

# TerraGreen

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**Exclusive article by Dr R K Pachauri**

## CAN WE END THE TRAGEDY OF THE COMMONS?

**From KP to DP:  
in search of the win-win**

**Lifestyle diseases:  
scourge of the First World**

### **IN CONVERSATION**

**Dr Ashok Khosla**  
Founder  
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WHILE ACCESS IS AN IMPORTANT ASPECT OF ENSURING EQUITY AND FAIRNESS, CONSERVATION OF BIODIVERSITY ACROSS THE GLOBE IS THE CENTRAL ISSUE ON WHICH URGENT GLOBAL EFFORTS ARE REQUIRED. ECOSYSTEMS IN SOME OF THE MOST VULNERABLE LOCATIONS IN THE WORLD COULD ALSO BE AFFECTED BY CLIMATE CHANGE.

“Protecting the Global Commons” is the main theme of the Delhi Sustainable Development Summit being held in early February this year. This theme has been positioned against the reality that the UN Conference on Environment and Development took place in 1992—20 years ago—when there was worldwide interest and an expression of intent to manage the global commons for the benefit of the present as well as future generations. How much has been done in keeping with the spirit and intent of Rio in 1992 is an issue that needs to be looked at in-depth and addressed with some sense of urgency. Global commons include the world’s forest resources and biodiversity, healthy soil, the oceans, and of course the earth’s climate. Information available from across the globe indicates that much has to be done in this regard. If we take the case of biodiversity, the recently accepted Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from the Utilization is a supplementary agreement to the Convention on Biological Diversity (CBD). It provided in October 2010, a full 18 years after Rio, a transparent legal framework for the effective implementation of one of the three objectives of the CBD, namely the fair and equitable sharing of benefits arising out of the utilization of genetic resources.

While access is an important aspect of ensuring equity and fairness, conservation of biodiversity across the globe is the central issue on which urgent global efforts are required. As it happens, ecosystems in some of the most vulnerable locations in the world could also be affected by climate change. The Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (IPCC) clearly highlighted the impacts on ecosystems by concluding that the resilience of many ecosystems is likely to be exceeded this century by an unprecedented combination of climate change, associated disturbances (e.g. flooding, drought, wildfire, insects, and ocean acidification), and other global change drivers, such as land-use change, pollution, fragmentation of natural systems, and over-exploitation of resources. It was also concluded that approximately 20%–30% of plant and animal species assessed so far are likely to be at increased risk of extinction if the increase in global average temperature exceeds 1.5 to 2.5 °C.

It was for this reason that the Rio Summit dealt with a range of planetary challenges, which have to be dealt with to ensure the conservation of the most valuable natural resources on earth. The question needs to be asked is whether global society has done enough to deal with these combined challenges. For this purpose, in June this year the Rio+ Summit would be held, where it is hoped that a greater sense of urgency is generated to deal with some of these combined challenges. But, while global agreements and actions may have their relevance, in the ultimate analysis, results will only be produced by local action by communities across the globe.



R K Pachauri  
Director-General, TERI

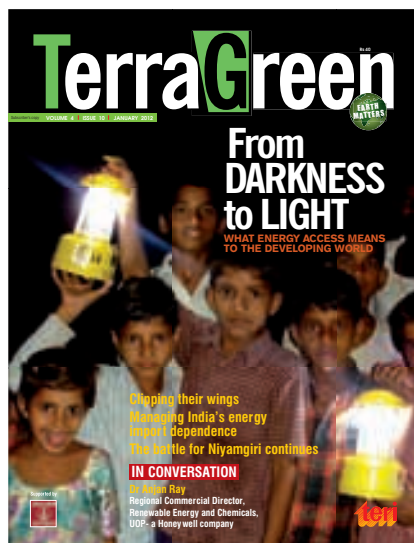
Environment protection has become extremely important these days. However, the youth today is busy using up the resources mindlessly. This is where I really appreciate the efforts of *TerraGreen*, which not only strives to spread awareness about Mother Earth, but also encourages young people to contribute towards its preservation. The stories covered by this magazine are simple and easy to understand. For a layman like me, *TerraGreen* is a must read. Kudos to the entire team!

