

# #globalcommons

## The Opportunity of the Commons

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INVESTING IN OUR PLANET



All life on Earth depends on clean air and water, biodiversity, healthy forests, land, oceans and a stable climate. These global commons—the ecosystems, biomes and processes that regulate the stability and resilience of the Earth system—are the very foundation of our global economy and modern society. Today, they are facing an all-too-familiar tragedy of over-exploitation and rapid degradation.

With increasing pressures from humanity, our window of opportunity to act is closing quickly. It is urgent that we bring about transformations in our key economic systems, from energy, cities and food to the “take-make-waste” economy, and leverage evidence and new information technology, political leadership, coalitions for change and innovation.

The necessity of making our societies and economies more sustainable and less inequitable is not just to avoid disaster, but to build lasting prosperity. Operating within planetary boundaries is not just the only way to ensure healthy economies, but has the potential to provide much greater and better-shared growth. That’s the opportunity of the commons.

On October 12–13, 2016, an International Dialogue on Our Global Commons was held at the National Academy of Sciences in Washington DC.

Preceded by a Science Day, the Dialogue engaged leading environment, innovation and system design thinkers in a strategic discussion to assess the latest evidence about the state of our global commons and discuss how best to disrupt the systems that drive pressures on them.

The participants came together around a “shared purpose” included in a summary of key “principles” that were articulated in the various sessions and interventions

The Dialogue was convened by the Global Environment Facility (GEF) and the International Union for the Conservation of Nature (IUCN), in partnership with the International Institute for Applied Systems Analysis (IIASA), the Stockholm Resilience Centre (SRC), the World Resources Institute (WRI) and the World Economic Forum (WEF) Environmental Systems Initiative.

This booklet includes commentaries from each of the partners, part of a series of articles in the online Guardian newspaper, where senior figures are exploring the state of the commons and how to address it.

The articles, and other contributions from well-known leaders in the sustainable development community, are featured in a special “GEF Partner Zone” as part of the paper’s Development 2030 Campaign. It can be found online at <https://www.theguardian.com/the-gef-partner-zone>

The October dialogue and online series is just the beginning of what promises to be a vigorous, authoritative—yet constructive debate about one of the defining issues of our time.

**For more information**

<http://www.thegef.org/events/our-global-commons-international-dialogue>

<http://globalcommons.earth/>



# Movement for the Global Commons Statement of Principles

## Our Lessons from Science

Life on Earth as we know it depends on what all humans share: a stable climate, healthy oceans, and the species, ecosystems, biomes and processes that provide the stability and resilience of the planet.

This is the Global Commons. For the past 10,000 years, the Global Commons has served as the foundation for dramatic growth in agriculture, cities, economies and cultures—in short, for civilization to emerge.

The prospects for sustainable development rest squarely on the integrity of the Global Commons, which is now being compromised.

The message from science is clear: humans are pushing the global commons to the limits of their coping capacity. We are facing a tragedy of the commons on a profound, global scale that only we can overcome.

## Our Shared Purpose

At this critical juncture for the survival of the diversity of life on earth and the systems upon which humanity depends, we are catalyzing a movement to defend, enhance and sustain our Global Commons through:

- protecting the diversity of life on earth;
- developing innovative solutions that reflect the interdependence of all systems, including food, urban, energy, production and consumption, freshwater and oceans;
- engaging broadly, from communities to corporations to cabinets.

Because never before have we understood our place in the Global Commons as we do now; never before have we had the tools, knowledge and creativity that we do now; and never before have we had the shared purpose and will to act that we have now.

And because never again, will we have the opportunity.

## Our resolve to achieve systems-level change

While time is short and the risks immense, the goal of a diverse, stable and prosperous planet is still within reach if we act now with a boldness that matches the unprecedented scale of the challenge.

With the Sustainable Development Goals and the Paris Climate Agreement, the world's nations have provided momentum and direction that must be seized.

