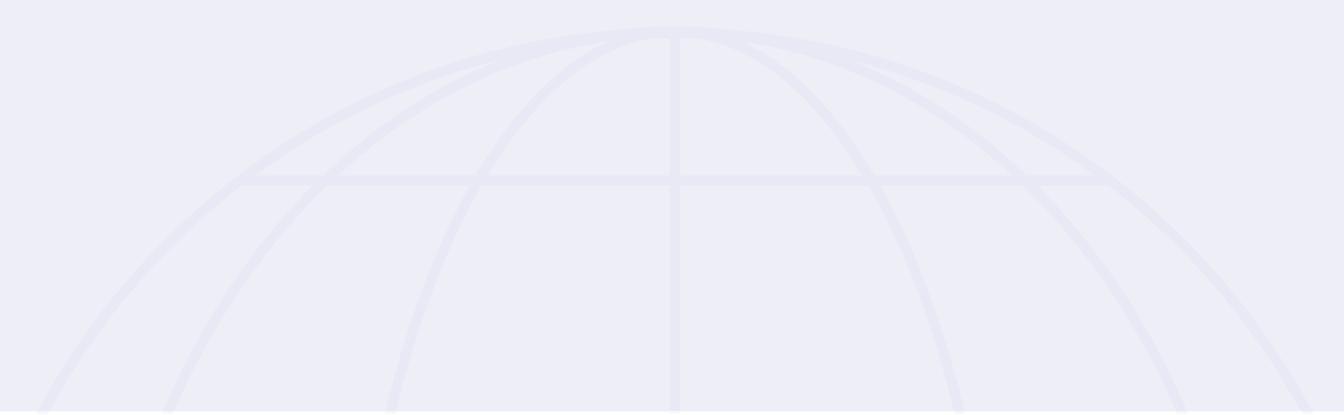


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The Road to 2050

Sustainable Development
for the 21st Century



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Sustainable Development
for the 21st Century



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FOREWORD



Long-term thinking produces better short-term decisions. By envisioning the world of 2050 we can pinpoint the critical choices that will need to be made now if our vision of a wealthier, more equitable, more sustainable world is to be achieved.

We see several dimensions to the challenge. The first is achieving better management of natural resources—this is a particular concern in low income countries, which are highly dependent on these resources. Stronger governance is an essential ingredient, cutting across all development domains. Social development is key—cohesive, inclusive, accountable institutions build stronger societies and minimize social conflict. Feeding 9 billion people while reducing pressures on other natural resources will require a major boost to agricultural productivity and competitiveness. Climate change will pose additional risks in all these domains—environmental, social, agricultural—and will require major changes in global governance.

Looking forward, we see a growing need for global issues management. Whether the issue is climate change, emerging infectious diseases, failed states or loss of biodiversity, it is clear there is a growing list of problems that do not stop at national borders. International institutions such as the World Bank need to bridge the gap between global priorities and national and local perspectives—they are mutually dependent.

Our optimistic vision of 2050 is achievable, but only if governments, civil society, business, and the development community work together, building action-oriented coalitions that can make a real difference. We look forward to the journey.

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Environmentally and Socially Sustainable Development
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The Vision

SECTION 1

A Wealthier More Equitable World by 2050

A long-term perspective on development offers some grounds for optimism. While gross domestic product (GDP) growth has been uneven across countries and over decades, developing countries have enjoyed significant growth in life expectancy and levels of education since 1960. If GDP growth in developing countries can return to the rates of the 1960s and 1970s, then we can foresee a significantly changed world by 2050—a world at once more wealthy and more equitable.

Aiming for this involves both creating opportunities and overcoming constraints. For the environment and natural resources, there are clear risks tied to growth. But there are also unexploited opportunities to transform natural capital into produced, human, and social capital. Governance is a major constraint on development today, and rectifying this will require both institutional reforms and the mobilization of civil society. Development must encompass the goals of cohesion, inclusion, and accountability if social

well-being is to rise and conflicts are to be avoided. New agricultural technologies must fill an impending gap between population growth and food supply—other sectors, including energy and water supply, face similar challenges. Further movement is required on the “aid and trade” agenda. And climate change risks must be reduced through mitigation and adaptation.

Consider a vision of the world of 2050. The United Nations medium population projection suggests that world population could be 9 billion, up from 6 billion today (Figure 1.1). Almost all that increase will show up in the cit-

ies and towns of developing countries. With 2 percent growth of per capita GDP in rich countries (the average over the past 20 years) and 3.3 percent in low- and middle-income countries (an optimistic figure, representing the growth experienced in the 1960s and 1970s), world income would be more than \$135 trillion, up from \$35 trillion today. With these growth rates, 40 percent of world income in 2050 would be earned in low- and middle-income countries—twice their share today (Figure 1.2).

If per capita incomes in low- and middle-income countries do rise at 3.3 percent a year, the average income in these countries would be \$6,300 by 2050. Basic human needs for shelter, food, and clothing could be more than met. And people would be healthier and more skilled. Even pessimistic estimates place life expectancy in 2050 in today’s low- and middle-income countries at 72 years (up from 64 today) and under-five mortality at 17 per 1,000 live births (down from 85 per 1,000 today). Adult illiteracy rates could be less than 5 percent, a fifth of today’s 25 percent.

In 2050, more than 65 percent of the population will live in urban areas. Unless current trends are reversed, the number of slum dwellers lacking tenure security and access to services—currently estimated at 934 million—will double to 2 billion. If city dwellers are to enjoy healthy and productive lives, their need for infrastructure, housing, and social services will have to be met. But this demand also presents a great opportunity. Because most of these infrastructure and housing investments have yet to be made, they could be de-

Figure 1.1 Historical and projected population

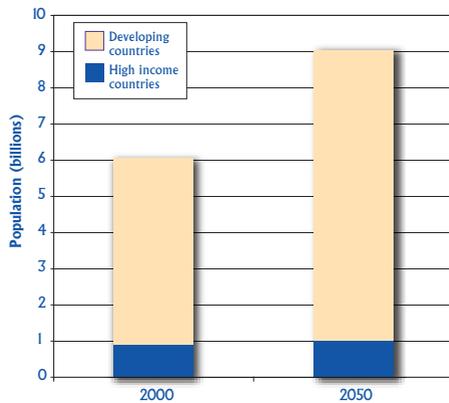
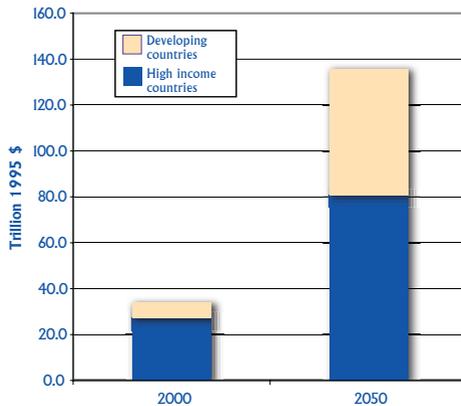


Figure 1.2 Historical and projected GDP



signed to contribute to environmentally sustainable urban environments.

The nature of growth in the rich world is also an issue. Today, 80 percent of global GDP goes to only 20 percent of the world's people. Consumption patterns for energy, water, food, manufactured goods, and services are highly skewed and will remain so for the near future. Are those patterns sustainable? Probably not, for as incomes in developing countries grow, consumption will increase to meet people's expectations.

A world with \$135 trillion in GDP simply cannot rely on current production and consumption patterns. If subsidies, mispricing, and inadequate taxation of environmentally damaging products continue to provide the wrong incentives for consumers and producers in the rich world, and if the developing world emulates the consumption patterns in rich countries, we can expect great damage to the environment and its ability to sustain growth. A major transformation, starting in the rich world, will be needed to decouple growth and environmental impacts and to radically change the composition of the world's output toward high-input efficiency and environmental responsibility. Future patterns of consumption and production must become a part of the global public policy dialogue.

This paper considers the challenges we will face if this optimistic outcome is to be achieved. What are the possible consequences of a much larger scale of human activity? Thinking about the long term can pinpoint some of the critical decisions that must be taken

soon to prevent undesirable outcomes much later.

THE WORLD IN 2050

At the assumed growth rates, the total GDP of developing countries in 2050 will be twice that of industrial countries today. This change raises some stark questions: How resource-intensive will these economies be? How energy- and carbon-intensive? How pollution-intensive?

We can draw some tentative conclusions by looking across industrial and developing countries today. Economies restructure as they grow, with most growth occurring in service sectors, which are less harmful to the environment. Services could constitute 60 percent of GDP in developing countries in 2050, but that figure would still be 10 percentage points lower than in industrial countries today. It is therefore possible that primary and industrial sectors will have a significant weight in the economies of developing countries.

Higher incomes will almost certainly reduce pressure on local biomass as an energy source. But the energy substituted may be carbon-intensive; historically, each 1 percent increase in GDP has led to a 1 percent increase in carbon dioxide (CO₂) emissions. Technical progress and structural change can make a difference, however. From 1980 to 1996, the average CO₂ emitted per dollar of world GDP fell by 12.5 percent.

If present trends continue, the world of 2050 will also be much less biologically diverse. Part of the challenge is to reduce the number of poor communities dependent on fragile ecosystems. Particularly important is finding the financing to preserve biodiversity, both through protective expenditures and through compensation to communities that may have to restrict their exploitation of natural areas for the benefit of their countries and the world as a whole. Ecotourism can help pay for preservation, as can new approaches such as systems of payments for environmental services.

Many decisions in the near term will have long-term consequences. Much of the infrastructure built in the next 20 years will still be with us in 2050. Perhaps more important, some choices are irreversible or can be reversed only with great difficulty. Species loss is an often-cited example of this. Carbon dioxide, once emitted, has an atmospheric adjustment time of more than 100 years. Climate change will reduce the quantity and quality of water in most arid and semiarid regions in addition to increasing the frequency of floods and droughts worldwide. With almost any degree of warming, climate change will decrease agricultural productivity throughout the tropics and subtropics, it will increase the incidence of vector- and waterborne diseases and heat stress mortality, it will make hydropower less reliable in some regions, and it will adversely affect biodiversity at the species and ecosystem levels.

Incomes and pressures on the global environment are now distributed very unequally and therefore need global so-

lutions. Poor countries suffer four times the incidence of environmental disease found in rich countries. Dealing with indoor air pollution and hygienic practices could have a major effect on the global burden of disease. Poor people have little voice in the decisions that affect them. Poor households depend on the quality of local natural resources for their livelihood. Poor countries and poor households are inordinately at risk from natural disasters. Small island states, South Asian countries, and Sub-Saharan Africa are all particularly vulnerable to global climate change, which is aggravated by consumption patterns in rich countries.

Meeting the targets of the Millennium Development Goals (MDGs) for 2015 is an essential step on the road to a prosperous and sustainable world and potentially the basis for a virtuous cycle of growth and human development in poor nations. Faster growth is the key to meeting the targets, and the payoffs will be great. Faster growth means less extreme poverty, less child malnutrition, and faster progress on many of the other MDGs. But the benefits of that growth must be widely spread, and it must be environmentally and socially responsible.

What will it take for such steady gains in income to materialize? Macroeconomic stability will need to be sustained. Massive infrastructure will have to be financed and built, with investment expenditures in developing countries rising from today's \$200 billion a year to nearly \$1.5 trillion in 2050. And technological progress will be required across a whole range of sectors.

THE CHALLENGES AHEAD

Growing to a world economy of \$135 trillion poses enormous risks to the natural environment, and the risks are greatest in developing countries. Investment decisions in the near future must factor in those risks and provide some insurance against undesirable surprises. Some of the most difficult issues will involve trade-offs between preserving natural systems and pressing forward with development. Truly global issues will require collective action on an unprecedented scale.

Sustained growth is the key to realizing a world without poverty by mid-century. What will fuel this growth, and what will support it? For all countries, investments in human capital, including health, will be essential. But this growth and development depend, in turn, on critical inputs, particularly water and energy. Supplying energy, water, and sanitation, not to mention transport and communications, will require major infrastructure investments. It is increasingly clear that investments in electricity, water supply, and sanitation underpin not only growth in incomes but growth in healthfulness and reductions in mortality as well, particularly for children under the age of five.

