OurPlanet

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Towards a Pollution-Free Planet

UN environment

Photo: © UN Photo/Kibae Park

OurPlanet

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Towards a Pollution-Free Planet

In this issue of Our Planet, policymakers, experts and business leaders examine the growing threat of pollution, its enormous impacts on people and the environment, and the innovative solutions that can help us move towards a pollution-free planet.

Erik Solheim
Reflections

Photo: © CC BY sandeepachetan.com travel photography

Erik Solheim

Executive Director, UN Environment

If pollution was simply about having to put up with a bad odour or some unsightly smog, it could be considered tolerable. The sad fact, however, is that it's also sending millions to an early grave.

Around the world, hundreds of millions of people live in areas with dirty air and are vulnerable to serious health problems. Children are growing up with asthma, permanent coughs and stunted growth. In New Delhi, doctors say many of their patients display the symptoms of hardened, lifelong tobacco users. Air pollution, something that cities around the world live with on a daily basis, is the single biggest environmental health risk of our time, and is linked to one out of every nine deaths worldwide.

It's also about the state of our water and soil. The Caribbean, which conjures up images of turquoise waters and pristine corals, is considered one of the most plastic-contaminated seas in the world. Plastic waste is even washing up on beaches in the Arctic, with lumps of polystyrene floating alongside icebergs. Pesticides have been linked to the decimation of crucial pollinators across Europe, while dangerous chemicals such as mercury threaten fragile tropical ecosystems.

Pollution also creates disproportionate burdens. It has a bigger impact on the poor and the vulnerable such as the elderly, children and the disabled. Wherever land is scarce, it is invariably the poor who end up living near toxic dumpsites, abandoned factories and smog-choked highways. The flipside is that citizens are more aware than ever before of how pollution affects their lives, their livelihoods and the future prospects for their children, and they are demanding action.

All this explains why the third session of the United Nations Environment Assembly from 4-6 December in Nairobi, has the theme: "Towards a pollution-free planet". It may sound like a lofty goal but, with the right tools and political will, it is achievable.

For too long, the relationship between prosperity and environment has been seen as a trade-off. Tackling pollution was considered an unwelcome cost on industry and a handicap to economic growth.

Global trends are demonstrating that this is no longer the case. It's now clear that sustainable development is the only form of development that makes sense. The drive towards a pollution-free planet provides an opportunity to innovate and create lasting business models.

The energy revolution currently unfolding is a game changer, as is the increased mobilization around climate. The rapidly falling cost of energy from renewable sources, such as wind and solar power, means that the countries leading the shift away from fossil fuels will reap the greatest benefits to their economies, as well as their environments.

With the transition to green and sustainable development under way, we need to focus on how to intensify and accelerate these trends in order to protect the environment, combat climate change and curb pollution. As I see it, there are five critical pieces to this puzzle:

We need political leadership and partnerships. A global compact on pollution would ensure sustained engagement at the highest level and make prevention a priority for all. It would also encourage policymakers and other key partners, including the private sector, to integrate prevention into national and local planning, development processes, and business and finance strategies.

We need the right policies. Environmental governance needs to be strengthened – with targeted action on "hard-hitting" pollutants through risk assessments and better implementation of legislation, including multilateral environmental agreements, and other measures.

We need a new approach to managing our lives and economies. That means promoting sustainable consumption and production through improved resource efficiency and lifestyle changes, and prioritizing waste reduction and management.

We need to invest big. Mobilizing finance for low-carbon opportunities and cleaner production and consumption will drive innovation and help counter pollution. More funding is also needed for research, pollution monitoring, infrastructure, management and control.

And finally, we need advocacy for action. Citizens need to be informed and inspired to reduce their own pollution footprint and advocate for bold pollution-beating commitments from the public and private sectors.

The UN Environment Assembly is a golden opportunity for key actors – from scientists and policymakers to civil society groups and business leaders – to advance the forward-thinking solutions to pollution that we all need. That would be an important initial stride along the road toward a pollution-free planet.▲

Citizens are more aware than ever before of how pollution affects their lives, their livelihoods and the future prospects for their children, and they are demanding action.

Photo: © Igor Ovsyannykov

Secretary-General's message to the third UN Environment Assembly

We have the right to live in a clean environment. We expect to be able to eat, drink and breathe without risking our health. Yet, we continue to pollute our air, land, waterways and oceans. We trigger sand and dust storms due to climate change and environmental degradation. We use dangerous chemicals and substances in everyday objects. We inflict global suffering that is inexcusable, preventable and reversible.

Dedicating this Assembly to working towards a pollution-free planet highlights the urgent need for rapid, large-scale and coordinated action by leaders from governments, industry, the scientific community and civil society. It also highlights the incredible opportunity to promote equitable and sustainable social and economic development. Beating pollution will help reduce poverty, improve public health, create decent jobs, address climate change and protect life on land and sea.

We already have much of the knowledge and technical solutions we need to prevent, mitigate and manage pollution. There are many examples of countries, cities and businesses taking action. And there are international successes, such as the entry into force of the Minamata Convention on Mercury and the recent announcement that the Kigali Amendment to the Montreal Protocol will enter into force on January 2019, having obtained the required threshold of 20 ratifications. With stronger policies, regulations, laws and fiscal incentives, we can scale up such progress.

Making our planet pollution-free is a long-term necessary endeavour. The world counts on this Assembly to show strong leadership by sounding the alarm and calling on all governments to act to beat pollution.▲

Photo: © United Nations

António Guterres

Secretary-General,
United Nations

Amina J. Mohammed
A clean environment for all

A right, not a luxury.

Amina J. Mohammed

Deputy Secretary-General,
United Nations

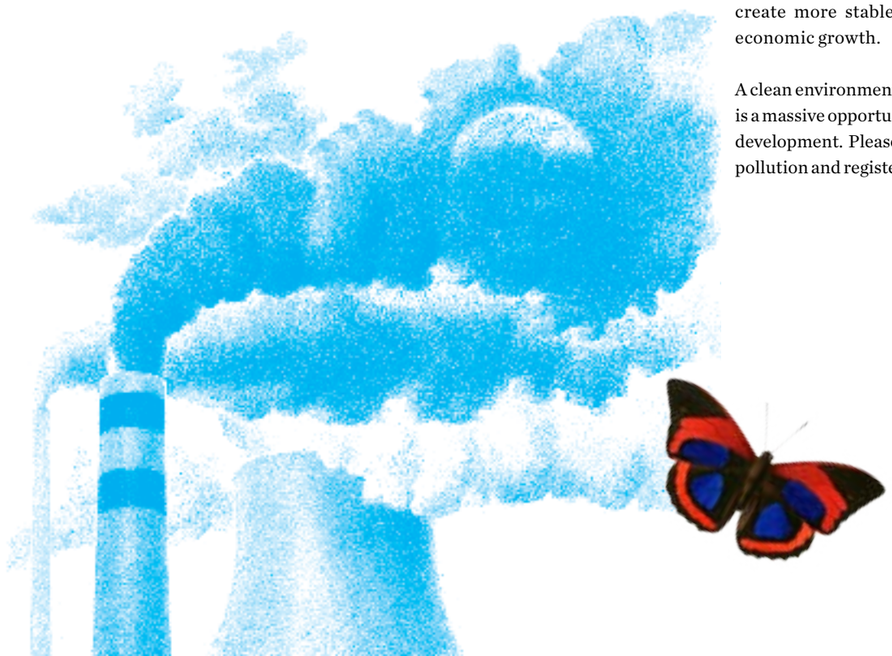
The world's governments have pledged to build a better future where no one is left behind, yet the most basic conditions for people to survive and thrive are out of reach for many. Over 90 per cent of us breathe dirty air and over 90 per cent of those who die as a result are in low- and middle-income countries, with women and young children disproportionally affected.

It is a cruel irony that the wealthiest in society -- who benefit most from the activities that pollute our environment – have the most options to avoid the impacts. The poorest – who rely most on our environment for food, water, shelter and income – have the least access to safe alternatives. This creates a destructive cycle of poor health, poverty, inequality and migration that is hard to break.

Hard, but not impossible. For example, up to three billion people cook and heat their homes using open fires and simple solid fuel stoves, leading to the deaths from respiratory disease of over four million people a year. Yet simple, inexpensive technology can save and transform those lives. Take Gokhari Solanki, a young woman from Temla village in the Jhabua District of India's Madhya Pradesh State. When she first saw a solar cooker, she didn't think it would be easy to use or very effective. However, the team at the Barli Development Institute for Rural Women in Indore provided the training and support to change her mind – and her life. This solar cooker training is part of a wider vocational programme that has benefited some 7,000 women and the 600 villages they live in. It's the kind of ground-level technology transfer that is gaining traction, but which we need to scale up much more quickly.

We spend $5 trillion a year on healthcare because of air pollution. Yet investing that in the kind of technologically and commercially viable solutions already available would slow, perhaps even reverse, our ever-decreasing cycles of poverty and vulnerability. In doing so, we would not only improve health and create decent jobs, we would create more stable communities and more sustainable economic growth.

A clean environment is not a luxury. It must be a right, and it is a massive opportunity for sustainable social and economic development. Please, join the millions determined to beat pollution and register your pledge at beatpollution.org▲



Edgar Gutierrez
The environment's parliament

The United Nations Environment Assembly can become a global coalition for a pollution-free planet.

Edgar Gutierrez

President of the UN Environment Assembly, Minister of Environment and Energy of Costa Rica

The United Nations Environment Assembly has been called the"Parliament of the Environment." The highest level of authority on the environment in the United Nations system, it is a unique and inclusive body that brings together high-level decision makers, civil society, experts, business representatives and others from all countries of the world to find solutions to the most pressing environmental problems. It is so much more than just another United Nations body. It has the potential to be a global coalition of institutions and organizations, supported by individuals united in combating environmental deterioration and pollution for the sake of future generations.

I became President of the Assembly on 23 May 2016 with a commitment to three key priorities: strengthening its role and visibility: implementing a vision for a pollution-free planet; and working towards clean seas. Fortunately, I was not alone in my work. Preparing for this 2017 Assembly was a collective effort of member states and the Committee of Permanent Representatives, supported by the UN Environment Secretariat and stakeholders from civil society and the private sector. I have participated in a number of significant international meetings and global events to give the Assembly visibility and we strengthened the role of regional ministerial fora in the lead up to it.

I wish to pay tribute to my colleagues from the Committee of Permanent Representatives and the members of the Assembly Bureau: many personally took the lead in preparing their regions' contributions to the Assembly. The two bodies have worked together in an innovative way, complementing each other's work since the Assembly decided to elect its Bureau at the end of its meetings so as to enable it to play a bigger role in preparing its sessions.

The 2017 Assembly has as its theme "pollution", a single environmental challenge that affects everyone, no matter whether rich or poor, no matter whether in Africa, Asia, Europe or the Americas. Though the issue has been addressed by decision makers for decades – including through multi-lateral agreements and the spending a lot of funds – there has, as yet, been no great breakthrough. Air pollution alone shortens the life span of up to 7 million people every year. We need new approaches and new partnerships if we are to reduce pollution considerably. The Assembly is where such new approaches can be presented, developed and initiated and where new, unconventional partnerships can be created.

The 2017 Assembly is expected to close with a ministerial declaration intended to speak not just to Ministers, but to ordinary people, showing them that decision makers take the problems they face seriously, and calling for action. Like many other major problems, pollution can only be addressed if all parts of society commit and get engaged. A successful Assembly that helps protect the planet and improves the lives of ordinary people calls for nothing less than a solid partnership between governments, civil society and the private sector.

Over the years, our partners from major groups and stakeholders have invested much time in contributing to Assembly resolutions and declarations, in preparing the Global Major Groups and Stakeholders Forum and in reaching out to societies, raising awareness about the Assembly and encouraging actions and commitments to combat pollution. Thus it was very important for me to help ensure the 2017 meeting will see more effective participation by civil society and the private sector than previous ones. While it was not possible to put in place a new Stakeholder Engagement Policy during my tenure, UN Environment is now, in practice, one of the most participatory and transparent organizations in the multi-lateral system – with doors open to everyone truly committed to engage.

Photo: © *Nguyen Tran*

The Assembly is where new approaches to pollution can be presented, developed and initiated and where new, unconventional partnerships can be created.

The private sector recognises the Assembly's importance more than ever before, Events around it – such as the Science-Policy-Business Forum and the Sustainable Innovation Expo – provide attractive opportunities for companies to showcase their contribution to combating pollution and engage with decision makers.

Is the United Nations Environment Assembly now the authoritative voice on the environment we would like it to be? Is it the "Parliament of the Environment"? Maybe not yet, but we are on the right road. However, more needs to be done. Although it is getting more and more important, the environment tends to be seen as the least important pillar of sustainable development, behind economic and social issues. This results in increasing pollution – and needs to change.

Despite member states opening doors to the Assembly – and its uniqueness in bringing together many different stakeholders from governments, civil society, the private sector and others – much of this participation still seems to be cosmetic. The questions remain: Have we achieved true qualitative change? Has increased participation led to better decisions? Maybe not yet. Therefore it will be important that, in future, we strengthen UN Environment's ability to engage even better with the wide variety of stakeholders that are so important to us, both to make the best decisions and to help ensure that they are implemented and monitored.

The Assembly must be more than just a place where interesting debates take place, resulting in large numbers of resolutions on various issues that often do not really change the environment. We need to put in place new mechanisms which ensure we deliver on our promise to the people of this planet. And we must ensure that decisions and resolutions are followed by actions that change the lives of ordinary people for the better, protect our planet and the secure the heritage of future generations.