**Rama Sen  
Kolkata**

The cover story of the January issue of *TerraGreen*, "From Darkness to Light" was a good read. It truly highlighted the dearth of lighting facilities in the villages of India. Millions of people in India live in complete darkness and they have no clue what lighting exactly means. The United Nations has taken a great step by declaring the year 2012 as the International Year of Sustainable Energy Access for All. But, I would also like to applaud the efforts of *TerraGreen* for covering this story in an unbiased manner. The facts and figures mentioned in the story were an eye-opener for me. That's the reason, why I look forward to the issue of *TerraGreen* every month.

**Sandeep Verma  
Mumbai**

The January 2012 edition of *TerraGreen* touched upon a topic that is of vital importance to the world today. As India, China, and other developing nations are trying to balance their economic growth with providing for the essential need of energy access for the burgeoning



populations, I think *TerraGreen* was quite right to focus on the need for the common man in these two developing economic powerhouses to be able to access energy at a level that is at par with their compatriots in developed industrial economies. Deepti Mahajan's article on India's energy import dependence was particularly well-written, as it effectively highlighted the need for India to be able to quit its dependency on foreign fossil fuel and be able to develop indigenous sources of clean, renewable energy as a pre-requisite for future economic ascendancy. As mentioned in the cover story, I was quite impressed with the work being done by TERI in its Lighting A Billion Lives initiative, and I hope *TerraGreen* continues to highlight this issue in future editions.

**Karthikeya Narayanaswami  
Chennai**

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# CAN WE END THE TRAGEDY OF THE COMMONS?

As the world hurtles towards climate catastrophe, one of the world's best known climate scientists, *Dr R K Pachauri* examines the tragedy of the global commons and calls on the international community to base their conclusions and future actions on solid scientific evidence.

It was in 1992 that the global community involved itself deeply in the United Nations Conference on Environment and Development (UNCED). This was a momentous event in which not only did the largest number of leaders from across the world participate in defining what needs to be done for development to take place with protection of the environment at the global level, but several important agreements were also initiated as part of this process, including the important UN Framework Convention on Climate Change (UNFCCC). A key document that embodied the intent and ambition of the global community and signaled actions that were

proposed to be taken was Agenda 21, which represented a comprehensive plan of action to be undertaken at the global, national, and local levels by organizations of the UN system, governments, and major groups in every area in which human impacts on the environment were highlighted. Agenda 21 was labeled as the Rio declaration on environment and development. This, along with the statement of principles for the sustainable management of forests, was adopted by more than 178 governments at the UNCED.

Ten years later, in 2002, the UN organized the World Summit on Sustainable Development (WSSD), which

was held in Johannesburg, South Africa. This major event strongly reaffirmed the full implementation of Agenda 21, a programme for further implementation of Agenda 21 and the commitments to the Rio principles. WSSD also saw the signing of a large number of so-called Type 2 agreements, which provided a central role to the corporate sector working in tandem with civil society and other stakeholders to bring about desirable changes as a follow up to Rio.

We are now 20 years beyond the historic Rio conference and 40 years since the first UN Conference on the Human Environment was held in Stockholm in June 1972. That



pioneering effort to focus global attention on the human environment saw only two heads of government participate on the occasion, the Prime Minister of Sweden, Mr Olaf Palme and India's Prime Minister, Mrs Indira Gandhi. It was on that occasion that Mrs Gandhi highlighted the link between environmental degradation and the existence of poverty. She stated "Are not poverty and need the greatest polluters? The environment cannot be improved in conditions of poverty. Nor can poverty be eradicated without the use of science and technology. For instance, unless we are in a position to provide for the daily necessities of tribal people and those who live in and around our jungles, we cannot keep them from combing the forests for their livelihood, from poaching and despoiling the vegetation. When they themselves feel deprived, how can we urge the preservation of animals?" These frequently quoted words place in perspective the need for an integral view of environmental protection and

poverty eradication. The statement also brought out in a very clear manner the link between ecosystems, common property resource, and the dependence of the poor on these vital resources. When we discuss the issue of the commons, we, therefore, need to see it in the context of prosperity as well as poverty. At both ends of the economic spectrum, the linkages between ecosystems and common property resource on the one hand and people on the other is strong and significant.

