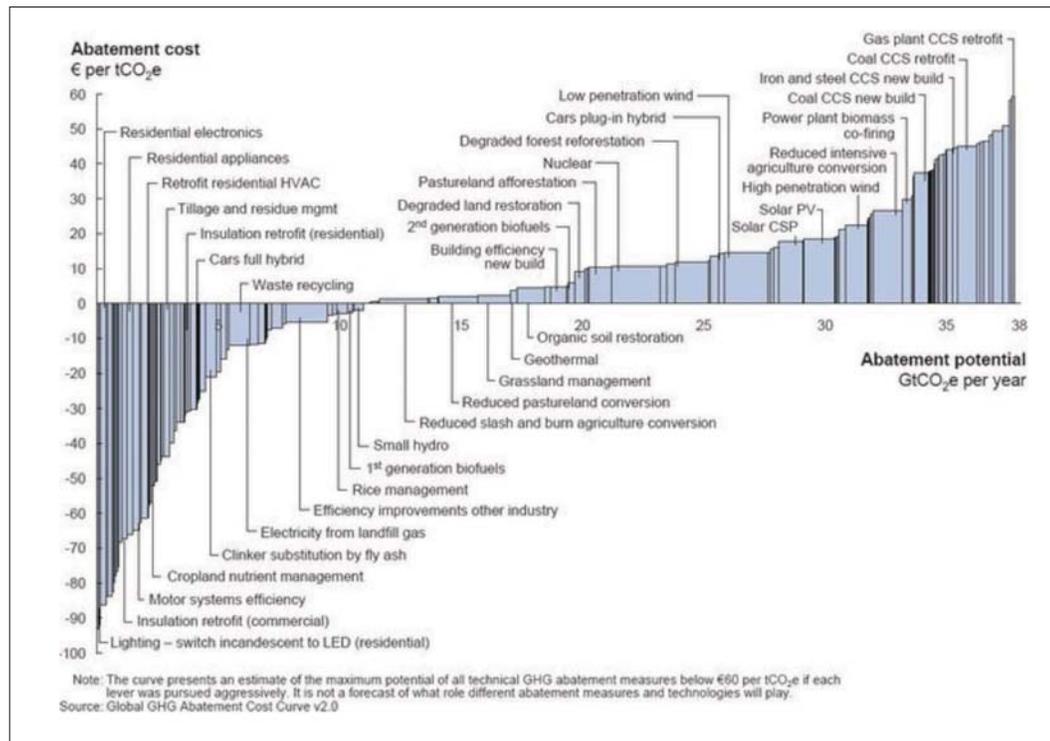
- A campaign of “no regrets” emission-abatement investments;
- Action on inefficient fossil fuel subsidies.
- Agreement on future standards on traded GHG-intensive goods and border tax adjustments on below-standard products.
- Agreement on R&D cooperation, addressing intellectual property issues.
- Agreement on investments in energy security of supply, sharing emergency reserve stocks and investing in LNG infrastructure.
- Strengthening international environmental organizations

6.1. “No Regrets” Emission Abatements – The McKinsey Curve

The first element of the grand bargain would be a campaign in G-20 countries to promote emission-abatement investments that are actually profitable. There are extensive opportunities for investments to reduce emissions that more than pay for themselves. Figure 9 provides a heuristic sketch. Of course, opportunities vary dramatically by country. G-20 members could commit to energetically and systematically pursuing all profitable investments in each of their own countries. They could catalyze the effort by inviting several international organizations to cooperate in monitoring and reporting progress and in actively promoting information on opportunities and best practices.

⁴⁴ http://www.google.ca/search?hl=en&source=hp&q=camp+david+accord+signed&rlz=1W1ADBF_en&aq=7v&aqi=g5g-v5&aql=&oq=Camp+David+accord+&gs_rfai=

FIGURE 9. Global GHG Abatement Cost Curve Beyond Business-as-Usual - 2030⁴⁵



6.2. Inefficient Fossil Fuel Subsidies

The Pittsburgh remit on fossil fuel subsidies is an interesting example of the G-20 requesting international organizations to prepare a report. The IEA, OECD, and World Bank presented a joint report for the November 2010 Seoul summit.⁴⁶ This G-20-commissioned report reviewed the over \$300 billion in direct fossil fuel subsidies as well as indirect subsidies through tax expenditures, under-priced access to government controlled resources and land, and concessional loans and guarantees. It concluded that G-20 agreement to phase out fossil fuel subsidies by 2020 would represent a “triple-win” solution, enhancing energy security, reducing GHG emissions, and bringing immediate economic gains. It would cut global energy demand by five percent and reduce oil demand by 4.7 million barrels per day. The report notes “It would also represent an integral building block for tackling climate change,” cutting growth in CO₂ emissions by two gigatonnes.⁴⁷ It is in the national self-interest of each G-20 country to phase out fossil fuel subsidies.

⁴⁵ Source: Global GHG Assessment Cost Curve v2.0. <http://www.mckinsey.com/client/service/ccsi/Costcurves.asp>

⁴⁶ “The Scope of Fossil-Fuel Subsidies in 2009 and a Road Map for Phasing out Fossil Fuel Subsidies” http://www.iea.org/weo/docs/second_joint_report.pdf

⁴⁷ While the subsidies at issue are primarily regressive, the report discusses alternatives to provide compensation for any negative impact on the poor.

6.3. Standards and Border Tax Adjustments

The G-20 could agree on future product and process standards on high-carbon traded goods. A universal product-by-product standard is not required. Standards could be enforced by border tax adjustments on goods “below the standards.” With sufficient notice, this would be feasible for basic industries like cement and aluminum (which are already engaged in designing more rigorous standards), and for high-volume industries that are highly integrated across borders. Ultimately, a monitoring and reporting system, with verification, possibly based on peer review around commonly agreed refined standards, would be the core of an agreement on truly global action.

6.4. R&D Cooperation

There are several examples of successful international cooperative research efforts that could serve as a model for the G-20.

- ITER, an international experiment to produce commercial energy from fusion, consists of member countries that share every aspect of the project: science, procurements, finance and staffing, with the long-term aim that each member will have the know-how to produce its own fusion energy plant.⁴⁸
- The Consultative Group for International Agricultural Research (CGIAR) generates cutting edge science through a “strategic partnership whose donors support 15 international centres, working in collaboration with many hundreds of government and civil society organizations as well as private businesses around the world ...The new crop varieties, knowledge and other products resulting from the CGIAR’s collaborative research are made widely available to individuals and organizations working for sustainable agricultural development throughout the world.”⁴⁹
- The China Greentech Initiative interactive website “designed to facilitate the collection, analysis and sharing of research on the evolving greentech market in China...is an open source, commercial collaboration of over 80 of the world's leading technology and services companies, entrepreneurs, investors, NGOs and policy advisors.”⁵⁰
- The Asia Pacific Partnership on Clean Development and Climate includes America, Australia, Canada, China, India, Japan and Korea. These countries work together and with private sector partners to accelerate the development and deployment of clean energy technologies.

The G-20 could build on the Major Economies Forum on Energy and Climate (MEF),⁵¹ launched just two years ago. All G-20 countries except Argentina, Saudi Arabia and Turkey are represented in the MEF. In addition to promoting dialogue and assisting the UNFCCC process, the MEF was intended to explore initiatives and joint ventures to increase the supply of clean energy and cut emissions. They are developing plans on ten technologies: advanced vehicles, bioenergy, carbon capture, building sector energy efficiency, industrial sector energy efficiency, low emissions coal, marine energy, smart grids, solar power and wind energy.

⁴⁸ www.iter.org

⁴⁹ www.cgiar.org

⁵⁰ www.china-greentech.com

⁵¹ <http://www.state.gov/g/oes/climate/mem/>

These ideas should not be dismissed because they are Bush-era initiatives. R&D cooperation may be a minor part of the answer, but it is key to building confidence and to generating political support for other policies and elements of a package deal.

6.5 Security of Supply

In the name of security of supply, the G-20 leaders could agree to expand and transform the International Energy Agency (IEA), currently an autonomous OECD organization. The IEA was initially established to respond to physical disruptions in the supply of oil. Its members agreed to maintain national emergency oil reserves and to plan for coordinated use of those reserves. They also agreed to cooperate on other national measures, including demand restraint, the coordination of effective national emergency organizations, as well as testing response measures and providing training emergency situations. Most important, the IEA provides for a system for sharing and reallocation of available supplies in emergencies.⁵²

All the G-20 members could be invited to join the IEA. Ten G-20 countries, including Australia, Korea and Turkey are already members. With China, India and Russia as members, the IEA could effectively enhance security in the world energy markets. More importantly, an expanded IEA could create a worldwide gas market by promoting initiatives to increase investment and reduce regulatory barriers in natural gas infrastructure.