With rising incomes and population growth, the demand for food could double by 2050. Higher incomes will shift the pattern of demand toward higher-protein foods, with consequences for fisheries, aquaculture, and livestock husbandry. Sustaining agriculture will require close attention to land and water degradation, nutrient manage-

ment, integrated pest management, conservation, and the institutions that can engender better practice. Adapting to climate change is another key priority. New agricultural technologies will drive this growth, but technology alone cannot do the job. Agricultural growth also requires better markets, better infrastructure (especially rural roads), better rural financial services, and better policies, phasing out the ones that discriminate heavily against agriculture.

Acting now also means making progress on the “aid and trade” agenda. Development assistance, partnered with good governance in recipient countries, can be a powerful engine for growth. But research suggests that the benefits from expanding trade by reducing the trade barriers faced by developing countries could dwarf development assistance. By 2015, annual income gains from expanded trade could equal \$350 billion in developing countries (compared with current aid flows of roughly \$50 billion), while increasing incomes in rich countries by \$170 billion.

These factors—human capital, energy, infrastructure, agricultural productivity, aid and trade—will clearly be essential underpinnings for achieving a wealthier, more equitable world by 2050. In what follows we discuss the cross-cutting issues that are key to making this vision a reality:

- **What is the role of natural resources in development?** Section 2 depicts the composition of the wealth of nations and draws conclusions on sustainability.

- **How important is governance for development?** Section 3 presents the evidence on governance reforms and creating the demand for better governance.
- **How do we build cohesion, inclusion, and accountability within developing societies?** Section 4 builds the case for socially sustainable development.
- **How will we feed a world of 9 billion people?** Section 5 presents the challenges inherent in boosting agricultural productivity and competitiveness.
- **How do we buffer the poor against the worst effects of climate change?**

Section 6 looks at the impending challenges in mitigating greenhouse gas emissions and adapting to climate change.

- **Can we bridge the gap from local to global?** Section 7 summarizes the challenges we foresee—in natural resource management, governance, social development, food and agriculture, and climate change—and makes the case for global issues management to deal with the expanding array of development issues that are truly global in scope.



The Challenges

SECTION 2

Managing Natural Wealth Sustainably

Can poverty reduction be sustained? The end of the twentieth century saw a renewed commitment to ending poverty, as embodied in the Millennium Development Goals. However, deep concerns remained that current rates of depletion and degradation of natural resources may undermine any progress to date. Achieving sustainable outcomes will require sustaining the total wealth—produced, human, institutional, and natural—on which development depends.

The exploitation of commercial natural resources in the form of minerals, energy, farmland, forests, and fish stocks can contribute to development. However, it is important to understand the indirect role played by many other natural resources in the development process. These roles include biodiversity conservation, nonextractive uses (such as ecotourism), and the regulatory and cultural services provided by forests and other natural assets. As the Millennium Ecosystem Assessment documented, protecting and enhancing

the environmental services provided by natural resources is a key challenge, particularly in developing countries.

Natural resources are special economic goods because they are not produced. As a consequence, they will yield economic profits—rents—if properly managed. These rents can be an important source of development finance, and countries like Botswana and Malaysia have successfully leveraged natural resources to bolster growth.

There are no sustainable diamond mines, but there are sustainable diamond-mining countries. Implicit in this statement is the assumption that it is possible to transform one form of wealth—diamonds in the ground—into other forms of wealth, such as buildings, machines, and human capital. Achieving this transformation requires a set of institutions capable of managing the natural resource, collecting resource rents, and directing these rents into profitable investments. Resource policy, fiscal policy, political factors, institutions, and governance structure all have roles to play in this transformation.

Exhaustible resources, once discovered, can only be depleted. Consuming rents from exhaustible resources is therefore literally consuming capital, which motivates a well-known policy rule for sustaining development: invest resource rents in other forms of capital.

Living resources are unique because they are a potentially sustainable source

of resource rents—truly a gift of nature. Sustainable management of these resources will be the optimal policy, but the question of the optimal stock size is complex.

Land resources are potentially sustainable if managed well. Land is particularly important in the poorest countries because it is a direct source of livelihood and sustenance for many poor households.

Natural resources play three basic roles in development:

- The first role, mostly applicable to the poorest countries and poorest communities, is that of local natural resources as the basis of subsistence.
- The second role is as a source of development finance. Commercial natural resources can be important sources of profit and foreign exchange. Rents on exhaustible, renewable, and potentially sustainable resources can be used to finance investments in other forms of wealth. In the case of exhaustible resources, these rents must be invested if total wealth is not to decline.
- The third role is as the source of environmental services—watershed protection and pollination, for example—that underpin many other economic assets. The value of agricultural land is closely tied to the value of the environmental services supporting its productivity.

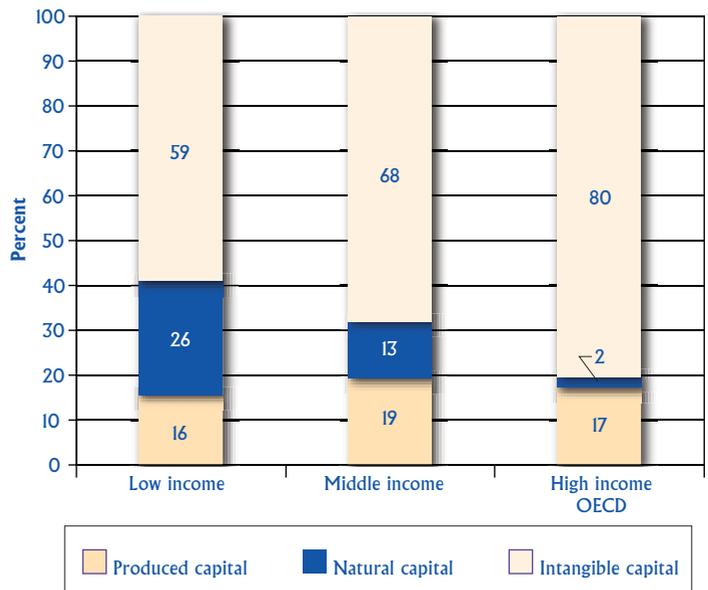
EVIDENCE ON THE IMPORTANCE OF NATURAL RESOURCES

Figure 2.1 provides summary information on the shares of natural resources in the total wealth of industrial and developing countries. A high share of natural wealth does not automatically imply that natural resources are important for growth, but it does at a minimum imply that these resources are important for current well-being.

Figure 2.1 classifies the total wealth of nations into three broad components across low-, middle-, and high-income countries. Produced capital is the familiar blend of buildings, machines, and infrastructure that is measured in standard national accounts. Natural capital is the value of agricultural land, forests, and subsoil resources such as minerals and energy. Intangible capital is the value of everything else—human capital, social capital, and the quality of institutions and governance. The underlying estimates of total wealth per capita are nearly \$440,000 in high-income countries, nearly \$28,000 in middle-income countries, and less than \$8,000 in low-income countries.

Intangible capital is by far the largest share of total wealth in all countries. For the poorest countries, however, natural capital is a larger share of total wealth than produced capital. This suggests that properly managing natural resources must be a key part of development strategies, particularly since the

Figure 2.1 Shares of wealth by income group, 2000



Source: *Where is the Wealth of Nations?* World Bank 2006. Oil states excluded.

poorest households in these countries are usually the ones that depend on these resources the most.

This analysis also shows how the share of natural resources in total wealth declines as incomes rise. This does not mean they are unimportant or that they can be exploited indiscriminately—food, fiber, minerals, and energy are essential for economic activity and well-being. Rather, this demonstrates how intangible assets become proportionately much more important as countries develop, with the productivity of people increasing along with the quality of their institutions. In fact, the value of natural capital per person actually rises with income, from roughly \$2,000 per capita in low-income countries to nearly \$9,000 in high-income countries.

From a development perspective, a key message of Figure 2.1 is that natural resources make up a significant share of the total wealth in low-income countries—25 percent—and that this is substantially larger than the share of produced capital. Sound management of these natural resources can support and sustain the welfare of poor countries and of poor people in those countries as they move up the development ladder.

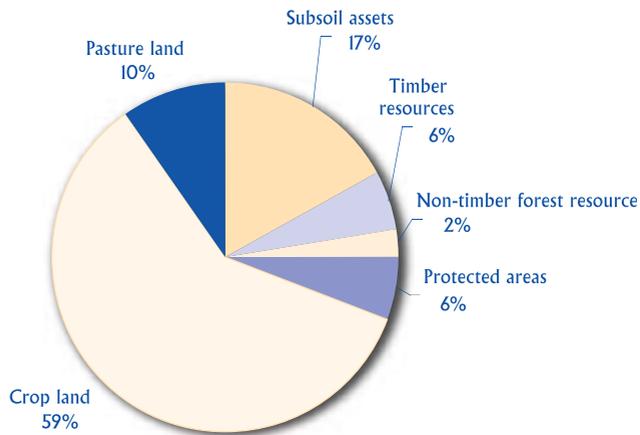
Figure 2.2 breaks down the natural wealth of low-income countries into its component parts. The striking fact is the overwhelming importance of agricultural land in these countries—nearly 70 percent of total natural wealth. Sustaining development in these countries will necessarily entail careful management of the land resource. Boosting the productivity of agricultural land will also help reduce pressure on other resources, particularly forests.

NATURAL RESOURCES AND WEALTH ACCUMULATION

Saving is a core aspect of development. Without the creation of a surplus for investment, there is no way for countries to escape a state of low-level subsistence. Saving is measured in national accounts as the difference between income and consumption—what is saved is by definition that which is not consumed. But standard national accounts do not measure the *dissaving* associated with the depletion of natural resources.

Adjusted net or “genuine” saving measures the true level of saving in a country after accounting for depreciation of produced capital, for investments in human capital (as measured by education expenditures), for depletion of minerals, energy, and forests, and for damages from local and global air pollutants. An important body of economic

Figure 2.2 Shares of natural wealth in low-income countries



Source: *Where is the Wealth of Nations?* World Bank 2006. Oil states excluded.

theory suggests that if current net saving is negative in a given country, then its future welfare must decline. In other words, if we care about sustainability we need to be concerned about the net rate of wealth creation.

Resource dependence complicates the measurement of saving effort because depletion of natural resources is not visible in standard national accounts. Countries can believe they are on a sustainable path, when in fact they are running down their total wealth. Figure 2.3 looks at genuine saving in Bolivia to illustrate this point.

This Figure makes the importance of resource depletion and pollution damages clear in any assessment of wealth creation in a resource-dependent economy. While investments in human capital partly offset the value of depreciation of produced capital, the depletion of natural resources (mostly natural gas

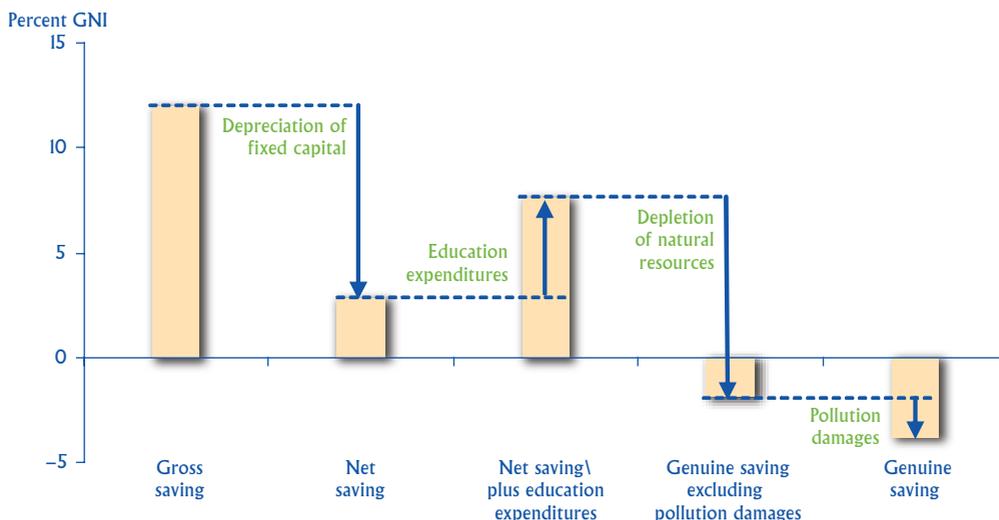
in this instance) plus damages from local and global air pollutants results in a negative net saving rate—total wealth in Bolivia actually declined in 2003.