Only if we achieve this, will the United Nations Environment Assembly truly be the "Parliament of the Environment". ▲

Judi Wakhungu
Free of plastic bags

How the menace of polythene bags has been handled in Kenya.

Judi Wakhungu

Cabinet Secretary, Ministry of Environment and Natural Resources, Kenya

Kenya faces major challenges in waste management. Most urban centres lack basic waste management structures and open dumping is the most popular option. A close look at problematic waste at roadsides, rivers, dumpsites, and most public spaces revealed that polythene bags were most widespread. Scientists claim that polythene bags take over 1,000 years to decompose: hence the earliest ones are still with us somewhere in the environment.

Polythene bags are associated with many negative impacts. The main challenges include: their inability to decompose; the aesthetic cost of littering; blockage of sewerage and water drainage infrastructure; public health costs; pollution of the coastal and marine environments; death of livestock and wild animals from consumption of plastic material; air pollution when disposed of through open burning; and danger to human health when used for packaging hot food.

Kenya's selling point to tourists is her natural and scenic beauty. This needs to be safeguarded. A major concern is that highways – the gateways to Kenya's major tourist attraction destinations – are strewn with plastic waste. Our national parks are no longer natural and are littered either by tourists or by polythene bags blown by the wind. This calls for behaviour change – even in the transport shuttles where tourists take refreshments – and for disposing of the plastic waste appropriately.

At least one case per day of animals with plastics in their digestive systems is reported in every abattoir in Kenya. The most affected are cows, due to the selective feeding preferences of other types of livestock such as sheep and goats. In one case, a slaughtered cow had 2.5 kg of plastic waste in its lumen. This has negative economic impacts, especially in dairy farming.

The Ministry of Environment and Natural Resources takes solid waste management very seriously. In the Constitution of Kenya 2010, Article 42 assures all Kenyans of a clean and healthy environment while, of course, demanding that all of us are responsible in safeguarding that right. Article 69 obligates the Ministry to eliminate all processes and activities that degrade the environment. Polythene bags are a common menace and need to be removed from the environment. In fulfilling these constitutional demands, the ministry is guided by several policies: key among them is Sessional Paper No. 10 of 2014 on Environment Policy. The waste management agenda is further legislated for in the Environmental Management and Coordination Act and its associated Waste Management Regulations 2006. The National Solid Waste Management Strategy 2014 further elaborates actions to be taken to address the waste challenge at national and county levels.

On 28 February 2017, I issued Gazette notice No. 2356, banning the use, manufacture and importation of all plastic bags used for commercial and household packaging. It notified the public that this would take effect from the sixth month from the date of the notice i.e. on 28 August 2017.

Several initiatives were put in place to help make implementation successful. These include:

Photo: © CC BY Brittany Danisch

Kenya is proud to have succeeded with the ban. The widespread public support was encouraging. The environment is now cleaner.

2.5 kg: *the amount of plastic found inside one slaughtered cow.*

- Awareness. The ban attracted a lot of attention and Ministry and National Environment Management Authority officials received many invitations from media houses – including those that broadcast in indigenous languages – to explain it. The Ministry and the Authority uploaded frequently asked questions on a website. They were also printed and circulated by daily newspapers. The Authority organized awareness meetings for diverse groups such as regulators, religious groups, supermarkets and public transport so as to clarify what was banned and what each stakeholder was expected to do.

- Alternatives. The Ministry held a two-day exhibition in Nairobi to showcase how stakeholders had adjusted and innovatively developed alternative eco-friendly packaging materials to replace polythene bags. This attracted 41 exhibitors and was mounted collaboratively with the Nation Media Group, which created much awareness through print and digital media before and during the exhibition.

- Exemptions. Implementing the polythene ban ran into some hiccups since the packaging industry is quite diverse and complex. Some products, especially food ones, had to be packed using polythene bags due to hygienic concerns. The manufacturing sector also raised several pertinent issues that had to be addressed on a case-by-case basis. The Authority received the complaints, considered them and gave those with merit conditional exemptions to continue using polythene bags. These exemptions only applied for primary industrial packaging and handling waste.

- Forests and parks. It was felt that some sections of the country should be made free of polythene bags to show Kenyans what is possible. This was implemented in all natural forests and game reserves. No visitor is allowed to access these areas while in possession of a polythene bag.

- Seeking partnerships. The Ministry wrote to other Ministries and the Council of Governors explaining the ban and seeking their support in creating more awareness and undertaking enforcement action to ensure success. This bore a lot of fruit: the Ministry received written commitments from various other ministries and semi-autonomous institutions, and from the Council of Governors, declaring their unwavering support to ensure that the ban was successful. The Kenya Airports Authority procured bins to take polythene bags from visitors entering Kenya.

- Enforcement. The National Environment Management Authority is responsible for enforcing the ban. To ensure success, it established a Joint Implementation Committee with members of the manufacturing sector to manage the transition, and a sub-committee to look at all issues of enforcement. Soon after the ban, its officers visited manufacturers and retail outlets to ensure that use of polythene bags was stopped, even confiscating any stocks of the bags found onsite. It announced specific areas where the public could drop polythene bags, including supermarkets, some banks and Kenya Red Cross offices, from where they were removed by registered recyclers. As the ban continues, enforcement action has been taken. Some people have been prosecuted and fined.

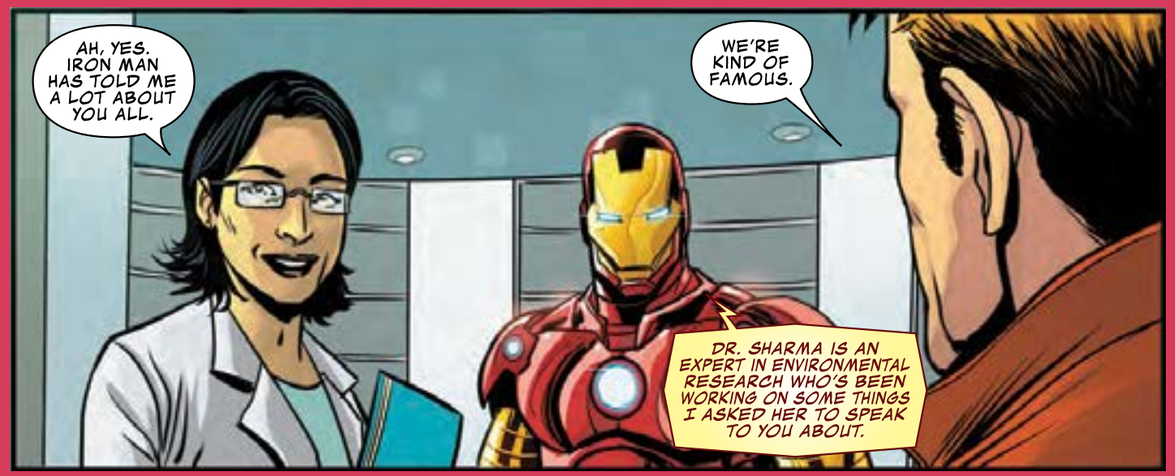
Kenya is proud to have succeeded in banning the use, manufacture and import of polythene bags. The widespread public support was encouraging. The environment is now cleaner.

We continue to address the teething problems of implementation especially on the needs of primary industrial packaging. However we are happy that we have closed discussions on carrier bags, and they are no more in use in Kenya. We appreciate the support given to the ban by the industry and will continue to work with it to transition Kenya into a plastic bags-free country. ▲

UN Environment at Work

Superheroes of our own

The 30-year fight to restore the ozone layer shows how concerted action can tackle the biggest environmental issues of our age.



The white-coated scientist explained calmly to the trigger-happy superheroes that the deadly menace they had come to Earth to fight was already under control.

"In the 80s, the global community came together to address the destruction of the ozone layer," Dr. Sharma said. "The 80s? Did they all have cool hairdos?" quips the Star Lord.

The science and politics of the atmosphere can be rather sober subjects. But a dash of humour and imagination is helping spread the good news that determined global action really can save the planet.

UN Environment has marked the 30th anniversary of the Montreal Protocol, the accord that has phased out chemicals that harm the protective ozone layer, by commissioning a special edition of the Guardians of the Galaxy comic strip.

Produced in partnership with Marvel Comics, readers can follow the Star Lord, Iron Man, Gamora and their fellow guardians as they discover that humans are the real superheroes who have tackled the issue.

"The fight against ozone depletion shows the power of international action when it has the support of industry and the public," says Tina Birmpili, who leads UN Environment's Ozone Secretariat, under which the Protocol falls. "We all need to be just as heroic against pollution and climate change."

The comic strip is part of an anniversary campaign celebrating the achievements of the Protocol and emphasizing its continued relevance also to the goal of combating global warming. So far, more than 22,000 people have become #OzoneHeroes through www.ozoneheroes.org. Visitors to the website can take a quiz to discover their own ozone superpower, create a morph, and share their image. The campaign's social media reach to date is estimated at over 30 million people.

The Montreal Protocol on Substances that Deplete the Ozone Layer was agreed on 16 September 1987. The goal was to slash the production and use of chlorofluorocarbons, and other ozone-depleting substances, used in aerosols, refrigeration systems and many other items.

While such innovations brought comfort and convenience to billions, the substances they ran on were pollutants tearing a hole in the ozone layer and allowing harmful ultraviolet radiation to stream through and threaten human health and the environment. Thirty years later, and the nations of the world – all of whom signed the protocol – have eliminated nearly 99 per cent of ozone-depleting substances. Scientists believe the ozone layer is healing and will return to 1980 levels by about 2070. As a result, millions of cases of skin cancer may be prevented annually.

The Protocol "can claim to be one of the most successful international treaties ever struck," Mario Molina, one of the scientists who first discovered the ozone hole, writes elsewhere in this edition of Our Planet.

Having set the upper atmosphere on the road to recovery, the Protocol has a new mission to prevent up to 0.5° Celsius in global warming by the end of the century, a significant contribution to the global effort to prevent dangerous climate change.

Hydrofluorocarbons became widely used substitutes for ozone-depleting substances, but these are also potent greenhouse gases. In October 2016, after long negotiations, the parties to the Montreal Protocol signed the Kigali Amendment to phase them down.

The Amendment commits countries to cutting the production and consumption of hydrofluorocarbons by more than 80 per cent over 30 years. The deal includes targets and timetables to replace them with more planet-friendly alternatives, and an agreement by rich countries to help finance the transition in developing countries.

More than 20 countries have now ratified the amendment, crossing the threshold for it to enter into force on 1 January 2019. Developed countries will start reducing hydrofluorocarbons as early as 2019. Developing countries will start later. It is another ambitious undertaking that requires sustained, concerted efforts from current and future generations. As with fixing the ozone hole, Earth's inhabitants will need to perform the heroics themselves. And success might mean they are remembered for more than their hairdos.

Help spread the understanding that we are all #OzoneHeroes by visiting http://www.ozoneheroes.org▲

Michael Gove
Bringing a sea change

Cutting pollution from plastics to protect the oceans and their species.

Michael Gove

Secretary of State for Environment, Food and Rural Affairs, United Kingdom

Few will forget the day in April 2010 a BP oil rig exploded in the Gulf of Mexico. Oil gushed for 87 days and the world reacted with horror. Birds, fish and marine mammals lay lifeless along the coastline, consumed by the deadly waste. It was one of the worst environmental disasters in the history of the United States.

Oils spills are big and ugly. They splash across the news channels and demand billions in compensation from guilty corporations. But what about less obvious threats to ocean life?

Photos: © Shutterstock

At this very moment, the same precious species are being choked not by oil but by plastic waste. The surge of plastic clogging our rivers and oceans is nothing short of a man-made environmental disaster. From large items like television sets and packaging to tiny microplastic particles, 8 million tons of discarded plastic reach our seas each year putting marine wildlife under serious threat and doing serious and irreversible damage to our environment.

It is easy to see why plastic is attractive. It is a versatile material with unique characteristics that make it ideal for manufacturing. But the evidence is indisputable – plastic waste dumped on land and in rivers is finding its way into our oceans at an alarming rate, smothering habitats and entangling marine animals. Many creatures, from turtles to plankton, mistake plastic for food, clogging their digestive systems and affecting growth and reproduction rates. Some plastics also contain chemicals added during manufacture. Others bond with organic chemical pollutants once in seawater. Either way, they are causing catastrophic damage to the delicate marine ecosystem.

Everyone, from government and industry to consumers, has a part to play in confronting this problem and protecting the world's most vital natural resource and single biggest habitat.

It is no surprise therefore that plastic pollution was the central issue at both the recent United Nations Ocean Conference in New York and the 'Our Ocean' meeting in Malta. It is the duty of every government to turn international concern into action at home to reduce the amount of plastic reaching our seas.

In the United Kingdom, we have made a promising start. Our 5-pence charge on single-use plastic bags has meant 9 billion fewer have been used since October 2015, a reduction of 83 per cent. The charge has also raised £95 million ($125 million) for good causes, all with the endorsement of consumers and businesses.

Photo: © Shutterstock

Our goal is for this generation to be the first to leave the environment in a better place than we found it

We are also introducing a ban on plastic microbeads in cosmetic and personal care products. These tiny specks of plastic can be devastating to marine life. Often we are oblivious to their existence but one shower can send 100,000 microbeads into the water system. Fish, seabirds and marine mammals are ingesting these particles of plastic, damaging not only their own health but human health too as they are consumed in seafood.

