

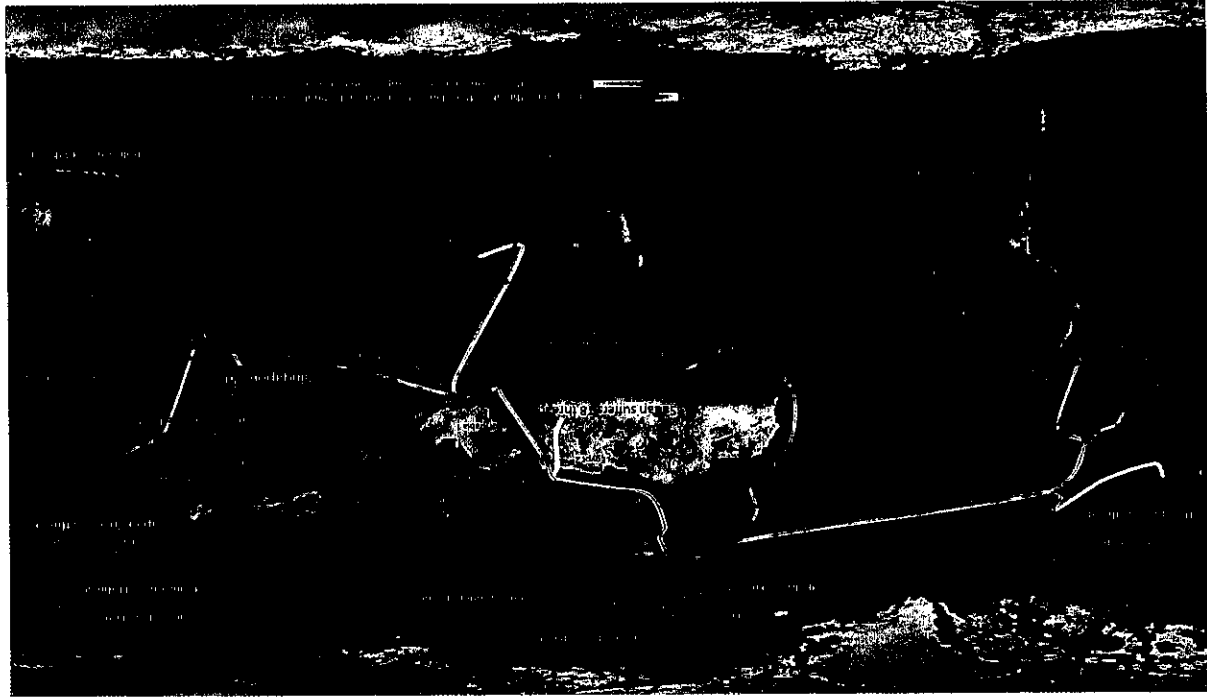
14

SUSTAINABLE DEVELOPMENT GOALS

I. The Sustainable Development Goals (SDGs)

The world is far off course for achieving sustainable development. The issue has been on the global agenda for more than forty years at least, dating back to 1972 with the first UN Conference on the Human Environment in Stockholm and the simultaneous publication of *Limits to Growth*, which correctly pointed out that the challenge of combining economic development and environmental sustainability would pose huge threats in the twenty-first century. Twenty years later, the world met in Rio de Janeiro at the UN Conference on Environment and Development, also known as the Rio Earth Summit, and adopted two major multilateral environmental agreements, the UN Framework Convention on Climate Change and the Convention on Biological Diversity (CBD), and also laid the groundwork for a third that was adopted two years later, the UN Convention to Combat Desertification. And on the twentieth anniversary of the Rio Earth Summit, in June 2012, the world met for a third time, once again at Rio, at the UN Conference on Sustainable Development, known informally as the Rio+20 Summit.

At Rio+20, leaders from all over the world took stock of forty years of international environmentalism and twenty years of three big environmental treaties. What they realized was very unsettling. All of the evidence showed that the diagnosis first made back in 1972 was fundamentally correct: the



13.18 Threats to species from global supply chains

Based on the Bora global trade database (worldmrio.com). Lenzon, M., Moran, D., Kanemoto, K., Foran, B., Lobefaro, L., Geschke, A. International trade drives biodiversity threats in developing nations. *Nature* 486(7401).

challenges of combining economic growth with social inclusion and especially environmental sustainability were still unmet, and indeed were intensifying. Back in 1972, the world's population was about 3.8 billion; now it is nearly twice that, at 7.2 billion. Back in 1972, the carbon dioxide (CO₂) concentration was around 350 parts per million (ppm) and was increasing by around 1 ppm per year. Now the CO₂ concentration stands at 400 ppm and is rising by more than 2 ppm per year. Back in 1972, the loss of biodiversity was hardly recognized; now we know that we are in the sixth great extinction.

The leaders also had to swallow a second difficult conclusion. The major environmental treaties, hailed as historic breakthroughs at the Earth Summit in 1992, had not succeeded, at least not yet. As I previously noted, *Nature* magazine gave the three treaties of the Earth Summit grades of F. Not one of them had delivered as promised by the time of the Rio+20 Summit.

With that in mind, world leaders at the Rio+20 Summit in June 2012 resolved once again to join this battle. They realized the world needs a new and dramatic approach. The first thing the world leaders said in their outcome document "The Future We Want" is that we absolutely must not give up (UN General Assembly [UNGA] 2012, 8):

We commit ourselves to re-invigorating the global partnership for sustainable development that we launched in Rio in 1992. We recognize the need to impart new momentum to our cooperative pursuit of sustainable development and commit to work together with Major Groups and other stakeholders in addressing the implementation gaps.

They also noted something else very important: that the single most urgent task in all of the interconnected challenges of sustainable development is the task that the world did take on in the year 2000 with the adoption of the Millennium Development Goals (MDGs): the fight against extreme poverty. Extreme poverty is the most urgent priority, because it is a matter of life and death for at least 1 billion people, and it is a struggle for survival in the here and now. Extreme poverty can rightly be defined as a condition in which mere survival is a daily struggle. People living in extreme poverty are wondering where their next meal will come from, whether the next drink of water will carry pathogens that could

threaten their lives, and whether the next mosquito bite might transmit a deadly case of malaria to them or their children.

Around 65 million children are still dying every year before their fifth birthday (down by around half of the child deaths that occurred in the year 1990), their deaths caused mostly by diseases that are either preventable or treatable. Extreme poverty is a crisis, an opportunity, and a moral challenge. We can solve this problem. In that spirit, the world leaders at Rio+20 declared that:

Eradicating poverty is the greatest global challenge facing the world today and an indispensable requirement for sustainable development. In this regard, we are committed to free humanity from poverty and hunger as a matter of urgency . . . We reaffirm our commitment to making every effort to accelerate the achievement of the internationally agreed development goals, including the Millennium Development Goals (MDGs) by 2015. (UNGA 2012, 1)

One of the most important steps at Rio+20 came when the world leaders said: "We recognize that the development of goals could also be useful for pursuing focused and coherent action on sustainable development" (UNGA 2012, 43).