Decision makers in Bolivia presumably believed that the rate of wealth creation in the country was nearly 12 percent of gross national income in 2003—this is what was reported in the national accounts. But a fuller analysis highlights the extent to which depletion and damage to the environment affect the bottom line on wealth creation.

SOME CONCLUSIONS ON NATURAL RESOURCES AND SUSTAINABILITY

If development is approached as a process of portfolio management, then the figures make clear that both the size

Figure 2.3 Decomposition of genuine saving in Bolivia, 2003



Source: *Where Is the Wealth of Nations?*, World Bank 2006.

and composition of the portfolio vary widely across levels of income. Managing each component of the portfolio well and transforming one form of asset into another efficiently are key facets of development policy.

While the analysis of wealth sheds light on sustainability, it is also directly relevant to the question of growth. As noted earlier, growth is essential if the poorest countries are to enjoy increases in well-being. Growth will be illusory, however, if it consists primarily of consuming the assets, such as soil nutrients, that underpin the economy.

The linkage between measured changes in real wealth and future well-being only holds if our measures of wealth are suitably comprehensive. This is the prime motivation for expanding the measure of wealth to include a range of natural and intangible capital. This richer picture of the asset base also opens the door to a range of policy interventions that can increase and sustain growth.

The notion of development as portfolio management is powerful. Certain assets in the portfolio are exhaustible and can only be transformed into other productive assets, such as infrastructure or human capital, through investment of resource rents. Other assets are renewable and can yield sustainable income streams. Economic analysis can guide decisions concerning the optimal size of these assets in the portfolio. Some assets, such as produced capital, depreciate over time. National savings can be used to invest in natural assets, produced capital, or human capital. The choice of investment will depend on the asset with the highest marginal

return on investment, a standard tenet of public finance.

Each year some 10–20 developing countries have negative genuine saving rates. What should the policy response be? Monetary and fiscal policies affect saving behavior, and public sector dis-saving can be a key target of policy. If investment in human capital is measured as saving, then efforts to increase effective education expenditures can boost overall saving. For natural resources, the general prescription is not to simply reduce exploitation but rather to reduce incentives for overexploitation, which will typically entail reforms in the resource sectors.

The policy responses to questions of natural resources and sustainability break down according to the different roles that natural resources play in development:

- For poor communities dependent on natural resources for subsistence, there is growing evidence that efforts to devolve ownership and control of local resources to communities—to nature conservancies or forest user groups, for example—can have important impacts on income and well-being. This generally means building capable local institutions to manage and share benefits from the resource base.
- For countries with commercial natural resources, the economic benefits from these resources can be maximized through incentive structures that reduce overextraction (tradable fishing rights, for example), transparent mechanisms for allocating resource rights, suitable instru-

ments (royalties, corporate taxes) for revenue collection, transparency concerning resource revenue generation, and budgetary processes that can direct resource revenues into productive investments.

- For natural resources that are the source of environmental services, the key concern is that many of these services are provided as externalities—that is, the provider of the benefit is distinct from the beneficiary. Thus owners of upland forests may be unaware of the benefits (in the form of stream flow regulation, for

example) that the resource provides to lowland farmers. One solution to this sort of problem is to set up payment schemes from beneficiaries to providers. Preserving environmental services could also entail a larger role for management at the landscape and watershed scale. The external nature of many environmental services means that they may be at risk when development decisions are being made—this puts a premium on programs to identify, quantify, and value these services more systematically.



SECTION 3 Improving Governance

Good governance is increasingly understood to be an important factor determining economic performance. If the optimistic vision of a richer, more equitable world by 2050 is to be achieved, improving governance must play a key role. While in many countries there is an obvious need for improved macro-level governance—the performance of national institutions—the welfare of poor households and poor communities is closely tied to governance at the local level. Voice and accountability at the local level are powerful tools for sustainable development. Improving governance is not only about building and strengthening public and private institutions—the supply side. It is also about building citizen engagement and voice—the demand side.

Governance can be defined as the traditions and institutions by which authority in a country is exercised for the common good. This includes the process by which those in authority are selected, monitored,

and replaced—the political dimension, the government’s capacity to effectively manage its resources and implement sound policies—the economic dimension, and the respect of citizens and the state for the country’s institutions—the institutional respect dimension. In contrast, corruption is defined more narrowly as the abuse of public office for private gain.

THE CASE FOR BETTER GOVERNANCE

Research shows that countries can derive a very large “development dividend” from better governance. A country that improves its governance from a relatively low level to an average level could almost triple the income per capita of its population in the long term and could similarly reduce infant mortality and illiteracy.

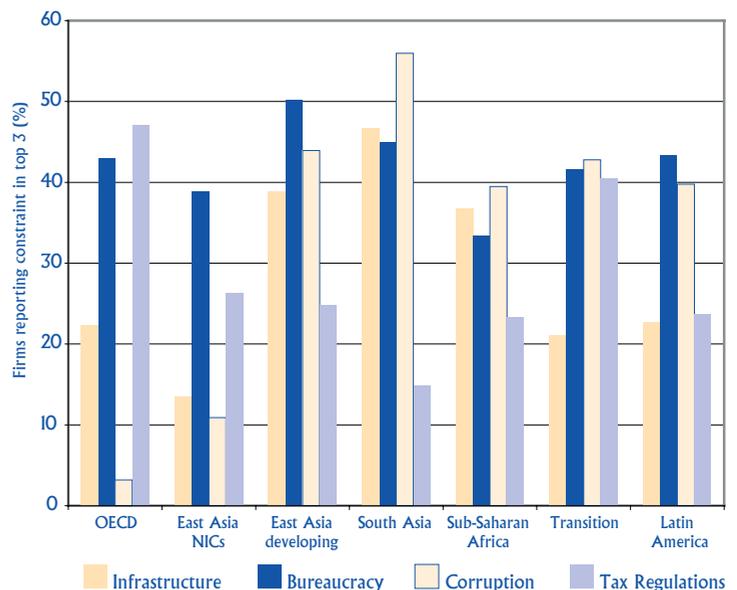
Governance also matters for a country’s competitiveness and for income distribution. In the case of corruption, research suggests it is equivalent to a major tax on foreign investors. In many developing countries, corruption represents a “regressive tax” on the household sector as well: to gain access to public services, lower-income families pay a disproportionate share of their incomes in bribes compared with higher-income groups, and they often end up with less access to such services because of corruption.

Poor governance in the natural resource sectors appears to be a major explanation for the “natural resource curse,”

whereby over several decades resource-rich countries have registered poorer growth performances than resource-poor countries did. Corrupt natural resource institutions can give favored groups access to resources, while rent-seekers pocket the revenues from natural resource exploitation—revenues that could be financing productive investments for the country. Rent-seeking displaces productive economic activity, with consequent effects on growth.

Figure 3.1 illustrates the main constraints faced by businesses in different regions of the world. Corruption tops the list in South Asia, Sub-Saharan Africa, and transition economies, while it is a close second in Latin America and developing East Asia. Bureaucracy is a serious constraint on governance everywhere, including in countries that belong to the Organisation for Eco-

Figure 3.1 Key constraints to business, by Region



Source: Executive Opinion Survey 2004, World Economic Forum.

conomic Co-operation and Development (OECD). Tax regulations constitute a severe constraint in OECD and in post-socialist transition countries, in contrast with regions such as South Asia, where they rank low as an impediment relative to the other constraints.

Similarly, infrastructure is a major constraint in Africa and developing Asia, in contrast to the East Asian tigers and, to an extent, to Latin America and the transition economies. This does not imply that in these regions it is unimportant to focus on infrastructure investments, since this type of survey gives only a relative ranking across different constraints for each country. But the fact that infrastructure was not rated at the top in so many countries—in Latin America, Africa, transition economies, and others that suffer from infrastructure problems and are in dire need of investments—is a sure sign of the extent to which some other factors, largely governance and corruption, impose even more severe constraints on business development.

Better governance is not a luxury that only rich countries can afford. It is misleading to suggest that corruption is due to low incomes and to invent a rationale for discounting bad governance in poor countries. In fact, the evidence points to the causality being in the direction of better governance leading to higher economic growth. A number of emerging economies, including the Baltics, Botswana, Chile, and Slovenia, have shown that it is possible to reach high standards of governance without yet having joined the ranks of wealthy nations.

While it is true that institutions often change only gradually, in some countries there has been a sharp improvement in the short term. This defies the view that while governance may deteriorate quickly, improvements are always slow and incremental. For instance, there has been a significant improvement since 1996 in the “voice and accountability” indicator in countries ranging from Bosnia, Croatia, and Ghana to Indonesia, Serbia, and Sierra Leone. And the improvements exhibited by some African countries in a short period of time challenge the “Afro-pessimists.”

A common fallacy in thinking about governance is to focus solely on the failings of the public sector. The reality is much more complex, since powerful private interests often exert undue influence in shaping public policy, institutions, and state legislation. In extreme cases, “oligarchs” capture state institutions. And many multinational corporations still pay bribes in some countries, undermining public governance in emerging economies. There are also weaknesses in the nongovernmental sector. Further, traditional public sector management interventions have not worked because they have focused on technocratic “fixes” rather than real institutional reform.

When it comes to governance reforms, historical and cultural factors are far from deterministic—witness, for instance, the diverging paths in terms of governance of neighboring countries in the Southern Cone of Latin America, the Korean peninsula, the transition economies of Eastern Europe, and Southern Africa. There are reform strategies that offer particular promise. The

coupling of progress on improving voice and participation—including through freedom of expression and women’s rights—with transparency reforms can be especially effective.

Increases in transparency can be particularly catalytic for change. A partial list of transparency reforms would include:

- Public disclosure of assets and incomes of politicians
- Public disclosure of political contributions
- Public disclosure of draft legislation and parliamentary votes
- Enactment and effective implementation of conflict-of-interest laws
- Public blacklisting of firms guilty of bribes in public procurement
- Enactment and effective implementation of freedom-of-information laws
- Freedom of the media, including the Internet
- Fiscal and public financial transparency
- Transparent and competitive procurement.

The challenge of governance and anti-corruption confronting the world today strongly argues against “business-as-usual.” A bolder approach is needed, and collective responsibility at the global level is called for. The rich world must not only deliver on its aid and trade liberalization promises, it must also lead by example. OECD countries should ratify and effectively implement the 2003 UN Convention against Corruption and should take steps, as Switzerland is starting to do, to repatriate assets looted and stashed abroad

by corrupt officials. And transnational corporations should refrain from bribery and support improving governance practices in host countries. As for the international financial institutions and donors, there is a need to anchor aid decisions within a governance framework. Improving transparency will be key. However, none of this can work unless countries themselves take the lead in improving governance.

SOCIAL ACCOUNTABILITY— WORKING ON THE DEMAND SIDE



As donors increasingly focus on improving governance, it is becoming clear that democratic elections, legislative oversight, and administrative and financial mechanisms are needed but are not enough to increase the transparency and accountability of the public sector and service providers. Elections, in and of themselves, are a weak and blunt instrument with which to hold governments accountable. Improvements in administrative and financial systems certainly help, but they are insufficient unless they are accompanied by increased demand from citizens and other stakeholders for better access, quality, and responsiveness in the delivery of public services.

The *2001 World Development Report* on poverty recognized accountability as an integral component of empowerment and hence poverty reduction. The need to strengthen accountability relationships between policy makers, service providers, and clients was at the core of

the *2004 World Development Report* on making services work for the poor. The donors' interest and support for social accountability derives from their interest in promoting poverty reduction and sustainable development. After concentrating for many years on the supply side of public sector and governance reforms, the development community now takes a more comprehensive approach by focusing also on citizen engagement to enhance public sector accountability and performance—the demand side of governance.

Social accountability is about affirming and operationalizing direct accountability relationships between citizens and the state. It therefore refers to the broad range of actions and mechanisms that citizens can use to hold the state to account, as well as actions by the government, civil society, the media, and other social actors to promote or facilitate these efforts. The concept of social accountability underlines both the right and the corresponding responsibility of citizens to expect and ensure that the government acts in the best interests of its citizens. The obligation of government officials to be accountable to citizens derives from notions of human rights and the need for citizens to understand and play an active and responsible role in exercising those rights—an important part of building citizenship.