*Only **57 per cent** of plastic bottles were recycled in the United Kingdom in 2016*

Plastic microbeads are not just harmful, they are unnecessary. Our work with the cosmetics industry has shown that natural alternatives are able to achieve the same effects. Manufacturers have already demonstrated their willingness to use substitutes like shells, salt and sugar as exfoliants, for example. When sustainable alternatives are available, we should do all we can to remove and reduce the use of microplastics.

That is why the government has drawn up what campaigners have described as the strongest microbead ban in the world. The ban on the manufacture of new cosmetic and personal care products containing microbeads will come into force in January 2018 and their sale will be banned from June 2018. We will also continue to work with scientists and industry to identify other products containing microplastics that could reach the marine environment.

Despite the action we have already taken on ocean plastics, there is still so much more do. In particular, we must tackle waste from plastic bottles and drinks containers.

Only 57 per cent of plastic bottles were recycled in the United Kingdom in 2016. We've got to make sure that we use fewer, recycle them better and – most crucially – stop them from ending up in our seas and causing terrible damage to wildlife as well as blighting the landscape.

We have launched a call for evidence on reward and return schemes and want to find the best approach for England. These schemes have delivered fantastic results in, for example, Denmark and South Australia, where recycling rates of deposit marked cans and bottles are 90 per cent and 80 per cent respectively. Big drinks manufacturers have acknowledged that more must be done. So we will work with them, as we have worked with the cosmetics industry, to develop an approach that achieves results.

The United Kingdom is a global leader in protecting beaches, oceans and marine life around the world. Our effort to reduce plastic waste is just one part of a wider strategy to improve how we care of our land, rivers and seas. We soon hope to publish our 25-Year Environment Plan, setting out an ambitious agenda at home and abroad for not just protecting but enhancing our environment. We have one goal – for this generation to be the first to leave the environment in a better place than we found it. That simple principle will guide us as we work with international partners to protect our planet. ▲

Corine Mauch
Clearing the air

How sustained action on pollution has achieved high air quality in a Swiss city.

Photo: © zuerich-old-town

Corine Mauch

Mayor of Zurich, Switzerland

Humankind's future will largely be decided in cities. Half the world's population already lives in them, and by 2050 this will have risen to 70 per cent. Cities are where global challenges and problems are concentrated: they consume three quarters of the world's resources and generate three quarters of all emissions.

But cities are also places where innovation occurs and solutions emerge. Implementing good solutions in them can have a big impact and bring direct benefits to many people and businesses. Cities are dynamic and hold the potential, know-how and experience that can make a difference to future global development. It is therefore appropriate and highly commendable that one of the United Nations' 17 Sustainable Development Goals is to "make cities and human settlements inclusive, safe, resilient and sustainable".

The commitment of cities and the effectiveness of the measures they can take can be seen in the efforts to combat air pollution in Zurich. By the 1980s, Swiss cities including Zurich had reached very high air pollution levels. Thresholds for nitrogen oxides, particulate matter, ozone and sulphur dioxide were continually exceeded by considerable amounts. The Swiss government's response was a nationwide air pollution control ordinance, which came into force in 1986 and has been steadily revised and tightened ever since. This provided the Zurich city government with the basis for taking action in areas such as industry, transport and heating systems.

Thanks to its rigorous enforcement of the national ordinance, the city achieved good reductions in the major pollutants throughout the 1990s and 2000s. Nitrogen oxide emissions fell by around 50 per cent between 1990 and 2000. The downward trend flattened thereafter, but in 2016 emissions were down to around just 30 per cent of the 1990 level. Stricter exhaust emission regulations for vehicles, refurbishing heating systems and retrofitting municipal waste incinerators all contributed to this decrease.

Pollution by particulate matter showed a parallel reduction: improvements achieved by 2000 were rapid and significant, though the pollution burden has decreased at a slower rate since. The overall pollution level has been reduced by about half, and Zurich only occasionally exceeds the long-term threshold.

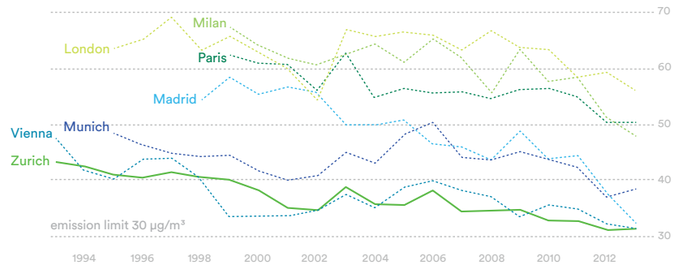
These efforts have resulted in Zurich performing very well by international standards. In a 2015 study on air quality in 23 European cities, the European Environmental Bureau concluded that Zurich had the cleanest air. This is all the more gratifying since air quality in most other European cities has also improved.

These results must not tempt us to cease or reduce our commitment to clean air. Even though our air is now cleaner than at any time in the last 30 years, pollution is still too high and action needs to be taken. Air pollutants cause health problems, and pose a particular threat to sensitive ecosystems. We estimate that air pollution in Zurich leads to additional health costs of around 200 million Swiss francs ($203 million) and around 70 million Swiss francs' worth of damage to buildings each year.

The city government has therefore set its sights on protecting the population from excessive particulate matter and nitrogen dioxide pollution by 2025. The thresholds are to be maintained at all times, even near busy roads. Attaining this ambitious goal will entail another major reduction in emissions.

Even though Zurich's air is cleaner than at any time in the last 30 years, pollution is still too high and action needs to be taken.

Nitrogen dioxide pollution (annual mean values in µg/m³)



Source: http://www.nachhaltigkeitsmonitoring.ch/luftqualitaet

Road traffic is a central starting point. It remains a principal source of pollutants - responsible, in particular, for 47 per cent of nitrogen dioxide and 37 per cent of particulate matter. The city's "Urban Transport 2025" strategy has introduced measures to encourage yet more travel by public transport, bicycle or on foot. Voters gave the city government a mandate to increase the proportion of public transport, pedestrian and bicycle traffic locally by at least ten percentage points between 2012 and 2022.

This target is already halfway to achievement: public transport, pedestrian and bicycle traffic now account for 75 per cent of Zurich's total. Almost half the households in the city no longer have their own car, and we continue to invest in expanding an already excellent public transport system and infrastructure for pedestrians and cyclists. The city administration is setting a good example: official vehicles are only replaced if staff bicycles or car sharing are not viable alternatives.

The city's government cannot simply decide and decree the solution and result. It needs the support of everyone, especially the public and the business community. So consistent and transparent information is important. The city offers environmental advice tailored to businesses, for example. It produces expert reports on the status of work to combat air pollution, and exploits new digital opportunities. A smartphone app displays current air quality in the city and throughout Switzerland, while a free-of-charge SMS service sends notifications when ozone and particulate matter exceed thresholds.

Despite the achievements to date – and an outlook suggesting that further improvements can be expected – clean air in the city remains a challenging goal. We must continue working on it, step by step and with unrelenting commitment.

For me, however, the reduction of air pollutants in Zurich demonstrates something more fundamental: change and improvement are realistic even in the face of major challenges. Of course, as a prospering and comparatively affluent city, we had a good foundation to begin with and the resources necessary for tackling air pollution. And clearly, we face other major challenges in the form of climate change and persistent overconsumption of resources. Yet the success achieved so far by politics, business and society acting together makes me optimistic.

Advancing urbanization will be one of the most influential trends of the 21st century and the potential of cities is yet to be fully exploited. If cities are integrated and included, they will become indispensable, constructive and strong partners in helping find solutions for the future. ▲

Mario Molina, Durwood Zaelke
Triumph by treaty

Redoubling efforts under the planet-saving Montreal Protocol can help achieve the Paris goals.

Mario Molina

Nobel Prize Laureate in Chemistry

Durwood Zaelke

President, Institute for Governance and Sustainable Development

Ozone depletion was the first human threat to the global atmosphere to be recognized. It was also the first to be addressed by the international community. The results have been truly remarkable. The Montreal Protocol on Substances that Deplete the Ozone Layer, which celebrates its thirtieth anniversary this year, can claim to be one of the most successful international treaties ever struck.

It has fulfilled its original objective by putting the stratospheric ozone layer on the road to recovery. But its effects have not stopped there: it has also done more than any other measure to date to combat climate change. And it has achieved all this through a united, indeed unanimous, world community. The Montreal Protocol is the first and only treaty ever to have been ratified by every nation on Earth. This has happened not just once, but six times over, including the underlying framework convention, the protocol, and its four amendments.

In 1974, one of us (Mario Molina) and Sherwood Rowland published the results of a scientific study that concluded that chlorofluorocarbons – then widely used mainly as refrigerants and propellants – were migrating to the upper atmosphere and affecting the ozone layer which shields terrestrial life, including humans, from deadly ultraviolet radiation. If such depletion had continued there would have been catastrophic global consequences, with many millions of people contracting skin cancer and widespread damage to crops.

Many originally disputed our conclusion, but the science was later confirmed by strong experimental evidence. Consumers in Europe and North America acted quickly and boycotted the use of spray cans using chlorofluorocarbons as propellants for such products as deodorants and hair spray: at the time, every household, on average, used 15 spray cans. The chemical industry, which had initially questioned the science, began to develop replacement chemicals that were less harmful to the ozone layer. A handful of national laws were passed, and UN Environment brokered an international framework treaty, the Vienna Convention for the Protection of the Ozone Layer, in 1985.

Just months after the Convention was agreed, a scientific paper was published revealing a "hole" in the ozone layer above Antarctica so great that the scientists who found it originally thought their instruments must be faulty. The development of the Montreal Protocol to the Convention was further catalyzed by this unexpected discovery – similarly confirmed by measurements and scientific evidence that also found chlorofluorocarbons and related chemicals to be responsible.

Photo: © CC BY NC ND AA Stwike

Photo: © CC BY CpLL

The amendment was achieved after an eight-year campaign initiated by the Federated States of Micronesia, Mauritius, and Morocco. The amendment also eases the world's path away from fossil fuels by promoting improvement in the energy efficiency of the air conditioners, refrigerators, and other products switching out of hydrofluorocarbons. This would be perfectly practicable: when replacing other damaging refrigerants in the past, manufacturers achieved just such gains in efficiency.

In China, moving to climate-friendly refrigerants and boosting the efficiency of cooling could save the energy produced by eight Three Gorges hydroelectric dams.

The Protocol, also agreed under UN Environment's auspices, aimed at starting, then strengthening, protective action. Initially, its parties agreed to cut chlorofluorocarbons by 50 per cent over 12 years, but they swiftly accelerated the reduction to 75 per cent by 1998, and then 100 per cent by 1992. Success has continued to breed success. Over its 30-year history, the treaty has succeeded in reducing nearly 100 ozone-depleting chemicals by nearly 100 per cent.

The ozone layer is healing, and is likely to recover in several decades. But that is only part of the Protocol's impact. The same chemicals that attacked the ozone layer are also greenhouse gases. So, phasing them out has made a great contribution to slowing global warming.

4,000 times greater: *the warming power of hydroflourocarbons compared to carbon dioxide.*

That contribution increased markedly last year when the nations that are party to the convention agreed in Kigali, Rwanda, to amend the Protocol to phase down the use of hydrofluorocarbons, which were introduced as ozone-friendly alternatives to damaging chemicals, but are also one of the six main sets of pollutants causing global warming. Their use has been growing rapidly and, molecule-for-molecule, they are up to 4,000 times more powerful than carbon dioxide in promoting climate change.

The phasedown will reduce use of the chemicals by 80 per cent, cut emissions equivalent to 80 billion tons or more of carbon dioxide by 2050, and avoid up to a half degree Celsius of warming by 2100. That is a significant contribution to the goal of the 2015 Paris Agreement, to keep the increase in average world temperatures to well below 2 degrees Celsius, aiming for 1.5 degrees Celsius above their pre-industrial level, with no net emissions of greenhouse gases beyond mid-century.

Improvements in efficiency would also bring many other advantages, including reduced air pollution and improved public health. Consumers also would save money – and be better able to afford cooling – since energy use typically makes up 90 per cent or more of the lifecycle impacts of an air conditioner. National economies would also gain. Just a 30 per cent increase in the efficiency of India's units, for example, could save enough electricity to avoid having to build 140 medium sized power plants to meet peak demand by 2030. In China, moving to climate-friendly refrigerants, and boosting the energy efficiency of cooling, could together save as much energy as would be produced by eight Three Gorges hydroelectric dams.

The Montreal Protocol's Kigali Amendment and associated energy efficiency efforts are at the leading edge of the triple-headed climate strategy that is needed to meet the Paris goals, as laid out in the recent report Well Below 2 Degrees: Fast Action Policies to Protect People and the Planet from Extreme Climate Change, published by the Committee to Prevent Extreme Climate Change, which we co-chair with Professor V. Ramanathan. This requires cutting both carbon dioxide and short-lived climate pollutants, including hydrofluorocarbons, black carbon, and methane, while also learning how to accelerate the removal of carbon dioxide already in the atmosphere.

We are rightly celebrating the achievements of the planet-saving Montreal Protocol this year. The most important tribute would be to redouble the efforts being made under it worldwide, including fast ratification and fast implementation of the Kigali Amendment, along with energy efficiency measures to double the climate benefits. ▲

Virginie Helias
Waste not …

Empowering responsible production and consumption in the emerging circular economy.