In fact, the leaders looked at the MDGs and saw how successful they had been in scaling up the world's efforts to fight extreme poverty in the preceding dozen years since their adoption in September 2000. The leaders agreed that the world now urgently needs a similar approach of scaling up the world's efforts on sustainable development. They therefore declared:

We further recognize the importance and utility of a set of Sustainable Development Goals (SDGs) . . . These goals should address and incorporate in a balanced way all three dimensions of sustainable development and their inter-linkages. (UNGA 2012, 43)

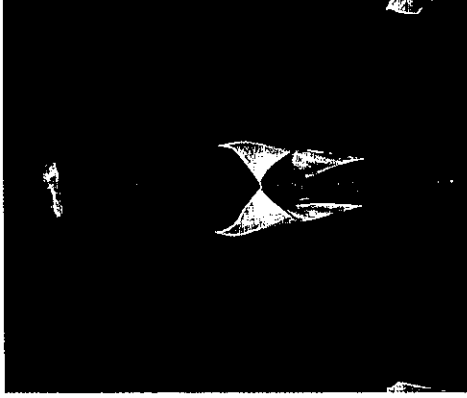
In essence, the world leaders agreed to make the transition from MDGs to SDGs. Just as the MDGs had inspired action by being a short set of compelling objectives, so too the new SDGs should motivate global enthusiasm, knowledge, and action. As the leaders put it in "The Future We Want":

SDGs should be action-oriented, concise and easy to communicate, limited in number, aspirational, global in nature and universally applicable to all countries while taking into account different national realities, capacities and levels of development in respecting national policies and priorities. We also recognize that the goals should address and be focused on priority areas for the achievement of sustainable development, being guided by this outcome document [“The Future We Want”]. Governments should drive implementation with the active involvement of all relevant stakeholders, as appropriate. (UNGA 2012, 43)

The call for SDGs is a potentially historic decision, a powerful way to move to a new global agenda that engages the world community, including not only governments but also businesses, scientists, leaders of civil society, NGOs, and, of course, students everywhere. Unlike the MDGs, which apply largely to poor countries and reference the rich countries mainly as donors, the SDGs will be universally applicable. The United States, just like Mali, needs to learn to live sustainably! The rich countries like the poor have to promote more social inclusion, gender equality, and of course energy systems that are low carbon and resilient.

These goals can give new impetus, new power, new social mobilization, new resources, and new political will to a challenge that has been more than forty years in public awareness and twenty years in international law, but has not successfully been addressed to date. These goals will not supplant international law. The treaties are still needed. But they can create a new global energy and atmosphere of problem solving that will help to implement the treaties.

In a follow-up to Rio+20 and the call of the world leaders to put sustainable development at the very core of the international development agenda, UN Secretary-General Ban Ki-moon (shown in figure 14.1) greatly honored me by tasking me with creation of a new global network of sustainable development problem solving. We call this the *Sustainable Development Solutions Network* (SDSN). The key motivation for the new SDSN is the idea that the world needs not only new goals, political motivation, and will, but also a new era of intensive problem solving in sustainable development challenges that include health, education, agriculture, cities, energy systems, conservation of biological diversity, and more. The SDSN is a network of universities around the world, hundreds of them, in partnership with governments,



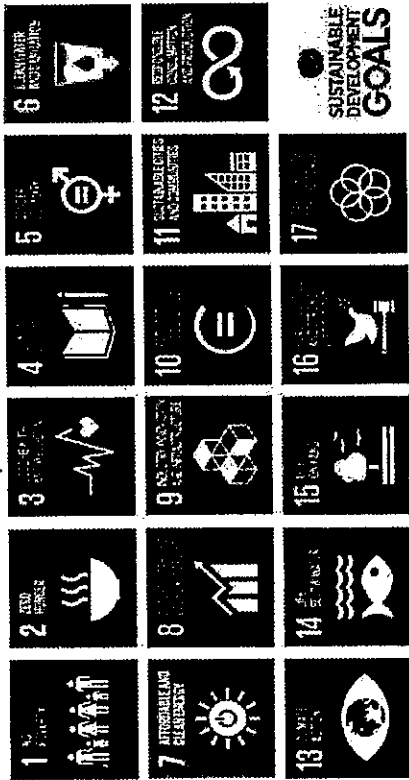
14.1 UN Secretary-General Ban Ki-moon

Ban Ki-moon—World Economic Forum Annual Meeting 2011, Remy Steinegger, World Economic Forum, Wikimedia Commons, CC BY-SA 2.0.

businesses, and nongovernmental organizations. It is launching national chapters in dozens of countries, and several regional chapters as well (for example, the countries of the Amazon basin, the African Sahel, and Southeast Asia).

The 193 countries of the UN General Assembly worked for three years, from 2012 to 2015, to agree on seventeen Sustainable Development Goals, which they adopted on September 25, 2015. These goals are summarized by their logos in figure 14.2. They embrace the three pillars of sustainable development: economic development (including the end of extreme poverty), social inclusion, and environmental sustainability. In addition to the seventeen goals, the UN General Assembly also adopted 169 more detailed targets distributed among the seventeen goals. The UN General Assembly emphasized, however, that each nation should choose its own national targets based on its national circumstances and priorities. Countries will also be expected to report on an agreed-upon set of indicators to measure progress towards the goals and targets.

SUSTAINABLE DEVELOPMENT GOALS



14.2 Sustainable Development Goals

United Nations Development Programme

Let's look at the seventeen goals in a bit more detail.

SDG 1: End extreme poverty. The first goal aims to finish the work of the Millennium Development Goals to "end poverty in all its forms everywhere." The essence of SDG 1 is to ensure that by 2030, all people are living above the line of extreme poverty set by the World Bank.

SDG 2: End hunger and promote sustainable agriculture. This goal is complex: to end hunger, improve nutrition, and ensure that the farm system is resilient to environmental stresses but also less destructive of the environment.

SDG 3: Ensure healthy lives for all. By 2030 all countries should have reduced under-5 mortality rates to below 25 per 1,000 live births, and maternal mortality to below 70 per 100,000 live births. Moreover, every country should by 2030 ensure universal health coverage (UHC), including treatment of many kinds of noncommunicable diseases.

SDG 4: Ensure quality education and lifelong learning. In many ways, the access to quality education will be the make-or-break of the SDGs. Countries with quality education reaching all children will do very well; those with major gaps in education coverage will suffer. SDG 4 calls for universal coverage of quality education from pre-school through at least secondary education, and then on to more advanced skills training.

SDG 5: Achieve gender equality and empower women and girls. This goal aims to end all forms of discrimination against women and girls, and to ensure that women have equal economic and social rights. One target calls for using information and communications technologies to promote women's empowerment, for example, through inclusive finance, online education, and job creation.

SDG 6: Ensure availability and sustainable management of water and sanitation. This goal seeks to ensure that every person has access to safe and affordable drinking water, as well as sanitation and hygiene. The goal also calls for large strides in reducing water pollution and raising the efficiency of water use.