Over the past two decades, it has become clear that empowerment is critical to poverty reduction. For such efforts to be sustainable, the poor must move from being passive recipients of government and donor aid (beneficiaries) to empowered actors (agents) in shaping

decisions that affect their livelihoods and welfare. The degree to which a person or group is empowered is influenced by agency (the capacity to make informed choices) and opportunity (the institutional context in which choice is exercised). By providing critical information on rights and entitlements and by introducing mechanisms to enhance citizen voice and influence on policy makers and service providers, social accountability initiatives enhance these two key determinants of empowerment. Of particular importance is the potential of social accountability to empower social groups who are systematically excluded from political, social, and economic development, such as women, young people, ethnic or other minorities, and the extreme poor.

Efforts by citizens and civil society groups to hold governments accountable have traditionally included a range of social actions, such as public demonstrations and protests, advocacy campaigns, investigative journalism, and public interest litigation. In more recent years, a new generation of social accountability has emphasized direct dialogue and negotiations with government counterparts and service providers, relying on the use of participatory methods, expanded data collection and analysis, and enhanced spaces and opportunities for citizen and civil society engagement with state and political actors.

Social accountability mechanisms can contribute to improved governance and genuine democracy by enhancing the capacity of ordinary citizens to obtain information, voice their needs, and demand accountability between elections.

By involving citizens and civil society in monitoring government performance, by enhancing transparency and information disclosure, and by exposing government failures and misdeeds, social accountability mechanisms are potentially powerful tools against public sector corruption.

A number of new tools and approaches have emerged in recent years to operationalize this increasing focus on social accountability. These include, among others, public participation in policy making, participatory budgeting and public expenditure tracking mechanisms, and participatory performance monitoring and evaluation using such tools as citizen report cards and community score cards.

The scope for enhanced social accountability will vary in each country context, depending on a range of factors related to the enabling environment. The effectiveness of social accountability efforts will depend critically on bridging

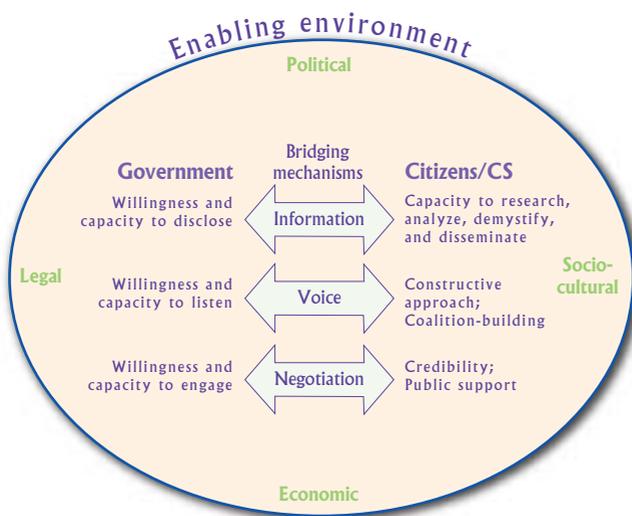
mechanisms between the government and citizens and on the willingness and the capacity of state and civil society actors to engage constructively (Figure 3.2). In order to be effective, social accountability mechanisms often need to be preceded or complemented by efforts to enhance both the willingness and the capacities of key actors.

LESSONS AND CHALLENGES ON SOCIAL ACCOUNTABILITY

Social accountability shows considerable potential to promote governance, improve development effectiveness, and empower citizens, especially those who are poor and marginalized. A number of lessons are emerging from the experience of the World Bank and other donors with social accountability.

- Social accountability is about more than tools—it is about reforming

Figure 3.2 Conditions for social accountability



political and institutional cultures, changing mindsets, strengthening civil society capacity, building citizenship, and above all helping to construct a new set of state-citizen relations.

- Both supply and demand sides matter. Social accountability is about strengthening bridging mechanisms. The demand for accountability by citizens must be matched not only by the willingness of the government and service providers but also by their ability to respond to civic demands.
- Access to information is vital. The quality and accessibility of public information and data are key determinants in the success of social accountability mechanisms. A common element of almost all successful efforts is the role of an independent media.

Although we have made a promising start in developing new approaches to strengthen social accountability, much remains to be done in making this agenda a part of the core business model in development institutions. Over the coming years, attention will need to focus on:

- Mainstreaming social accountability across operational and analytical work, particularly in building ownership in client governments
- Strengthening the evidence base on the positive impact of social accountability on governance and sustainable development outcomes
- Training and encouraging innovation on social accountability
- Strengthening donor coordination and international networks of social accountability practitioners.



SECTION 4 Socially Sustainable Development

For decades the main development debates focused on economic development, underlined by a belief that economic growth was enough to solve the complex problems of poverty and income inequality. Today development practitioners and theorists have shifted toward a new approach that incorporates the social dimensions of economic activity—from including all segments of society to encouraging more transparent and accountable institutions. Social development tools enabled development practitioners to consult people directly about poverty. Their own voices tell us that poverty is about more than low income—it is also about vulnerability, exclusion and isolation, unaccountable institutions, and powerlessness.

Increases in income are not enough to sustain poverty reduction. Sustainable change requires social change—with systematic attention to embedded social, political, and economic exclusion, to social cleavages

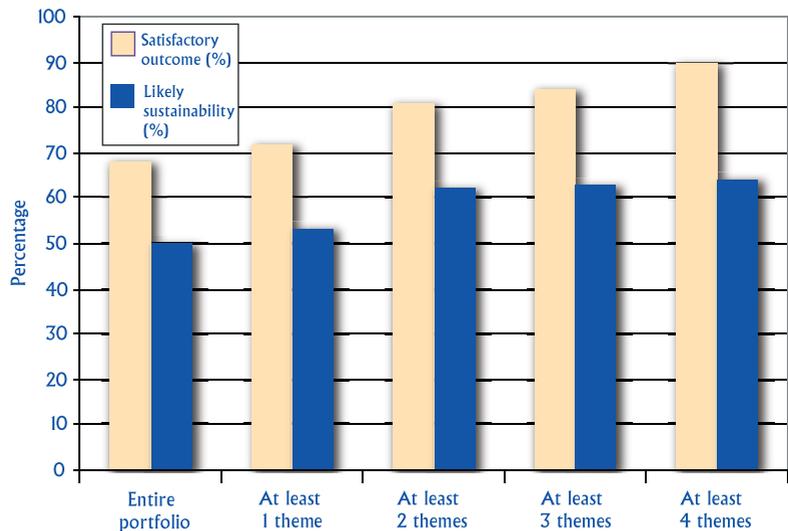
that can lead to violent conflict, and to support for transparent and responsive institutions. Social and economic development are two sides of the same coin. Sustainable social development can be achieved only on the basis of social inclusion, cohesion, and accountability. In its broadest sense, social development is about putting people at the center of development efforts.

Supporting positive social change requires an understanding of power dynamics, culture, and value systems, as well as the informal and formal structures of societies. What is critical is that the social effects of economic measures be factored into policy decisions. More significantly, economic interventions that take into account social dimensions appear to be more effective—and sustainable. This insight is based on a review of 4,000 World Bank development projects across the world over 30

years, which found a strong positive association between including social development themes and project success. The more that social factors are included, the more successful projects are in reducing poverty and the more sustainable is the positive change (Figure 4.1).

Social development also matters for growth. Growth depends on an efficient use of resources. If institutions systematically exclude certain groups from economic opportunities, so that people have no access to employment or livelihoods or are discriminated against, the result is wasted resources and reduced growth. Research shows that some social development indicators, particularly those related to social cohesion, correlate positively with foreign direct investment and that lower initial conditions of cohesion hamper growth. Studies of civil wars show that

Figure 4.1 Ratings for World Bank projects addressing social development themes, 1972–2002



incomes are on average 15 percent lower at the end of a conflict than they would have been otherwise. There is also ample evidence that more inclusive, cohesive, and accountable institutions in a given year correlate with higher growth in the following decade.

WHERE WE'VE COME FROM

In the 1970s and early 1980s, the major objective of social scientists in development institutions was to improve project effectiveness. As the adverse social impacts of large-scale development projects became more evident and the understanding of poverty more complex, approaches and tools were developed to incorporate the social considerations and the views of the poor into project design. The mid-1990s saw a flurry of conceptual and organizational changes—foreshadowed by the 1995 UN World Summit on Social Development—that put social development concepts and practitioners into the mainstream of development efforts.

Since 1997, the social development agenda has evolved around five key axes:

- Social analysis—from project-based analysis to broader social analysis of projects, policies, and country strategies to enhance poverty outcomes and social change
- Participation—from consultation and individual beneficiary involvement in project implementation to

empowerment involving community-driven development (CDD), civic engagement, and social accountability

- Vulnerability—from a concern with marginal and disadvantaged groups to a broader concern with social vulnerability and exclusion and the policies and institutions that affect these groups
- Institutions—from the analysis of formal institutions and rules to a focus on local-level institutions, social capital, and formal and informal rules
- Conflict—from post-conflict physical reconstruction to rebuilding the social and economic fabric of societies torn apart by conflict, a conflict-sensitive approach to development, and increasing concern with conflict management and prevention

Evolving good practice, as reflected in the World Bank's social development strategy, for example, suggests that social development is based on three operational principles: inclusion, cohesion, and accountability. Inclusive institutions promote equal access to opportunities, enabling everyone to contribute to social and economic progress and share in its rewards. Cohesive societies enable women and men to work together to address common needs, overcome constraints, and consider diverse interests—they resolve differences in civil, nonviolent ways, promoting peace and security. Accountable institutions are transparent and respond to the public interest in an effective, efficient, and fair way.

PUTTING COMMUNITIES IN THE DRIVER'S SEAT

Although development within communities had been part of the development agenda since the 1970s, in the late 1990s donors began to recognize that community involvement and control over the planning, design, and implementation of projects could be effective—leading to a major increase in funding to community-driven projects.

CDD differs from earlier approaches in a number of ways. It entails community authority and control over decisions and resources, and it enhances local community accountability for the use of the resources. These types of operations have also provided opportunities to achieve a number of other social objectives. Rules and incentives generally promote the inclusion of women, minority groups, isolated communities, and the very poor—groups frequently excluded from development activities. Community involvement and experience builds social capital and empowers communities by allowing them to define their own needs, decide how to meet them, and control resources. Transparency and accountability mechanisms in CDD approaches in turn reduce corruption and strengthen citizen demand for greater accountability by local governments.

SAFEGUARDS

Concern about the environmental and social impacts of development projects

has been an issue for nearly two decades. Today social safeguard policies within development institutions are sharply focused on indigenous peoples, resettlement, and cultural heritage. Over the years, attention to social safeguard issues has increased within the development community.

SOCIAL ANALYSIS

The need to consider the impact of social factors in project appraisal has been recognized at least since 1984, and guidance on carrying out social assessments was provided by the World Bank in 1994. The major innovation was to bring social analysis and participatory processes together under a single approach, and the guidelines laid the groundwork for efforts to mainstream social assessment and participation in lending and analytical work to improve project quality.

A major effort has been initiated within the development community to clarify and formalize the purpose and key elements of social assessments and to make them more rigorous and systematic. The objectives of social assessment were to improve poverty and social outcomes by enhancing social inclusion, strengthening social cohesion, increasing social capital, and reducing adverse social impacts. Recognizing that attention to social issues is fundamental to poverty reduction and project quality but that a mandatory social assessment for individual projects along the lines of environmental assessments was not likely to be feasible, efforts shifted to

more upstream social analysis as a way to mainstream social concerns.

In recent years, social analysis work at the project level has expanded in two new directions. First, as the social development agenda gained traction, there was a clear need to move beyond the assessment of project impacts to an analysis of key social issues at the country level. To date, over 15 Country Social Analyses have been completed by the World Bank, complemented by a number of Conflict Assessments specifically targeted and designed for countries affected by violent conflict. Since 2002, poverty and social impact assessment (PSIA) of economic reforms and adjustment operations has been developed by the World Bank, the IMF, and major donors. Key aspects of this work include disaggregating social groups, undertaking stakeholder analysis, recognizing individual and institutional interests, and assessing social and political risks in order to fully understand the distributional impacts of policy reforms. More than 100 PSIAs have been undertaken across the developing world in the past four years and are now influencing the design of development policy lending.