Natural gas, at half the carbon intensity of coal in power generation, offers great potential for near-term GHG reduction. Natural gas vehicles have a GHG footprint that is 20 percent reduced relative to their gasoline-powered equivalents. By most estimates, global demand for natural gas will double by 2030. However, in North America, Europe, China and South and East Asia, which are the areas of highest-expected demand, the projected consumption of gas is expected to far outstrip indigenous supplies. The world liquefied natural gas (LNG) market, with major suppliers in Algeria, Australia, Indonesia, Nigeria, Qatar, Russia, Trinidad and Venezuela, could become similar to the world market for oil. Delivering gas from the world's major reserves to the future demand centres will require a major expansion of inter-regional, cross-border gas transport infrastructures.

Making the prospects for natural gas even brighter is a revolution in the last several years in technology for extracting “unconventional” gas that was previously inaccessible. Unconventional gas resources include gas in coal deposits (coal bed methane, CBM) or in shale rocks that have too few pores for the gas to move freely and be extracted by conventional wells.⁵³ “The US-led revolution in techniques for extracting unconventional gas has challenged previous assumptions about global gas supply.”⁵⁴

⁵² <http://www.iea.org/papers/2004/factsheetcover.pdf>

⁵³ <http://pesd.stanford.edu/research/gas/>

⁵⁴ PESD Policy Brief, Mark Thurber May 18, 2010 <http://pesd.stanford.edu/research/gas/> This is by no means without controversy given fugitive emissions, demand for water and other environmental consequences. See Ian Urbina series, Drilling Down, NYTimes, http://topics.nytimes.com/top/news/us/series/drilling_down/index.html

The G-20 could encourage initiatives to increase the role of LNG connections of regional markets and explore the potential for natural gas to play a larger role in China and India. Natural gas makes up only about four percent of China's energy supply at present. Chinese discoveries of substantial unconventional gas resources would immediately align domestic gas development with both energy security and air quality goals. The G-20 could encourage the replacement of other fossil fuels with gas by removing fossil fuel subsidies and cooperating on infrastructure investments. The G-20 could include promotion of R&D and the widespread application of new technologies to access “unconventional gas.”

6.6 Strengthening International Environmental Organizations

The G-20 could reinforce a grand bargain by strengthening several international environmental organizations, addressing the weaknesses described in Section 5 above. There is a long history of the G-7 initiating changes in international organizations and there are several examples of the G-20 leading the push for reforms of the IMF and World Bank. Indeed, the G-20 created the newest major international organization – the Financial Stability Board. Agreement in the G-20 could trigger a welcome strengthening of the mandates and resources of the UNEP and the UNFCCC. The disparate secretariats of the various UN environmental conventions could be reorganized into clusters or a more coherent organization. Other ideas to explore include expanding the role of the Global Ministerial Environment Forum, building up the environmental competence of the WTO, reforming the UN Trusteeship Council and establishing a World Environment Court. They may even initiate creation of a powerful “World Environment Organization.”⁵⁵ In any case, the G-20 could establish a working group to propose options for strengthening the various MEA Convention Secretariats, to reinforce the UNEP, and to develop alternatives for the mandate, resources and decision- making process for a World Environment Organization. One of the trial balloons may fly.

6.7 Conclusions on Climate Change

There are good reasons for scepticism regarding the prospects for the G-20 to agree on the initial six elements for a grand bargain tackling climate change. Investments in most climate change policies and projects have amortization periods of 10-25 years or longer, but governments find it very difficult to look and invest beyond two to three years. It may be particularly difficult for governments to engage in meaningful coordinated action on energy security. For example, a strategy to boost investment in spare capacity requires Saudi Arabia's participation. A strategy to boost investment in alternative supplies might be opposed by low-cost oil suppliers. It may be difficult for governments to promote and coordinate large R&D projects without them becoming patronage-ridden. The intellectual property issues may prove difficult to resolve.

Certainly it would be ideal if the G-20 could forge a deal on binding national emission targets and large financial transfers to developing countries. But “the perfect is the enemy of the good.” The prospects for a package deal pursuing “no-regrets” abatements, fossil fuel subsidies, R&D, product and process standards, security of supply and strengthening of international institutions are brighter than for a deal on targets and transfers from developed countries of hundreds of billions of dollars.

⁵⁵ See Steve Charnovitz's “A World Environment Organization” for a convincing and pragmatic argument. <http://www.wilmerhale.com/files/Publication/6ad8618d-6535-4a81-8046-cd084016b0f2/Presentation/PublicationAttachment/d61941b0-fa16-4ad1-9e19-254449cf83be/Charnovitz1.pdf>

7. CONCLUSION

“Politicians are caught in a dilemma between political suicide and ecological suicide.”
– *Mathis Wackernagel*

Unless Sarkozy changes his mind and decides to make the environment a priority, highly unlikely given current events, the responsibility will fall on the Mexicans in 2012. There are major obstacles to G-20 action on international environmental issues. The dangerous downside risks occur in the distant future, but policies and actions that lessen warming have immediate costs. Some countries, like Russia, see positives in global warming including lower heating costs and better agricultural and timber harvests. Any concerted action will require the wholehearted participation of China and the US.

Both China and the US have many urgent issues that take precedence over climate change and other environmental issues. China's priority is fueling economic growth and employment to maintain domestic political stability. US attention is fully absorbed by several international security issues (e.g., Libya, Afghanistan-Pakistan, North Korea, the Middle East) and the economic fallout of the financial crisis (debt, unemployment, external imbalances). They are unlikely to urge France to add environmental issues to Sarkozy's announced list of priorities (reform of the international monetary system, strengthened financial sector regulation, commodity price volatility, employment, corruption and development).⁵⁶ Even if the US pushed, it faces a credibility problem – doubts that the US administration can deliver on commitments – given the dysfunctional gridlock of its domestic political system.

A G-20 package would go part way to resolving the climate change dilemma, provide some essential early action and could lead to improved prospects for an agreement on binding targets for emission reductions. If leadership is required, Mexico is a better bet in 2012. Proponents of G-20 action should focus on supporting the Mexicans and subsequent G-20 Presidents.

⁵⁶ <http://www.elysee.fr/president/les-actualites/dossiers-de-presse/2010/dossier-de-presse-de-presentation-de-la-presidence.10496.html> & <http://www.g20-g8.com/g8-g20/g20/english/priorities-for-france/the-priorities-of-the-french-presidency/the-priorities-of-the-french-presidency.75.html>

GLOSSARY OF ACRONYMS

| | |
|--------|--|
| 3G | Global Governance Group |
| ASEAN | Association of Southeast Asian Nations |
| AU | African Union |
| BRIICS | Brazil, Russia, India, Indonesia, China, South Africa |
| CEB | Chief Executives Board |
| CGIAR | Consultative Group for International Agricultural Research |
| EU | European Union |
| FAO | Food and Agriculture Organization |
| G-20 | Group of Twenty |
| GHG | Greenhouse Gases |
| IADB | Inter-American Development Bank |
| IAEA | International Atomic Energy Agency |
| IEA | International Energy Association |
| ILO | International Labor Organization |
| IMF | International Monetary Fund |
| IUCN | International Union for Conservation of Nature |
| LNG | Liquefied Natural Gas |
| LPI | Living Planet Index |
| MA | Millennium Ecosystem Assessment |
| MEA | Multilateral Environmental Agreements |
| MEF | Major Economies Forum on Energy and Climate |
| NASA | National Aeronautics and Space Administration |
| NEPAD | New Partnership for Africa's Development |
| NFA | National Footprint Accounts |
| OECD | Organization for Economic Cooperation and Development |
| UN | United Nations |
| UNEP | United Nations Environment Program |
| UNCSD | United Nations Commission on Sustainable Development |
| UNFCCC | United Nations Framework Convention on Climate Change |
| WANO | World Association of Nuclear Operators |
| WHO | World Health Organization |
| WTO | World Trade Organization |
| WWF | World Wildlife Fund |

ANNEX 1

A1. Biodiversity

Biodiversity and the world's ecosystems are under threat. Biodiversity refers to the worldwide variety (13 million species) of plants, animals and organisms.⁵⁷ Ecosystems provide oxygen, food, fresh water, fertile soil, medicines, shelter, protection from storms and floods, stable climate and recreation. Agriculture, energy security and protection from fires and flooding strongly depend on biodiversity.⁵⁸ The Millennium Ecosystem Assessment concluded that problematic management of our ecosystems has caused loss of biodiversity and ecosystem degradation. In the last half of the previous century, and as a result of human activity, ecosystems changed at a rate greater than in any comparable period of time in human history.⁵⁹ Species' extinctions are continuing at up to 1,000 times the natural rate⁶⁰ and are irreversible. Although extinction is a natural process and today's species represent only two to four percent of all species that have ever lived, the high number of recent extinctions suggests the world is facing a rapid net loss of biodiversity.