The whole issue of the commons was highlighted in a pioneering article published in 1968 by Garrett Hardin. The author was a professor of biology at the University of California, Santa Barbara, and his view of this subject exhibited a remarkable level of brilliance on the part of someone who supposedly dealt only with cells and DNA. He challenged the concept of technical solutions as being the panacea to all of humanity's existing problems. He mentioned, for instance, that "the population problem

has conventionally been conceived as a member of this class" in defining the class of "no technical solution problems". He also commented that those who anguish over the population problem are trying to find a way to avoid the evils of overpopulation without relinquishing any of the privileges they now enjoy. Elaborating further, he stated that these people think that farming the seas or developing new strains of wheat will solve the problem technically. He then stated that the population problem cannot be solved in a technical way.

The world indeed has a major challenge on its hands if we consider the fact that it took the entire history of the human race, spreading over many thousand years right upto the beginning of the 20th century, to reach a population of 2 billion. In the next 40 years, however, placed as we are today, we will be adding 2 billion possibly to reach a total of 9 billion human beings on this planet. At the same time, income levels have grown dramatically in several parts of the world, and are likely to do so



*The forest wealth of the world is being systematically destroyed, putting ecosystems in peril and endangering biodiversity all over the world*

in the future, particularly in those regions where income growth has been tardy for centuries or longer. As opposed to the view of a biologist, such as Garrett Hardin who saw the world and the universe within the framework of well-established scientific relationships, a remarkable economist whose intellect was certainly in the realm of genius came up with the prospect of entropy, a purely scientific phenomenon as part of the economic process. This economist, far ahead of his time, was Nicholas Georgescu-Roegen. In their own way, both Hardin and Georgescu-Roegen brought together the disciplines of economics and basic science. Georgescu-Roegen stated that the vision of economists has reacted to the discovery of the first law of thermodynamics, that is, the principle of conservation of matter-energy. However, he found it hard to explain that loud though the noise caused by the Entropy Law has been in physics and the philosophy of science, economists have failed to pay attention to this law, the most economic of all physical laws. He concludes that the literature on economic development has proved beyond doubt that most economists profess a belief tantamount to thinking that even entropy bootlegging is unnecessary; the economic process can go on, even grow without being continuously fed low entropy. His observation was that there is in the world the general practice of representing the material side of the economic process by a closed system, that is, by a mathematical manner in which continuous flow of low entropy from the environment is completely ignored. As against this, he feels that even this symptom of modern econometrics was preceded by a more common one; the notion that the economic process is wholly circular. He concludes that the purely physical viewpoint is that the economic process is entropic; it neither creates nor consumes matter or energy, but only transforms low into high entropy. But, the whole physical process of the material environment is entropic too. His view was that the entropic process of the material environment is automatic, in the sense that it goes on by itself. The economic process on the contrary is dependent on

the activity of human individuals who sort and target environmentally low entropy according to rules, though these rules may vary with time and place.

To understand the challenge of protecting the commons that we have today, it is essential to take a larger philosophical and broader economic view because as Hardin clearly enunciated, the problem that the issues we face cannot be solved purely by technology. Hardin explains the tragedy of the commons along the following lines: "Picture a pasture open to all. It is to be expected that each herdsman will try to keep as many cattle as possible on the commons. Such an arrangement may work reasonably satisfactorily for centuries because tribal wars, poaching, and disease keep the numbers of both man and beast well below the carrying capacity of the land. Finally, however, comes the day of reckoning, that is, the day when the long-desired goal of social stability becomes a reality. At this point, the inherent logic of the commons remorselessly generates tragedy."

Hardin looks at the motivation of each herdsman who would ask: "What is the utility to me of adding one more animal to my herd? The response to this would be in the form of a positive component, because the proceeds from the sale of the additional animal for him would be positive. A negative component of the response would be the effects of overgrazing created by the additional animal. Adding together the component partial utilities, the rational herdsman would conclude that he would benefit from adding another animal to his herd. And then another, and another..... According to the author, therein lay the tragedy of the commons. He says that ruin is the destination towards which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons. Thus, there would be ruin for all.