But incremental progress will not be enough. Only with disruptive, systems-level change can we hope to get on the right path. Our focus should be a complete overhaul of key economic systems and development pathways:

- Our food system must be dramatically reshaped in a way that enables it to meet a 60–70 percent increase in global calorie demand—from aquatic and land-based sources—by 2050 while at the same time dramatically shrinking its footprint on the global environment.
- The world's cities to a significant degree hold the keys to success for the global commons. The coming decades will see a sharp burst in cities' growth. This is a once-in-a-lifetime opportunity to create the compact, connected and coordinated cities that the future requires.
- Decarbonizing the world's energy systems is a *sine qua non*. Recent data suggesting that global energy-related GHG emissions have plateaued despite continued economic growth are welcome, but the underlying power demand is still on the rise, and we are still a long way away from a radical shift towards a carbon-free energy system.
- The move from a "take-make-waste" to a circular economy must be radically accelerated. Today's linear approach to production, consumption and disposal of products is highly resource inefficient.

For each, we must continue to develop a compelling story about needs and opportunities for the Global Commons and work with those who can amplify the message; we must help unleash and leverage technology, and we must build and support emerging coalitions for change both from the bottom-up and the top-down.

## Our mutual and individual roles

Only a broad and truly diverse movement can solve the problem of the Global Commons. No individual, organization, business or nation can succeed on her own. We must all play our part to catalyze change and build the movement. Some are champions who delivers the message, engage, excite, and help build momentum. Others are drivers who brings the evidence forward and point toward scalable solutions. Enablers provide the financing, the policy frameworks, and the necessary technical support. And conveners create the platforms for dialogue, facilitates discussion, and bring in new actors.

Our bottom line for safeguarding the Global Commons is the following: It is urgent, it is needed for people and planet, and the world will be so much better for it—so let's get on with it!

***We invite all to join and contribute.***



# Goodbye forever, friendly Holocene

Johan Rockström  
*Executive Director, Stockholm Resilience Centre*

***Earth has left the geological epoch that we know and love. Now our political and economic systems must change fast to deal with the Anthropocene***

**G**eologists rarely make headlines. But this month the word ‘Anthropocene’ flooded the media following an intervention by scientists at the International Geological Congress in Cape Town. Since 2009, they have been poring over the evidence to work out whether the Earth has slipped abruptly and unexpectedly into a new geological epoch.

They reached a startling conclusion: Earth has left the cosy confines of the epoch we humans know, love and absolutely depend upon—the Holocene.

This was as profound an observation as two of science’s most significant discoveries—Copernican heliocentricity and Darwin’s evolution. Like them, the coming of the Anthropocene demands we rethink our world view. No longer are we a small world on a big planet; we leave a giant footprint. When future historians look back at the 20th century, the most significant event will not be the world wars, the Cold War, the Great Depression or the end of apartheid—as important as these are. Instead, it will be the great acceleration of the human enterprise that drove Earth into a new state.

The Holocene has been good for us. It began 11,700 years ago as Earth slipped from the grip of a deep ice age—as it has, like clockwork, every 100,000 years. Since then, the average temperature of the planet has fluctuated no more than one degree Celsius or so.

Without this remarkable stability, which provides us with reliable growing and rainy seasons, we would not have developed agriculture. It is the reason why we have complex societies. It is the foundation for our cities and science, art and culture. It is how we can feed seven billion people, cure diseases and land on the moon.

Unfortunately, this stability can no longer be relied upon. Records keep getting smashed. August was the warmest month globally since modern records began 136 years ago. September is the tenth straight month of record temperatures. According to NASA, it is now “almost a certainty” that 2016 will go down in history as the warmest year on record, beating the warmest so far, 2015. Alarm bells are ringing in the Earth research community.

But are they ringing elsewhere? Up to this month, all has been worryingly quiet as nations deal with more immediate calamities. Almost one year after the launch of the Sustainable Development Goals and nine months after the Paris Agreement on climate change, short-term political agendas seem to have trumped planetary stability. It is worth recalling the September 2015 speech by Mark Carney, governor of the Bank of England, in which he argued that once climate change becomes a defining issue for financial stability, it may be too late.

This is perhaps the greatest paradox of the world we now live in. We have a frontiers mentality. The vastness of Earth’s atmosphere, oceans, ice sheets and rainforests seem to continue forever over an endless horizon. This was certainly true throughout the 200,000 years since humans first walked the African savanna. It was true even 40 years ago. But it is not true now. The exponential growth of industrial societies since the 1950s means that Earth has reached saturation point.