PARTICIPATION AND CIVIC ENGAGEMENT

In the 1970s and early 1980s, participation referred primarily to community involvement in implementation, such as building and maintaining roads and irrigation systems. The development community has since engaged more fully with nongovernmental organiza-

tions (NGOs) in both the North and the South in order to more fully reflect civil society views in development projects.

As the importance of participation to institutional accountability became more apparent, and its links to governance and development became more evident, the need to facilitate dialogue between borrowers and civil society organizations (including but not limited to NGOs) has become an important part of development assistance. Participatory processes have been adopted across development projects, in country assistance strategies, and in poverty assessments and Poverty Reduction Strategy Papers.

VIOLENT CONFLICT

The eruption of violent conflict represents the complete breakdown of social cohesion. The interest of social development practitioners in the conflict and development agenda emerged naturally from:

- Work on vulnerability, which was clearly linked with the social impact of conflict
- A recognition in the 1990s that in the post-Cold War era the vast majority of violent conflicts occur within countries and that social exclusion, marginalization, and unaccountable institutions provide the grievances that fuel civil conflicts
- The realization that building social capital through community-driven approaches not only restores liveli-

hoods but also promotes social cohesion across communities

With a growing portfolio in countries recovering from conflict, the development community has had to clarify its engagement in post-conflict reconstruction. At the World Bank, a new operational policy has redefined the Bank's role in the context of a more comprehensive approach to development—from an approach focused on rebuilding infrastructure to one that seeks to understand the root causes of conflict, to integrate a sensitivity to conflict in donor activities, and to promote assistance that minimizes the potential causes of conflict.

Over the years, the World Bank has led the way in cutting-edge research on the links between development and conflict and has built up considerable expertise and skills in assisting countries affected by conflict. Today, it is in the forefront of international efforts to rebuild societies torn apart by conflict—from Afghanistan and the Balkans to Timor-Leste, Haiti, Liberia, Sudan, and the Democratic Republic of Congo. It is also actively engaged in countries still beset by conflict, such as Colombia, Nepal, and Somalia.

The major breakthrough was the recognition that conflict, unlike a natural disaster, is not an exogenous shock but is deeply rooted in the development process itself—in effect, conflict is a failure of development. A social development lens called attention to the fact that where conflict occurs within a country's borders, post-conflict recovery needs to be about more than the bricks and mortar of reconstruction—it needs to

focus on restoring human and social capital and on promoting social inclusion and cohesion to avoid a relapse into violence.

GLOBAL IMPLICATIONS OF LOCAL CONFLICTS

Concern over the past two decades with global security threats has led the international community to focus increased attention on two global, interrelated issues: human security and countries affected by violent conflict or fragile or failed states.

Building on the work of Amartya Sen and others, the UN Human Security Commission proposed shifting attention from the security of the state to the security of people. It places people, rather than nation states, at the center of the security agenda. Human security focuses on empowering as well as protecting vulnerable people—seeking freedom from want as well as freedom from fear. Human security thus joins and integrates the international community's main agenda items of peace, security, and development. This agenda is wholly consistent with the principles of social development.

The challenge of meeting the MDGs has also called attention to the large share of the world's poor who, through no fault of their own, live in countries affected by violent conflict or in fragile states incapable of delivering basic services, including security.

Research from the social and economic fields has highlighted the characteristics of societies that are more resilient to conflict, including:

- Political and social institutions that are largely inclusive, equitable, and accountable
- Economic, social, and ethnic diversity—pluralism and inclusion, rather than polarization and dominance
- Growth and development that raise incomes and opportunities across society
- A culture of dialogue rather than violence.

In short, working to reduce the global threats posed by conflict and by fragile

states amounts to a restatement of social development objectives at the country level.

In addition to contributing to meeting the MDGs, social development has an important role to play at the country level in improving human security and assisting deeply divided countries avert the risk of new or renewed conflict. Promoting social structures and institutions that are more cohesive, inclusive, and accountable—the core principles of social development—can make a major contribution to reducing global poverty and ensuring the next generation inherits a more peaceful and safer world.



SECTION 5

Agricultural Productivity and Competitiveness

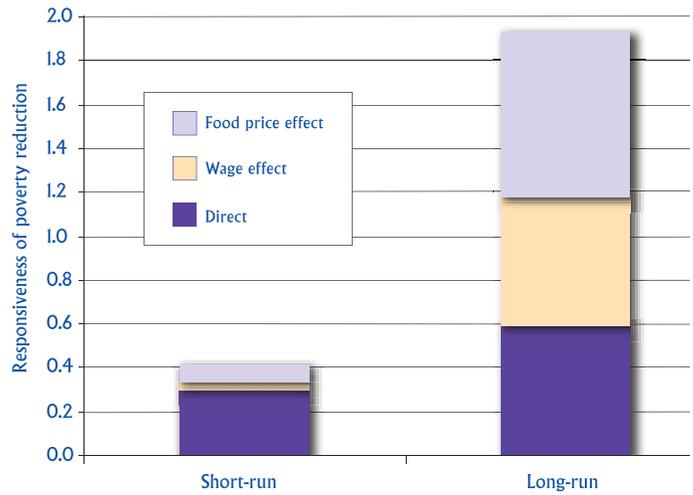
The Green Revolution increased crop yields through research and development (R&D) in improved technology and through investments in infrastructure and agricultural services. As a result, it reduced poverty and hunger while fostering economic growth, especially in Asia and Latin America. Even beyond the Green Revolution, investment in agricultural research has had a major impact on poverty reduction through its direct effects on producer incomes, its indirect effects on consumer welfare through lower food prices, employment, and wages, and its growth-induced effects throughout the economy (Figure 5.1 and Box 5.1). Studies in India and China by the International Food Policy Research Institute have shown that investments in agricultural R&D had a higher impact on poverty reduction than most other public investments, behind only education in China and rural roads in India.

Studies consistently show high returns to investments in agricultural research in developing countries, averaging over 40 percent. Rates of return tend to be higher for research in industrial countries and for

commodities with short production cycles. The paradox is that despite such evidence of high returns, agricultural research funding is stagnating in many countries. Stagnation is particularly harmful to agriculture because the returns to investment in research can take 10–30 years to be fully realized.

The impetus for the Green Revolution was to avoid the specter of mass famine and starvation, and it largely reached that goal. We now live in a world awash in food. Yet access to sufficient, safe, nutritious, and affordable food is still the primary problem for nearly 800 million chronically undernourished people. Ironically, most of the hungry live in rural areas and make a living from agriculture. Moreover, the environmental impacts of these investments and the tapering off of yield growth in recent years present new challenges to agriculture. Compounding the stresses, experts expect the demand for food to double in the next 25–50 years, primarily in developing countries, as global population reaches 8–10 billion. Further, higher incomes are leading to a shift in dietary preferences to animal

Figure 5.1 India — Poverty reduces as yields increase



Source: Datt and Ravallion 1998.

products, thus triggering a shift from the Green Revolution to the Livestock Revolution.

The global community faces an enormous task in trying to enhance rural livelihoods and ensure nutritional security in a world where population is growing and consumption patterns are evolving. At the same time, countries need to reverse environmental degradation, redress social and gender inequality, and ensure human health

Box 5.1 Impact of the Consultative Group on International Agricultural Research on prices, production, land use, and trade

- World food production would have been 4–5 percent lower and developing countries would have produced 7–8 percent less—exacerbating hunger, malnutrition, and poverty.
- World food and feed grain prices would have been 18–21 percent higher—adversely affecting poor consumers.
- The area planted to crops would have been significantly higher for all food crops, as cultivated area in developing countries would have expanded by 11–13 million hectares (and by 5–6 million in industrial countries) at the expense of primary forests and fragile lands with high biodiversity.
- In developing countries, per capita food consumption would have declined by 5 percent on average and by up to 7 percent in the poorest regions—causing food, income, and nutrition insecurity.
- Some 13–15 million more children would have been malnourished, predominantly in South Asia, where the incidence of hunger is highest.

and well-being. These problems and demands require fundamental changes in the culture and business of the sector. The agricultural sector once relied on formal, supply-driven R&D systems to ensure ample food supplies. It now must draw from policy and management reforms, market forces, empowered farmers and other stakeholders, and a broader spectrum of science and technology solutions to meet growing and diversifying demands.

A NEW SYSTEM FOR PRODUCTIVITY AND COMPETITIVENESS

A number of forces, including shifting demand patterns, improved technology, integrating trade, and market pressures, are shaping the evolution of the agriculture sector. Strengthened research systems will increase the availability of new knowledge and new technologies, but not necessarily the number of innovations that will be implemented by agricultural producers. Several inter-related developments have led to this conclusion.

Agricultural development is increasingly market-oriented rather than production-driven, for example. While for most of the last century major progress in agricultural development was made by improving the productivity of staple food crops, the situation is now changing. With falling staple food prices and rising urban incomes, the goal has shifted to diversifying agricultural production to livestock and higher-value crops. But it has often been difficult for

centralized public research or knowledge systems to cater to this trend.

The private sector is becoming a more prominent player as the source of knowledge generation, diffusion, and application. A substantial part of the technology package that farmers use—fertilizers, machinery, pesticides, and seeds—has been designed by and supplied through private businesses. With increasing intensification, the role of the private sector as technology supplier will increase. While the trend is global, available statistics on agricultural research show that the role of the private sector today is clearly more prominent in industrial than in developing countries.

Degradation of natural resources and public concern over environmental issues are shifting research priorities and funding toward broader issues, many of them global in nature: sustainable use of land, water, forests, and biodiversity; mitigation of and adaptation to climate change; pesticide residue minimization; livestock waste management; water quality preservation; and watershed protection, to name a few. There are also increasing opportunities for agriculture to provide environmental services through carbon farming and biodiversity conservation. Success in meeting these challenges requires sharply increased skills in research on natural resources management, social sciences, and environmental issues.

Future increases in agricultural productivity must come from intensification rather than exploitation of additional natural resources. Agricultural systems must use natural resources more

efficiently and repair past damage to ecosystems. This depends on the application of scientific knowledge, development of farmers' skills, and a policy framework to improve resource use and conservation.

The public sector still produces much of the agricultural research relevant to the poor. Small farmers have limited purchasing power and cannot finance research. Private firms see limited opportunity for profits from providing technologies to small farmers, so they do not invest sufficiently in this type of research. Moreover, much of the knowledge that the private sector develops builds on information developed in publicly funded research.

With the private sector increasingly serving the commercial farming sector, public funding must focus more sharply on the poor, giving priority to the commodities, regions, and technologies that are important to this group. For this to work, the public sector has to use bottom-up, participatory processes to identify, execute, and evaluate research. And these processes must be sure to address gender, since women are responsible for 60–80 percent of food production in developing countries.

FROM RESEARCH AND DEVELOPMENT TO INNOVATION SYSTEMS



Development depends on knowledge, much of which needs to be generated in or adapted to the national context. A strong science and technology system

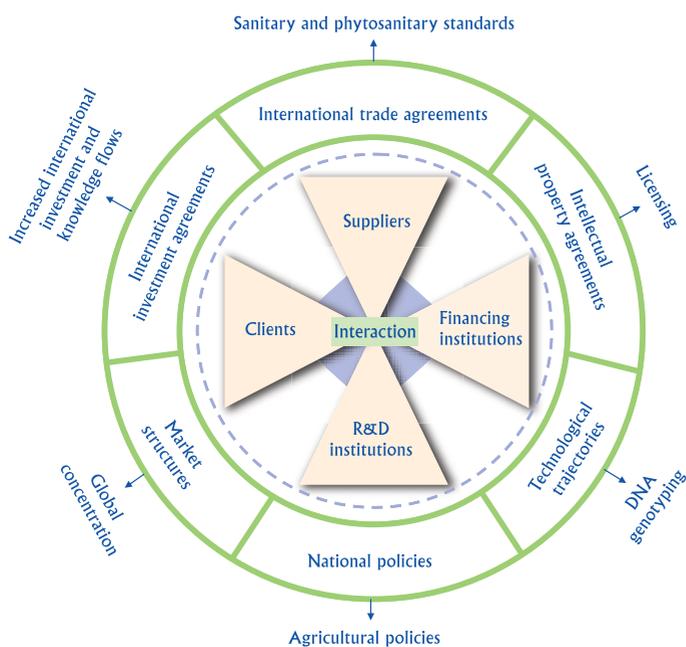
can make important contributions to sustainable and equitable agricultural development, but it is not sufficient to ensure a productive and competitive agricultural sector.