This disturbing assessment is confirmed by work of the International Union for Conservation of Nature (IUCN), the World Wildlife Fund (WWF), and the United Nations Environment Programme (UNEP). According to the IUCN's **Red List**, 17,291 species are under threat out of the 47,677 assessed: 21 percent of all known mammals, 30 percent of all known amphibians, 12 percent of all known birds, 28 percent of all known reptiles, 38 percent of all known freshwater fishes, 70 percent of all known plants and 35 percent of all known invertebrates.⁶¹

The WWF's Living Planet Index (LPI) calculates global trends in populations by averaging three ecosystem-based population indices (terrestrial, freshwater and marine). The LPI dropped by approximately 40 percent between 1970 and 2000, with a 30 percent drop in the terrestrial species populations index, 30 percent in the marine species populations index and 50 percent in the freshwater species population index. Although criticized for taxonomic and regional bias, and far from being a comprehensive assessment of the planet's species, the LPI reveals downward trends for well-known taxa and regions. The global decline of commercially important fish stocks is widely reported: most industrial fisheries are either fully or overexploited and many marine populations will not be able to recover from severe depletion, even if fishing is suspended.⁶²

⁵⁷ <http://www.cbd.int/2010/biodiversity/>

⁵⁸ www.iucn.org/iyb/about/biodiversity

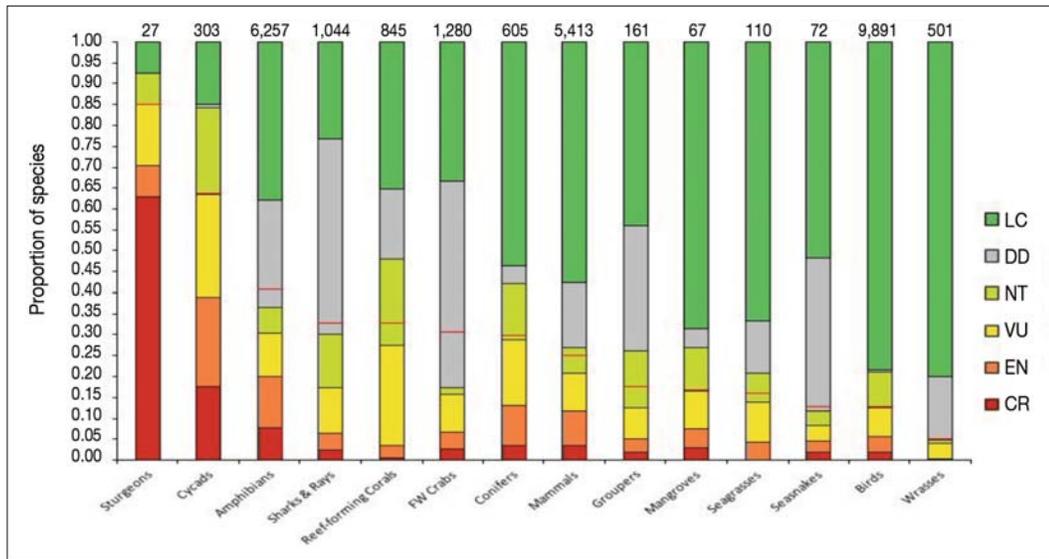
⁵⁹ www.maweb.org/documents/document.273.aspx.pdf

⁶⁰ www.iucn.org/iyb/about/biodiversity_crisis/

⁶¹ <http://www.iucnredlist.org/about/red-list-overview>

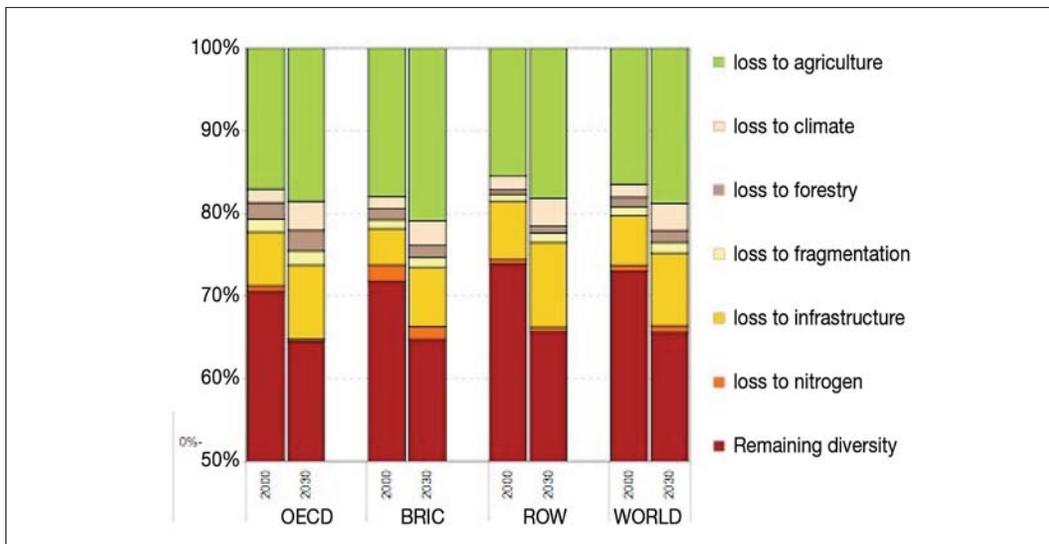
⁶² www.maweb.org/documents/document.273.aspx.pdf

FIGURE A1. Red List Status of Species by Major Groups, 2009⁶³



The numbers above each bar represent the total number of extant species assessed for each group. CR – Critically Endangered, EN – Endangered, VU – Vulnerable, NT – Near Threatened, DD – Data Deficient, LC – Least Concern.

FIGURE A2. Sources of Losses in Mean Species Abundance to 2030⁶⁴



⁶³ Source IUCN. http://www.iucnredlist.org/about/summary-statistics#Fig_2

⁶⁴ OECD Environmental Outlook Baseline <http://dx.doi.org/10.1787/261161731365>

A UNEP team of researchers identified nine components of Earth's systems that show signs of global environmental change and suggested a safe space or boundary in which human activity can operate to sustain the planet's natural systems.⁶⁵ Biodiversity loss is considered to have surpassed the boundary designating safe operating space for human activities.⁶⁶ Population and economic growth contribute to biodiversity loss as a result of land-use changes, unsustainable use of natural resources and pollution, climate change and our increasing demands for food, fresh water, timber, fuel, and fibre. Habitat loss through clearing or degradation is currently the primary cause of range declines in species and populations.⁶⁷

According to the OECD, a considerable number of today's known animal and plant species are likely to become extinct, largely due to expanding infrastructure and agriculture, as well as climate change. Food and biofuel production together will require a ten percent increase in farmland worldwide with a further loss of wildlife habitat.⁶⁸ Climate change takes its toll on rich marine habitats like coral reefs, not just with rising temperatures but also increasing absorption rates of carbon dioxide, with an increasing rate of ocean acidification. The reefs serve as habitat for nearly a quarter of the globe's marine fish species, many of which struggle to adapt to acidification.⁶⁹ In sum, the continuing loss of biodiversity is likely to limit the Earth's capacity to provide the valuable ecosystem services that support economic growth and human well-being.

A.2. Forestry

In 2005, forests accounted for 30 percent of earth's total land area.⁷⁰ Forests are the most biodiversity-rich terrestrial ecosystems and provide a variety of habitats for plants, animals and micro-organisms. Forests are invaluable sources of timber, pulp and paper, rubber and environmental services; they also regulate the climate and represent a major carbon reservoir.

Deforestation, degradation and fragmentation threaten forest biodiversity. About 45 percent of the Earth's original forest cover has disappeared – most in the past century. Factors that degrade forests, aside from unsustainable forest management, include conversion to agricultural land, overgrazing, introduction of invasive alien plant and animal species, infrastructure development, mining and oil exploitation, anthropogenic forest fires, pollution and climate change.⁷¹ Natural disasters and invasive species cause severe damage in some regions. Deforestation in Australia is increasing because of droughts and forest fires. In western Canada, the mountain pine beetle has destroyed more than 11 million hectares of forest since the late 1990s.