Last year, my colleagues and I published a detailed assessment of the state of the planet. We confirmed that Earth’s resilience is dependent upon nine planetary boundaries relating to climate, deforestation, biodiversity, ocean acidification, chemical pollution, ozone, water, fertiliser use and aerosols. We also estimated that human activity has driven Earth across four such boundaries, particularly relating to greenhouse gas emissions and the devastating loss of species which may place us at the start of a sixth mass extinction on Earth.

This generation is facing a “tragedy of the commons” on a profound scale. We are simply not geared up to deal with this. Our

institutions—such as the United Nations, the banking system, and nation states—were designed for the Holocene, not the Anthropocene. Economics assume a forgiving planet with infinite resilience, the capacity to buffer such abuse as the injection of 40bn tonnes of CO<sub>2</sub> each year.

Up until 1990 Earth could withstand our pressures. But since then it has started to send invoices back to society in the form of heatwaves, droughts, accelerated ice melt and sea level rise, and collapsing lakes and fish stocks. And we have not recognised how a nation’s security and economy depends on a stable Earth. Our notion of global commons focuses on user rights over “resources” such as Antarctica, outer space, the high seas and the atmosphere. In practice, the ice sheets, oceans, waterways and rainforests—essential for the stability of the whole planet—are priced in the same way as luxury goods: their value in the distant future calculated as negligible.

It is time to re-evaluate our economic and political models for the Anthropocene. The starting point must be our very notion of the global commons. Any attempt to stabilise global temperatures, for example, implies a finite carbon budget—the amount of greenhouse gas emissions—that we must not exceed. At current rates we will use up this budget in the next 10 to 20 years (as far as science can tell). Earth can only tolerate only 400 to 800bn tonnes of CO<sub>2</sub> without tipping over the two degrees Celsius planetary limit. This is humanity’s budget for our remaining time on Earth. And you do not negotiate with Earth.

The global carbon cycle, whether within or beyond national jurisdiction, is a global common. The same applies to rainforests, freshwater, the ozone layer, biodiversity. Our thoughtless assumption that we can take all this for granted is humanity’s biggest gamble, as myself and colleagues argued recently and in the Earth Statement last year.

Industrial societies now wield astonishing power. Earth’s future is in the balance and we must handle it with care and respect. We need new institutions to catalyse the transformation of societies. The new global goals and the Paris Agreement on climate are the first signs of a new approach to the global commons. The US and China’s ratification of the Paris Agreement has sent a powerful signal to all nations that is impossible to ignore. We now need this signal to spark rapid, deep, systemic change across all societies.



# Taming Bigfoot

Andrew Steer  
*President and CEO, World Resources Institute*

***Ways to shrink our environmental footprint  
so as to safeguard the global commons***

**W**elcome to the Anthropocene, an era built on centuries of economic growth. In the 50 years before this new age, the human economic footprint grew faster in terms of GDP than at any time in recorded history. By the year 2100, it could grow to Bigfoot proportions, possibly 1,000 times the size it was in 1900.

This rapid growth has been a sign of markets working, leading to broader prosperity and falling real commodity prices despite a 25-fold increase in demand. Poverty levels dropped, demand in emerging markets skyrocketed and the global middle class is likely to double or even triple by 2030.

These economic advances have been built on a key characteristic of the old geologic era, the Holocene: stability. For 10,000 years, patterns of temperature, precipitation and seasonality stayed essentially the same, with global temperatures varying less than a degree. This “Goldilocks” pattern—not too hot or cold—encouraged society to grow. But we have taken the stability of our global environmental systems for granted—just as we have the global environmental commons that sustain them.

Economic growth has reached a scale that puts the global commons under immense pressure from such threats as climate change, pollution, extinction, habitat loss, overuse and over-extraction. Unlike in functioning economic markets, no clear market signals or rules and regulations exist to manage the global environmental commons. And current traditional approaches to securing them have fallen far too short.

The resulting Bigfoot-size impact of cumulative human economic and industrial activities severely strains the commons. So what can be done when doing more of the same is clearly not enough?

Four revolutionary shifts in social and economic life are needed to tame Bigfoot-style economic impacts and safeguard the global commons.