The conditions must be put in place to ensure that this knowledge actually leads to accelerated development. This realization has led to extensive changes in rural development strategies and agricultural research systems in the industrial world. In particular, agriculture has borrowed the concept of national innovation systems from the industrial sector. This ensures that new knowledge is relevant in the market context and that the role of the private sector in the development and diffusion of new knowledge is explicitly recognized. Innovation systems consist of the institutions, enterprises, and individuals that demand and supply knowledge and technologies and the rules and mechanisms by which these different agents are interacting.

In this concept, the focus is not on the science suppliers but on the totality of actors who are involved in innovation. Private sector investment, the financial system, the policy and regulatory environment, and stakeholder participation are more explicitly recognized. End-market demands are more integrated, and the conditions that need to be fulfilled for innovations to become successful are spelled out more clearly (Figure 5.2).

The effectiveness of the agricultural innovation system depends on three main elements:

Figure 5.2 Overview of agriculture innovation systems



- An institutional environment that is conducive to the flow of knowledge, collaboration, experimentation, and the implementation of innovations
- A well-articulated demand for new knowledge and technology—producers, traders, and others must be able to express their demands and must have the capacity to adapt and adopt new knowledge and technology
- The effective supply of new knowledge and technology from the public research system but also from other sources, such as indigenous knowledge, private sector research, and transfers from abroad.

The agricultural innovation system will be effective to the extent that the different elements work in harmony. If research produces a great deal of new knowledge but results are not used by producers in the marketplace, the investments in the research system have a

low payoff in the economy. If demands for new technologies are not recognized by the research system, it is hard to see how the right type of innovations can be generated.

To realize the potential gains from innovation systems, it will be important for countries to:

- Establish an environment conducive to business development by putting in place key national trade and investment policies and an intellectual property rights (IPR) regime and by establishing unambiguous measures, standards, testing, and quality systems
- Put in place a framework for the generation of new ideas, their subsequent commercialization, and the establishment of new businesses through tax incentives, IPR protection, competitive research programs, technology financing programs, venture capital, and start-up funds
- Support the establishment of new knowledge-based companies and carry out R&D activities through incubators, technology centers, technology parks, and other means.

REALIGNING INTERNATIONAL AGRICULTURAL RESEARCH TO MEET NEW CHALLENGES

The changing food security challenge, urbanization and globalization, increased private sector involvement in agricultural research, and global concerns about the sustainable management of resources have all prompted the

Consultative Group on International Agricultural Research (CGIAR) to develop a new set of system priorities. Developed in close consultation with its stakeholders and led by the CGIAR Science Council, the vision for the longer term is one in which the CGIAR provides international public goods through agricultural research aimed at the alleviation of poverty. The five priority areas are:

- Sustaining biodiversity for current and future generations
- Producing more and better food at lower cost through genetic improvements
- Reducing rural poverty through agricultural diversification and emerging opportunities for high-value commodities and products
- Promoting poverty alleviation and sustainable management of water, land, and forest resources
- Improving policies and facilitating institutional innovation to support sustainable reduction of poverty and hunger.

These priorities were determined based on the need to meet expected impact, to focus on international public goods, and to recognize the existence of alternative sources of supply of research. The CGIAR aims to progressively devolve some site-specific research to National Agricultural Research Systems. Special attention will be paid to building partner capacity in Sub-Saharan Africa. Research-for-development objectives are being pursued through the CGIAR Centers' core programs, through systemwide and ecoregional programs, and through the broader partnership-based challenge programs.

BUILDING A FOUNDATION FOR GLOBAL COOPERATION IN AGRICULTURAL KNOWLEDGE



How can we reduce hunger and poverty, improve rural livelihoods, and facilitate equitable, environmentally, socially, and economically sustainable development through the generation, access to, and use of agricultural knowledge, science, and technology? This is the core question of the International Assessment of Agricultural Science and Technology for Development (IAASTD). This unique international effort will evaluate:

- The relevance, quality, and effectiveness of agricultural knowledge, science, and technology (AKST)
- The effectiveness of public and private sector policies as well as institutional arrangements in relation to AKST to meet the development goals of environmental sustainability, improved rural livelihoods, nutritional security, and human health.

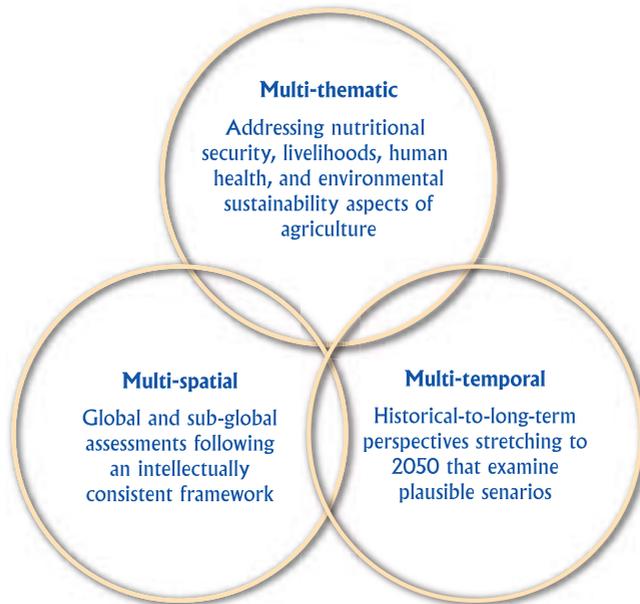
IAASTD is co-sponsored by FAO, UNEP, UNESCO, GEF, UNDP, WHO, and the World Bank. It brings together governments, NGOs, the private sector, producers, consumers, the scientific community, and signatories of multilateral environment agreements to share views and gain common understanding and a vision for the future. The main output of the assessment to be completed in September 2007 is a series of critical, in-depth global and subglobal assessment reports.

The IAASTD does not aim to predict the future; however, it will create “plausible scenarios” based on knowledge from past events and existing trends such as population growth, rural/urban food and poverty dynamics, loss of agricultural land, water availability, and climate change effects. Based on these issues, “What if?” questions can be formulated that allow the implications of different technological options and in-

stitutional arrangements to be explored and understood (Figure 5.3).

The assessment will not dictate what countries or stakeholders should do; rather, it aims to inform processes of future planning and thinking as to what may happen over the next 30–50 years and therefore what different AKST options, scenarios, and policies may yield if the world follows different pathways to address these challenges.

Figure 5.3 Scope of the International Assessment of Agricultural Science and Technology for Development





SECTION 6

The Challenge of Addressing Climate Change

Governments today face one of the greatest challenges of the new millennium: how to achieve prosperity for all while preventing economic growth from irreversibly changing the planet's climate. Sustaining global prosperity becomes increasingly difficult with a climate that continually becomes warmer and more unstable. But economies cannot grow without increasing energy consumption. And today's energy generation depends primarily on carbon-emitting fuels that result in human-induced climate change. There is general agreement that the way that energy and environmental challenges are addressed in the next two decades will to a large degree determine whether growth is sustainable. Unfortunately, new, cleaner, and more efficient technologies remain underutilized, while carbon-intensive energy infrastructure and inefficient cities are being rapidly built and expanded—setting the capital stock for decades.

SCIENTIFIC UNDERSTANDING OF CLIMATE CHANGE

There is wide recognition that human-induced climate change is a serious environment and development issue. The Earth is warming—with most of the warming of the last 50 years attributable to human activities, predominantly in the energy and agricultural sectors.

Most greenhouse gases (GHGs) are projected to increase significantly over the next 100 years—carbon dioxide (CO₂), for example, which has increased from about 280 parts per million (ppm) to 377 ppm since the pre-industrial era, is projected to reach 540–970 ppm by 2100 (Figure 6.1). The global mean surface temperature, which rose by about 0.7° Celsius over the last 100 years, is projected to increase by a further 1.4–5.8° Celsius by 2100. The spatial and temporal patterns of precipitation, which have already changed, are projected to change even more in the future. Sea levels rose 10–25 centimeters during the last 100 years and are projected to rise an additional 8–88 centimeters by 2100, and most non-polar glaciers are retreating. The frequency of extreme events, such as heat waves, droughts, and floods, is also projected to increase.

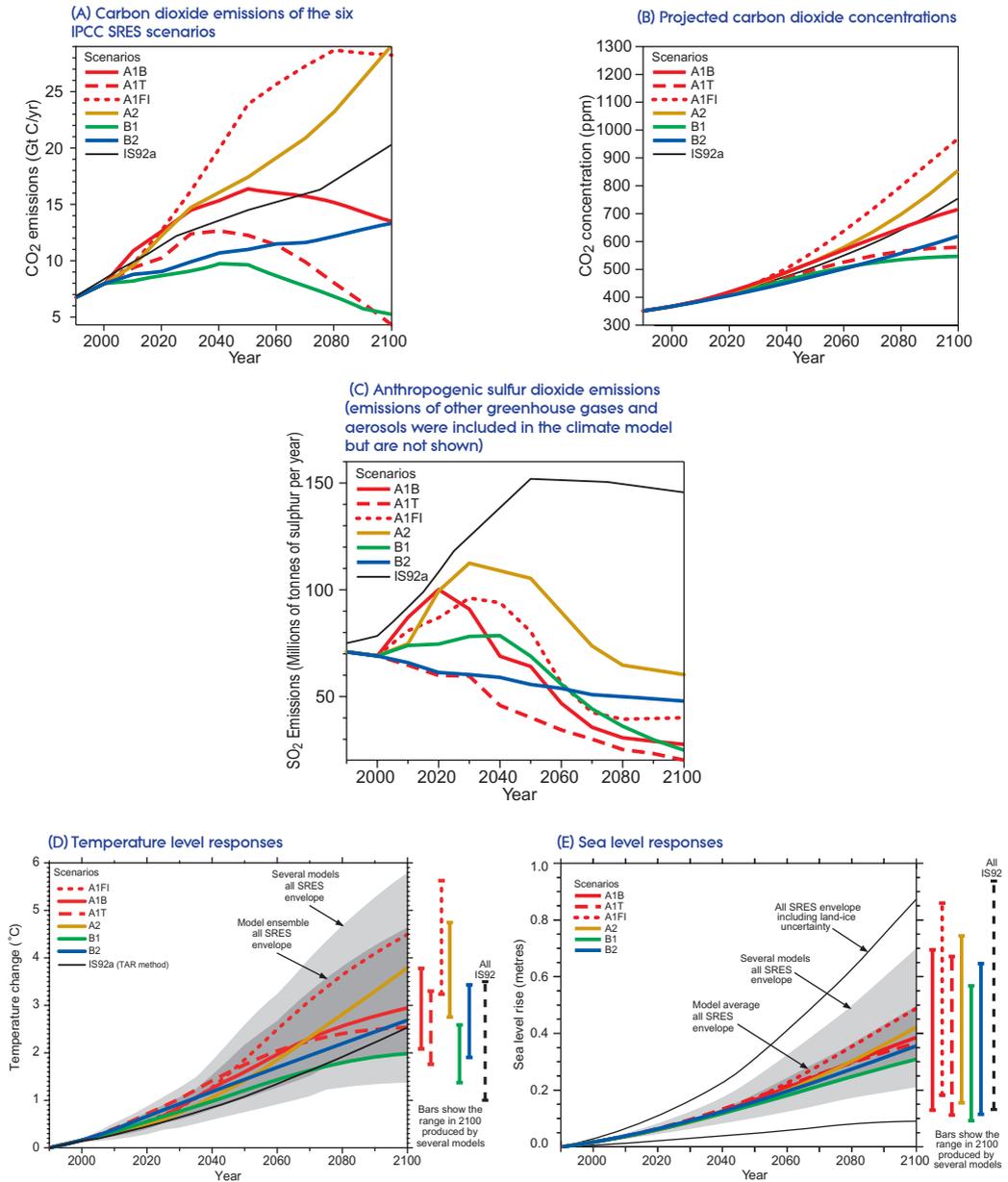
The observed changes in climate have already affected ecological, social, and economic systems, and poverty alleviation and sustainable development are threatened by projected changes in climate. Over the next 100 years, water availability and quality are expected to decrease in many arid and semiarid regions. Human health is threatened by

projected increases in the incidence of vector-borne diseases such as malaria and dengue and water-borne diseases such as cholera, as well as in heat-stress mortality. Hunger alleviation is threatened by projected reductions in agricultural productivity in the tropics and subtropics for almost any amount of warming, as well as by depleted fisheries. Biodiversity and the goods and services of many ecological systems, especially coral reefs, are likely to be adversely affected. Developing countries and particularly poor people in developing countries are the most vulnerable.