⁶⁵ Biodiversity loss, nitrogen and phosphoric cycle, climate change, ocean acidification, stratospheric ozone depletion, chemical pollution, atmospheric aerosol loading, change in land use, global freshwater use
www.unep.org/yearbook/2010/PDF/year_book_2010.pdf p.13

⁶⁶ Ibid p.13

⁶⁷ www.iucn.org

⁶⁸ OECD, 2010, p.198.

⁶⁹ http://yaleglobal.yale.edu/content/devastation-beneath-seas?utm_source=newsletter1&utm_medium=email&utm_campaign=YGNewsletter

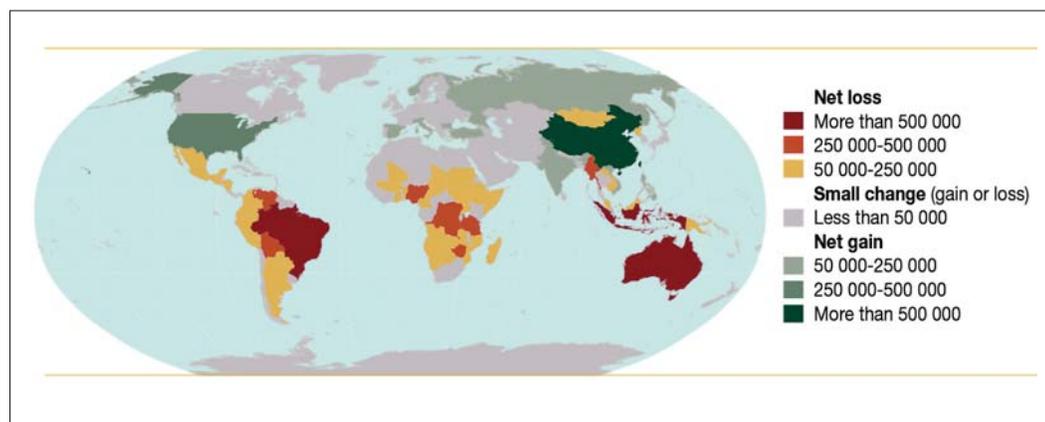
⁷⁰ www.oecd.org/document/20/0,3746,en_2649_37465_39676628_1_1_1_37465,00.html

⁷¹ www.cbd.int/forest/problem.html

The FAO has been monitoring the world's forests at five and ten-year intervals for the past 60 years. They recently released the Forests Resources Assessment Report 2010,⁷² which reported a positive trend in forest management: the slowing of the conversion of forests to other uses or lost to natural causes in the last decade from 16 million hectares per year in the 1990s to 13 million hectares per year in the last decade. The OECD anticipates this deforestation to cause a decrease in forest cover of 13 percent from 2005 to 2030, with the greatest rates in South Asia and Africa.⁷³

To avoid the destruction of forests, there has been an increase in the area of forest designated for conservation of biological diversity, now accounting for 12 percent of all forest area. Large-scale planting of trees and natural expansion of forests have reduced the net loss of forest area globally. Plantation forests, however, differ from natural forests in their degree of biodiversity (much less), soil structure, chemical composition and regional hydrological cycle, and can cause large water depletion in local basins.⁷⁴ Forests are becoming increasingly prominent in climate change negotiations as stakeholders recognize their importance in regulating the climate – especially in developing countries. Deforestation accounts for approximately 20 percent of anthropogenic GHG emissions.

FIGURE A3. Net Change in Forest Area by Country, 2005-2010 (ha/year)⁷⁵



⁷² www.fao.org/forestry/fra/en

⁷³ OECD, 2008.

⁷⁴ OECD, 2008.

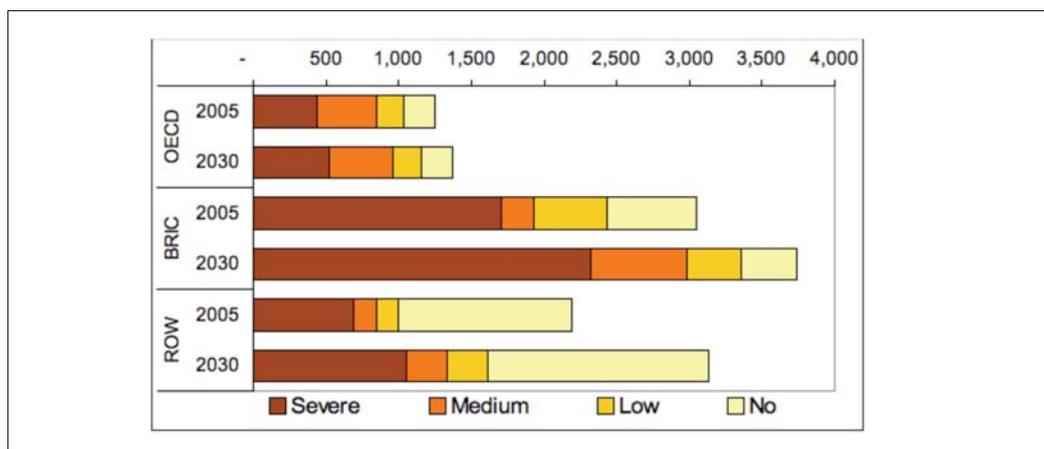
⁷⁵ Source: Global Forest Resource Assessment, Key Findings, <http://www.fao.org/forestry/fra/en/>

A.3. Water

Clean water is imperative for human well-being and healthy ecosystems. Fresh water is the most important resource on the planet. It is essential for drinking, food security for millions of the world's poor, climate regulation, flood mitigation, nutrient recycling, water purification and waste treatment.⁷⁶ Access to safe drinking water is a global public good. Several experts have typecast water as the “oil of the 21st century,” classifying it as “the most precious commodity.”⁷⁷ Fresh water is a scarce resource and a limiting factor for development.

Currently, 25 percent of people live in areas with insufficient water to support them and 44 percent of people live in areas of “high-stress.”⁷⁸ By 2030, in absolute numbers, there will be 3.9 billion people living in such conditions. The OECD predicts water scarcity will worsen due to unsustainable resource use and management as well as climate change. More than five billion people are expected to be without a connection to public sewerage in 2030 – 1.1 billion more than today.

FIGURE A4. People (millions) in Areas of Water Stress, by Level of Stress, 2005 and 2030⁷⁹



In OECD countries, the greatest demands for water come from irrigation, mainly for agriculture (43 percent), electrical cooling and industry (42 percent) and public water supply (15 percent).⁸⁰ In developing countries, the predominant demand is from agriculture. In Sub-Saharan Africa, even where water is available, the infrastructure needed for people to access it is absent or poorly maintained. In this regard, the problem is not necessarily water's availability but the ability to store, deliver and use it efficiently. The increasing pressures of climate change, population growth, urbanization and evolving energy needs are putting unprecedented pressure on our finite freshwater resources.⁸¹

⁷⁶ www.cbd.int/waters/importance

⁷⁷ An article in Fortune Magazine in May 2000 used this statement to indicate that water was the “precious commodity that determines the wealth of nations”. Cited in <http://www.investmentu.com/2010/March/the-water-industry-and-blue-gold.html>; and http://www.alive.com/4065a3a2.php?subject_bread_cramb=59

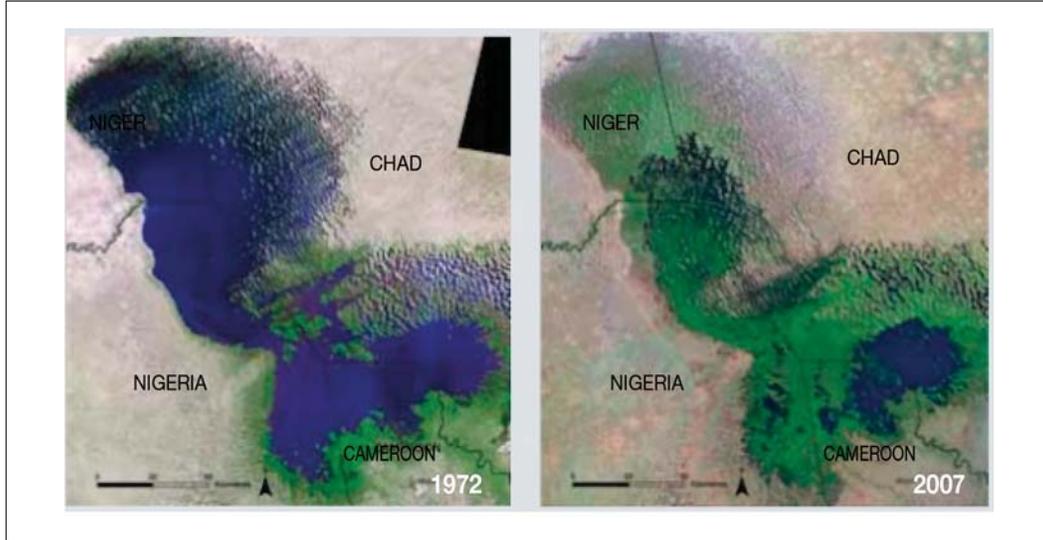
⁷⁸ State of the World Atlas 2009.