SDG 7: Ensure access to affordable, sustainable modern energy. This goal aims to end "energy poverty," in which households lack access to electricity and safe cooking fuels. The targets include major strides in the provision of renewable (low-carbon) power and in energy efficiency.

SDG 8: Promote sustainable economic growth and decent work for all. SDG 8 might be considered the economic development goal. SDG 1 calls for ending extreme poverty; SDG 8 calls for economic growth to raise incomes per person and to enable today's poor countries to narrow the gap with high-income countries. Targets also emphasize full employment, decent work, labor rights, and the end of modern slavery and human trafficking.

SDG 9: Build resilient infrastructure and promote sustainable industrialization. SDG 9 recognizes that many countries in the developing world lack key infrastructure: quality road networks, power grids, fiber grids (for the Internet), rail networks, and suitable ports and airports. Yet in the twenty-first century, having infrastructure

will not be enough. It must also be sustainable, meaning resilient to environmental stresses and also "green" in that it imposes little pressure on the natural environment. Future infrastructure, for example, should support the transition to a decarbonized energy system by around 2070. Other targets under this goal call for improved innovation systems (to speed the development and diffusion of new technologies) and sustainable industrialization, especially in low-income regions such as sub-Saharan Africa where industrialization is still very low and incomplete.

SDG 10: *Reduce inequalities within and among countries.* SDG 10 is a conceptual breakthrough for the world community: a globally shared recognition that large income gaps between the rich and the poor are highly deleterious for social stability, social trust, and protection of individual rights of the poor. Other targets under this goal emphasize the enhanced voice of poorer countries in global institutions and the facilitation of "orderly, safe, regular, and responsible migration," something that alas is still far from being achieved.

SDG 11: *Make cities and human settlements sustainable.* This goal represents the recognition of central governments that cities should pursue sustainable development in their own right. Partnerships among cities are now being formed to promote decarbonization and sustainable development. Targets also call for the protection of the world's cultural heritage and steps to reduce the deaths and displacement from natural disasters.

SDG 12: *Ensure sustainable consumption and production patterns.* The main idea of SDG 12 is to promote the "circular economy," in which today's wastes become tomorrow's inputs and recycled products. Targets include the sound management of industrial chemicals, including the significant reduction of their release into the environment, and reducing the massive amount of food waste in today's production and supply chains.

SDG 13: *Take urgent action to combat climate change and its impacts.* This goal calls for decisive actions under the UN Framework Convention on Climate Change. It emphasizes both mitigation (reducing greenhouse gas emissions) and

adaptation (increasing climate resilience). It calls on high-income countries to honor their pledge of at least \$100 billion per year in financing by 2020 to help developing countries to confront climate change.

SDG 14: *Conserve the oceans and marine resources.* This goal recognizes the profound threats to the world marine environments from several human activities. These include overfishing, ocean acidification caused by massive fossil-fuel use, degradation of marine and coastal ecosystems, and pollution.

SDG 15: *Protect and restore terrestrial ecosystems, sustainably manage forests, and halt biodiversity loss.* This crucial goal recognizes all of the threats to terrestrial ecosystems and biodiversity around the world. There are no fewer than twelve targets. They span the conservation of terrestrial ecosystems; the sustainable management of forests; the combatting of desertification; the protection of biodiversity and habitats; the prevention of invasive species; and the mobilization of new financial resources to protect biodiversity.

SDG 16: *Promote peaceful and inclusive societies.* This goal calls for the reduction of violence, the defense of the rule of law, the end of human trafficking, the promotion of inclusive and transparent institutions of governance, and the protection of fundamental freedoms.

SDG 17: *Strengthen the means of implementation of the SDGs.* This goal details key global steps needed to promote the SDGs, including finance, technology development and transfer, capacity building, a rule-based trading system, multi-stakeholder partnerships, and data and monitoring for the SDGs.

Taken as a whole package, the SDGs are meant to orient the world in clear, specific, measurable, concise, and understandable ways to help the world to make the shift from the business as usual and increasingly dangerous course to a new trajectory of sustainable development. It is now up to the world's governments, in partnership with business and civil society, to implement the seventeen SDGs adopted by the UN General Assembly in September 2015. The specified date for completing the SDGs is end-2030.

organize and mobilize the world's leading malariologists. As a group, these experts recommended practical steps to fight the disease, and those recommendations have worked. The role of epistemic communities is extremely important, because governments by themselves do not have the expertise that exists to guide action. The expert-knowledge communities can make critical recommendations of what actually to do, such as the recommendations made by the UN Millennium Project.

And finally, goals not only mobilize knowledge networks, but they also mobilize stakeholder networks. Community leaders, politicians, government ministries, the scientific community, leading nongovernmental organizations, religious groups, international organizations, donor organizations, and foundations are all constituents that need to be pulled together. That kind of multistakeholder process is essential for the complex challenges of sustainable development and for the fight against poverty, hunger, and disease. That has happened by conscious design in area after area of the MDGs. It is one of the clearest ways that the mere statement of goals leads to improved outcomes by bringing together these multistakeholder processes.

No one has ever put the case for goal-based success better than John F. Kennedy did fifty years ago in one of the greatest speeches of the modern U.S. presidency. In his famous peace speech in June 1963, President Kennedy (figure 14-3) said: "By defining our goal more clearly, by making it seem more manageable and less remote, we can help all people to see it, to draw hope from it and to move irresistibly towards it" (Kennedy 1963c). This is the essence of the importance of goal setting.

What have been the accomplishments and weaknesses of the MDGs? Probably the biggest accomplishments have been in the area of public health. Three out of the eight MDGs are about health: reducing child mortality and maternal mortality and controlling the epidemic communicable diseases. In all of those cases, the MDGs have made a very big difference. Why were they so effective in those areas? First, the health MDGs were stated in terms of specific, quantifiable targets, so the progress and outcomes could be measured and assessed.

Second, these health MDGs seemed more manageable and less remote because the epistemic communities helped to map the pathways to achieve them. Many organizations in academia, private foundations (such as the Bill and Melinda Gates Foundation), businesses, and international agencies worked together to develop and disseminate new technologies and business models for success.

II. Goal-Based Development

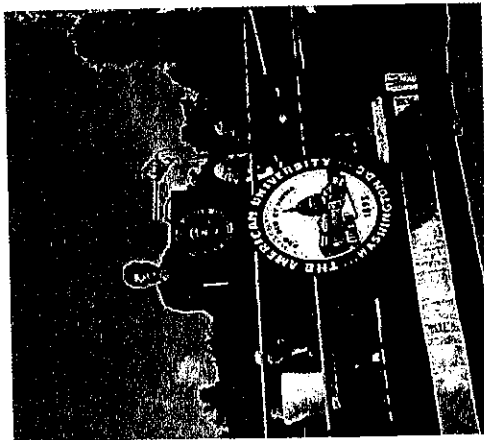
The world's governments have now adopted the SDGs, but will these new goals really make a difference? Will a new set of goals somehow help the world to do what it has not yet been able to do, to shift from a dangerous business as usual path to a path of true sustainable development? Can UN goals actually make a difference?