Virginie Helias

Vice President of Global Sustainability, Procter & Gamble

The consumer goods industry has entered an era of responsibility, where companies, consumers, governments and non-governmental organizations are collaborating more and more frequently to address some of the biggest challenges facing the world. We now have a better understanding of the wide-ranging impacts of the manufacture and use of consumer goods. Companies like Procter & Gamble are continually refining their approach to developing, manufacturing and marketing products more responsibly and encouraging mindful consumption of the everyday products that many of us often take for granted.

For years, affordability and convenience were among the biggest drivers of consumer purchasing decisions. Yet, around the turn of the century, consumers became more conscious of what they threw away. We saw a shift from a linear, single-use economy to a circular one that encouraged awareness of what was being used, and how it was being disposed of. Slowly, more and more recycling facilities were created, new policies were instituted and new recyclable packaging was developed. Collectively, we became more educated about, and more engaged in, reducing the impacts of consumption on the world we share.

Now, many consumers look for sustainable products made by environmentally-responsible companies. They care about the companies that make the brands they love. And while convenience is still a big factor in their decisions, we believe it can be compatible with a commitment to environmental sustainability. We embrace the growing circular economy, which emphasizes recovery, recycling and reuse to encourage thoughtful consumption of resources and to extend the lifecycle of the materials that go into our products and our packaging. There is now the potential, and the desire, for an economy that is circular – that doesn't end with a product in landfill.

By enabling the consumers of our products to become a more integrated part of that cycle of use and reuse, we seek to protect our environment and to ensure a better world for our children and our children's children.

But we know that empowering consumers is only part of what we can do to be good neighbours in our communities and good stewards of the world we live in and the resources we use. We are also constantly examining and refining our own approaches to manufacturing, packaging and shipping;

Photo: © Shutterstock

Photo: © CC BY NC ND Nacho

There is now the potential, and the desire, for an economy that is circular – that doesn't end with a product in landfill.

measuring the impacts we have on the environment; and finding ways to reduce that impact.

I'm especially proud of several of the ways Procter & Gamble is innovating to deliver on our commitment to enable consumers to make more sustainable choices.

70 per cent: *proportion of Procter & Gamble sites sending zero manufacturing waste to landfill.*

Earlier this year, our Head & Shoulders brand partnered with recycling and environmental management companies TerraCycle and Suez to introduce France to the world's first recyclable shampoo bottle made from beach plastic. Through this partnership more than half a billion bottles per year will include up to 25 per cent post-consumer recycled waste by the end of 2018. This will represent more than 90 per cent of all the bottles sold in Europe across our hair care portfolio – all completely recyclable, and made with plastic reclaimed from the world's oceans. And in the United Kingdom, we are introducing Fairy dishwashing soap in bottles made from 100 per cent recycled plastic including 10 per cent from beaches and ocean.

We've also discovered a way to increase the use of recycled polypropylene in packaging. It's difficult to find enough high-quality recycled polypropylene, so one of our scientists invented a technology which removes colour, odour and contaminants to get it to a near-new condition. We are now scaling up this innovation with PureCycle Technologies, and expect it to have a significant impact on the plastics recycling industry – and potentially revolutionize it – by unlocking billions of pounds of polypropylene for reuse.

Besides extending the lifecycle of recycled materials, we're seeking to reduce waste. In the past, 640,000 metric tons of waste produced at our manufacturing facilities has been disposed of in landfills. So in January, we announced that all our manufacturing facilities around the world will send zero manufacturing waste to landfill by 2020. We have been working with local partners to identify ways to eliminate waste created during the manufacturing process, or to capture and reuse materials and byproducts that would previously have been disposed of. More than 70 per cent of our sites – including all manufacturing sites in two of our largest markets, China and India – have now achieved that status.

We also see an important role for companies like ours in helping reduce the pressure municipal waste is putting on the world's landfills. We are co-creating and bringing to life sustainable solutions for managing solid municipal waste in the Philippines through our Waste 2 Worth partnership with the Asian Development Bank. Procter & Gamble is also a member of the Ocean Conservancy's Trash Free Seas Alliance®. Along with other Alliance members, we are committed to a near-term goal of cutting the overall flow of plastic into the world's oceans in half by 2025. We are now innovating with an eye to reducing or eliminating the potential impact of products and packaging on ocean life and ecosystems.

By keeping manufacturing waste out of the ocean and landfills and extending the lifespan of previously used materials, the company is creating a fundamental shift in the way we, and our consumers, impact the world we live in. This is our responsibility: to use our resources and voice not only to shrink our own environmental footprint, but to encourage those around us to do the same. I am inspired by the progress that has been made as the global community comes together to improve our collective future, for ourselves, each other and future generations. ▲

A framework for action on pollution

UN Environment has identified 50 interventions that can drive the transition to a pollution-free planet. Some of these target specific pollutants, while others aim to bring about system-wide changes that can put the world on a cleaner, more sustainable path.

Air pollution

- Develop and adopt electric and hybrid vehicles
- Reduce emissions of ammonium and methane from agriculture
- Invest in air quality monitoring networks, assessment systems, institutional capacity and information disclosure to the wider public in order to address gaps in capacity, data, information and awareness
- Develop air quality policies and strategies at the subnational, national and regional levels to comply with World Health Organization air quality guidelines
- Designate and expand green spaces in urban areas
- Adopt and enforce advanced vehicles emissions standards
- Reduce emissions from major industrial and manufacturing sources
- Increase investment in renewable energy and energy efficiency
- Enhance climate change activities of Governments and businesses to better tackle local and regional pollution
- Provide access to public transport and non-motorized transport infrastructure in cities
- Protect and restore ecosystems to avoid erosion, fires and dust storms
- Improve access to clean cooking fuels and green technologies for residential heating

Water pollution

- Establish, improve and harmonize (in situ) water quality and quantity (flow) monitoring systems in surface water and groundwater
- Adopt and enforce national guidelines for freshwater ecosystem management to protect and restore wetlands and other natural systems that contribute to water purification
- Increase treatment, recycling and reuse of wastewater to reduce the amount of untreated wastewater discharged into freshwater bodies by at least 50 per cent by 2030
- Provide safe drinking water and access to sanitation for all by 2030
- Define national and water-body standards to provide an ongoing picture of the quality of available water resources and to identify opportunities and risks in relation to human and ecosystem health
- Improve data collection and sharing, build capacity for data quality assurance and control and make information on water quality freely available to the public

Land and soil pollution

- Invest in long-term environmental monitoring following industrial closures
- Invest in building the knowledge of all those associated with the design, construction, operation and closure of tailings dams
- Reduce the use of antimicrobials, including antibiotics in the livestock sector, to avoid unintended releases into the environment and food chain, and increase public awareness and international collaboration on research and product development
- Remediate contaminated sites
- Adopt agroecological practices and integrated pest management and establish guidelines for the reduction and efficient use of fertilizers and environmentally friendly pesticides in agriculture
- Reduce point-source pollutants, such as heavy metals from industry, and diffuse pollutants including pesticides and inefficiently used fertilizers in agriculture

Develop efficient governance frameworks and strategies for the prevention and minimization of the generation of marine plastic litter, in particular from land-based sources, and make producers more responsible for the sustainable design, recovery, recycling and environmentally sound disposal of their products

Reduce or phase out the use of certain types of plastic (e.g. microbeads, packaging, single-use plastics) and promote their recovery

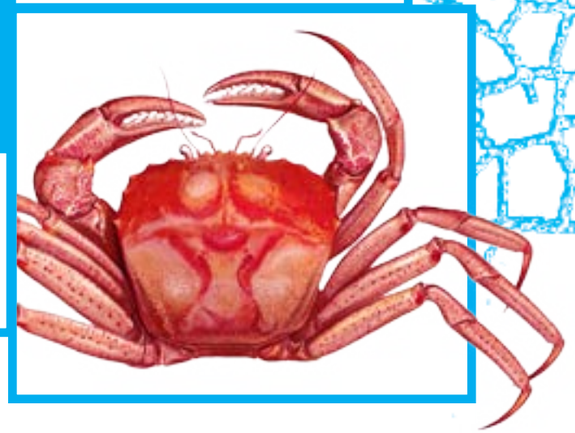
Regulate the leaking of radioactive waste into the ocean

Restore and conserve coastal ecosystems and wetlands to reduce the amount of excess nutrients and other pollutants such as heavy metals entering coastal and marine environments

Do not discharge untreated wastewater and reduce excess nutrient run-off from agricultural systems into the marine environment

Marine and coastal pollution

Establish waste collection systems in coastal areas and monitor programmes for marine litter to inform upstream interventions



Prevent and reduce marine litter, including microplastics, and harmonize monitoring and assessment methodologies to facilitate the adoption of reduction targets

Increase material and energy recovery of waste, including through recycling

Accelerate efforts to eliminate PCBs (polychlorinated biphenyls) to meet the Stockholm Convention deadlines for phasing out the substances by 2025 and disposing of them completely by 2028

Establish and strengthen pollutant release and transfer registers (PRTRs) to measure progress and provide baseline data on chemical emissions

Phase out mercury use in a number of specific products by 2020 and manufacturing processes by 2025, and phase down use in dental amalgams and mining

Increase publicly available information and monitor data on the presence of chemicals in the environment, in humans and in pollution hotspots

Phase out the production and use of asbestos and ensure its sound disposal

Provide reliable and effective consumer information on the impacts of consumer products throughout their life cycles

Reduce exposure to lead from battery recycling, pottery, ammunition, paint and contaminated sites

Increase efforts to deploy locally safe, effective, affordable and environmentally sound alternatives to chemicals of concern, including DDT (dichlorodiphenyltrichloroethane), PCBs (polychlorinated biphenyls), asbestos, lead and mercury

Chemicals and waste

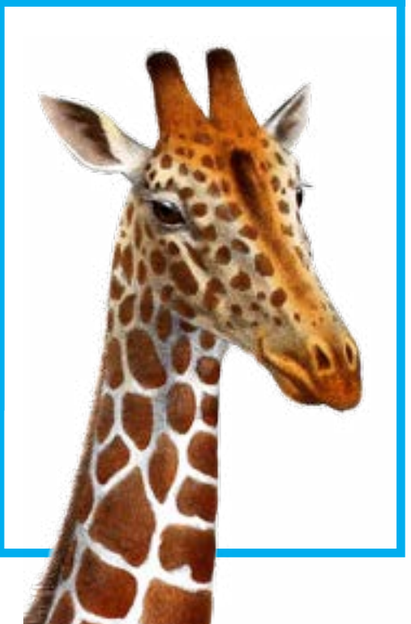
Minimize the generation of waste, and improve its collection, separation, reuse, recycling, recovery and final disposal through policy frameworks and regulations at the national and subnational levels

Improve the enforcement of existing regulations on the transboundary movement of hazardous waste, in particular toxic waste streams from developed to developing countries

Eliminate uncontrolled dumping and open burning of waste

Introduce producer responsibility schemes to collect, treat and safely recycle waste from production and consumption

Accelerate the implementation of the Basel, Rotterdam and Stockholm conventions, the Minamata Convention and the Strategic Approach to International Chemicals Management in a coordinated manner at the national level



Extend product lives

Adopt sound chemicals management and advance sustainable chemistry within business approaches, policies and practices

Reduce food waste throughout value chains, including at the consumer level

Improve knowledge relating to chemicals in products throughout their life cycle (production, use, consumption and disposal)

Introduce eco-labelling schemes

Matt Damon, Gary White
Investing in clean water

Drinking water polluted with human faeces takes a heartbreaking toll, but can be avoided.

Matt Damon

Actor, Film Producer, Screenwriter and Co-founder, Water.org

Gary White

Co-founder, Water.org

There are women we work with who wait for hours to answer the call of nature. They can "go" on the edge of their village, on the river, or on the train tracks. Open defecation leads to all kinds of problems. Think of the health impacts of not defecating all day when you need to, and the safety issues of going out at night. Think of the potential for contamination.

Globally 2.3 billion people lack access to a toilet. At a time when technology can instantly connect people across the globe, when more people have cellphones than toilets, we have nearly a billion people defecating in the open. Flies breeding on faeces deliver infectious organisms back to humans by contaminating food and water.

The health toll is enormous and heart-breaking. Nearly 1 million people die every year from a water, sanitation, and hygiene-related disease. Diarrhoea is one of the top three leading causes of child death. Those that survive have compromised digestive systems that fail properly to absorb nutrients, causing permanent stunting. In India alone, 39 per cent of children under the age of 5 were stunted in 2016: some 10-year-old children are the size of the average 3-year-old.

Lack of sanitation is a large factor in the lack of safe drinking water. Water polluted by human and animal waste is often the only source available for people living in urban slums or rural communities far from infrastructure that isolates drinking water from contaminants. Currently 884 million people live without access to safely managed water. It is difficult to comprehend, given that we have known how to solve water and sanitation pollution issues like this for over 100 years.

So, what is in the way? For many people, like those living under $4 a day, it is simple economics. They cannot afford the upfront costs to construct a toilet, tap into a water line, or build a rainwater harvesting and storage unit. People pay for their water daily through purchasing from vendors, walking to water sources of dubious quality, waiting in long lines for water at a community tap that may or may not turn on. They pay in direct medical costs for treatment of disease caused by drinking unsafe water. These costs are enormous, but are paid a little at a time; eating away at the resources of a family and keeping them trapped in a cycle of poverty.

There is a solution and it is found at the center of the problem. For the past 14 years, Water.org – the organization we co-founded – has executed a financial innovation called WaterCredit with great success. Working with 79 active partners in 10 developing countries, we have reached 8.4 million people with safe water and sanitation solutions. The upfront cost, an average of $311, is given in the form of a microloan and payments are made through recaptured costs and, sometimes, through an increase in income – the time saved from collecting water or finding a place to defecate is turned into time to earn money. We have issued 1.9 million loans to date – with a 99 per cent repayment rate.