⁷⁹ Source: OECD Environmental Outlook to 2030 – OECD 2008 <http://dx.doi.org/10.1787/258506125571>

⁸⁰ OECD, 2008, p.221.

⁸¹ www.gwp.org/The-Challenge/The-Urgency-of-Water-Security/

FIGURE A5. Lake Chad Drainage Basin 1972 to 2005⁸²



As an example of the pressures put on these sources, the picture below, figure A5, depicts the impact over time (1972-2007) on Lake Chad. Less rainfall and increased water consumption by the area's inhabitants (20 million people from eight countries: Algeria, Cameroon, Central African Republic, Chad, Libyan Arab Jamahiriya, Niger, Nigeria and Sudan) have changed the water balance in the basin area. As a result of lower rainfall and greater water usage, the shallow lake's surface area decreased 95 percent from 1972 to 2005.⁸³

Scientists anticipate climate change will significantly affect the hydrological cycle.⁸⁴ A warmer climate will shift precipitation and evaporation patterns, aggravating water stress while extreme weather events will increase heat waves, droughts and flooding.

A.4. Air Pollution (Acid Rain)

Air pollution is a ubiquitous problem in cities around the world. Lead, ozone, carbon monoxide and volatile organic compounds are common pollutants. Three of the most dangerous types of air pollution, however, are sulfur dioxide, nitrogen oxides and particulate matter (PM).⁸⁵ PM is suspended in air and composed of a complex mix of solid and liquid particles of organic and inorganic substances including sulfates, nitrates, ammonia, sodium chloride, carbon, mineral dust and water.⁸⁶ Industrial processes, vehicle emissions, power plants, and the burning of fossil fuels are the main source of air pollution. Air pollution affects local and global air quality because PM can exist for several days (local impacts) to several weeks, allowing it to travel on air currents across continents. Other pollutants – methane, ozone, and carbon monoxide – are longer lasting, migrating long distances and affecting different parts of the environment.⁸⁷

⁸² Source: Atlas of Our Changing World. www.unep.org/yearbook/2010/PDF/year_book_2010.pdf

⁸³ www.unep.org/yearbook/2010/PDF/year_book_2010.pdf

⁸⁴ OECD, 2008.

⁸⁵ www.earthtrends.wri.org/updates/node/325

⁸⁶ Ibid.

⁸⁷ OECD Outlook 2030.

The health impacts of air pollution are projected to increase worldwide. The WHO states that air pollution is a major risk to health and estimated to cause two million premature deaths each year.⁸⁸ The serious risks to health are a result of exposure to PM and ozone.

Particles are identified by their diameter. Smaller particles are more dangerous to humans because of their ability to enter the body and affect gas exchange in the lungs. Effects of exposure to PM include: respiratory death in children less than a year old, increasing number of deaths from respiratory and cardiovascular diseases, and lung cancer.⁸⁹ Ground-level ozone is toxic to humans. It forms when sunlight reacts with pollutants from vehicle and industry emissions.⁹⁰ Ozone is one of the major components of smog, and the highest levels occur during sunny weather, causing breathing problems, asthma, reduced lung function and lung diseases.⁹¹

There is a global trend of urbanization. As cities expand, the growing population's energy and transport needs will create more emissions.⁹² The WHO estimates that more than half the burden from air pollution on human health is borne by people in developing countries. This is likely a result of indoor exposure to pollutants from traditional cooking methods and fuel combustion. The WHO set targets for the concentration in air of PM and in many cities, the annual average is more than three times the acceptable level.⁹³ In addition to health effects, air pollution has adverse impacts on vegetation and ecosystems.

Acid rain, precipitation with high levels of nitric and sulfuric acid, occurs naturally from decomposing vegetation and volcanoes but is mainly a result of human activity – heating homes, producing electricity, driving vehicles⁹⁴ – or activities that combust fossil fuels.⁹⁵ Nitrogen dioxide, sulphur dioxide (SO₂) and ammonia deposits acidify terrestrial and freshwater ecosystems, damaging lakes, streams, forests, plants and animals.

The buildup of excess nitrogen disturbs the function and structure of ecosystems and is thought to cause loss of biodiversity and excessive algae blooming on surface waters.⁹⁶ Acidic waters are toxic to crayfish, clams, fish and other aquatic animals. Acid rain also damages forests by disrupting trees' ability to absorb water and by bonding with other nutrients in the soil, making them unavailable for uptake.⁹⁷ Most developed countries have taken deliberate steps to reduce their emissions of SO₂, one of the key pollutants responsible for acid rain.⁹⁸ For example, from 1980 to 1999, eastern Canada cut its emissions of SO₂ by more than half.⁹⁹ Unfortunately, developing countries' standards on SO₂ emissions are not as strict as developed countries, and as such, acid rain will continue to be a problem, especially in Asia.

⁸⁸ www.who.int/mediacentre/factsheets/fs313/en/index.html

⁸⁹ OECD Outlook 2030.

⁹⁰ www.who.int/mediacentre/factsheets/fs313/en/index.html

⁹¹ Ibid.

⁹² OECD Outlook 2030.

⁹³ www.who.int/mediacentre/factsheets/fs313/en/index.html

⁹⁴ www.epa.gov/acidrain/what/index.html

⁹⁵ <http://environment.nationalgeographic.com/environment/global-warming/acid-rain-overview.html>

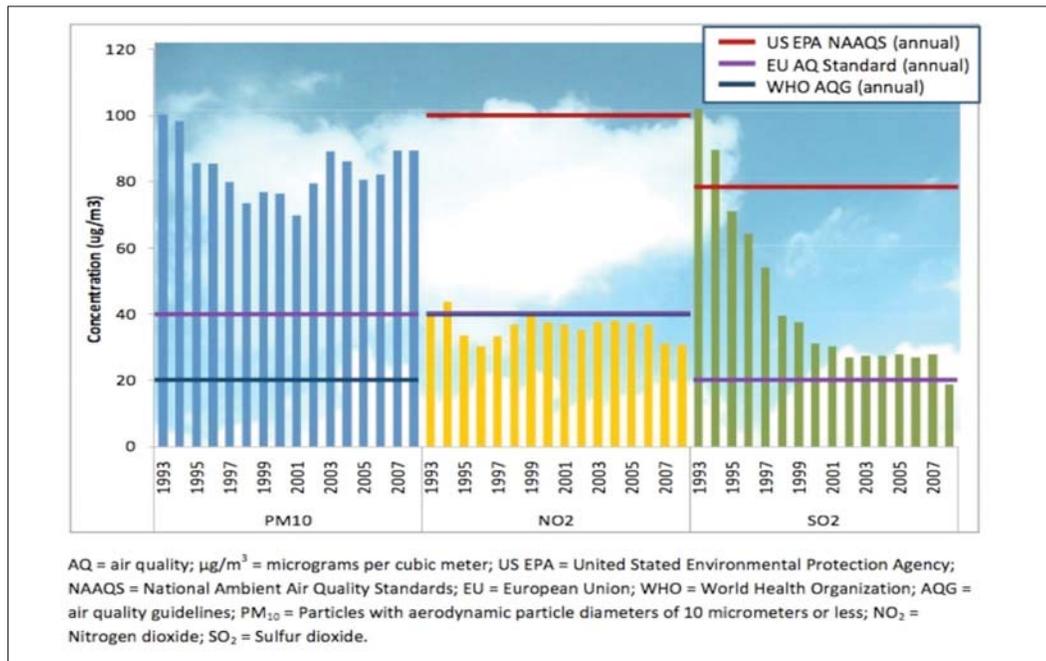
⁹⁶ OECD, 2008, p.181.

⁹⁷ Ibid.

⁹⁸ www.earthtrends.wri.org/text/climate-atmosphere/feature-27.html

⁹⁹ www.msc-smc.ec.gc.ca/cd/factsheets/acidrain/index_e.cfm

FIGURE A6. Annual Average Ambient Air Quality in Selected Asian Cities (1993-2008)¹⁰⁰



Successful policies and efforts in OECD countries have reduced air pollution and most of these countries have decoupled air pollution from economic growth. In non-OECD countries, however, particularly China and those in continental Asia, economic growth has not yet been decoupled from air pollution. Air pollution and emissions will continue to grow through 2030.¹⁰¹

A.5. Waste Management

Recent decades have seen unprecedented growth in population and economic well-being. Resource and material consumption have fed this growth and have had adverse environmental impacts. Resource extraction moves huge amounts of materials, creating huge amounts of waste and unused materials (from mining overburden, fisheries by catch and harvest losses), disrupting ecosystems or habitats and altering landscapes.¹⁰² A continuously growing demand for raw materials will be matched by a continuous rise in the amount of waste produced to fuel economic activity.