Several recent scientific findings suggest there is even greater reason for concern:

- Increased oceanic acidity is likely to reduce the oceans' capacity to absorb CO₂ and affect the entire marine food chain.
- A regional increase of only 2.7° Celsius above present (associated with a globally averaged temperature rise of about 1.5° Celsius above today) could trigger a melting of the Greenland ice cap.
- An increase in ocean surface temperature of 1° Celsius is likely to lead to extensive coral bleaching.
- A reversal of the land carbon sink is possible by the end of this century.
- Destabilization of the Antarctic ice sheet becomes more likely above 3° Celsius, and the Larson B ice shelf is already showing signs of instability.
- The North Atlantic Thermohaline Circulation may slow down or even shut down within the next 100–200 years.

Figure 6.1 The global climate models for the twenty-first century



Source: Intergovernmental Panel on Climate Change.

Based on the current understanding of the climate system and the response of different ecological systems and socio-economic sectors, if significant global adverse changes are to be avoided, the best guidance today suggests limiting

the increase in global mean surface temperature to less than 2° Celsius above pre-industrial levels and keeping the rate of change below 0.2° Celsius per decade. Recent probability analysis suggests that accomplishing the for-

mer with relatively high certainty will require keeping the equivalent CO₂ concentration below 400 ppm. It also suggests that stabilizing the equivalent CO₂ concentration at 450 ppm would imply a medium likelihood of staying below 2°C above pre-industrial levels. And if the equivalent CO₂ concentration were to rise to 550 ppm, this outcome would be unlikely.

Instead of declining, however, global GHG emissions are increasing. Despite the Kyoto Protocol coming into force, emissions have increased in OECD countries and are growing rapidly in developing countries, especially China and India. Because of global economic growth, the world is experiencing a boom in energy use that is dominated by coal-power generation of unprecedented proportions. Unless concrete actions are taken now to provide a long-term policy and investment framework for carbon emission reductions, the largest producers of coal-fired electricity—the United States, China, and India—will remain carbon emission-intensive. Consequently, decisions taken today on technologies and policies in these countries will have irreversible consequences on GHG emissions and hence on development paths for 40–60 years.

Given that the Earth’s climate has already changed and that further change is inevitable, future alterations need to be mitigated by reducing projected emissions of greenhouse emissions at the same time that countries adapt to climate change. The exact nature of the trade-off between mitigation and adaptation is veiled by uncertainty on the actual impacts and on the potential progress of research and development

on lower-cost cleaner technology. But we do know this: action cannot wait.

MITIGATION OF GREENHOUSE GAS EMISSIONS

Significant reductions in net greenhouse gas emissions are technically feasible due to an extensive array of technologies and practices in energy supply and demand, waste and land management, and industrial sectors—many at little or no cost to society. However, realizing this technical potential will involve the development and implementation of supporting policies to overcome barriers to the diffusion of these technologies into the marketplace, increased funding for R&D, and effective technology transfer.

Reducing projected GHG emissions in the energy production and supply sector will require a broad portfolio of technologies, including:

- Increased power plant efficiency, such as sub-critical to super-critical thermal power plants, and ultimately integrated gasification combined cycle (IGCC) coupled with carbon capture and storage (CCS)
- Increased use of natural gas as a bridging fuel in a transition period until renewable energy technologies become commercially available
- Reduced transmission and distribution losses
- Increased use of renewable energy technologies (biomass, solar, wind,

run-of-the-river and large hydro-power, and so on)

- Nuclear power.

New efficient coal technologies and the renovation and modernization of existing inefficient thermal power plants are by far the most important priorities in the short to medium term, as coal will remain a primary energy source of many OECD and developing countries, particularly China and India. While widespread adoption of supercritical coal technologies would substantially improve efficiency in many developing countries, it would not over the long term solve the problem of carbon emissions. The real savings could come from combining IGCC with CCS, where the technology virtually eliminates carbon emissions into the atmosphere, making coal essentially a carbon-clean fuel. However, IGCC is still in its early stages and therefore is expensive. With substantial effort and lower cost manufacturing at scale, IGCC could become commercially competitive in 7–10 years.

To complement low-carbon energy supply technologies, there are numerous technologies, practices, and policies

that can improve the efficient end-use of energy in the transportation, buildings, and industry sectors, thus reducing the demand for energy (Box 6.1). Improved efficiency in energy use offers one of the greatest opportunities to address energy security, price, and environmental concerns.

Finally, only with accelerated R&D will new technologies move into the realm of commercial viability and adoption. The level of investments in energy technology R&D in the public and private sectors is significantly less in real terms than historically. Promising technologies include in the near term CCS and fuel cells, as well as end-use efficiency options (zero-emission vehicles, for instance, and more efficient buildings), and over the long term hydrogen as an energy carrier and nuclear fusion. Increased OECD public sector support for energy R&D that is predictable and long-term is needed to overcome the technical challenges to commercial deployment of promising advanced clean energy technologies.

Reducing carbon emissions must be complemented by efforts to reduce emissions of the more radioactively po-

Box 6.1 End-use technologies and practices

- **Transportation:** Efficient gasoline/diesel engines, urban planning, urban mass transport systems, modal shifts to inter- and intra-city rail and water transport
- **Buildings:** Insulation, advanced windows, new lighting technology, efficient space cooling and heating, water heating, refrigeration, and other appliances
- **Industry:** Cogeneration, waste heat recovery, pre-heating, new efficient process technologies, efficient motors/drives and improved control systems, incineration of waste gases
- **Municipalities/Urban Local Bodies:** District heating systems, combined heat and power, efficient street lighting, efficient water pumping and sewage systems
- **Agricultural:** Efficient irrigation pumps, land management (such as afforestation, reforestation, reduced deforestation, and no-till agriculture).

tent greenhouse gases such as HFC-23, nitrous oxide, and methane. These are low-cost, high-impact investments, as these gases have a much greater impact than CO₂ per ton of gas. These in turn can be complemented by improved land use, land-use change, and forestry (LULUCF) activities. Afforestation, reforestation, improved land management, and agroforestry provide a wide range of opportunities to increase carbon uptake. Slowing deforestation provides another opportunity to reduce emissions. LULUCF activities have the potential to sequester up to 1–2 gigatons of carbon per year over the next 50 years, which is equivalent to 10–20 percent of projected fossil fuel emissions over the same period. The Kyoto Protocol limits the total credit that its ratifiers can claim from LULUCF activities, however, and only afforestation and reforestation activities are eligible under the Clean Development Mechanism.

Many energy-efficient technologies have not been adopted on a wide scale because of poor pricing policies and an incomplete legal and regulatory reform agenda. In addition, there are non-pricing as well as pricing bottlenecks, such as transaction costs, insufficient information availability, and institutional constraints.

Significant restructuring of the energy system will require energy-sector reform, including:

- Removal of subsidies to reflect the true cost of energy supply
- Internalization of the costs of externalities (such as local and regional air pollution) through markets, taxes, or subsidies

- Establishment of credible legal and regulatory frameworks that provide the stability on rules and prices that will induce investments into financially viable products
- Development of enabling policy environments through regulatory interventions, such as appliance energy efficiency standards and labeling policies, mandated utility demand-side management programs, mandatory energy audits, industrial energy efficiency norms, market access for clean energy generators, carbon taxes
- Creation of market-based approaches, such as emissions trading, risk mitigation instruments, and innovative clean energy and energy efficiency funds
- Voluntary programs and education and training.

Many of these policies feed back onto each other—for example, legal and institutional responses give rise to economic incentives that in turn will push technological initiatives such as renewable energy and energy efficiency. Policy targets for renewable energy that exist in 45 countries today are one example of how to accelerate the use of energy technologies that do not emit GHGs.

ADAPTATION TO CLIMATE CHANGE



Some further climate change is inevitable, and ecosystems and human societies will thus need to adapt to new conditions. These changes will expose people to the adverse effects of climate change,

some of which may be countered with current coping systems while others may need radically new behaviors. Climate change needs to be factored into national and sector-wide development plans. While its adverse consequences can be reduced by adaptation measures, they cannot be completely eliminated.

Climate variability is already a major impediment to reducing poverty and will become increasingly so as the Earth's climate warms. Most of the steps needed to adapt to a future climate are compatible with those necessary to reduce vulnerabilities to current climates. Immediate attention is needed for small island states and low-lying coastal areas exposed to storms, but for most countries the longer-term challenge is in the key sectors related to agriculture and associated water resource management.

Adaptation in developing countries is more difficult than in OECD countries because of increased exposure to climate impacts, restricted human capital and technological capacities, and limited access to credit markets and international markets.

Adaptation will require the transfer of existing technologies, new technologies, and the revision of planning standards and systems. Priority funding is needed to develop typologies of country cases to better understand options and costs; to establish better planning and screening tools, especially for hydrological and biological resource management; and to "climate proof" agriculture through a new generation of drought- and water-resistant seeds and breeds. Much of the technology and knowledge needed for adaptation is either currently available

or can be developed at relatively low cost. Given the probability of more extreme weather events, there is an urgent need to upscale emergency response mechanisms.

Successful adaptation will require the efforts of many—from governments that should include adaptation in sector and national development planning to communities that need to cope better with changing conditions. Adaptation activities range from economic measures such as insurance for extreme events to capacity building for alternative crop cultivation and management of the impacts of sea level rise, infrastructure and investment for water storage, groundwater recharge, storm protection, flood mitigation, shoreline stabilization, and erosion control.

FINANCING NEEDS AND SOURCES



The incremental costs of mitigating greenhouse gas emissions is estimated to range from less than \$10 billion a year to over \$200 billion (in 2005 dollars), depending on the stabilization target, the pathway to stabilization, and the underlying development pathways of developing countries. The central estimate for stabilizing carbon dioxide at 550 ppm, for instance, is about \$60 billion per year. The reduction in projected GDP increases moderately when passing from a 750 ppm to a 550 ppm concentration stabilization level, with a much larger increase in passing from 550 ppm to 450 ppm. The percentage reduction in global average GDP over the next 100 years for stabilization at

450 ppm is about 0.02–0.1 percent a year, compared with projected annual average GDP growth rates of 2–3 percent.

Developing countries are not expected to bear the additional costs of a low-carbon economy because of the recognition of common yet differentiated responsibilities in the United Nations Framework Convention on Climate Change and because industrial countries are responsible for most of the anthropogenic GHGs currently in the atmosphere. There are only three sources of funding for mitigating greenhouse gas emissions: voluntary actions, international grants, and trade. While all are potentially important, trade is likely to confer the biggest flow of funds—between \$20 billion and \$120 billion per year.

Market mechanisms and incentives can significantly reduce the costs of mitigation. International project-based and emissions-rights trading mechanisms allowed under the Kyoto Protocol, in combination with national and regional mechanisms, can reduce the costs of mitigation for OECD countries that have ratified the Kyoto Protocol. In addition, countries can reduce net costs of emissions abatement by taxing emissions (or auctioning permits) and using the revenues to cut distortionary taxes on labor and capital. Project-based carbon trading can facilitate the transfer of climate-friendly technologies and

produce a revenue stream to developing countries consistent with their national sustainable development goals.

To deal with the scale of investment needed in climate change, it is therefore imperative that a long-term, stable, and predictable regulatory system be established, based on a wide variety of principles, common policies, energy efficiency improvement goals, and technology standards or targets. Ideally a framework should be established that reaches out to 2050 to produce market certainty, stimulate R&D, and allow time for appropriate policies to be enacted. Even with an improved regulatory environment and the use of policy and political risk mitigation instruments, the challenge of financing incremental costs and reducing technology risks will be significant. Financing vehicles are needed that could blend grants with carbon finance and provide funds to collateralize clean energy technologies.