First, as the global population shifts quickly from rural to urban, transforming the world's cities from congested, disorganised and sprawling to compact, connected and coordinated ones are critical. The magnitude of the shift can be mind-boggling: in 1900, only 3% of people lived in cities; now 55% do. Urban population is expected to grow by 700 million each decade until 2060, while 3 billion people are expected to join the global middle class, almost all of them in urban areas.

Congestion and sprawl are expensive. In the United States alone, urban sprawl costs an estimated \$1 trillion annually. In many emerging economies, the spread of cities pushes infrastructure to the breaking point, making for longer commutes and the use of scarce resources to build roads, which worsens quality of life and the environment.

Designing cities for people instead of cars can shrink environmental pressures and make businesses more productive, saving \$3 trillion in urban infrastructure investment worldwide over the next 15 years.

Second, we need to re-think food and agriculture. Food production already takes up 37% of the world's landmass (excluding Antarctica), and accounts for 70% of global freshwater withdrawals and 24% of the world's greenhouse gas emissions. Even as population and appetite grow, agriculture is exhausting cropland, with 10m hectares abandoned each year due to soil degradation.

By 2050, we will need 60–70% more food calories for an estimated 9.7 billion people, many of them with middle-class tastes for resource-intensive products like beef and dairy. We must make cropland, livestock and aquaculture more productive while minimising food loss and waste and shifting diets to less resource costly foods.

Third, decarbonising energy systems can help us decouple global greenhouse gas emissions and economic growth. Global energy use has increased roughly 13-fold since 1900. To create energy access for all, energy use will probably need to increase by another 50% by 2040.

Under current patterns this will create a 34% rise in energy-related carbon dioxide emissions when they actually need to be falling by at least the same amount.

The good news is 70% of the energy infrastructure needed to meet this growing demand has yet to be built, providing immense opportunity for investment in energy efficiency and clean energy sources.

Fourth, we need to transition from linear approaches to production, design, use and disposal of materials to circular economic models that can make us more resource productive and efficient across the economy.

We must minimise waste by keeping resources and products—and their value—circulating in the economy as long as possible. This means discovering how to loop our production, consumption and waste management processes, improve designs and make use of waste outputs from one system as inputs for others.

Revolutions aren't easy, but they are possible. However, the shifts we need—in policies, behaviours and business—to “tip” our economic and social systems worldwide are not happening at the speed and scale required.

We must identify potential paths of influence that can catalyse revolutionary changes and learn from examples of positive tipping points. And we must develop strategies to bring them together with the disruptive power of information technology and multi-stakeholder cooperation that are already driving profound, far-reaching convulsions in our wider models of government, business and society.

A diverse group of first movers from business, international organisations, think tanks and civil society met in Washington DC this month to do just that. The dialogue on the global commons—led by the Global Environment Facility and the International Union for the Conservation of Nature, with World Resources Institute's full and active support—proved to be an exciting first step towards agreeing on such strategies.

The task ahead is immense. But existing tipping points—like the radical improvement of economic policies in 100 countries between 1985 and 2000 or the spread of bike sharing from zero to 850 cities in less than 10 years—along with technological advancements and emerging practices offer unprecedented hope for the economic and environmental action we need.



# Safeguarding the global commons is the wisest investment we can make

Naoko Ishii  
*CEO and Chairperson, Global Environment Facility*

## *We are at a defining moment for the future of our planet and its people*

Scientists tell us that the biophysical processes that determine the stability and resilience of earth, our “planetary boundaries” that allowed our societies to thrive during the past 10,000 years, are being pushed to their limit. Evidence is mounting that the miraculously, favourable earth conditions that scientist call the Holocene—the only ones we know can support a human population of 7.4 billion and more—risk coming to an end.

The greenhouse gases that cause climate change are at higher levels than at any time in at least 800,000 years; 2015 was the hottest year on record, and 2016 may be hotter still. Globally, species are being lost at a rate only seen before during mass extinctions. The health of our oceans is declining rapidly.

The alarm bells are ringing. On the current trajectory, the worsening global environment will be an ever-increasing threat to our global aspirations for economic growth, jobs, security and prosperity. There is an enormous amount of work to be done, and success remains far from certain, but now is the time to tackle the world’s most pressing environmental and social problems

Our fate is in our own hands. As the world moves out of the Holocene into what is being gradually recognised as a new Anthropocene epoch—an epoch where humans are the largest driving force of change on planet Earth—it is our common responsibility to change our ways of operating to ensure that this vital system continues as our essential global commons.