The evidence from the MDGs is powerful and encouraging. In September 2000, the UN General Assembly adopted the "Millennium Declaration," which included the MDGs. Those eight goals became the centerpiece of the development effort for poor countries around the world. Did they really make a difference? The answer seems to be yes. There has been a marked acceleration of poverty reduction, disease control, and increased access to schooling and infrastructure in the poorest countries of the world, and especially in Africa, as a result of the MDGs. They helped to organize a global effort.

How did they do this? Why do goals matter? There are many answers to this question. First, goals are critical for social mobilization. The world needs to be oriented in a direction to fight poverty or to help achieve sustainable development, but it is very hard in our noisy, disparate, divided, crowded, congested, distracted, and often overwhelmed world to mobilize any consistency of effort to achieve any of our common purposes. Stating goals helps individuals, organizations, and governments all over the world to agree on the direction.

A second aspect of global goals is peer pressure. After the MDGs were adopted, even if governments were not necessarily initially inclined to take on this effort, they knew that progress (or lack thereof) was going to be reported. Each country would be compared with others. Peer pressure came in when leaders were publicly and privately questioned on their progress and the steps they were taking to achieve the MDGs. That kind of dynamic has been absolutely real and effective.

A third way that goals matter is in mobilizing *epistemic communities*. Epistemic communities (or "knowledge communities") are networks of expertise, knowledge, and practice around specific challenges like growing food, fighting diseases, or designing and implementing city plans. When goals are set, those communities of knowledge and practice come together to recommend practical pathways to achieve results. I have watched how the goal to fight malaria, for example, has helped to



14.3 President Kennedy giving the peace speech at American University (June 10, 1963)

Commencement Address at American University. Cecil W. Stoughton, John F. Kennedy Presidential Library and Museum.

Third, there were specific funding mechanisms attached to achieve the health MDGs. Most important was the arrival of the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM), which was established in 2001, just one year after the MDGs were adopted, and put into motion in 2002. There is no doubt that the MDGs made a very big difference in giving birth to the GFATM. Many individual countries, led by the United States, also created new national efforts motivated by the MDGs. The U.S. government adopted the President's Emergency Plan for AIDS Relief (PEPFAR) in 2003 and put billions of dollars into the fight against AIDS in poor countries. In 2005, the U.S. government adopted the President's Malaria Initiative (PMI). Both PEPFAR and PMI have played major roles in fighting these diseases. In many countries, the increase in donor funding was accompanied by an increase of domestic financial resources as well, as governments were encouraged to spend more of their own limited funds on high priorities such as disease control.

Finally, the health MDGs succeeded in those areas because of monitoring, measurement, evaluation, and feedback to program design.

The MDGs did not work as well in certain other areas. In areas like sanitation, the achievement of the MDGs is lagging. There has not been a global fund for clean water and sanitation along the same lines of the GFATM. International funding was not elaborated and increased; goals were not made to seem more manageable and less remote through detailed plans of action; the epistemic communities did not organize quite as well; and the political leaders were more neglectful. Education, surprisingly, was also not quite as high on the global agenda and not as well financed as global public health. As a result, the gains in health have outpaced the gains in education. The agriculture and hunger MDGs are also a bit further behind; while agricultural progress has been real, the changes in global policies and politics have not been as dramatic as for global public health.

What these cases show is that goals can make a galvanizing difference, but that there is nothing inevitable about achieving large-scale results after stating a goal. Stating a goal is merely the first step of implementing a plan of action. There must be good policy design to implement that program of action. There must be new financing. There must be new institutions (such as the GFATM) to help implement that goal. And when the outcomes occur, they must be measured, and strategies must be rethought and adapted in a continuing loop of policy feedback, all under the pressures and the motivations of a set of goals and a clear set of timetables.

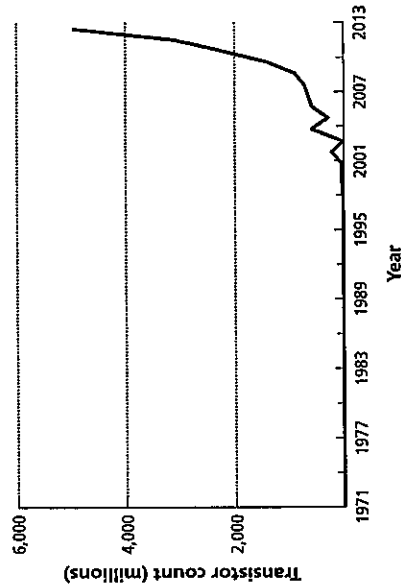
The sustainable development agenda is of course even bigger and harder than the MDGs, which themselves are no small challenges. Sustainable Development Goals have included not only the continuation of the fight against extreme poverty but also the integration of that goal with several others, including social inclusion and environmental sustainability. The set of challenges is therefore even more complex, and there are at least two aspects of sustainable development that make the problems even more complicated. First, the natural time horizon for results is longer term. Decarbonizing the energy system is going to require a thirty- to forty-year effort, even if we move as fast as we can. Making our cities more resilient will certainly take a couple of decades and more. There is a tremendous need to look forward at least twenty to thirty years in setting the kinds of

frameworks needed to actually achieve SDGs. Second, the goals this time will be universal, requiring the buy-in and action of all parts of the world, rich and poor. There are two specific tools that will be important for translating SDGs into reality. The first of those tools is called *backcasting*. Rather than forecasting (or guessing!) what will happen in 2040 or 2050, one sets the target for a certain date and then analyzes the problem from the target to the present (backward in time) in order to chart a course between today and the future goal. Backcasting is about asking: How can we get from here to there?

The second closely related tool is *technology road-mapping*. Road-mapping asks deep questions about the pathway from today to the future goal. What does the policy terrain really look like? What are the big challenges? What are the technological barriers to overcome between now and 2030 or other future dates? On the pathway of sustainable development, we may have to cross a technological mountain range. Obstacles to overcome in the energy sector, for example, will include the intermittency of renewable power; the challenge of storing wind and solar power; the relatively high costs of certain alternative energy possibilities; and the need to create new power grids to connect major low-carbon energy sources with major population centers, such as connecting the wind power of North Dakota with the energy needs of the Eastern Seaboard of the United States. In other words, we also need a road map for passing through difficult terrain.

To some people, especially those steeped in free-market economics, the combination of goals, backcasting, and road maps might seem to be a kind of planning that is impossible and even contrary to the market process. That is not correct. In sophisticated high-technology industries, exactly this kind of road-mapping is the norm. A recent successful example of this is a great motivator: the road-mapping of Moore's Law.