WaterCredit is proven, it is scalable, and we are actively sharing our practices with others to encourage further mobilization of capital for clean water and sanitation.

Photo: © CC BY water.org

Besides facilitating people to solve their own water and sanitation needs, using finance effectively stretches aid dollars to reach people living in absolute poverty.

99 per cent: *repayment rate on Water.org loans for household water and sanitation.*

Besides facilitating people to solve their own water and sanitation needs, using finance effectively stretches charity and aid dollars to reach those people living in absolute poverty (under $1 a day).

The needs of some 565 million people could be met in this way and we have chosen to lead in mobilizing the capital needed. WaterEquity – a social impact investment fund and a Water.org innovation – unlocks affordable social investment capital to help finance institutions and other enterprises to scale up their water and sanitation efforts to meet this market demand. It provides subsidies and technical assistance to finance institutions to help them launch loan portfolios. The loans enable the world's poor to pay for a connection to a water source or install a toilet in their homes.

There is a global perception that the water and sanitation crisis can only be solved through charities digging wells and installing toilets. But there is simply not enough charity and aid to meet the need. If we change the perception of the poor being a problem that can only be solved through charity, we can tap into the power of finance to solve this water and sanitation crisis by 2030. ▲

Photo: © CC BY water.org

Ellen MacArthur
Beating pollution by redesign

Redesigning the "take-make-dispose" economy as a circular one is the only long-term solution.


Photo: © Shutterstock

Ellen MacArthur

Founder and Chair of Trustees, Ellen MacArthur Foundation

Over 8 million tons of plastic pollute the oceans each year. The problem is so severe that, if nothing changes, there could be more plastic than fish in the sea by 2050. We must urgently rethink how we make and use this ubiquitous material, now a staple of our modern economy. The appetite to take action is real: public and private sector financial commitments to combat ocean pollution made at the European Union's Our Ocean conference this year, for instance, totalled 7.2 billion euros. Yet if cleaning up is a short-term necessity, only a whole system reset will provide a long-term solution to plastics pollution and the economic losses associated with it.

Pollution is just one symptom of our hugely wasteful plastics system. It is an iconic example of our linear "take-make-dispose" economy as a whole. Forty years after the launch of the first universal recycling symbol, a report by the Ellen MacArthur Foundation to the 2016 World Economic Forum revealed that only 14 per cent of plastic packaging is collected for recycling globally: this results in a loss of $80-120 billion a year to the global economy.

Packaging is not the only culprit. The International Union for the Conservation of Nature has estimated that around half a million tons of plastic micro-fibres shed from the washing of plastic-based textiles like polyester end up in the ocean every year. The challenge is to reconcile the undeniable benefits of plastics and clothing, among other everyday products, with systems that work in the long-term and avoid pollution and the loss of valuable materials.

Can such a dilemma be solved by applying the principles of a circular economy? These are to design out pollution, keep materials in use, and build natural capital within a restorative and regenerative system. The circular economy could contribute significantly to achieving the Sustainable Development Goals which, since their adoption just two years ago, seem to be generating an unprecedented level of collaboration between private and public stakeholders.

The circular economy does not just apply to global streams of materials like plastics and textiles. Sustainable production and consumption may, at first glance, be the prime target of this system shift, but its reach is wider. Analysis from New Climate Economy, for instance, has shown that China's air quality targets can only be achieved by combining accelerated economic restructuring, energy conservation, fuel switching and environmental policy: even the strictest end-of-pipe treatment measures could only do half the job. Similarly, the Ellen MacArthur Foundation has found that circular economy opportunities in India's food system could, by 2030, yield a 15 per cent reduction in spending on food, while reducing carbon dioxide emissions and the use of synthetic fertilisers and pesticides (and their associated pollution) by 21 per cent and 45 per cent respectively. The circular economy provides a positive way forward on a wide range of issues, from helping urbanization take place in a way that benefits its citizens to preserving life below water.


Photo: © UNEP Photo

Only a whole system reset will provide a long-term solution to plastics pollution and the economic losses associated with it.

14 per cent *the share of plastic packaging collected for recycling globally.*

Realising such benefits requires a concerted effort. Revolutions do not happen by decree, so public-private dialogue around policy design must be at the heart of any serious system shift. Policymakers have an important catalysing role in both setting a direction for industries, and in putting in place mechanisms to help them move faster. The Ellen MacArthur Foundation's Toolkit for Policymakers report provides a methodology to help structure such a transition.

Policy can be about setting the rules of the game. For plastics, for example, this could include being selective about the use of certain polymers, other chemicals or applications. Such action can be effective, cost little and garner public support. Rapid reductions in single use shopping bags – through bans or charges – have been achieved with little disruption in France, Rwanda, and the United Kingdom.

Restriction, however, is only part of the story. It must be complemented by mechanisms that foster innovation. Policymakers are well-positioned, as they can connect the design of plastic packaging with collecting, sorting and subsequently reusing or recycling it. The New Plastics Economy initiative, led by the Ellen MacArthur Foundation, aims to establish initial elements of a "Global Plastics Protocol" to address the industry's need for common guidelines and standards in plastics design, use and reuse. This would be a crucial step in getting all the industry actors involved in producing and using plastics packaging that can be either reused, recycled or composted – thus staying out of the environment. Policymakers' most potent tool, however, is the ability to set high-level ambition, providing both a vision for a better system and visibility for industry. Clear signals indicating that the future will be materially different from the past must be sent to the market to help investment decisions.

The Sustainable Development Goals aim at a materially better future. We must think hard about what model of economic growth we want, since it will form the bedrock of that future. It must be fit for its purpose – promoting sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all. There are several ways of looking at such a model but, whatever its complexion, it must build economic, societal, and natural capital rather than deplete it. ▲

Young Champions of the Earth

Young Champions of the Earth is a forward-looking initiative designed to breathe life into the ambitions of brilliant young environmentalists. In this inaugural year, six young people – one from each global region – have been selected to receive mentorship, specialized training, and $15,000 in seed funding to bring their big ideas to life. UN Environment has partnered with Covestro, a world-leading supplier of high-tech polymer materials, to develop and run the initiative. In addition to seed funding for each Young Champion, the winners are put through an incubator training programme and are offered mentorship by Covestro staff.

Follow their journeys at unenvironment.org/youngchampions

Liliana Jaramillo,
28, Ecuador

Latin America and the Caribbean

"Sustainable, resilient and liveable cities teem with native biodiversity"

Native plants for green roofs in Quito

"My idea is to propagate and experiment with native plants on green roofs in Quito, Ecuador. I have developed a replicable methodology to assess the effectiveness and efficiency of green roofs in generating ecosystem services. Optimising this type of green infrastructure will help to mitigate the effects of climate change, reconnect people with nature, and strengthen the resilience of cities."

Adam Dixon,
25, United Kingdom

Europe

"Through market-driven innovation, we are edging closer to truly sustainable agriculture"

Phytoponics: a hydroponic growing system for the commercial greenhouse

"In the future, it's either us or the planet and I want to stop this by making agriculture sustainable. I invented a new way of growing fruit and vegetables for less than half of the cost of hydroponic technology now. My aim to transform agriculture. I see a future without hunger and deforestation"

Eritai Kateibwi,
28, Kiribati

Asia and the Pacific

"With small and simple steps, we will reclaim our food sovereignty"

A modular hydroponics food-growing system for Pacific islands

"With land being lost to king tides and flooding as well as imported food bringing unwanted garbage, I have developed a low-impact hydroponics growing system to bring fresh crops to Kiribati. It has already proven to work sustainably. Locally grown, nutritious food will reduce diabetes and malnutrition, as well as provide entrepreneurial opportunities to the local communities. Less waste and better nutrition mean a happier, healthier future for the people of Kiribati."

Mariama Mamane,
27, Burkina Faso

Africa

"We must find nature-based solutions to meet the challenges of the planet"

Innovative eco-management of water hyacinth

"I view water hyacinth - a highly aggressive invasive alien species which has devastated waterways across Africa - as a valuable untapped resource. By introducing a plant-based water purification technology, anaerobic composting and biogas facilities, I will use water hyacinth to produce clean drinking water, organic fertiliser and sustainable energy. In doing so, I will help to address Africa's energy deficit and the degradation of cropland caused by chemical fertilisers."

Kaya Dorey,
29, Canada

North America

"A model of automation, responsibility and locality is what the apparel industry needs to fight the true cost of fashion"

Closed-loop apparel manufacturing hub

"It is my goal to create a closed-loop clothing line and an automated manufacturing hub. There will be a research and development facility to learn about the decomposition of fabrics, test natural dyes and develop new sustainable fabrics. I also will work in partnership with local universities and give students the opportunity to gain valuable experience at the hub."

Omer Badokhon,
24, Yemen

West Asia

"Waste is treasure! It can power our communities towards a sustainable future"

Biogas for all: improving rural livelihoods with sustainable energy

"I want to help over a million of Yemenis by deploying small-scale biogas plants which turn organic waste into clean cooking fuel. This will help to reduce greenhouse gas emissions and limit the spread of cholera which has affected tens of thousands of my compatriots this year. The fuel will also reduce indoor air pollution potentially saving many lives."

Olga Speranskaya, Yuyun Ismawati, Reacting to chemicals

Advancing chemical safety is a necessary component of sustainable development.

Olga Speranskaya

Co-Chair, International POPs-Elimination Network

Yuyun Ismawati

Lead for Artisanal and Small-scale Gold Mining/ Mining, International POPs-Elimination Network

Toxic chemicals threaten current and future generations. To protect them, we must change course by shifting our chemical practices to a more sustainable model.

Global data indicates rapidly growing pressure on the environment from toxic chemicals and wastes. The shift of chemical production to developing and transition countries has been accompanied by an increase in the use of pesticides, products and processes containing hazardous chemicals – including those that disrupt reproduction, cause birth defects and persist in the environment and human bodies causing harm.

Weak national legislation, sparse or non-existent information about the environmental and health effects of toxic chemicals, lack of funding and poor technological and human resources in developing and transition economies all make these countries vulnerable to and disproportionally affected by toxic hazards.

While developed countries strengthen their environmental and health legislation, developing and transition countries still struggle with problems that are not considered an issue in the developed world any more. An example is lead in paint, which still poses a threat to children in most developing economies. Many still struggle with stockpiles of obsolete and banned pesticides that pollute their soil, water and food, threatening the health of people and wildlife. And they have been turned into dumping grounds for newer hazardous pesticides already banned in the developed world but made by its companies and aggressively marketed to developing countries.

Besides already known chemicals, thousands of new ones are introduced to the market every year. Most are not regulated by existing chemical conventions or by national legislation. However, we lack information about these chemicals as well as protective regulation. Many of them potentially cause comparable harm to that from such known substances as mercury or persistent organic pollutants. Disclosing chemicals used in production and in products should be a global standard so as to minimize the risks of exposure that causes suffering and additional burdens on countries' economic development and health systems.

We are witnessing an epidemic burden of disease and disability associated with exposure in the womb to toxic chemicals that cause irreversible changes in the current generation and will impact the life of generations to come. Children are born "pre-polluted" with dozens, if not hundreds, of hazardous chemicals in their tiny bodies. Many

Children are born "pre-polluted" with dozens, if not hundreds, of hazardous chemicals in their tiny bodies.

Photo: © Colin Maynard

chemicals harm pregnant women and children's developing brains with devastating lifelong and inter-generational consequences.

600,000 *people suffer severe mental disabilities from exposure to lead every year.*

According to the World Health Organization, lead exposure alone causes severe mental disabilities in 600,000 children annually. Subsistence gold miners, women and their children inhale mercury vapour as they work to make a living. Children across the world play with toys made of toxic plastics, lead and endocrine-disrupting chemicals. Moreover, some countries still depend on pesticides that can harm children's brains and lead to cancer.

Governments and industry should make a serious step towards meeting the Sustainable Development Goals by preventing children from being exposed to pollution and toxic chemicals, including substances whose risks are not well understood. Initial steps along this path include replacing hazardous chemical components in products and processes with safer substitutes and banning goods containing hazardous materials – including ingredients in household products, paints and long-shelf-life food.

In some cases, it will be necessary to abandon completely some chemicals or technologies, like incinerating hazardous and unsegregated waste, including e-waste and plastic. Agricultural knowledge, science and technology should not pose health and environmental threats, but should improve rural livelihoods, and facilitate sustainable development that is equitable as well as environmentally, socially and economically viable.

Chemical safety is implicit in many, if not all the Sustainable Development Goals, but it is usually sidelined and invisible. Now is the time to act on chemical pollution so that sustainable development can become a reality.

Moving to a circular economy is important for sustainability, but recycling materials that contain toxic chemicals merely contaminates new products and continues exposure. There is data showing that toxic chemicals from e-waste have been recycled into children's toys – even in developed countries. Recycling materials containing toxic chemicals, including ones already banned by international treaties, poisons the supply chain and the circular economy and undermines the importance of recycling.

Dumping old technologies in developing and transition countries is all too common. Coordinated global actions need to restrict this harmful practice. There are many examples of transferring polluting, outmoded technologies to the developing world, including exporting pesticides and incinerators. Both create continued corporate profits at the expense of public health and the environment.

All technological developments should concentrate on reducing hazards, increasing resource efficiency and substituting non-chemical alternatives in industrial uses and in agriculture. The private sector must design safer, non-toxic chemicals from the start, promoting occupational health and safety and pollution prevention as well as providing itself with a clear, proactive role in reducing and eliminating the use or generation of hazardous substances in the design, manufacture and application of products.