The world’s governments took the first steps in that direction last year. In September, nearly 200 nations gathered in New York, pledged their commitment to 17 sustainable development goals (SDGs) to

guide growth over the next 15 years in ways designed to end poverty and ensure prosperity while respecting planetary boundaries. Three months later in Paris the same governments adopted an agreement to combat climate change, committing to achieving zero net emissions of greenhouse gases in the second half of the century.

Shifting to a low carbon and resilient trajectory will require coordinated, integrated solutions to catalyse the transformation of three key economic systems: energy—how we power our homes, offices and industry, and move goods and people; urban—how we live in cities and build new ones; and land use—how and where we produce food, and what we eat.

As an institution dedicated to ensuring the health of the global environmental commons, we at the Global Environment Facility recognise that while we have won some battles the war to maintain the conditions for future prosperity and well-being is still being lost. There have been many good individual actions, but they have not added up to the systemic changes that are needed.

Transformational change will require actions on multiple fronts and at all levels of society. It will require political and social mobilisation and bold leadership.

It is our hope that this new effort will lay the foundation for a new paradigm for the global commons. We need a new way of thinking that enables transformational change, new alliances, social and economic opportunities, and provides the stable conditions necessary for sustainable growth, poverty reduction, peace and security.

It will be a journey not just to avoid disaster, but to build lasting prosperity. Operating within the planetary boundaries is not just the only way to ensure healthy economies, but has the potential to provide much greater and better shared growth than sticking to business as usual. Safeguarding and enhancing the global commons is therefore the wisest investment we can possibly make.

*Our fate is in our own hands.*





# The natural way forward

Inger Andersen  
*Director General, International Union for Conservation of Nature*

***We must work collectively to secure the support systems that nature provides***

**T**wo competing narratives frame the debate of the future of the global commons, of the earth's operating system, on which all life depends. One pessimistically claims that it is already too late to avoid catastrophe and that we must therefore now focus on survival and recovery. The other is a stubborn optimism, which argues that humanity has faced and overcome many great challenges in the past and will continue to do so. The first leaves people in despair, the second risks indifference and denial.

There is, however, an emerging viable alternative—one that embraces the reality that we live in a world of complex, interdependent systems and acknowledges that changes to them can either enhance resilience or result in greater instability and uncertainty. It stresses that nature conservation and human progress are not mutually exclusive. Despite such tremendous forces of transformation as climate change and dramatic socioeconomic inequality, there are credible and accessible political, economic, cultural and technological choices that can promote general welfare in ways that support and even enhance our planet's natural assets.



This alternative future has long been given expression by the international community through such declarations as The World Charter for Nature, Agenda 21, The Earth Charter, and the UN General Assembly resolutions on harmony with nature, which point to the need for profound transformations in our patterns of production and consumption, and recognise that every form of life has value regardless of its worth to human beings.

Now it has climaxed in the world's commitment to deliver the ambitious sustainable development goals, within a 15 year timeframe. There is a real sense of urgency in this call to action, since we live in a time of tremendous change when the imperative of meeting immediate human needs clashes with its long-term impact on the planet's capacity to support life. Many believe that current trends are not sustainable and that there is a closing window of opportunity to effect meaningful change in humanity's trajectory. Time is running out to find ways of making progress that both safeguard and reinforce the natural world that sustains us. Our future will be decided by the choices we make now.

Certainly there are grounds for concern. We are now some 7.3 billion people on Earth and the UN estimates that, under a medium growth scenario, we will be more than 8.5 billion by 2030. Over half the world's population is already living in urban areas, increasingly disconnected from the complex systems of nature and biodiversity that keep us all alive.

Shifting patterns of global wealth and economic growth over the past 15 years have led to important increases in economic wellbeing, lifting hundreds of millions of people from poverty, and improving other such important indicators as maternal health. But other problems persist or grow steadily worse. The benefits of development are not shared equitably, the gap between rich and poor is widening, and economic growth is occurring at the expense of ecological integrity. Scientists have reported that the "planetary boundaries" to the biophysical processes on which the earth depends are being pushed to the limit:

some, such as the climate and the integrity of the biosphere, have already been exceeded.