Moore's Law, shown in Figure 14.4, is the information technology principle that the capacity of integrated circuits is doubling roughly every eighteen to twenty-four months. Gordon Moore first outlined this law in 1965 when he was the CEO of Intel, the leading company in integrated circuits. He noted at the time that for the past ten years or so, the number of transistors that could be packed into an integrated circuit was doubling roughly every eighteen months to two



14.4 Transistor count on Intel microprocessors (1971–2012)

Source: Intel.

years. As these integrated circuits became more powerful, they were commensurately improving the ability to process, store, and transmit data (as bits and bytes). This tremendous increase of the information capacity of central-processing units, storage, and the ability to transmit enormous volumes of information has transformed our world. Since 1965, we have had roughly a billionfold improvement in the capacity to process, store, and transmit information. We therefore live in a world of interconnectedness of information that was unimaginable at the time that Moore first enunciated this principle. Intel's newest chip in 2013, the XEON PHI, now has 5 billion transistors on the integrated circuit. Moore's Law has delivered a startling, indeed a world-changing, billionfold information revolution.

But how was it achieved? How did the industry succeed? It succeeded through a combination of the individual genius of engineers and scientists, industry competition, and also an industry-wide road map. One aspect of that road-mapping is a formal process called the *International Technology Roadmap for Semiconductors*, in which leaders in the industry get together and map out the steps ahead needed to ensure the continuation of Moore's Law in the upcoming decades. They have done this brilliantly and successfully. Their success has transformed our world and is also a lesson to the skeptics about looking ahead. It may not be possible to

know the future, but it is certainly important to plan on how to overcome certain obstacles, to think ahead, to be prepared for the problems that will come, and to take measures to move in the target direction in the upcoming decades.

The final point that will be absolutely crucial is that like the MDGs, the SDGs will be a multistakeholder process. There will need to be hands-on effort and engagement across the public sector, the private sector, civil society, governments, individuals, academia, research centers, foundations, and so on. People from every part of society must be involved. The planetary boundaries are already so pressing that speed of action is essential, and the multistakeholder approach that mobilizes all parts of society is also vital. That is a big roundtable, a lot of discussion, a lot of harmonization of different approaches; some for profit, some not for profit, some basic science, some very applied decision making, some on-the-ground in communities all over the world, some training and educating the leaders of the future. But all of these interconnected parts of a global social network will need to be brought together for effective problem solving, decision making, and implementation of the SDGs.

III. Financing for Sustainable Development

Achieving the SDGs will require a lot of new investment: new infrastructure in water, energy, and transport; new educational systems; new health care; and other critical areas. Like anything that concerns building for the future, investing in the future—in people, technologies, infrastructure, and natural capital—is at the very heart of achieving the SDGs. Yet who will pay for the SDGs? How will they be achieved through effective financing?

In the end, we are all going to pay in some sense, because as citizens and consumers we have to pay for the goods and services that are part of our lives. We pay for them in one of two fundamentally different ways. One is that we participate in markets as consumers and suppliers. In the market sector of our economy, the interaction of supply and demand generates the economic activity and provides the motivation for financing. Businesses build factories because they anticipate they will make profits from those factories.

The other way that we buy the things that we need is by paying taxes as citizens, so governments can provide public services such as building roads; providing health care, public education, or fire and police services; and funding the scientific research that underpins technological change. In this sense, all of us will pay for sustainable development in both ways: through markets and through political institutions. But tremendous and sometimes very bitter fights ensue over the proper balancing of financing between the market-oriented, profit-seeking investments of business driven by their sales of goods to consumers, and the financing that comes through the public sector. The free-market advocates argue that markets will be more efficient than governments; whereas advocates of public leadership argue that markets are not making the necessary investments and providing the necessary services, so a public approach is needed.

In fact, these different kinds of financing are complementary mechanisms to finance sustainable development objectives. Both public and private (and philanthropic) approaches are needed. An analysis of where the right boundaries are needs to be at the core of our analytical understanding of these issues. What are the most effective ways to allocate responsibility for financing between market-based private sector financing and public financing?

There are cases in which the market has done brilliantly almost on its own. The greatest example of this is the massive expansion of mobile telephony to all parts of the world. In just roughly twenty-five years, the number of mobile subscribers has increased from a few tens of millions of subscribers around 1990 to around 7 billion subscribers today, including many of the world's poorest people. This massive scale-up was not on the basis of a government program. It was accomplished overwhelmingly by private telecommunications companies looking for profit and making investments in their base stations (for mobile transmission) and fiber-optic lines and by consumers buying the phones and the access to connectivity. This is a wonderful example in which private markets have done the job. Of course, we must keep clearly in mind that the underlying technologies that have made the global connectivity revolution possible started with the basic sciences—including solid-state physics and quantum mechanics—and then applied engineering, much of which was originally financed by the public sector and then taken up by the private sector. Indeed, some of the roots of this

industry, like so many others, occurred during World War II, when the U.S. government financed science and engineering in support of the war effort.

Other kinds of critical activities in no way had the kind of dynamics of mobile phones. More than a decade ago, markets plus subsidies were the preferred mode of organization for financing malaria control, but the uptake of malaria control (e.g., bed nets) was still very small. When companies producing insecticide-treated bed nets tried to market those bed nets to the public, they found that the poorest people absolutely were not customers for the nets even though they needed those nets to stay alive. People in rural areas were so impoverished they could not afford even the very cheap nets they needed to keep themselves alive! And when it came to organizing the delivery of malaria control systems, including Community Health Workers, linkages to local clinics, malaria diagnostic services, outreach, availability, and access to the right kinds of medicines, the private sector approach simply was not delivering. The new systems did not emerge on a for-profit basis.

Then came the GFATM and the PMI. These programs mobilized increased public financing both internationally from donor countries and from the malaria-stricken countries themselves. Much more comprehensive measures could then be introduced as a provision of social services instead of as a profit-based activity. Businesses then played a key role. They manufactured high-quality, long-lasting insecticide-treated bed nets. They produced antimalaria medicines in large amounts. They devised and produced new rapid diagnostic tests that could be used in the community rather than in the laboratory. Yet these innovations depended on public financing like the GFATM and the PMI to buy the bed nets, medicines, and diagnostic kits, and to fund the Community Health Workers to utilize the new technologies.

Economics teaches us a lot about where the right boundaries are. There are a few crucial reasons why the private sector approach, which would ideally be the universal one if it actually solved problems, does not solve many critical problems in particular and important cases. The first case is when the challenge is fighting extreme poverty. Markets are basically designed to *ignore* the poor, as they are generally not good customers. But when it is a question of access to health care, for example, the poor can die as a consequence of this lack of market access. This is where the concept of “merit goods” comes in. There are areas of our economic

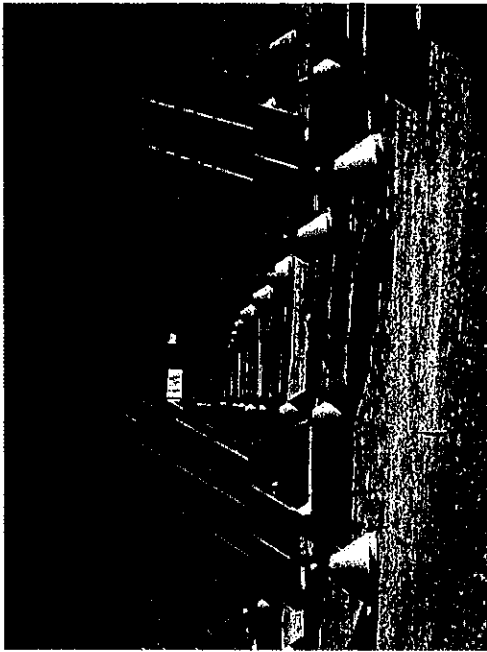
life—health, education, and other areas—where government should provide services whether people can pay for them or not, because these are meritorious goods that should be universally accessible. Public financing is essential to ensure the poor have access to merit goods.