Hazardous waste is produced from manufacturing processes, chemical and petroleum industries and other industrial sectors. Examples of hazardous wastes include acids, alkalis, solvents, medical waste, resins, sludge and heavy metals. Hazardous wastes require special technology for their disposal because they are potentially dangerous to human health, terrestrial and aquatic ecosystems and the environment.¹⁰³ According to the best estimates available to OECD researchers, OECD countries alone generated approximately 115 million tonnes of hazardous waste in 1997 – 2.7 percent of total waste. In the 25 countries of the EU, hazardous waste increased between 1998 and 2002 by 13 percent.¹⁰⁴

¹⁰⁰ Source: Clean Air for Asian Cities (CAI-Asia) Center, 2010. Air Quality in Asia: Status and Trends – 2010 Edition. Pasig City, Philippines.

¹⁰¹ OECD, 2008, p.178.

¹⁰² Ibid, p.241.

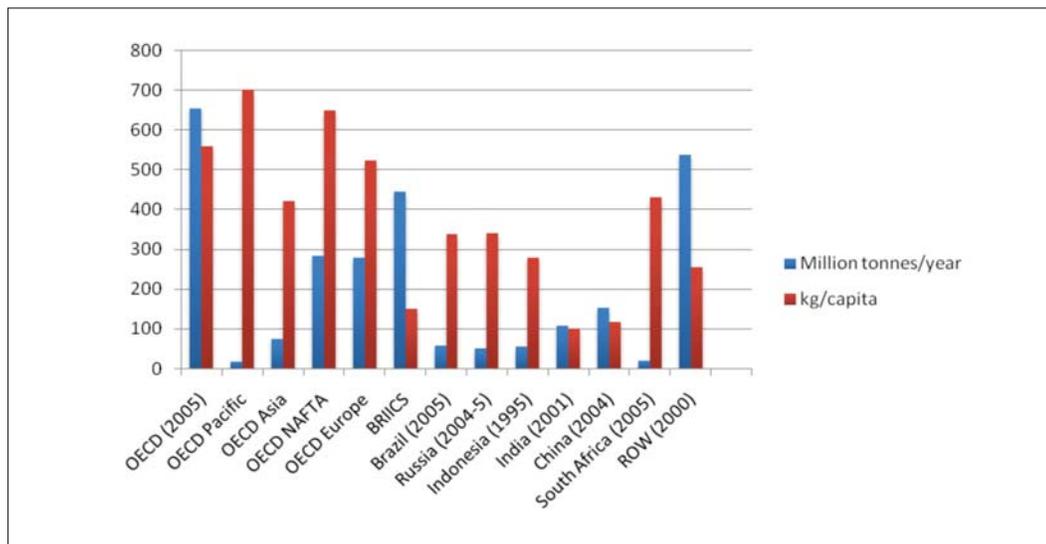
¹⁰³ <http://www.environmentalindicators.com/htdocs/indicators/12haza.htm>

¹⁰⁴ Ibid.

Although not traditionally considered hazardous waste, waste from end-of-life electric and electronic appliances is creating a challenge in both developed and developing countries. The world generates an estimated 20-50 million tonnes of “e-waste” every year and this is the fastest growing form of waste in the EU, totaling 6-7 million tonnes annually.¹⁰⁵ Since the late 1990s, OECD countries have managed to stabilize their generation of non-hazardous industrial waste as a result of recycling programs, pollution reduction measures and perhaps because of the economic downturn and outsourcing of waste-intensive industries to non-OECD countries. For all types of waste, the OECD projects global increases forward to 2030.¹⁰⁶

Figure A7, below, illustrates estimates of the millions of tonnes in recent years and the kilograms of municipal waste per capita. Note that in 2030, this situation will be dramatically changed with non-OECD countries expected to produce 70 percent of the world’s waste and the kilogram per capita per year in Brazil, Russia, India, Indonesia, China and South Africa (BRIICS) almost doubling to 270 kilograms per capita, still less than half of OECD countries.

FIGURE A7. Current Municipal Waste Generation in OECD, BRIICS, and the Rest of the World¹⁰⁷



A growing problem in international waste management is the transport of hazardous or problematic wastes to countries with lenient policies. Illegal shipments of end-of-life materials and products are estimated to account for approximately 50 percent of trans-boundary waste movements into and out of the EU area in 2004-2006.¹⁰⁸ The high cost of treatment or disposal in countries with stricter rules results in illegal shipping to countries with lax enforcement. Looking forward, waste will continue to be a problem, increasingly so in non-OECD countries. Like air pollution, there is a need to decouple municipal waste generation from economic growth so that countries can continue to grow but with a smaller impact on the environment.

¹⁰⁵ OECD, 2008, p.243.

¹⁰⁶ Ibid, p.238.

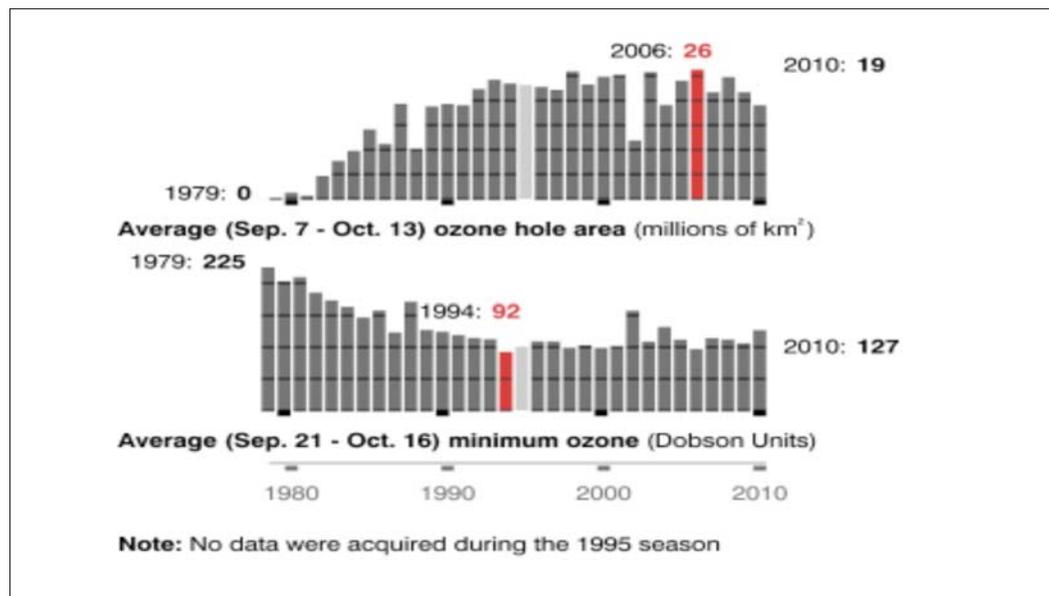
¹⁰⁷ Source: data at <http://dx.doi.org/10.1787/257332441322>

¹⁰⁸ Ibid.