The world has several examples of how we are dealing inadequately with the challenge of managing the commons in an equitable and efficient way. However, there is perhaps no area more significant as an example of failure than what we have done to the earth's atmosphere,

TO UNDERSTAND THE CHALLENGE OF PROTECTING THE COMMONS THAT WE HAVE TODAY, IT IS ESSENTIAL TO TAKE A LARGER PHILOSOPHICAL AND BROADER ECONOMIC VIEW BECAUSE THE PROBLEM IS THAT THE ISSUES WE FACE CANNOT BE SOLVED PURELY BY TECHNOLOGY.

which has created the problem of climate change. The answer of course lies in harnessing knowledge and accepting the implications of ignoring this problem while grasping the attractiveness and the merits of taking action to deal with it effectively. If we take the increase in the concentration of greenhouse gases (GHGs) in the earth's atmosphere, we find, for instance, that in pre-industrial times, the concentration of CO<sub>2</sub> in the atmosphere was 280 part per million (ppm). It is now inching rapidly towards 400 ppm, and given the inertia that exists in respect of infrastructure, patterns of production, and consumption and technologies that are employed for human activities across the globe, reducing emissions to stabilize the concentration is not likely to occur instantaneously. Yet, we need to be aware of the costs that society would have to bear if this most precious of our commons, namely the earth's atmosphere, is not stabilized early enough. It is for this reason that the Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (IPCC) clearly stated that efforts to mitigate GHG emissions to reduce the rate and magnitude of climate change need to account for inertia in the climate and socio-economic systems. It also stated that after GHG concentrations are stabilized, the rate at which the global average temperature increases is expected to slow within a

few decades. However, small increases in global average temperature could still be expected for several centuries. Sea level rise from thermal expansion would continue for many centuries at a rate that eventually decreases from that reached before stabilization due to ongoing heat uptake by oceans. It was also concluded that delayed emissions reductions significantly constrain the opportunities to achieve lower stabilization levels and increase the risk of more severe climate change impacts. Even though benefits of mitigation measures in terms of avoided climate change would take several decades to materialize, mitigation actions begun in the short term would avoid locking in both long-lived carbon intensive infrastructure and development pathways, reduce the rate of climate change, and reduce the adaptation needs associated with higher levels of warming.

Destabilization of the earth's atmosphere, as we have experienced since industrialization, and consequent climate change, have major implications for other commons as well. For instance, climate change is expected to exacerbate current stresses on water resources from population growth and economic and land-use change, including urbanization. On a regional scale, mountain snow pack, glaciers, and small ice caps play a crucial role in freshwater availability. Widespread

**AVAILABLE RESEARCH SUGGESTS A SIGNIFICANT FUTURE INCREASE IN HEAVY RAINFALL EVENTS IN MANY REGIONS, INCLUDING SOME IN WHICH THE MEAN RAINFALL IS PROJECTED TO DECREASE. THE RESULTING FLOOD RISK POSES GRAVE CHALLENGES TO SOCIETY.**

mass losses from glaciers and reductions in snow cover over recent decades are projected to accelerate throughout the 21st century, reducing water availability, hydropower potential, and changing seasonality of flows in regions supplied by meltwater from major mountain ranges (e.g. Hindu-Kush, Himalaya, Andes), where more than one-sixth of the world's population currently lives.

Changes in precipitation and temperature lead to changes in runoff and water availability. Runoff is projected with high confidence to increase by 10% to 40% by mid-century at higher latitudes and in some wet tropical areas, including populous areas in East and South-East Asia, and decrease by 10% to 30% over some dry regions at mid-latitudes and dry tropics, due to decreases in rainfall and higher rates of evapotranspiration. There is also high confidence that many semi-arid areas (e.g. the Mediterranean Basin, western United States, southern Africa, and north-eastern Brazil) will suffer a decrease in water resources due to climate change. Drought-affected areas are projected to increase in extent, with the potential for adverse impacts on multiple sectors, e.g. agriculture, water supply, energy production, and health. Regionally, large increases in irrigation water demand as a result of climate changes are projected. The negative impacts of climate change on freshwater systems outweigh its benefits. Areas in which runoff is projected to decline face a reduction in the value of the services provided by water resources. The beneficial impacts of increased annual runoff in some areas are likely to be tempered by negative effects of increased precipitation variability and seasonal runoff shifts on water supply, water quality, and flood risk.

Available research suggests a significant future increase in heavy rainfall events in many regions, including some in which the mean rainfall is projected to decrease. The resulting increased flood risk poses challenges to society, physical infrastructure, and water quality. It is likely that up to 20% of the world population will live in areas where river flood potential could increase by the

2080s. Increases in the frequency and severity of floods and droughts are projected to adversely affect sustainable development. Increased temperatures will further affect the physical, chemical, and biological properties of freshwater lakes and rivers, with predominantly adverse impacts on many individual freshwater species, community composition, and water quality. In coastal areas, sea level rise will exacerbate water resource constraints due to increased salinization of groundwater supplies.