Public financing is also essential in areas where it is hard to recoup the returns on an investment in a direct cash sense. Consider investing in basic science. Scientific knowledge is freely available and the returns to science come via broad societal improvement, but the scientist does not patent the basic forces of nature uncovered in her or his research. Science requires public financing because the profit motive by itself will not be sufficient. Fortunately, many countries have recognized this and support the sciences. As we want to speed research and development of new low-carbon energy sources, public financing for the research and development of low-carbon energy will be absolutely essential.

Public finance is also very important for social insurance—when people are left unemployed by shifts of global markets or when they succumb to other kinds of hardships that cannot be insured effectively in private markets, government can be there as a kind of social safety net.

These are three of many reasons why public financing will be crucial for the SDGs. International help from taxpayers from the high-income countries will also play a vital role in helping poor countries that do not have an adequate tax base to meet the SDGs. There are many areas where the private sector is the natural way to finance advances. Private companies will most likely have the lead in building and operating large-scale energy systems in the future. But in order to give the right incentives for the private sector, we will need proper price signals (sometimes called “corrective pricing”). For example, a carbon tax will be advisable to shift the investments of private utility companies toward wind and solar power (shown in figure 14-5) as opposed to coal-fired power plants. Even when the financing is strictly within the private sector, a proper regulatory framework and corrective measures are very important to make sure that the private sector is investing in the right areas and is driven by market signals that are giving accurate indicators of overall social costs and social benefits.

There has been an often intense and ongoing debate about one aspect of public finance—when taxpayers in one country help to provide public services



14.5 Solar panels at Bear River Migratory Bird Refuge (Utah)

Solar Panels at Bear River Migratory Bird Refuge, Jason St. Sauer / USFWS, Flickr, CC BY 2.0.

in another country through aid, also known as official development assistance (ODA). There are harsh critics of foreign aid, while others, including myself, have argued that a taxpayer-financed approach is vital, lifesaving, and crucial for organizations like the GFATM, PEPFAR, or other international development efforts aimed at helping very poor people. The debate about ODA has been running pretty strongly during the whole period of the MDGs, because MDG 8 calls for increased ODA.

To break down this debate, one line of thinking, in which I would include my own views, says aid can be useful and indeed vital in certain circumstances. Yet to be successful, such aid needs to be well targeted and well managed. The critics come in a variety of areas. One camp argues that aid is simply unnecessary and markets are always the solution. A second camp of aid skeptics believes that aid is inevitably wasted. A third argument says that aid is absolutely debilitating, not just wasted; that it leads to a kind of dependency mentality that is demeaning and diminishes motivation. And some people just want to be left alone regardless

of what is happening abroad. These camps have been arguing for quite a while. I would like to give a brief explanation of why I believe aid is important.

I agree with the aid skeptics that much aid is wasted. There are cases called "aid" that are little more than shoving money in the pockets of warlords. This is not aid, at least not development aid. It may play a role in foreign policy (though I doubt it). Yet it is certainly not the kind of aid that I support to achieve development objectives.

My argument is somewhat different. My argument is that *aid can work and that it is vital in certain circumstances*. It is especially vital when people are very poor and facing life-or-death challenges, such as malaria, AIDS, safe childbirth, safe water, sanitation, or growing enough food to stay alive. Markets cannot meet the needs of the very poor. The desperately poor are not consumers who will create an immediate profit. Nor can the urgent needs be met through the very meager budgets of the poor countries. And so the poor need help through other means. Then the question is whether it is possible to help effectively through international aid, without too much corruption, theft, and debilitating bureaucratic inefficiencies. My answer is yes, if done thoughtfully (Sachs 2014).

We certainly need to think hard to design effective aid-delivery systems. My favorite examples of this are the GFATM and the Global Alliance for Vaccines and Immunizations (GAVI). Both of these new organizations (created around the time of the MDGs) pool the aid from the richer countries, have an expert process of evaluating proposals for the use of the aid by recipient countries, and then monitor very closely whether that aid is effective. To my mind, that exemplifies the ways that aid can work. Pool the resources of many donors into a common pot so the process is streamlined. Put the aid under careful scrutiny with expert review and with careful quantitative monitoring and evaluation. Have a plan of action that a certain amount of money is going to be used to procure bed nets, antimalaria medicines, diagnostics, emergency obstetrical equipment, and so forth. And then closely monitor what happens afterward.

The evidence is quite strong that this kind of aid has worked very well. While there were huge skeptics at their founding, the GFATM and GAVI have both delivered. We have seen the results on the ground. There have been cases of corruption, but because the system is closely monitored, there are quantified targets,

and there is follow-up, so that even when there is money stolen (as will happen in any human system), it is possible to stop, check, correct, and move forward. That kind of feedback system is essential.

I believe we need more of these pooling mechanisms, more global funds for health, for education, for safe water and sanitation, for smallholder farming, for access for all to low-carbon energy sources, and for mechanisms to protect biodiversity. We have a Global Environment Facility, which was established under the CBD, a major step forward. Rather than lumping together all types of policies and programs and claiming they are doomed to fail, we need to clarify and understand the directions in which success is very likely. We also need innovation in financing and more public-private partnerships, wherein private and public financing are linked in a package to the right kinds of regulatory steps. We will need public-private partnerships for clean energy and new infrastructure; we have already had successful ones for technology development, such as antiretroviral drugs to fight AIDS.

The effectiveness of ODA and public finance in general requires a serious process of planning, backcasting, road-mapping, monitoring, evaluation, and strategy updates. With this efficacious system in place, the incremental costs of meeting the SDGs are probably in a global cost range of about 1-2 percentage points of world output per year for the kinds of global transformations needed, including public financing plus ODA plus public-private partnerships. (This is a very rough estimate, in need of refinement in the coming year or two.) This level of financial effort will not break the bank. But it will not happen through market forces alone. A clear, effective strategy of official financing of national budgets for national needs, and of ODA for the poorest countries in particular, will play a vital role in the success of the SDGs.

IV. Principles of Good Governance

I see four major dimensions of sustainable development. There are the traditional three—economic development, social inclusion, and environmental sustainability. But those three require in all cases the underpinning of a fourth dimension: good governance. Good governance will play a central role in the eventual success

or failure of the SDGs, so it behooves us to think clearly about what we really mean by the term. Governance is about the rules of behavior, especially in organizations. It is not only about our politics and government, but also about major organizations that are key actors in sustainable development, including our private corporations. Good governance encompasses both the public sector and the private sector, and especially the large multinational corporations in the private sector.