Green chemistry principles for designing safer chemicals should become a core part of technological development so as to ensure safer products and processes (including non-chemical alternatives), cleaner production and the informed substitution of chemicals of concern. It is more efficient and less costly to start with a safe substance than to deal with a toxic one.

By integrating green chemistry principles into sustainable development priorities, we will achieve better chemicals management and non-toxic substitution at the design stage or "upstream". This will lead to consumer and occupational safety, ensure environmental protection, and reduce chemical hazards. Indeed, advancing chemical safety is a vital component of sustainable development. ▲

Lucia Buvé
Regaining ground

How to bring contaminated land back into use.

Lucia Buvé

Pollution Prevention Manager, Umicore, Brussels, and Chair of the Network for Industrially Co-ordinated Land Management in Europe

Over hundreds of years, industrial activities including mining, chemical production, manufacturing of consumer goods and agriculture introduced pollutants into the soil, contaminating it along with groundwater, often over large areas. Past practices were different from today's: waste was dumped in an uncontrolled way or used in applications that are no longer acceptable, while unabated emissions to air and water had widespread impacts on surrounding populations and the environment.

Several notorious cases of pollution led to increasing public awareness of the risks related to the uncontrolled use and disposal of certain substances. One example is the mercury poisoning that emerged in 1956 in the Japanese city of Minamata, caused by emissions from a nearby chemical company that had bioaccumulated in fish eaten by local people. Another is DDT, the synthetic pesticide used extensively after the Second World War. DDT harmed wildlife, was identified as a potential human carcinogen and linked to premature births.

In the 1970s, concern grew that (re)using contaminated land could pose a serious risk to human health. In 1978, Love Canal – a neighborhood in Niagara Falls, New York, where a school and houses were built on and next to a former chemical waste landfill - became a national media issue in the United States. Numerous families exhibited serious health effects and had to be relocated. In 1979 a similar case occurred at Lekkerkerk in the Netherlands, where 300 families had to be rehoused because their homes were built on a waste dump.

Global economic growth together with population expansion has created the need to use additional land. Suitable uncontaminated land has become scarcer and awareness has grown that leaving land derelict has a negative and stigmatizing effect on the surrounding population, even causing feelings of insecurity and an increase in crime. At the same time, it is increasingly recognized that natural land and ecosystems have to be preserved and protected. All this has contributed to the realization that contaminated land should be brought back into use in a suitable and safe way.

It was quickly apparent that removing all contaminants from an area of affected land is unfeasible in almost all cases because of the cost and the time required. So the concept of remediation based on risk assessment was introduced as a valid and acceptable tool. Such an assessment estimates the nature and probability of adverse health effects in humans and the wider environment that could be exposed to chemicals in contaminated environmental media (such as soil and groundwater), now or in the future. It takes into account, for example, the nature of contaminants and their impact on human health, the way that people are likely to be exposed, and for how long.

Humans can be exposed in different ways: directly ingesting contaminated soil and groundwater; inhaling soil particles; consuming vegetables and fruit grown on contaminated land; inhaling volatile contaminants present in groundwater and migrating as vapors in buildings; and taking in contaminants through the skin.

The level of exposure depends on how the land is used. Obviously, residential uses – including schools, daycare centres and hospitals – are more sensitive than industrial uses where only healthy adults are present. Similarly, parks, football fields, golf courses and other recreational uses are less sensitive, since people spend only limited time in these areas. Sensitive land uses therefore require more stringent land management and/or remediation efforts. Clearly spatial land-use planning is extremely important, as well as a system that tracks the history of each piece of land so as to avoid future Love Canals and Lekkerkerks.

Photo: © Shutterstock

Remediation based on risk assessment acknowledges that removing all contaminants from an area of affected land is not usually feasible.

Increasingly, professionals working with contaminated land recognize that sustainability considerations are a key factor in holistic solutions, especially when dealing with the redevelopment of old industrial areas and bringing contaminated sites back to beneficial use. Sustainable remediation – integrating environmental, social and economic aspects – provides a framework for balanced decision-making in selecting the strategy to address soil and groundwater contamination. This is an integral part of sustainable land use.

Communication and stakeholder engagement are key to the success of any project, and trust between stakeholders needs to be built from the very beginning. Good communication is crucial for reaching a common understanding of a sustainable remediation management plan. The majority of stakeholders should accept and agree not just the final choice of redevelopment, but also the way to get there by choosing the most appropriate remediation and management options.

While risk assessment remains the basis for understanding the seriousness of contamination and its longer-term impact, sustainable remediation brings in other tools to better balance decision-making. Examples are: carbon footprint and lifecycle assessment; energy efficiency assessment; quality of life assessment; and cost-benefit analyses and financial risk assessment. Sustainable land management is the appropriate way to deal with contaminated land by: offering protection of human health and the environment; guiding the allocation of resources; and enabling the cost-effective management of risks, based on sound and agreed decision-making.

In 2010, The Network for Contaminated Land in Europe (the predecessor of the Network for Industrially Co-ordinated Land Management in Europe) published a Road Map to Sustainable Remediation that shows this process graphically. It has defined the way forward into the next decade. Sustainability considerations will truly bring together economics, environment and social needs in transforming contaminated land so that it is suitable for its future intended use and can be assimilated back into our communities. ▲

UN Environment at Work

The weight of cities

How the International Resource Panel is working to lighten the load on the planet.

Photo: *Shutterstock*

How do we prepare for the doubling of the global urban population by 2050? By dramatically rethinking urbanism and its governance. That means designing cities for people, not cars; allowing everyone access to urban opportunities; investing in resource-efficient buildings, transport, energy, water and waste systems; and enabling cities to experiment and to learn from each other.

These are among the conclusions of an upcoming report from the International Resource Panel, the most authoritative scientific forum for scientists and experts working on natural resource management. UN Environment hosts the secretariat of the Panel, which was launched in 2007 to build and share the knowledge needed to improve the use of resources worldwide.

In The Weight of Cities, experts from the Panel assess the infrastructure, technology and spatial patterns as well as the governance arrangements needed to shift to socially inclusive, resource efficient and sustainable modes of urban development.

With the portion of the population living in cities set to rise from 54 per cent in 2015 to 66 per cent in 2050, there will likely be another 2.4 billion urban dwellers worldwide. The bulk of urban growth will happen across the global South, for instance in China, India and Nigeria.

As existing cities expand and new ones emerge, material consumption is predicted to grow even faster, presenting a huge challenge in the face of scarce resources and intensifying environmental problems including pollution and climate change.

The report uses the concept of "urban metabolism" to frame thinking about how cities can improve citizens' access to essential services while managing their resources wisely and producing minimal waste.

Cities should be encouraged to innovate and experiment, and to learn from one another in order to hasten this transition.

Earlier modelling of resource consumption in 2050 has indicated a sustainable range of between 6 and 8 tons per person per year. Unless things change, the real-world figure will rise to 8-17 tons by 2050, the new report calculates. However, cities that become more resource efficient in three sectors – transport, commercial buildings, and building heating/cooling – could achieve reductions of 46-67 per cent, it estimates, suggesting that an overall 50 per cent improvement in efficiency is possible.

Restructuring the morphology of cities is key to pursuing that goal as well as achieving greater social inclusion. Denser, better connected cities designed to be more open to the elements could improve well-being along with social and economic exchanges while economizing on all the asphalt, concrete, electricity and water currently consumed in sprawling contemporary urban centres.

The report promotes an alternative urban model featuring networks of "high density nodes" with a mix of housing, jobs and amenities at the neighbourhood level; 'soft' mobility such as walking and cycling; passive heating and cooling of buildings; and more intensive use of public spaces.

The report builds on case studies from Minneapolis, in the United States; Beijing and the highly industrial northern city of Kaifeng, China; and the Indian cities of Ahmedabad and Delhi.

It finds that Minneapolis, for instance, could achieve a 33 per cent reduction in greenhouse gas emissions and a 62 per cent saving in mineral construction materials by 2050 with interventions including a switch to nuclear and renewable energy, district energy systems and advanced timber construction. Fast-growing Beijing and Kaifeng could achieve significant resource efficiencies over just 5 years with interventions in areas including industrial efficiency, energy efficient buildings and using waste to generate energy. This suggests that rapid urbanization can also offer rapid gains in resource efficiency.

Accelerating urban productivity by restructuring neighbourhoods, investing in city-wide transit systems, building inclusive renewable energy grids and energy efficient buildings, reducing wastes to zero and resource sharing will depend on the emergence of appropriate modes of urban governance.

Cities should be encouraged to innovate and experiment, and also to learn from one another in order to hasten this transition, for instance through "twin town" initiatives or city networks. Moreover, the report says it will be necessary to replace a "competitive cities" governance approach to urban economies with a "well-grounded cities" approach that serves the interests of all citizens.

That will influence how the estimated $90 trillion that will be invested in urban infrastructure through 2050 is spent: either it reinforces the paradigm of the car-oriented city, or promotes solutions that given residents a good quality of life while keeping greenhouse gases and resource consumption sustainable.

The task ahead is to "rethink the city for the era without cheap fossil fuels," the authors write. Moving away from fossil fuels and current consumption rates will create "a spike of sustainability-oriented innovations. If done well, sustainability will become an aspirational good in itself."

The International Resource Panel will present the report at the World Urban Forum in Kuala Lumpur, Malaysia in February 2018. It will be available on the Panel's website.▲

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Rana Roy
A race against the clock

Urgent action is needed to limit an explosive increase in the costs of air pollution in Africa.

Rana Roy

Author, OECD Development Centre Working Paper "The Cost of Air Pollution in Africa"

Air pollution causes millions of premature deaths worldwide every year, as confirmed in each of the recent Global Burden of Disease surveys by the Institute for Health Metrics and Evaluation, the world's most comprehensive epidemiological database. The economic cost, as calculated by the Organisation for Economic Co-operation and Development and in other authoritative studies, runs into trillions of dollars.

Household air pollution results from the burning of solid fuels – such as coal but more usually renewable biomass – for cooking and other domestic consumption. Ambient air pollution results mainly from burning fossil fuels for use in transport, power plants, and industry. Road transport is the largest single source of deaths from ambient air pollution in the European Union, the United States, and most other advanced economies. Industry and coal-fired power plants play a larger role in China, India, and other emerging economies.

The annual world-wide death toll from household air pollution has been in slow decline, with recent estimates showing a fall in annual deaths from just above to just below 3 million from 2005 to 2015. The count has fallen to near zero in the advanced economies; in China it has been falling for the last two decades.

By contrast, the estimated annual world-wide death toll from ambient air pollution has continued to climb over the last quarter-century, with recent estimates showing an increase from just above 4 million in 2005 to 4.5 million in 2015. Advanced economies accounted for 0.5 million of these deaths. The centre of the problem lies in Asia: China and India alone accounted for an absolute majority of the total in 2015.

In the light of this evidence, it is tempting to conclude – as does the Lancet Commission on pollution and health – that "modern" air pollution will continue to rise while "traditional" air pollution will continue to fall, and that between now and 2050 the sharpest increase in deaths will occur in the cities of South and East Asia. But there is reason to suppose that the sharpest increase is more likely to be in Africa – and that a majority of Africa's air pollution deaths will continue to originate in household air pollution.

Advanced economies have succeeded in controlling ambient air pollution through effective regulation in the past and possess the knowledge and policy tool-kit to do so, at relatively little cost, in future. Their recent uptick in deaths is a self-inflicted wound, the result of a weakening of regulatory pressure and the singular misstep of promoting – via tax incentives – a shift from petrol to diesel vehicles. Deaths in China remain high but they peaked a decade ago and have been falling since, as they have in a number of other major emerging countries, though not yet in India.

In Africa, deaths from ambient pollution have increased steadily, outpacing the global increase, albeit from a relatively low base. And deaths from household pollution, starting from an already high base, have also continued to increase, against the global trend.

By United Nations projections, Africa's population is set to increase from 1.25 billion today (17 per cent of the global total) to 2.5 billion by 2050 (26 per cent) – and thence to 4.5 billion by 2100 (40 per cent). Meanwhile, Asia's population is set to fall in relative terms from 60 per cent of the global total to 54 per cent by 2050 and 43 per cent by 2100: China's is set to fall in both relative and absolute terms. It is Africa which will dominate the numbers, including the numbers for mortalities.

Photo: © CC BY-NC Andrea Moroni

4.5 billion: *Africa's projected population in 2100, compared to 1.25 billion today*

Projections for coming decades also show continuing growth in Africa's urban population, in both absolute and relative terms. To date, the continent's death toll from air pollution there has risen in tandem with the growth in its urban population. The sources of ambient emissions are mainly urban, while the combination of polluting forms of domestic energy use with high-density poor-quality housing in urban areas exacerbates its health impacts. If these patterns of urban life remain unchanged, the growth of urban Africa is likely to bring with it an explosive increase in premature deaths from both types of air pollution.

The combination of polluting domestic energy use with high-density poor-quality housing means the growth of urban Africa is likely to bring an explosive increase in premature deaths from air pollution.

But the population of North Africa, where household air pollution is much less of a problem than ambient air pollution, is set to fall from 15 per cent of the continent's total today to 11 per cent by 2050 and to 7 per cent by 2100. It is Sub-Saharan Africa, where household air pollution is the larger problem, which will dominate. Hence, if current patterns remain unchanged, household air pollution is more likely than not to continue to account for the majority of the toll in Africa.