The overall annual costs to adapt to projected climate change—that is, to climate-proof development—are likely to lie in the range of \$10–40 billion a year, of which about a third is associated with public finance. Most of the initial funding will come from the public sector, but this needs to be integrated in national development planning and private investment plans.



The Response

SECTION 7

Bridging from Local to Global

Actions must be taken in this decade to lay the foundations that will carry us well into the middle of this century. Global and national policies, investment strategies, and new institutional relationships need to be developed. In today's interconnected world, the management of fragile ecosystems, transboundary water systems, communicable diseases, climate change, and scientific and technological pathways and knowledge systems all warrant attention. Management of these systems will require cooperative action. And in today's mobile world, issues of demographic change, migration, and social conflict need to be addressed. This fact suggests greater attention to promoting the long-term development of human capital and stable, inclusive societies.

We have argued that there are grounds for optimism when we take a 50-year view of the prospects for development. The optimistic vision of a wealthier, more equitable world is achievable, but we should

not doubt the scale of the challenges we face. This paper has emphasized five issues that will be critical in achieving this vision:

- Sustaining natural wealth
- Improving governance
- Achieving social development
- Boosting agricultural productivity and competitiveness
- Managing climate risks

Many of these challenges are local, and local investments and institutional reforms will suffice to deal with the issues. But there is a large and growing set of challenges that are truly global in nature. Dealing with these will require increased coordination at the global level. This final section offers summary thoughts on the challenges we have highlighted and concludes with a discussion of some “issues without passports” that we foresee.

SUSTAINING NATURAL WEALTH

Better management of natural resources is a particular concern in the poorest countries. These nations are the most highly dependent on natural resources as a source of income and wealth, and the policies and institutions dealing with these resource issues tend to be weakest in these countries. Two priorities stand out in low-income countries: first, boosting the profitability of natural resources, since these can be a source of development finance; second, better management of the soil resource, since fully two-thirds of the natural wealth of

low-income countries consists of cropland and pasture.

We are learning how devolution of resource management to local communities can boost profits from these resources. For agricultural land, the key is clearly boosting yields while preserving soil quality, as discussed later in this section. For commercial resources, such as minerals and energy, avoiding the distorting effects of large resource rents is vital—the solutions here span macro policies and better governance in the resource sectors. Transparency in commercial natural resource management is particularly important in order to ensure that the benefits of resource abundance are not hijacked by special interests. Water will need to be managed as an economic good. We see living resources—forests and fish—in decline in most of the developing world. Better governance and the rule of law are the linchpins in transforming natural resource wealth into sustainable economic development.

Finally, the Millennium Ecosystem Assessment concluded that the majority of the environmental services provided by nature are in decline. In most cases these services are provided as “externalities,” where the provider of the service is distinct from the beneficiary. Under these circumstances it is possible to make truly damaging development decisions concerning natural resources. There is an urgent need to inventory and value environmental services as a first step to designing interventions to better protect them.

IMPROVING GOVERNANCE THROUGH INCREASING TRANSPARENCY

Partly because there is a higher comfort level with technocratic “fixes,” traditional themes such as public sector management (including civil service reforms, codes of conduct, and so on) continue to be given significant prominence in the aid community. By contrast, transparency has been an underemphasized pillar of institutional reforms. Even popular lore subscribes to the importance of transparency in the old adage “sunlight is the best disinfectant.”

Transparency reforms can span political processes (publishing campaign contributions, or publishing votes and draft legislation), public procurement, enforcement of conflict-of-interest laws, and laws on access to information. Freedom of the media and transparency of public finances are also key.

Of course, transparency reforms are not the only institutional reform priorities. International financial institutions and donors can complement these reforms by continuing to support traditional core competencies, helping with capacity building, sharing knowledge, and supporting focused reforms in key institutions in developing economies, such as in the judiciary, customs, and tax and procurement. These targeted reforms supporting highly vulnerable institutions would, however, have to be adapted to specific realities, and thus might vary considerably from country to country in their priority and in specific design. In some countries the first

priority might be to support procurement reforms, stronger accountability institutions in parliament, and freedom of the press; in others, it may be reforms in the judiciary, women’s rights, and customs and excise.

Governance and corruption challenges are not the exclusive responsibility of developing countries, nor are public institutions the only culprits. The industrial world must not only deliver on its aid and trade liberalization promises, it must also lead by example. OECD countries, which are lagging behind, should ratify and effectively implement the 2003 UN Convention against Corruption and take concrete steps to repatriate assets looted and stashed abroad by corrupt officials.

SOCIALLY BALANCED DEVELOPMENT

We have learned that for development to be sustainable it must be accompanied by positive social change—it is not just about economic growth. This requires action at the local level to build more accountable institutions, to invest in social capital, to include the marginalized as empowered actors in the development process, and to support societies that are more cohesive. It is also clear that when societies fail, when deep divisions and exclusion are not addressed, countries erupt into violent conflict or the state gradually erodes.

As has become painfully clear, the problems of conflict-affected or fragile states do not respect borders. They

provide the breeding grounds for global threats—from terrorism to the spread of HIV/AIDS and other diseases. The international community spends vast amounts of resources trying to reconstruct societies torn apart by violent conflict and to contain the spread of disease and terrorism. A more cost-effective approach is surely to support social and development processes that can produce more cohesive societies, better able to peacefully manage social tensions and nurture more accountable and effective institutions that do not provide a springboard for global threats.

Social accountability is about reforming political and institutional cultures, changing mindsets, building citizenship, strengthening civil society capacity, and above all helping to construct a new set of state-citizen relations. Both supply and demand sides matter. Social accountability is about strengthening bridging mechanisms. The demand for accountability by citizens must be matched not only by the willingness of the government and service providers, but also by their ability to respond to civic demands. Finally, access to information is vital. The quality and accessibility of public information and data are key determinants in the success of social accountability mechanisms.

BOOSTING AGRICULTURAL PRODUCTIVITY AND COMPETITIVENESS



In the past, major investments in technology and infrastructure averted a global food crisis. But as demand for

safe, nutritious, and affordable food increases, the challenge to countries is to increase the productivity of limited agricultural land and water without harming the natural resource base, including biodiversity. Achieving this goal will take a concerted effort by the public, private, and civic sectors acting at all levels of intervention. At the local level, we need to empower rural farmers to organize and demand services and appropriate technology from various sources. Farmers will need to work closely with other stakeholders to develop new varieties and to adapt existing or create new technologies that meet their needs. They will also need to shift their production patterns to preserve the environment.

National and subnational governments need to create an enabling environment where the private and civic sectors can operate to meet the needs of both farmers and consumers. With an average 20-year delay on returns to research, governments and the private sector need to support research systems now, so that they can reap the benefits in the future. Perhaps most important, the public sector needs to target investments carefully to complement private sector activities at the national and international level. While the private sector invests in commercially viable technology, the public sector must focus on technology to meet the needs of the poorest, where the profit margins are not guaranteed. International organizations such as the CGIAR will be central to generating the science, technology, and practices that will form the future of sustainable agriculture. Activities such as the International Assessment of Agricultural Sci-

ence and Technology for Development can help build a consensus among the stakeholders in agriculture as a basis for future cooperation that will move the sector forward.

Agriculture still retains a central role in the livelihoods of rural people, especially in Africa. Higher rates of growth in agricultural productivity are essential to promote broad-based economic growth, reduce rural poverty, and conserve natural resources. Productivity growth, in turn, is based largely on the application of science, technology, and information provided through national agricultural innovation systems embracing all the stakeholders who generate, share, import, and use agricultural knowledge and information.

MANAGING CLIMATE RISKS

Developing countries recognize that they must accelerate access to affordable and reliable modern energy services in order to decrease poverty and increase productivity, enhance competitiveness, and improve their economic growth prospects. Transformational policies and strategies will be needed to meet national expectations of secure, safe, and clean energy and to deal with the implications of climate change. The widespread commercialization of energy efficiency technologies is an effective strategy both to reduce local and regional air pollutants and to address climate change and energy security concerns without affecting economic growth.

Unfortunately, carbon-intensive energy infrastructure and inefficient cities are being rapidly built and expanded, setting the capital stock for decades, while new, cleaner, more efficient technologies remain underutilized. Decisions taken today on technologies and policy will have profound consequences on development paths for 40–60 years. In addition to the need to transform the energy sector, there needs to be a transformation in land management, with policies, practices, and technologies that decrease net emissions of greenhouse gases.

Many developing countries are not yet willing to commit to reducing their greenhouse gas emissions because they fear it will adversely affect their ability to gain access to cheap energy for development. Yet developing countries and poor people who live there are the most vulnerable to climate change. Climate change threatens the quantity and quality of water, agricultural production, human health, human settlements, and ecological systems throughout most of the tropics and subtropics. The challenges, therefore, are to ensure access to affordable, climate-friendly energy for development and to reduce the vulnerability of socioeconomic sectors and ecological systems to climate change.

Because of the recognition of common yet differentiated responsibilities in the United Nations Framework Convention on Climate Change and because industrial countries are responsible for most of the anthropogenic greenhouse gases currently in the atmosphere, developing countries are not expected to bear the additional costs of a low-carbon economy. To deal with the scale of

investment needed in climate change, it is imperative that a long-term, stable, and predictable regulatory system be established that encompasses the concept of differentiated responsibilities and that promotes cost-effective reductions in greenhouse gas emissions through an international trading system. Depending on the specific obligations negotiated, project-based carbon trading could facilitate the transfer of climate-friendly technologies and produce a revenue stream of between \$20 billion and \$120 billion per year to developing countries, consistent with their national sustainable development goals.

Addressing climate change will require national energy sector reform, internationally coordinated climate policies, international collaboration on technology development and diffusion, the establishment of new financing mechanisms for both mitigation and adaptation, and the integration of climate concerns in sector and national economic planning.

ISSUES WITHOUT PASSPORTS— THE NEED FOR GLOBAL ISSUES MANAGEMENT



The Asian financial crisis of 1997/98 demonstrated in stark terms the risks of financial contagion in global capital markets. Unsound policies in individual countries led to financial crises that quickly spilled over to neighboring countries, where it was feared that similar vulnerabilities existed. Financial markets around the world felt the pain.

The lessons learned from the crisis have led to better global systems, enforced by institutions such as the International Monetary Fund and the Bank for International Settlements, for tracking debt, increasing transparency, and strengthening regulation of financial institutions.

From the sustainable development perspective, we see a range of issues that are truly global, spanning:

- Emergent infectious diseases of humans, plants, and animals, such as avian influenza
- Loss of biodiversity, which imposes global costs
- Damage to the ozone layer
- Global warming and climate change
- Failed states, exporting instability to neighbors and the world.

Local actions can be important in dealing with many of these issues, whether it is adopting carbon-neutral energy technologies or eliminating substances that harm the ozone layer. But the incentives for taking these actions must lie in better systems for global coordination. For example, individual emitters of carbon dioxide have no incentive to reduce emissions because most of the damage they do is remote in space and time. The solution to the problem lies in global agreements that provide the incentives through regulatory or economic instruments. One very successful example of such a global scheme is the Montreal Protocol on Substances That Deplete the Ozone Layer.

It is increasingly apparent that these issues interact. Some chemicals that dam-

age the ozone layer are highly effective greenhouse gases as well. Global warming and climate change will affect the incidence of disease, as well as stressing local “hotspots” of biological diversity. Failed states can harbor disease, frustrating efforts at eradication.

This long and growing list of global issues will require that the truly global institutions—the United Nations system, of which the World Bank is a part—step up to meet the challenge.

There is also a growing need for the provision of what might be termed “global technological public goods.” There are problems such as tropical diseases and the vulnerabilities of tropical agriculture that do not lead to profitable investment opportunities for the private sector. Finances and the ability to pay are limiting factors. Innovations

in global finance and strengthening institutions such as the Consultative Group on International Agricultural Research are key steps in solving some of the most intractable problems of developing countries.

Better means to deploy knowledge and human ingenuity must surely be part of the solution to the challenges highlighted in this paper. This will require new thinking on the modalities of international development assistance. The need for finance will not go away in developing countries, at least not in the near term. But increasingly it will be delivery of the “software” of development—creating and sharing knowledge, building capable institutions that can use this knowledge—that will define the relationship between donors and recipients.



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