Clearly there are many types of governments and sets of governing principles around the world, so it would be unworkable to impose one set of political rules to dictate implementation of the SDGs. Rather than universal prescriptions, there can be certain shared principles of governance for the public and private sectors. The first is *accountability*. Governments and businesses need to be accountable for their actions. Businesses are in part accountable to markets, but they are also accountable to the court of law, and they need to be accountable to the court of public opinion as well. Governments are accountable to their citizens in democratic elections, but they need to be accountable even in nondemocratic systems. By *accountability*, I do not mean a specific set of election rules, though some are better than others; but rather the idea that governments will adopt goals and be responsible for following through on outlining the measures needed to achieve those goals, to report on them, and to provide public assessments of progress toward those goals. This should be the case across all political systems.

That requires a second feature that also transcends a specific government or corporate organization: *transparency*. We as citizens, as market participants, and as fellow human beings intent on achieving sustainable development, can only hold government and business accountable for their actions if we know those actions and behaviors. This means that we must press our powerful institutions to resist secrecy, including the institutionalization of secrecy in the form of tax havens and “secrecy havens” around the world that allow people to hide their money and behavior, even when this behavior hugely impacts the global goals of ending poverty and saving the planet. Governments of all different political systems have a responsibility of transparency.

A third key tenet is *participation*: the ability of citizens and of stakeholders vis-à-vis business to participate in decision making. There are, of course, many different views about this and many different ways of participating. Elections are a

kind of participation, but they must not be the only kind. The ability to participate through public discourse, through public deliberations, and through hearings on regulation are all extremely important. Businesses similarly need to engage their stakeholders through institutional means and clear processes not only with the shareholders but also with the workforce, the suppliers, and the consumers. Good businesses always have a multistakeholder approach.

A fourth aspect of good governance that falls under accountability is the polluter pays principle, which says we all need to clean up after ourselves. Whenever we as individual consumers or as parts of companies are imposing costs on others not reflected in market prices, such as when companies pollute the waterways or air, we need to bear that cost. Economists call this "internalizing the externality," meaning that companies and consumers need to bear the full social costs of their actions.

This raises the question of corporate responsibility. For example, is it "right" for a business operating in a poor country with weak environmental standards to pollute in that country, even if it is technically not against the law? Some extremist views would say that it is actually the *responsibility* of the company to pollute if it is not illegal, in order to maximize shareholder profit. To my mind, this is a clearly mistaken view. We should instead insist that companies desist from creating external damages (such as pollution) if those actions are technically legal. My view is closely related to an ancient and very important doctrine in Latin known as *primum non nocere*, which means, "First, do no harm." A principle of good governance in my view is first, do no harm. Even if the law for whatever reason allows an enterprise to impose costs on others, it is the company's responsibility not to do so, because our higher responsibility is an ethical responsibility to do no harm.

Finally, I would say good governance includes a clear affirmative commitment to sustainable development. Governments have a responsibility to the planetary needs. It is not feasible or good enough in our interconnected world for politicians to deny a responsibility beyond their narrow constituency. Good governance is also a responsibility toward a sense of universal commitment and universal participation in sustainable development.

We are not there yet. The process of elaborating SDGs throughout 2015 and then their implementation beyond will be a vital opportunity for improving global governance. If these basic principles of accountability, transparency,

participation, the polluter pays principle, and commitment to sustainable development are universally adopted in some form, I believe that we can make important headway. Governments can work far more effectively together and businesses can play a responsible role. They can pursue sustainable development rather than spend profits doing more harm, such as in anti-climate change propaganda or corporate lobbying. As we move to the good governance needed to underpin the SDGs, we will need that kind of good governance and responsible leadership in both our public and our private sectors.

V. Is Sustainable Development Feasible?

Is sustainable development feasible? Can we elaborate SDGs and carry them out in time? In our confusing, confused, and distracted world, we are running powerfully off course in many ways—climate change, the sixth great extinction, cities in danger, food supplies under threat, massive displacements, widening inequalities of income, high youth unemployment, broken politics. Is it even conceivable that we can get back on course? This is a very deep and real concern.

Some of the most important thinkers in the world have expressed some very serious doubts. Three authors whom I tremendously admire have all recently made me shudder with their pessimism. Jane Jacobs, who was one of the world's greatest urbanists and champion of vibrant sustainable urban areas, in her last years of life wrote a book called *Dark Age Ahead*. It was a troubling book to read from such a wonderful thinker. She argued that not only are we on the wrong track but that the tendencies will continue to worsen. Communities are fraying; public spirit is disappearing; there is dysfunctional higher education; governments are responsive to vested interests rather than real needs; and we have a culture that distracts us from the central challenges. Also, who could rival the pessimism of the title of the great astronomer Lord Martin Rees's book *Our Final Century: Will the Human Race Survive the Twenty-First Century?* The title says it all—Lord Rees argues that there is a way out, but that our circumstances are extraordinarily dangerous. And the great ecologist, the pioneer of the interconnectedness of global ecosystems as well as inventor of the Gaia theory, James Lovelock, declared in his recent book *The Revenge of Gaia* that we have already passed the planetary safety margins and major parts of the world are doomed

to disaster. He said afterward that perhaps he was too pessimistic, but we still are making a serious mistake if we are glib about the road ahead.

Simply speaking, sustainable development is the greatest, most complicated challenge humanity has ever faced. Climate change alone is extraordinarily difficult, but then add in these other challenges of a rapidly urbanizing world, a great extinction process underway due to human domination of ecosystems, increasing population, overextraction from oceans and land resources, massive illegal trade, and all the other issues already discussed. These are complex problems, and are science-based issues without the necessary worldwide public literacy in the scientific underpinnings. These are issues of tremendous uncertainty in chaotic, nonlinear, complex systems. This is a multigenerational problem that we are unequipped by tradition to think about. It goes to core areas of our economic life like energy, transport, infrastructure, and food supply, all of which need major technological overhauls. There are powerful vested interests like Big Oil that have hindered clarity and progress on implementation. There are long lead times in rebuilding our infrastructure because infrastructure has such a long life expectancy, 50–100 years or more. And we have very limited space left, partly because we have in a way frittered away the last twenty-two years since the Rio Earth Summit, even though we had been on notice decades earlier.

We must not give up hope. We have identified very specific ways through our backcasting and our road-mapping of how we can get from here to where we need to be. We have identified technologies that can decarbonize the energy system and lead to tremendous energy efficiency. We have identified technologies that can economize tremendously on land, raise agricultural productivity, and reduce the fluxes of nitrogen and phosphorus and their poisoning of the estuaries. We have shown how cities can plan ahead and design smart infrastructure. These are opportunities within our grasp, not fanciful science fiction, but things that we know how to do where the costs are absolutely within reach. In many cases, as with wind power and solar power, the costs are already close to the traditional technologies, at least in some favored regions of the world.