Thus the challenge posed to policymakers in Africa is starkly different to those in the advanced economies and many emerging economies. Whereas others have eliminated, or steadily reduced, deaths from "traditional" household pollution, sub-Saharan African countries need to confront a steadily rising toll. And whereas others can focus on ambient pollution in its "modern" forms, this is not the case in Africa. It is not a matter there of tightening regulations on major power plants or of better enforcing European vehicle standards but rather – as Professor Mathew Evans of York University put it – a matter of dealing with "millions of steel diesel electricity generators" and "cars which have had their catalytic converters removed". It is not a problem of modernity but of insufficient modernisation.

If Africa is to limit an explosive increase in air pollution and all its attendant human and economic costs, it will need bold policies: not targeted adjustments here and there, but massive investments in urban improvements, infrastructure and reconstruction. Inefficient fuel stoves will need to be replaced with modern cookers, biomass with natural gas or electricity, diesel generators with modern power plants, second-hand diesel vehicles with mass transit, and so on. These investments will be expensive. But the benefits in lives saved, improved health, productivity gains, and a higher material standard of living should outweigh the costs. ▲

Maureen Cropper
Pollution's toll

The costs of air pollution and the lack of clean drinking water are huge.

Photo: © CC BY Photo by Olliver Girard/CIFOR

Maureen Cropper

Distinguished Professor of Economics, University of Maryland

In 2015, according to the Global Burden of Disease study, over 9 million deaths — 16 per cent of the total — were attributable to pollution, specifically to lack of access to clean water and sanitation, household burning of solid fuels for cooking, outdoor air pollution or exposure to lead. Virtually all deaths due to lack of safe water and sanitation and three-quarters of those due to indoor air pollution occurred in either low or low-middle income countries, as did half the deaths attributable to outdoor air pollution. Upper-middle income countries accounted for just one-quarter of deaths due to indoor and 40 per cent of deaths associated with outdoor air pollution.

The economic costs of premature death associated with pollution – and of the illness that precedes death – are huge. They include losses in productivity, which affect a nation's economy, and losses in income, which can impoverish a family. Life years lost due to premature death result in a loss in enjoyment both to those who die and to their families.

The recent report from the Lancet Commission on Pollution and Health, of which I am a member, quantifies part of the economic burden that these deaths impose. It estimates the future output lost when a person dies before the end of his working life – specifically, the gross national product that is forgone. This, however, is a vast underestimate of what studies throughout the world have indicated people are willing to pay to reduce their risk of dying, which reflects the loss in the enjoyment of living as well as the loss in output. So the Commission report also estimates what people would pay to reduce their risk of dying, multiplied by the risk of death associated with pollution.

The lost productivity when people die prematurely – the loss of output that they would have produced – is considerable. For low income countries (those with per capita incomes below $1,025 in 2015), this amounts to about 2 per cent of gross domestic product; for low-middle income countries, it is about 1 per cent. In low income countries, over 1 per cent of gross domestic product is lost due to lack of access to clean water and sanitation, with the remainder attributable to household and outdoor air pollution. In low-middle income countries, productivity losses are similarly evenly divided between lack of access to water and sanitation and air pollution.

The amount people are willing to pay to reduce their risk of dying, multiplied by the risks of death due to pollution, are much higher. Aggregated over all countries and five categories of pollution, it adds up to $4.6 trillion in 2015 – approximately 6 per cent of world output. The value of willingness to pay is much higher in dollar terms in high income countries than in low income ones, since willingness to pay is conditioned on ability to pay. But it is larger in low incomes ones as a percentage of gross domestic product, due to the much higher death rates associated with pollution in developing countries.

We estimate the sum of willingness to pay to reduce risks of death from pollution to zero, in 2015, at about 8 per cent of gross national product in low income countries, and 9 per cent in low-middle income ones. This corresponds, in low income countries, to a willingness to pay per person of $18 to reduce risk of death from air pollution to zero and $12 to do the same for risk of death from unsafe water and sanitation. The corresponding figures are $370 and $140 for low-middle income countries.

Estimates suggest that many pollution control projects in low and middle countries will pass the benefit-cost test based solely on health considerations.

Photo: © Josh Sobel

2 per cent *of gross domestic product: value of lost productivity from premature deaths to pollution in low income countries.*

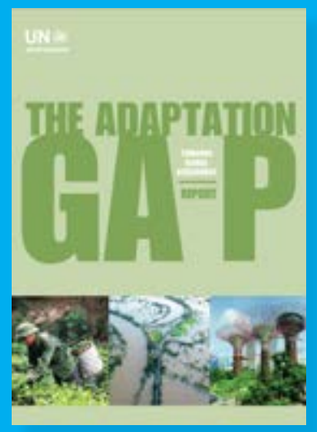
Both the productivity losses and broader willingness to pay estimates reflect only the benefits of reduced mortality from pollution. The costs associated with pollution-related illness while people are alive, including medical costs, are more difficult to estimate, especially on a country-by-country basis. We do know that in countries where the morbidity impacts of pollution have been quantified – such as in Colombia and China – morbidity costs are over 25 per cent of the costs associated with premature mortality. In one low-middle income country, Sir Lanka, the health costs associated with air pollution alone amounted to 7 per cent of total health spending in 2005.

These estimates suggest that many pollution control projects in low and middle countries will pass the benefit-cost test based solely on health considerations. Taking other economic impacts into account only strengthens the case for action. Air and water pollution reduce crop yields, impair timber growth and harm freshwater ecosystems. The aesthetic damages associated with pollution themselves harm economic growth. The case for reducing pollution is, however, overwhelming on public health grounds alone. ▲

UN Environment Publications

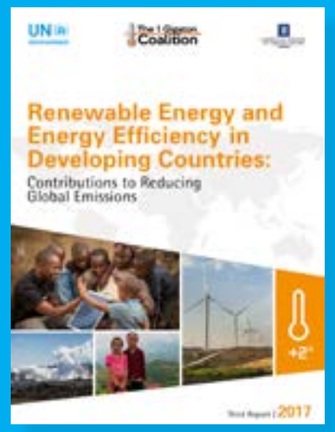
The Emissions Gap Report 2017: A UN Environment Synthesis Report

The eighth UN Environment Emissions Gap Report provides an up-to-date scientific assessment of the global progress towards the emissions reductions required to be on track to meet the long-term goal of the United Nations Framework Convention on Climate Change (UNFCCC). The overall conclusion of the assessment is that government and other stakeholder's emissions reduction commitments are far from the level of ambition required for an emissions pathway consistent with staying below a 2°C, let alone a 1.5°C, temperature increase.



The Adaptation Gap Report 2017: Towards Global Assessment

The report explores key opportunities and challenges associated with assessing progress on adaptation at the global level. The report synthesizes information relevant for the ongoing work under the United Nations Framework Convention on Climate Change (UNFCCC) to prepare for the implementation of the Paris Agreement.

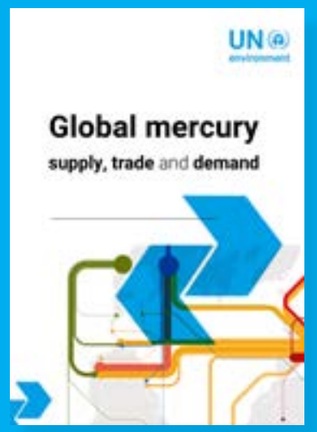


Renewable Energy and Energy Efficiency in Developing Countries: Contributions to Reducing Global Emissions - Third Report

Providing real world examples of RE and EE initiatives in developing countries, this report features six in-depth case studies of ongoing programmes and policies in cities throughout the world. These case studies demonstrate the compounding benefits to human health, the economy, and environment that result from smartly planned RE and EE efforts. The cases feature collaborative initiatives in which the public sector and private companies work together to develop, implement, and scale climate action.

African Elephant Fund: Transforming Strategies into Action

The African Elephant Fund, which is a partnership venture between the United Nations Environment Programme, the Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora, donor States and range States, have been working together to curtail the growing threats to elephant populations. Efforts to meet this objective have been stepped up since the adoption of the Action Plan in 2010. The lessons learned and recommendations outlined in this publication offer comparative strategies for possible replication in implementing the Action Plan, serving potentially as a critical resource for policymakers, development practitioners and those involved in the conservation of elephants. It is hoped that country initiatives such as these will continue to be developed and lend further momentum to national and regional efforts to strengthen elephant conservation.



Global Mercury: Supply, Trade and Demand

A good understanding of mercury supply, trade and demand is critical to effective implementation of the Convention. This report provides detailed and timely information on where mercury comes from, how it moves in commerce, and how it is used in products and industrial processes. To further facilitate informed decision-making, the report also evaluates data sources, discusses trends and identifies knowledge gaps.

Coral Bleaching Futures: Downscaled Projections of Bleaching Conditions for the World's Coral Reefs, Implications of Climate Policy and Management Responses

The purpose of this report is threefold: 1. to present downscaled projections of coral bleaching conditions (i.e. exposure to the primary climate threat to coral reefs) at a spatial scale that enables use of the data in management planning, conservation planning and in support of other decisions influencing coral reefs and reef use; 2. to evaluate the implications of the Paris Agreement as well as failure to achieve its goal, by comparing the projected timing of annual severe bleaching between emission scenarios RCP4.5 and 8.5; and 3. provide public access to data as well as main findings in order to enable their application in management planning, policy formulation, and as education and outreach tools.

All UN Environment publications are available online at:
www.unep.org/publications

Anu Ramaswami
Towards zero-pollution cities

Urban infrastructure transformations can produce resource-efficient, inclusive and healthy cities.

Anu Ramaswami

Charles M. Denny Chair Professor of Science, Technology and Environmental Policy at the Humphrey School of Public Affairs, and Professor of Bioproducts and Biosystems

Air pollution is a global killer and predominantly an urban one. Worldwide, about 7 million premature deaths are associated with indoor and outdoor air pollution by fine particulate matter. Most occur in urban areas where a majority of people now live, breathing air that can cause asthma, respiratory infections, high blood pressure, heart and lung disease, and cancer. Diverse cities – rich, poor, small, large, developed and developing – are reporting airborne levels of these particles that exceed the World Health Organization's clean air guidelines: some of the most polluted air, and the heaviest toll on human lives, occur in Asia.

End-of-pipe pollution controls are important, and have reduced air pollution in the past, but they alone cannot keep up with urbanization's current massive scale and pace. Eventually, a transformation of urban land, buildings, transportation, energy, water, waste management and food systems will be needed, both to reduce pollution and to sustainably and inclusively support the 6 billion urban dwellers expected by the year 2050.

Such transformation is urgently needed. The 2.5 billion new urban residents expected in Asia and Africa by 2050 require supporting infrastructure in their new cities, while existing cities in advanced economies must repair or replace aging infrastructure. Once put in place, these systems will then last for 40 more years. This presents a once-in-a-lifetime opportunity for infrastructure transformation worldwide.

Focusing on inclusive and resource-efficient infrastructure offers win-win strategies that can advance human health and wellbeing by reducing air pollution, in line with Sustainable Development Goal 3. It can also achieve additional Goals related to inequality, clean energy, climate change, sustainable cities and communities, and sustainable production and consumption. Such strategies include:

- Sustainable urban land expansion with inclusive rural-urban interactions. Urban areas worldwide are taking over prime agricultural land (often destroying farmers' livelihoods), and depleting valuable ecosystem services. Meanwhile, agricultural waste-burning greatly contributes to urban particulate air pollution. New urban-rural arrangements can address these issues systemically. Urban development agencies are coordinating land-pooling programs with farmers to guide urban infrastructure expansions so as to preserve critical ecological functions, while offering rural land-owners a stake. Novel arrangements are converting agricultural crop residues to valuable products – like electricity generated from rice husks – for sale in urban areas, thus preventing uncontrolled crop-waste burning. This reduces air pollution, and improves health, resilience and livelihoods in both rural and urban areas;

- Compact and inclusive urban form. A compact city limits both urban land expansion and motorized travel with its pollution. Compact city planning around the principles of density, diversity of uses, multi-modal design, short distances to transit, and easy access to destinations (primarily jobs), have reduced motorized travel by up to 40 per cent in diverse cities. The urban poor are fully integrated in the city core, rather than being relocated on the periphery, enabling them to walk, cycle or use public transport to access nearby jobs. This has been demonstrated through inclusive approaches for in situ slum rehabilitation in Indian cities. The popularity of car-sharing, the revival of walking and cycling, and the emergence of new smart technologies for on-demand transit, together give hope for achieving resource-efficient and low polluting urban mobility for all;

Photo: *Sophia Valkova*

A compact city limits both urban land expansion and motorized travel with its pollution.