A.6. Ozone Layer Depletion

Ozone naturally occurs in the upper layers of the atmosphere as a result of oxygen reacting with sunlight. This layer forms a protective barrier around the Earth absorbing about 97-99 percent of potentially harmful ultraviolet rays from the sun.¹⁰⁹ The ozone layer is beneficial – unlike ground-level ozone (as discussed above) – because it prevents eye, skin and genetic damage. In recent history, the ozone layer has been threatened. According to NASA, “Each year for the past few decades during the Southern Hemisphere spring, chemical reactions involving chlorine and bromine cause ozone in the southern polar region to be destroyed. This depleted region is known as the ‘ozone hole.’”¹¹⁰

FIGURE A8. Annual Record of Ozone Hole Area Since 1979¹¹¹



The ozone hole was first reported in 1974 and was linked to the use of chlorofluorocarbons (CFCs), released mainly from aerosol containers. Although the size of the hole fluctuates seasonally and annually, the hole in the ozone layer has actually been shrinking since it reached its largest size (in area) in September 2006.¹¹² See figure A8 above. Factors that affect ozone layer concentrations are: stratospheric sulphate aerosols (from large volcanic explosions), stratospheric winds, GHGs (to the degree that they heat the planet and affect the stratospheric winds), the sunspot cycle and stratospheric chlorine.¹¹³

¹⁰⁹ <http://www.nas.nasa.gov/About/Education/Ozone/ozonelayer.html>

¹¹⁰ <http://www.nas.nasa.gov/About/Education/Ozone/ozone.html>

¹¹¹ Source: <http://ozonewatch.gsfc.nasa.gov/>

¹¹² <http://ozonewatch.gsfc.nasa.gov/>

¹¹³ For more details on these factors see: <http://www.nas.nasa.gov/About/Education/Ozone/ozonelayer.html>

The Montreal Protocol was the international resolution tasked with managing the problem of ozone depletion.¹¹⁴ The Protocol was highly successful in reducing ozone depleting substances in part because a readily available and easily substituted alternative for CFCs, the main culprit, had been developed. Once DuPont, the industry leader and major producer of CFC-containing substances had this alternative, they cooperated with the Protocol's objectives. A stringent worldwide CFC phase-out schedule was signed by over 100 nations representing 95 percent of the world's current CFC consumption in 1992.¹¹⁵ Efforts of industry, government, and public interest groups motivated by improvements in scientific understanding, technical capability, and a willingness to overcome social and economic barriers resulted in phase-outs and reductions progressing faster than expected.¹¹⁶

A.7. Oceans

The ocean covers approximately 70 percent of the Earth's surface and provides habitat for almost 50 percent of all living species.¹¹⁷ Ocean currents are instrumental in regulating the global climate by transferring heat from the tropics to the polar regions and are home to abundant marine life, providing livelihoods for people from all corners of the world while serving as vital arteries for global trade and transport. The Nature Conservancy estimates that oceans provide more than \$20 trillion annually in ecological goods and services, including food, medicines and protection from storms.¹¹⁸

The ocean absorbs approximately 25 percent of the CO₂ emitted from anthropological sources annually. Since the industrial revolution, it has absorbed about 50 percent of CO₂ emitted – greatly mitigating the impacts of human activity and slowing the climate change these emissions would have instigated if they had remained in the air.¹¹⁹ But relatively new research is finding that the introduction of massive amounts of CO₂ into the seas is altering water chemistry and affecting the life cycles of many marine organisms, particularly those at the lower end of the food chain. The recent increase is 100 times faster than any change in acidity levels experienced by marine organisms for at least the last 20 million years.¹²⁰

¹¹⁴ <http://www.nas.nasa.gov/About/Education/Ozone/history.html#government>

¹¹⁵ <http://www.nas.nasa.gov/About/Education/Ozone/history.html>

¹¹⁶ Philippe G. Le Prestre et al., "The Montreal Regime : A New Model for International Cooperation on Global Environmental Issues?," in *Protecting the Ozone Layer: Lessons, Models and Prospects*, eds. Philippe Le Prestre, John D. Reid and E. Thomas Morehouse. (1998). See also Edward Parson's chapter, "The Montreal Protocol: The First Adaptive Global Environmental Regime," in same volume.

¹¹⁷ <http://www.noaa.gov/ocean.html>

¹¹⁸ www.nature.org/initiatives/marine/features/art21692.html

¹¹⁹ <http://www.ocean-acidification.net/OAdocs/SPM-hirez2b.pdf> and <http://ocean.nationalgeographic.com/ocean/critical-issues-ocean-acidification/>

¹²⁰ Ibid.

Recent changes to historically stable ocean acidity levels (measured in surface pH) could have devastating global effects.¹²¹ Ocean acidification occurs when carbonic acid is produced during CO₂ absorption by seawater. Ocean acidification is a direct result of CO₂ emissions, not climate change.¹²² The phenomenon is causing seawater to become toxic to shells and skeletons of numerous marine organisms and affecting the reproduction and physiology of some marine life. Scientists at the second symposium on the “Ocean in a High CO₂ World” concluded that in a few decades, “the chemistry of the tropical oceans will not sustain coral reef growth while large parts of the polar oceans will become corrosive to calcareous marine organisms [e.g., coral].”¹²³

Another issue threatening oceans, in addition to acidification, is the creation of “dead zones.” “Dead zones” are areas where the bottom water is depleted of oxygen (anoxic) or where dissolved oxygen levels are very low. One factor contributing to “dead zones” is phytoplankton. Phytoplankton (algae) blooms produce organic matter at the surface of the ocean. This organic matter sinks to the bottom and is broken down by bacteria, which absorb oxygen and give off carbon dioxide in the process (bacteria respiration).¹²⁴ Like so many processes on earth, a phytoplankton bloom is a natural biological cycle that has been accelerated by human activity as a result of an increase in nutrients such as phosphorous and nitrogen from agricultural fertilizers and sewage.¹²⁵ Enhanced phytoplankton activity increases organic matter production, which increases bacteria respiration and depletes oxygen. Additionally, overfishing of species near the top of the phytoplankton food chain interferes with their natural production levels. These blooms have recently mushroomed at an alarming rate¹²⁶ causing the dead zones to spread over larger areas of the sea floor.

Another factor contributing to “dead zones” is the restriction of natural water flow. This prevents the water with normal dissolved oxygen concentrations from mixing with anoxic water and refreshing the oxygen supply.¹²⁷ Mouths of major river systems are areas where increasing bottom water anoxia has recently been observed. The Mississippi River delta and the Pearl River mouth in China both experience high levels of sediment and have been affected by large flooding, causing a heavy load of nutrients (dead animals, animal waste and fertilizer) to be washed into the sea, resulting in lower oxygen levels. Islands and narrow channels restrict the Baltic Sea’s water flow; this augments the level of nutrients facilitating phytoplankton blooms and results in bottom water anoxia.¹²⁸

¹²¹ <http://ocean.nationalgeographic.com/ocean/critical-issues-ocean-acidification/>

¹²² <http://www.ocean-acidification.net/OAdocs/SPM-hirez2b.pdf>

¹²³ Ibid.

¹²⁴ http://disc.sci.gsfc.nasa.gov/oceancolor/additional/science-focus/ocean-color/science_focus.shtml/dead_zones.shtml

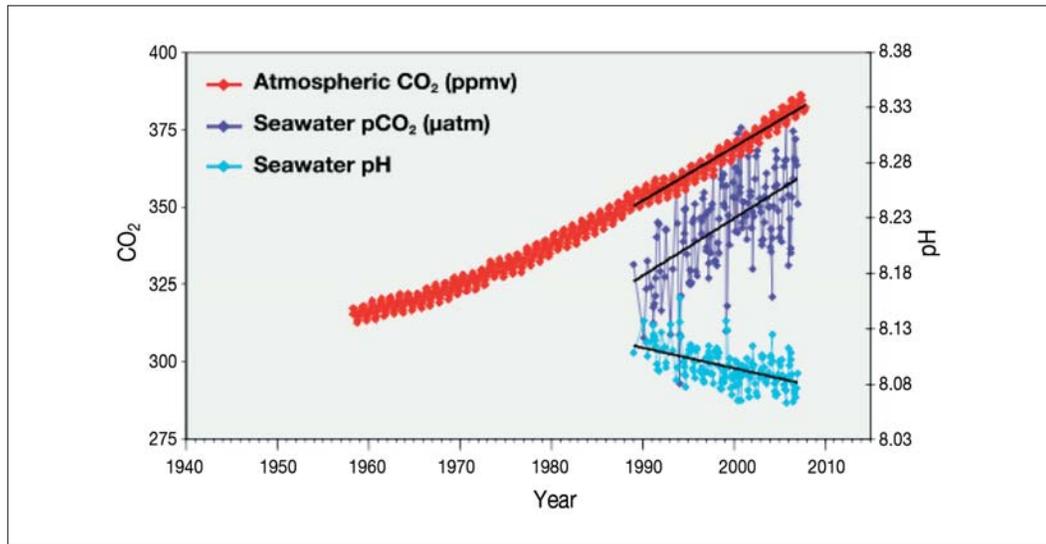
¹²⁵ <http://news.nationalgeographic.com/news/2010/02/100305-baltic-sea-algae-dead-zones-water/>

¹²⁶ Ibid.