We can see how we could succeed with the SDGs, just as the world has made tremendous progress with the MDGs. I believe that despite the cynicism, the darkness, the confusion, and the miserable politics on many of these issues, we

can make a breakthrough. Even though it looks as if the political systems are unresponsive, things can change. The most important message I would send is that ideas count. They can have an effect on public policy far beyond anything that can be imagined by the hard-bitten cynics.

Ideas have been transformative throughout history and have sparked some of the greatest transformational movements of the last two centuries (the time of our modern economic growth). First consider the end of slavery. The outlawing of slavery in the British Empire was the result of a massive social movement, the first of its kind in modern history. In the late eighteenth century and the early nineteenth century, English leaders such as William Wilberforce, Thomas Clarkson, Granville Sharp, Charles James Fox, and William Pitt the Younger took on the deeply economically embedded institution of slavery. It took a few decades in the face of much cynicism and dirty dealings, but in 1807 the British Empire abolished the slave trade and in 1833 abolished slavery in the British holdings entirely. This flew against powerful and entrenched British economic interests. In the end, the ideas and morality were the underlying forces of change.

The struggle against European colonial rule, led by Mahatma Gandhi (figure 14.6) and by many of his contemporaries in Africa and in Asia, also at first seemed



14.6 Mahatma Gandhi

Gandhi during prayer at Mumbai, September 1944

impossible. One would have bet in 1910 or 1930 that Gandhi would have been long forgotten by now and the British Empire would have continued to rule over India and Africa. But of course it is Gandhi's leadership in helping to end colonialism that we regard as the correct moral answer for our age, and it is one that inspired many in the civil rights movement, the human rights movement, and beyond. Ideas played a role so powerfully that the interests and entrenched power structures were in the end completely overwhelmed.

The human rights movement followed, partly led by Eleanor Roosevelt, who championed the UN Universal Declaration of Human Rights. This moral charter is sadly violated massively every day, but the Universal Declaration of Human Rights has changed the world. It has expanded the recognition and reach of human rights, empowering major initiatives like the MDGs that have turned into real results on the ground.

These ideas of course all inspired the civil rights movement. As the great civil rights leader Martin Luther King Jr. said, "The arc of the moral universe is long, but it bends toward justice." Ideas and morality have repeatedly paved the way for great breakthroughs. The women's rights movement, which is playing such a magnificent and crucial role in enabling the world to get on a path of sustainable development, is another idea of our time. It has been literally hundreds of years in the making, but it has had great advances in recent decades, often in the least likely places in the world and largely due to brave crusaders.

This brings us to the key ideas of our own time. The idea that we can end extreme poverty is now an official doctrine of major institutions like the World Bank, and it is at the core of the new set of SDGs adopted in 2015. The idea of sustainable development is now a worldwide commitment to a safer, more prosperous, and more just planet. There is an underpinning of ethics in all these ideas. When we talk about moving to global SDGs, we are also talking about the need for and possibility of a shared global ethics. It is heartening that many of the world's religious leaders have come together and declared that the world's religions share a common ethical underpinning that could underpin a shared commitment like SDGs, including the Golden Rule; the commitment to "first, do no harm;" and the standards of good governance, including human rights, accountability, transparency, and participation.

It has been a half-century since two great episodes in U.S. history where values changed history: the U.S. civil rights movement and President John F. Kennedy's quest to make peace with the Soviet Union. They both give us inspiration for our challenges today. In 1963 Kennedy succeeded in negotiating the Partial Nuclear Test Ban Treaty with the Soviets, which was a major step back from the nuclear arms race and an easing of the tensions that had brought the two parties to the brink of nuclear war in the 1962 Cuban Missile Crisis. It is astounding and inspiring that Kennedy used ideas and words, not force, to bring about this advance of peace. His words can teach us today about how sustainable development can be achieved.

President Kennedy gave what is called his "Peace Speech" on June 10, 1963 (Kennedy 1963c). It is a speech about values, human rights, and ideas; and the most important idea is that humanity can solve its problems peacefully and can live together, because what we have in common is so much more important than what divides us. Kennedy said:

No problem of human destiny is beyond human beings. Man's reason and spirit have often solved the seemingly unsolvable, and we believe they can do it again. I am not referring to the absolute, infinite concept of universal peace and good will of which some fantasies and fanatics dream. I do not deny the value of hopes and dreams but we merely invite discouragement and incredulity by making that our only and immediate goal. Let us focus instead on a more practical, more attainable peace, based not on a sudden revolution in human nature but on a gradual evolution in human institutions—on a series of concrete actions and effective agreements which are in the interest of all concerned. There is no single, simple key to this peace; no grand or magic formula to be adopted by one or two powers. Genuine peace must be the product of many nations, the sum of many acts. It must be dynamic, not static, changing to meet the challenge of each new generation. For peace is a process—a way of solving problems.

Sustainable development also is a process, a way of solving problems peacefully and globally, using our science and technology, our know-how, and our shared global ethics to address our deep common needs. Kennedy was grappling

with the divide between the United States and the Soviet Union, the divide of deep values, political systems, and nuclear arms pointed at each other. But his message was that we have common interests, and can resolve our problems peacefully. He had an absolutely magnificent way of describing those common interests that resonates today:

So let us not be blind to our differences, but let us also direct attention to our common interests and the means by which those differences can be resolved. And if we cannot end now our differences, at least we can help make the world safe for diversity. For in the final analysis, our most basic common link is that we all inhabit this small planet. We all breathe the same air. We all cherish our children's futures. And we are all mortal.

Yes, we are all today breathing the same air now with 400 parts per million of CO₂; it is a threat to our wellbeing and future survival. We all cherish our children's futures. And we know what needs to be done.

After Kennedy made the Peace Speech, he visited Europe and made a stop in his own family's ancestral country of Ireland. He spoke magnificently in the Irish Parliament (Kennedy 1963b):

This is an extraordinary country. George Bernard Shaw, speaking as an Irishman, summed up an approach to life: Other people, he said "see things and... say 'Why?'... But I dream things that never were—and I say: 'Why not?'" It is that quality of the Irish—that remarkable combination of hope, confidence and imagination—that is needed more than ever today. The problems of the world cannot possibly be solved by skeptics or cynics, whose horizons are limited by the obvious realities. We need men who can dream of things that never were, and ask why not.

Kennedy got his peace treaty signed and helped the world step back from the nuclear brink as part of a practical and step-by-step process. We need that kind of practical process again. We will need, as Kennedy said, to look beyond the skeptics and the cynics. They have every reason to point out our difficulties. But we will need to look forward to what needs to be done and to find the pathways to achieve it.

In Kennedy's last speech to world leaders, in the United Nations in the fall of 1963, just after the Partial Nuclear Test Ban Treaty was signed, he ended his speech with absolutely remarkable words that must guide us today: "Archimedes," said Kennedy, "in explaining the principles of the lever was said to have declared to his friends: 'Give me a place where I can stand and I shall move the world.' My fellow inhabitants of this planet: Let us take our stand here in this Assembly of nations. And let us see if we, in our own time, can move the world to a just and lasting peace." (Kennedy 1963a)

Now it's our turn to see if we can move the world toward sustainable development.