- Resource-efficient multi-storey buildings with low-polluting construction materials. Structurally-sound, resource-efficient high-rise and mid-rise buildings are essential for compact cities. Well-designed green buildings can reduce energy demand by about 50 per cent, thus cutting electricity generation from polluting fossil fuels. Multi-storey buildings also use about 30 per cent less construction materials than single-storey concrete ones, reducing polluting cement and brick manufacture. Alternative low-polluting construction materials – such as slag cements and "smokeless bricks" – are being mainstreamed in China and Bangladesh to help conserve resources, create local livelihoods, and reduce air pollution. Linking sustainable building codes in cities with clean industry policies simultaneously achieves market transformation and pollution reduction;

50 per cent: *the reduction in energy use in well-designed green buildings.*

- Synergies using circular economy principles. Cities present powerful opportunities to exchange "waste" energy and materials across sectors. Low grade "waste heat" from industries can, for example, be transmitted efficiently for 30 kilometres for reuse in advanced district energy systems that heat and cool homes and offices, thus displacing inefficient coal-fired boilers. Such cross-sectoral strategies – already being piloted in many cities in the United States, the European Union and China – realize greater energy efficiencies in urban systems than could be achieved within single sectors, like buildings or transport. Applying such strategies in all China's cities would, it is estimated, reduce national carbon emissions by about 4 per cent and avoid 47,000 premature deaths each year;

- Municipal solid waste management to prevent air pollution. Open burning of garbage in the streets of developing world cities is a major source of particulate pollution. Innovative solutions are emerging in many cities, including employing the informal sector, which is skilled in recycling and reusing diverse waste streams, and segregating and converting food waste into biogas, thus providing clean cooking fuel and stimulating a virtuous cycle toward a zero-pollution city;

- Resources for more inclusive and equitable cities. The urban poor are also exposed to air pollution indoors, where the use of dirty cooking fuels contributes to more than 4 million annual deaths worldwide. Providing clean cooking fuels and electricity is essential for inclusive development. Household consumption data, available in many world cities, are being used to both identify resource needs for the under-served, and to design innovative behavioural campaigns that promote energy efficiency among high consumers;

Implemented together, these strategies can significantly reduce air pollution while advancing health, equity, inclusion, resource efficiency, carbon mitigation, and sustainable consumption and production patterns in cities worldwide. Such transformations in urban infrastructure – paired with end-of-pipe pollution control technologies – can pave the way to zero-pollution cities. Case studies exemplifying these strategies are summarized in the "Assessing Global Resource Use" report that UN Environment's International Resource Panel will present at the third UN Environmental Assembly in December 2017. Many strategies save resources and hence are cost-neutral and can be implemented though well-designed partnerships among public and private sectors and civil society.

Isn't it time to say "No to air pollution" through transforming urban infrastructure systems? ▲

John Sauer
Giovanni Dusabe
Keeping water fresh

Poor sanitation pollutes both drinking water and the environment.

Photo: © CC BY Andrea Moroni

The Global Goals are an opportunity to highlight how little progress has been made and the huge amount of resources and political will be required to achieve universal access.

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Guaranteeing safely managed clean water and sanitation for everyone remains one of the biggest global challenges that are solvable in our lifetimes. But we must prioritize collaboration and monitoring.

The Sustainable Development Goals are an important call to action for governments, the private sector and households/consumers to take a more active role in ensuring these basic services are put in place. Without safely managed clean water and sanitation, public health cannot be guaranteed, children will continue to die from diarrhoea and suffer from stunting and improper cognitive development – and countries will not reach their full economic potential. This is an imperative not only for households but for institutions like schools and health care facilities, and in markets, bus depots, and the work place.

Recent data from the World Health Organization and The United Nations Children's Fund paint a troubling picture, and require the global community to take a hard look at what it wants its legacy on water and sanitation to be over the next 15 years.

Two thirds of all people in developing countries aren't enjoying safely managed drinking water services and more than a third of all countries are not on track to achieve universal household access to improved water sources by 2030. While notable progress was made towards meeting the Millennium Development Goals, countries in Sub-Saharan Africa and Oceania made the smallest advances.

For sanitation, the situation is far worse. The needle is hardly moving in improving it for the 2.3 billion people that lack even a basic service. As many as 109 countries, including ones from every region of the world, are not on track to achieve universal basic sanitation by 2030. Twenty countries are even going backwards, because their incredibly slow progress is being outpaced by population growth. An astounding 61 per cent of the world's population – nearly 4.5 billion people – lack safely managed sanitation services.

Almost a tenth of the total burden of disease worldwide is associated with unsafe drinking water, sanitation, hygiene, and water resource management. About 842,000 deaths occur annually from diarrhoea and the World Health Organization states that an important share of diseases like malnutrition, intestinal nematode infections, lymphatic filariasis, trachoma, schistosomiasis, and malaria could be prevented if people had sufficient water quality and quantity and clean sanitation facilities – and if they practiced safe hygiene and water resource management.

One reason for the slow progress on sanitation is that an inordinate amount of time and resources have been spent in building sewerage systems in developing countries. The consequences have been that relatively few people tend to benefit, leaving vast majorities without any services at all. Treatment facilities are high tech and not properly maintained, while rural populations tend to be forgotten entirely. So, most faecal waste and sewage in developing countries finds its way into neighborhoods, drainage and water, causing sickness and pollution.

4.5 billion: *people in developing countries without safely managed drinking water services*

However, new studies by the World Bank and the Toilet Board Coalition on the role of sanitation in the circular economy are showing that onsite options – including container based sanitation – can offer more cost-effective solutions when paired with faecal sludge management. Such solutions should therefore also be on the radar of sanitation planners.

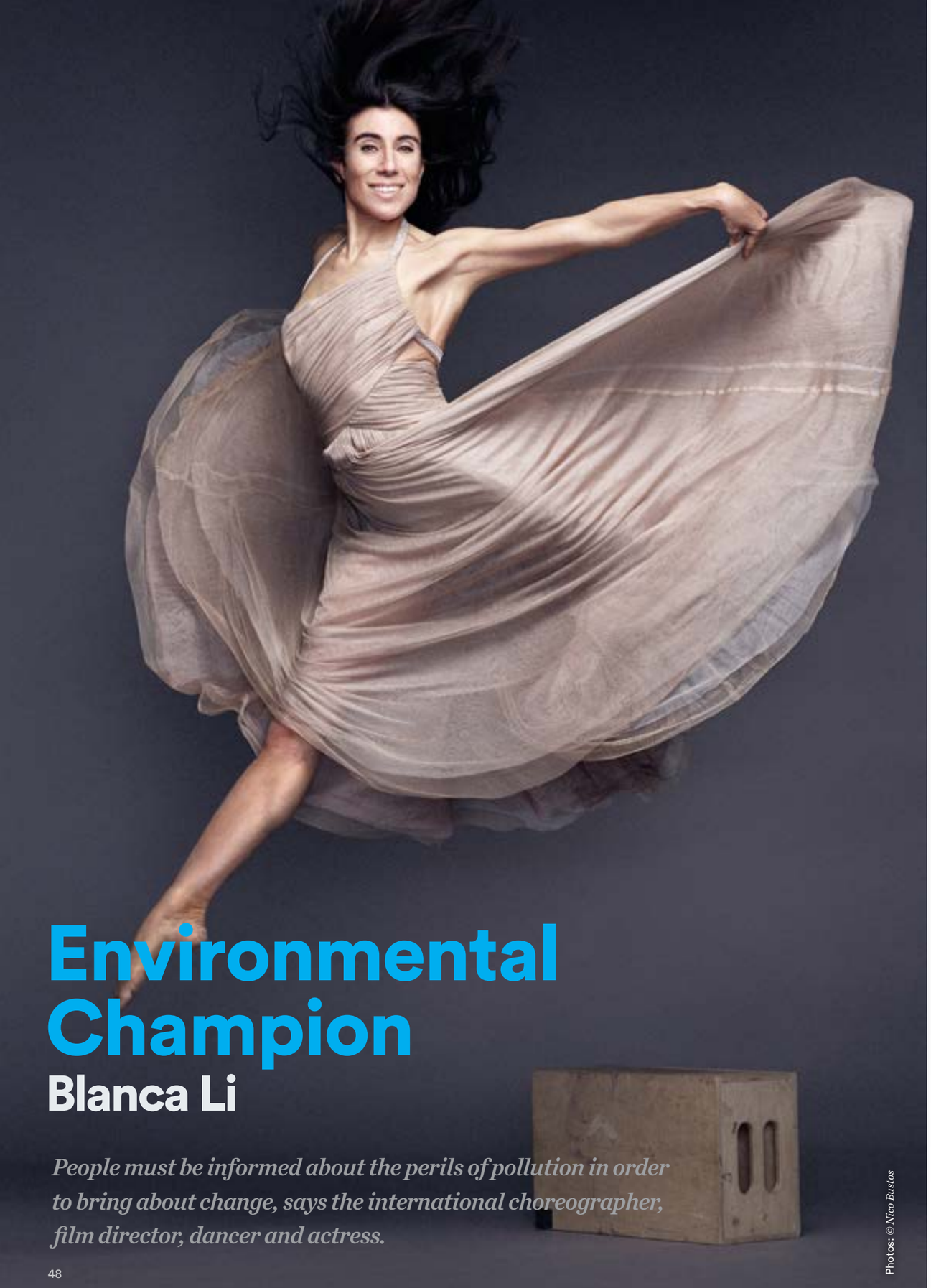
The drastic sanitation situation is an often-ignored contributor to environmental pollution as well as pollution of water supplies. Most environmentalists are familiar with the effects of food production and goods manufacturing on the escalating contamination of rivers, lakes and coastal areas, but the lack of safely managed sanitation also has a direct effect. In developing countries, more than 80 per cent of sewage goes untreated into water bodies and the problem is only going to become more acute with population growth and rapid urbanization.

Many of the innovations in products and services for improving sanitation focus on treating and reusing faecal waste. And many of the byproducts of reuse – such as fuel for cement manufacturing, natural fertilizers, and briquettes to replace charcoal – have positive implications for more environmentally friendly manufacturing and agricultural production.

The water and sanitation challenge is a gauge for progress on equity and human dignity worldwide. These services are a human right and it is the responsibility of governments to ensure they are delivered in partnership with the private sector, civil society and consumers.

This includes specifically focusing on how those services include the poor, disenfranchised and marginalized – especially women and girls and people living with disabilities – while working with the private sector and civil society to ensure they are delivered sustainably. Disaggregating national data to look at water and sanitation access by income level or region reveals vast disparities that must be resolved through targeted, inclusive interventions. Governments and the global community must hold themselves accountable by monitoring progress.

The Sustainable Development Goals have offered a new opportunity to shed light on how little progress has been made and to highlight the huge amount of human and financial resources and political will that will be required to achieve universal access to safely managed water and sanitation. The goals the world has set will only be met if governments, civil society and the private sector acknowledge their dependence on each other and learn to collaborate. ▲



Environmental Champion

Blanca Li

People must be informed about the perils of pollution in order to bring about change, says the international choreographer, film director, dancer and actress.

Photos: © Nico Bustos

Blanca Li has put her environmental convictions into practice in her new dance work, and by making changes in her own life.

Solstice, which premièred recently in Paris, addresses how to "provide for the development of our civilisation without exhausting our planet". She believes it is "urgent"that information about the state of the earth is "circulated". She told Our Planet: "Communication is fundamental. People have to be informed of the real dangers of living in polluted environments so that they understand and support every political decision that helps reduce pollution. We also have to learn to consume differently."

She adds: "Pollution is a matter of public health and it has a very strong impact on our everyday lives. The recent Lancet Commission report on pollution and health revealed that it is the largest environmental cause of disease and death in the world today, responsible for an estimated 9 million premature deaths".

Born in Granada, Spain, in 1964, she has created choreographies for the Paris Opera Ballet, the Berlin Ballet, and the Metropolitan Opera as well as for film-makers like Pedro Almodovar and Michel Gondry, and musical artists including Paul McCartney, Beyoncé, Kanye West, Coldplay and Daft Punk. In France, she has been made an Officer of the Légion d'Honneur, Officer in the Ordre des Arts et des Lettres, and Chevalier of the Ordre National du Mérite as well as being awarded the Gold Medal of Fine Arts in Spain.

Her work flits between dance styles from classical to contemporary to many kinds of club dances and has drawn inspiration from a host of sources, from Moroccan Gnawa trance ceremonies to ancient Greek art. She witnessed the birth of hip-hop in New York and created a Flamenco Rap Band, before setting up her own dance company and studios in Paris in the 1990s.

She has often engaged with contemporary issues, saying "I like to give life to all that's in my brain". She staged a show in 2002 reflecting the 9/11 attacks, while her Robot was inspired by the growth of technology. "Art" she told Our Planet," can reflect the world we live in and make us think about it. Dance is my most natural and efficient way of expression when an issue is on my mind".

The approach she takes in Solstice is, she says, "the logical continuation of Robot". She explains: "The two themes are part of our contemporary lives. On the one hand, we are experiencing an incredible technological revolution, which is making us dependent upon – and in interaction with – machines. On the other hand, we are concerned about the future of the planet and the effects of climate change, and we are trying to correct an evolution that frightens us".

The idea of the new show emerged when "I decided I needed to do something more concrete for the planet". At first, she adds, "I was thinking about celebrating the beauty and the power of nature. But the more I worked on the project the more I started to realise I wanted to be more percussive and committed.

Art can reflect the world we live in and make us think about it. Dance is my most natural and efficient way of expression when an issue is on my mind.

"The dance has been very much inspired by tribal dances from all over the world, which generally refer to nature. This show really talks about the relationships between men and nature, and how much we depend on it. It tells how important it is for us to take care of our planet".

In the meantime, she says, "I am doing my best to change things in my everyday life. I use shared electric cars when I am in Paris. I changed all my cleaning products in order to reduce pollution at home. I do not use disposable plastic items, and I recycle as much as I can. From clothes to electronic devices and batteries to oils etc. I recycle pretty much everything. And, in my shows, I am always trying to recycle pieces of cloth and elements of decors and give everything a second life.

"I try to eat as natural and organic as I can. I am careful about the amount of water I consume, and always try not to use too much. My wish would be to make people realize they can act too, by doing small things. Even if it is not easy, every small gesture we make can help change the world.". ▲

Photo: XXY Y

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