We can expect more of this to happen over the next 15 years, in ways that simultaneously bring hope yet further strain the planet's biodiversity and its capacity to support human needs and expectations. Yet a steady increase in global wellbeing can only be achieved through an enhanced understanding of the planet's complex life support systems and the predominant global trends that act upon them—urbanisation, economic growth, burgeoning consumption, disappearing biodiversity, wealth inequality, climate change, population growth, and so on. Nature will most likely go on, whatever happens, so the relevant questions are: to what extent will healthy, prosperous and secure societies continue to be a part of the story, and how much of the greater community of life will persist?

IUCN—which holds its World Conservation Congress in Hawaii in the first 10 days of September—has been aligning conservation efforts all over the world around three solid lines of work: valuing and conserving nature's diversity; advancing effective and equitable governance of its use; and deploying nature-based solutions to climate, food and development challenges. The approach emerging from our collective efforts demonstrates that nature is not an obstacle to human aspirations, but an essential partner, offering valuable contributions towards all our endeavours.

For the alternative path to be credible and viable, we need new partnerships across the planet, between governments, NGOs, conservationists, scientists, consumers, producers, urban planners, entrepreneurs, grassroots and indigenous organisations and financial backers. Each partner holds a vital piece of the puzzle, in knowledge, tools and resources. We need to bring these pieces together, and collectively complete the greatest puzzle ever attempted, to secure nature's support systems so that humanity and the greater community of life may continue to prosper on earth. This is our collective challenge for the next 15 years.

***Our future will be decided  
by the choices we make now.***



# Leave no SDG behind

Nebojsa Nakicenovic

*Deputy Director General and Deputy CEO, International Institute for Applied Systems Analysis*

Caroline Zimm

*Researcher, International Institute for Applied Systems Analysis*

***Science has an important role in supporting new global social contract and the 2030 agenda***

## 2

015 marked a historic turning point. The Sustainable Development Goals (SDGs) unanimously adopted by the United Nations last September provide an aspirational narrative and specific targets for human development: a world free from hunger, injustice and absolute poverty; a world with universal education, health and employment; a world with inclusive economic growth, based on transparency, dignity and equity.

The 17 SDGs' call for "global citizenship and shared responsibility" and provide legitimacy for a new global social contract for a grand transformation toward a sustainable future. They fully acknowledge the scientific advances achieved during the last three decades that have established compelling evidence that otherwise, as the UN general assembly warned, "the survival of many societies, and of the biological support systems of the planet, is at risk." Humanity has pushed the Earth system and its global commons to their limits and the SDGs provide us with the long-needed paradigm shift towards realising the opportunity of a sustainable future for all.

The climate agreement adopted in Paris last December has further strengthened understanding that our society depends on sustainable

stewardship of the global commons, shared by us all—and particularly on the stability of the climate system. The Earth system can no longer be viewed as an economic or social externality. Last year we moved beyond the traditional view of global commons as merely the common heritage of humankind outside national jurisdiction. Now we must move beyond national sovereignty to deal with the Earth system and human systems holistically, as the SDGs require. The Paris agreement is a huge step in the right direction.

Time is running out, so we must take urgent action to implement the UN 2030 agenda. Just 14 years are left—less than the wink of an eye in the history of human development, or of the Holocene’s stable Earth systems. But where to start? Which of the 17 goals, which of the 169 targets should be tackled first? Policy makers, the media, civil society and scientists all ask these questions.

However, the 2030 agenda stresses that the SDGs are indivisible and integrated—and cumulative, since efforts to achieve them must be sustained well into the second half of the century, especially in preserving the regulating function of the global commons. Some of the goals, such as SDG13 on climate, must operate on a time scale longer than century.

Moreover, there are interactions between and among the SDGs. For example, achieving SDG7, the energy goal, could jeopardise SDGs related to water, health and climate. Tackled in harmony, however, these goals can support one another: there would, for example, be clear health benefits from reducing indoor and outdoor air pollution through global decarbonisation. Jointly implementing all the SDGs would contribute both to further human development and to safeguarding the commons and the stability of the Earth systems. Importantly, joint implementation that avoids silo-type thinking would be cheaper and faster than tackling them separately.