¹²⁷ http://disc.sci.gsfc.nasa.gov/oceancolor/additional/science-focus/ocean-color/science_focus.shtml/dead_zones.shtml

¹²⁸ Ibid. and <http://news.nationalgeographic.com/news/2010/02/100305-baltic-sea-algae-dead-zones-water/>

FIGURE A9. CO₂ and pH Time Series in North Pacific Ocean¹²⁹



A.8. Fisheries

Global overfishing is the quintessential example of the tragedy of the global commons. The FAO estimates that over 70 percent of fish species are either fully exploited or depleted. Fishermen have caught close to 90 percent of all large predatory fish. The causes of gross unsustainability in fisheries include the presence of illegal, unreported and unregulated (IUU) fishing, excess capacity, inappropriate subsidies, poor domestic governance at the national level and poor management. The Law of the Sea Convention does not deliver effective management. We have not had the necessary political leadership needed to carry internationally agreed targets and declarations into effect. Key states do not participate in existing multilateral instruments and there is inadequate implementation at the regional level. Subsidies have created excess fishing capacity, estimated at 250 percent more than is needed to catch the oceans' sustainable production.¹³⁰

The international community's efforts to address the problems of international fisheries governance include a range of hard and soft law instruments. These take the form of legally binding global treaties like the 1995 United Nations Agreement for the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks¹³¹ (UNFSA), non-binding declarations (the Declaration of Cancun, the Reykjavik Declaration, the Rome Ministerial Declaration to name a few) and resolutions by the FAO Conference and the United Nations General Assembly. The most comprehensive non-binding instrument that has been adopted is the FAO Code of Conduct for Responsible Fisheries (CCRF). The end result is a patchwork quilt of measures in the form of binding and non-binding instruments with differing geographical and legal reach and different levels of participation by States.

¹²⁹ Source: Doney, S. C., V. J. Fabry, R. A. Feely, and J. Kleypas. 2009. Ocean Acidification: The Other CO₂ Problem. Annual Review of Marine Sciences 1 :169-192. from <http://www.nrdc.org/oceans/acidification/figures.asp>

¹³⁰ <http://www.unep.org/Documents.Multilingual/Default.asp?l=en&ArticleID=5688&DocumentID=519>
See also <http://www.unep.ch/etu/etp/acts/manpols/fishery.pdf>

¹³¹ Argentina, China, Indonesia, Mexico and Turkey are not parties to the UNFSA.

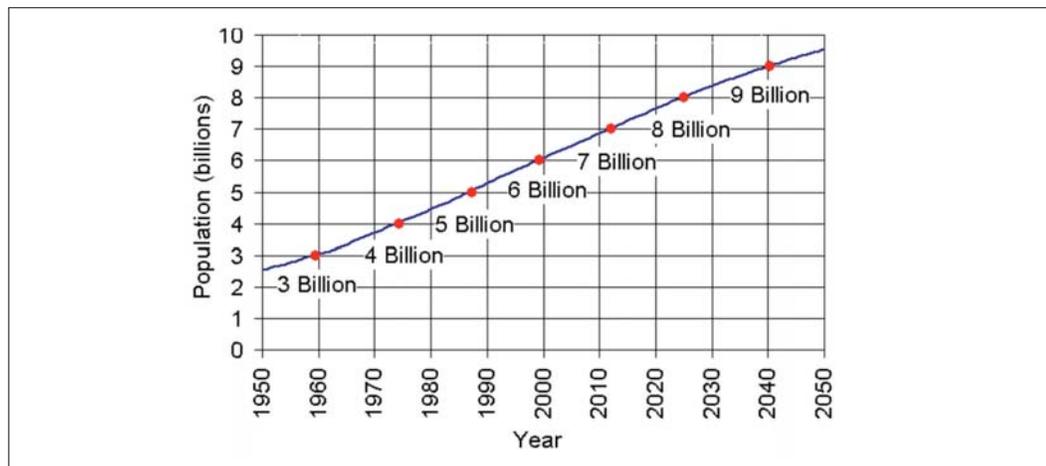
The UN Convention on the Law of the Sea, the FAO's International Plan of Action and Compliance Agreement, the High Seas Task Force¹³² and a patchwork of Regional Fishery Bodies are all ineffective.

Recent initiatives include the 2009 treaty on port measures to prevent IUU fishing and UNEP's Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities.¹³³ A useful initiative is the Busan agreement for an Intergovernmental Science Policy Platform on Biodiversity and Ecosystem Services (IPBES), an independent platform mirroring the IPCC.¹³⁴ Further action is required.

A.9. Population Growth

The most serious challenge to environmental sustainability is population growth. Consider the biological capacity available per person for the more than 6 billion people on earth. "There were 13.4 billion hectares of biologically productive land and water on this planet in 2005. Dividing by the 6.5 billion people alive in that year, gives 2.1 global hectares per person. This assumes that no land is set aside for other species that consume the same biological material as humans."¹³⁵ In North America, we are consuming at four times that rate – it takes about 8 hectares per capita to support our lifestyle. The forecast increase in world population¹³⁶ is not consistent with a world consuming at North American levels and the future prospects for many appear to be life that is nasty and brutish, if not short.

FIGURE A10. World Population 1950-2050¹³⁷



¹³² Fisheries ministers from Australia, Canada, Chile, Namibia, New Zealand and the UK, together with the Earth Institute, IUCN-World Conservation Union, WWF International and the Marine Stewardship Council joined together in 2003 to launch the Task Force combat IUU fishing on the high seas. The goal of the Task Force is to set priorities among a series of practical proposals for confronting the challenge of IUU fishing on the high seas.

¹³³ The United Nations Environment Programme's intergovernmental programme addressing the links between freshwater and coastal environments adopted by 108 governments. <http://www.supergreenme.com/go-green-environment-eco:Overfishing>

¹³⁴ <http://www.ipbes.net/home/64-the-g8-supports-the-establishment-of-an-ipbes.html?139181e9463c94a418d97a0a0634b1b9=7d15ade24789c5f1a1fe11049113885f>

¹³⁵ <http://www.footprintnetwork.org/en/index.php/GFN/page/glossary/>

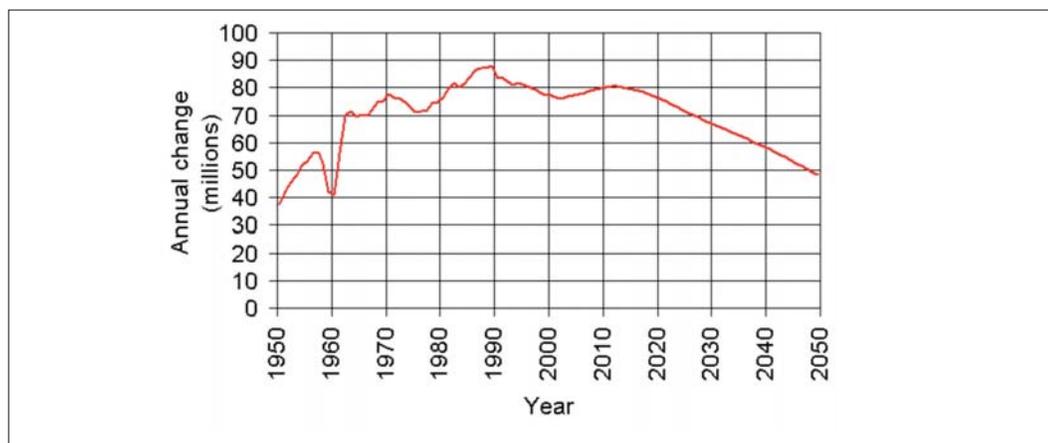
¹³⁶ <http://www.census.gov/ipc/www/idb/worldpopgraph.html>

¹³⁷ Source: US Census Bureau, International Data Base, December 2008 Update. See Hans Rosling's www.gapminder.org for animated graphs on global population and population change.

Another way to look at population growth is to consider annual changes in world population. The annual increase in world population peaked at about 88 million in the late 1980s. The peak occurred then, even though annual growth rates began decreasing in the late 1960s, because the world population was higher in the 1980s than in the 1960s. The consequence is that for the next several decades, we face an inexorable increase in world population and the accompanying challenge to the earth's carrying capacity.

To a large extent, the slowdown in the growth of population is due to China's one-child policy. India¹³⁸ and Bangladesh have also made strides. Bangladesh is improving; its total fertility rates fell from 3.17 in 2003 to 2.65 in 2010.¹³⁹ Given that the replacement rate is 2.0, there is still a way to go.

FIGURE A11. Annual World Population Change 1950-2050¹⁴⁰



¹³⁸“Wait two years before getting pregnant and the Indian government will pay for a ‘honeymoon package,’ 5,000 rupees, or about \$106, if the couple waited to have children. ‘An educated girl is your best contraception aid,’” said Dr. Amarjit Singh, executive director of the National Population Stabilization Fund, a quasi-governmental advisory agency.” http://www.nytimes.com/2010/08/22/world/asia/22india.html?_r=1

¹³⁹http://www.indexmundi.com/bangladesh/total_fertility_rate.html

¹⁴⁰Source: US Census Bureau. Ibid

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