All these goals should be achieved in such a way as to maximise synergies and minimise investment costs and trade-offs. The SDG credo “leave no one behind” also applies to the SDGs themselves. They are indivisible. We have to deliver on all of them if we want to succeed.

The SDGs are very ambitious but it appears that tackling them together will help humanity make rapid progress and enter a new era for human societies and the Earth system. Yet, many interactions—and their scope—are unknown, and this hampers holistic policy making. We lack clear understanding of the benefits of achieving SDGs and of costs of inaction, especially when it comes to regional and national differences. We urgently need this fact-based information.

We have a plethora of knowledge, but need new ways to synthesise, integrate and share it so as to use its full potential in support of the SDGs and the global commons. Science—one of the strongest voices of the environment in governance—must become more active and leave its ivory tower to engage more intensely with other stakeholders.

This is why we at IIASA, together with the Stockholm Resilience Center, and the Sustainable Development Solutions Network have launched the scientific initiative The World in 2050 (TWI2050), designed to provide the scientific knowledge to support the policy process and implementation of the 2030 agenda.

TWI2050 aims to address the full spectrum of transformational challenges in fulfilling the SDGs in an integrated way so as to avoid potential conflicts among them and reap the benefits of potential synergies through achieving them in unison. This requires a systemic approach.

The time for “climate-only” or “economic development-only” approaches is over. We urgently need an integrated understanding of the processes that account for the inter-linkages between the economy, demography, technology, environment, climate, human development, all global commons and planetary boundaries. TWI2050 brings together leading policymakers, analysts, and modelling and analytical teams to collaborate in developing pathways towards the sustainable futures and policy frameworks necessary for achieving the needed transformational change.

Such a grand transformation goes beyond a purely technology-centred view of the world or the substitution of one technology by another. It encompasses social and behavioural changes at all levels, as well as technological ones. Incremental changes, now being experienced in some areas, are useful but will not suffice: we have waited too long and the window for action is closing rapidly in some domains including such global commons as climate. We will need radical changes in human behaviour and technological paradigms. TWI2050 will look beyond 2030 to 2050—and, in some cases, even to 2100—to draw a vision of the world where the SDGs are eventually fulfilled.

The SDGs and the Paris agreement show what institutional international governance can achieve with joined forces. We have entered a new era of global governance, acknowledging the complexity and the connectivity of human development with the global commons and the Earth system. TWI2050 hopes to serve the global community with the best science available in tackling these key global challenges for humankind.



# Three wicked problems of the commons

Dominic Waughray  
*Head of Public Private Cooperation, World Economic Forum*

***We urgently need to manage the interrelated challenges of energy, water and agriculture in a changing climate***

**G**lobal energy consumption is forecast to increase by nearly 50% by 2040 according to the International Energy Agency (IEA) 2016 Global Energy Forecast, with energy-related CO<sub>2</sub> emissions rising by 34% from 2012 levels. Emerging economies like China and India will drive most of this, as they continue to rely heavily on fossil fuels to meet demands from their expanding industry and cities. India will need to quadruple its present installed capacity of about 270GW by then, creating another United States in terms of energy use.

On top of this there is, of course, the urgent need for more energy access for rural and poorer people. At present more than three billion people in developing countries still rely on traditional “biomass” for heating and cooking: 1.5 billion lack access to electricity. India alone has 240 million, mostly rural, people without such access and rightly seeks to move them out of energy poverty as quickly as possible. It submitted a bold target of achieving a 40% share of non-fossil fuels in its energy mix by 2030 to last year’s climate negotiations in Paris. But it also plans to expand its coal capacity to 400GW of coal fired electricity, over 40% of the mix, by 2035. Its greenhouse gas



emissions will grow rapidly to around 5 gigatonnes by 2030, about as big as those of the United States today.

So here is wicked problem number one in protecting our global commons: how do we get millions of people out of energy poverty without significantly increasing greenhouse gas emissions?

Electricity production can also be surprisingly thirsty. A megawatt hour of electricity generated from sub-critical coal-fired power stations can require up to 2,000 litres of water. The US Geological Survey estimates that to produce and burn the around 900m tons of coal the United States uses each year to provide about 34% its electricity, requires between 55-75tn gallons of water annually; about equal to the amount that pours over Niagara Falls in five months!

India, the IEA estimates, will need up to 60bn cubic metres of water a year for its coal-fired electricity plans by 2035. Its expansion of coal will push the water requirements of its industry and energy sectors up from 2-8% as a share of overall withdrawals.

This extra water equates to about 37m<sup>3</sup>—more than an oil-tanker truckload—for every person in India just to meet India's coal fired electricity plans by 2035 (assuming its population is then about 1.6 billion). Or, to put it another way, it would mean accessing some 12% of the Ganges average historic annual flow of 500bn metres cubed of water, including in non-monsoon seasons when energy is still needed but rivers are low.

As emerging economies urbanise and industrialise, using fossil fuel power, more of their water will need to be allocated to energy. Modelling by the Colombia University Water Group for the World Economic Forum suggests a 76% increase in water demand for energy and industry will be required across Asia by 2030. And 70% of the continent's river and groundwater is on average already being used for agriculture.

So here is wicked problem number two in protecting our global commons: how can the competing needs of water for agriculture and fossil-fuel energy be squared off? Without radical changes in agricultural or energy production, it is not clear how well the future water needs for India's coal sector will go down with the country's farmers.

And here's the third wicked problem: India's coal fired power stations will have to be built somewhere.

More than 70% of India's power plants are located in areas that are already water stressed or water scarce, and most of the new coal-fired ones will be required where it is scarcest. The country's warm temperatures and the poor quality coal used in most of its power plants will increase their cooling water requirements. The high levels of pollution in rivers and waterways won't help either; nor will the seasonality of river flow. Power plant costs can rise 40-400% as you try to improve water use efficiency, without much benefit in wider efficiency ratios, as Eskom in South Africa has experienced – making coal no longer cheap.

Yet without water there can be no coal fired electricity production, making energy security a problem. In March, the flagship 2,300MW coal plant at Farakka town in West Bengal had to suspend its generation due to low water in the canal that feeds it. India's 91 reservoirs are at an average 29% of storage capacity according to the Central Water Commission. Historic levels of over-abstraction combined with forecast climate change will add extra stress on future water availability, making an already wicked problem super wicked.

These interrelated challenges of energy, agriculture, water and climate change are what we would call a "systems" challenge. The United States and India are by no means alone in facing it. Who is working with the power sector to place their investment programmes into the context of basin wide hydrological risk maps assessing who will need what water (including for the environment)? Answer: no one. Who is agreeing on adjustments to the cost benefit analysis of investment appraisals to take proper account of these risks? Answer: no one. Who is overlaying these investment analyses with different climate scenarios for water scarcity? Answer: again, no one.

Someone will have to do all this, and soon, or these wicked problems will come home to roost, and we will never properly address the competing challenges of managing our global commons and ensuring needed economic development. Then, as ever, it is likely to be the poorest people who will lose out.



**GLOBAL ENVIRONMENT FACILITY**  
INVESTING IN OUR PLANET

## About the GEF

The Global Environment Facility (GEF) was established on the eve of the 1992 Rio Earth Summit to help tackle our planet's most pressing environmental problems. Over the last 25 years it has invested more than \$14.5 billion, leveraging in excess of \$75.4 billion for some 4000 projects in 167 countries, implemented through a network of 18 agencies. Today, the GEF is an international partnership of 183 countries, international institutions, civil society organizations and the private sector that addresses global environmental issues.

The GEF's 18 implementing partners are Asian Development Bank (ADB), African Development Bank (AfDB), Development Bank of Latin America (CAF), Conservation International (CI), Development Bank of Southern Africa (DBSA), European Bank for Reconstruction and Development (EBRD), Foreign Economic Cooperation Office—Ministry of Environmental Protection of China (FECO), Food and Agriculture Organization of the United Nations (FAO), Fundo Brasileiro para a Biodiversidade (FUNBIO), Inter-American Development Bank (IDB), International Fund for Agricultural Development (IFAD), International Union for Conservation of Nature (IUCN), United Nations Development Programme (UNDP), United Nations Environment Programme (UNEP), United Nations Industrial Development Organization (UNIDO), West African Development Bank (BOAD), World Bank Group (WBG) and World Wildlife Fund U.S. (WWF-US).

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