The important conclusion from these findings is the fact that the problem of human-induced climate change has been caused because of overuse of the global commons, in this case the earth's atmosphere. If the externalities associated with increasing the concentration of GHGs were to be included in the price of those activities, which cause this problem, then perhaps we would have avoided the problem of climate change as we see it today. The answer, therefore, lies in estimating externalities that the use of the commons is associated with and then somehow incorporating these in the pricing system that determines the quantity demanded of the services provided by the commons.

With respect to the increased risk of more severe climate change impacts mentioned above, the IPCC has recently brought out a Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX). Some of the findings of this report have direct relevance for defining our attitudes and actions for protection of the global commons. For instance, a major finding of this report was that models project substantial warming in temperature extremes by the end of the 21st century. It is virtually certain that increases in the frequency and magnitude of warm daily temperature extremes and decreases in cold extremes will occur in the 21st century on the global scale. It is very likely that the length, frequency, and/or intensity of warm spells, or heat waves, will increase over most land areas. Based on specific emissions scenarios, a 1-in-20 year hottest day is likely to become a 1-in-2

year event by the end of the 21st century in most regions, except in the high latitudes of the Northern Hemisphere, where it is likely to become a 1-in-5 year event. The 1-in-20 year extreme daily maximum temperature (i.e., a value that was exceeded on average only once during the period 1981–2000) will likely increase by about 1 °C to 3 °C by mid-21st century and by about 2 °C to 5 °C by late-21st century, depending on the region and emissions scenario.

It is likely that the frequency of heavy precipitation or the proportion of total rainfall from heavy falls will increase in the 21st century over many areas of the globe. This is particularly the case in the high latitudes and tropical regions and in winter in the northern mid-latitudes. There is medium confidence that droughts will intensify in the 21st century in some seasons and areas, due to reduced precipitation and/or increased evapotranspiration. This applies to regions, including southern Europe and the Mediterranean region, central Europe, central North America, Central America and Mexico, northeast Brazil, and southern Africa.

Measures that provide benefits under current climate and a range of future climate change scenarios, called low-regrets measures, are available starting points for addressing projected trends in exposure, vulnerability, and climate extremes. They have the potential to offer benefits now and lay the foundation for addressing projected changes (high agreement, medium evidence). Many of these low-regrets strategies produce co-benefits, help address other development goals, such as improvements in livelihoods, human well-being, and biodiversity conservation, and help minimize the scope for maladaptation.

The AR4 concluded that neither adaptation nor mitigation alone can avoid all climate change impacts. Adaptation is necessary both in the short term and the longer term to address the impacts resulting from warming that would occur even for the lowest stabilization scenarios assessed. Adaptation and mitigation can complement each other and together can significantly reduce the risks of climate



*Carbon emissions are at the heart of the argument that places the blame for climate change directly on humans*

change. What prevents mitigation action is of course a lack of information and knowledge as well as what was referred to earlier as the all-pervading inertia in the system. This seems odd in the face of an important finding that mitigation opportunities with net negative costs have a potential to reduce the emissions by about 6 Gt CO<sub>2</sub>—equivalent per year in 2030. This of course would require dealing with implementation barriers. This fact also signifies that the economic mitigation potential, which is generally greater than the market mitigation potential, can only be achieved with adequate policies in place and barriers removed. Hardin puts forward the view that the tragedy of the commons reappears in problems of pollution. In his view, this is not a question of taking something out of the commons, but of putting something in—sewage, or

chemical, radioactive, and heat wastes into water; noxious and dangerous fumes into the air; and distracting and unpleasant advertising signs into the line of sight. The calculations of utility are much the same as before. The rational man finds that his share of the cost of the wastes he discharges into the commons is less than the cost of purifying his wastes before releasing them. Since this is true for everyone, we are locked into a system of “fouling our own nest,” so long as we behave only as independent, rational, free-enterprises.

There are major equity issues that need to be kept in mind while dealing with the subject of the global commons. For instance, the SREX found that extreme events will have greater impacts on sectors with closer links to climate, such as water, agriculture and food security, forestry, health, and tourism. The implication of

this reality is that it is the poor that are likely to suffer the most from the impacts of climate change, and particularly as a result of extreme events that would be caused. Hence, the issue of management of the commons is not merely one of economic efficiency, but most significantly one of equity as well. Economic policies and agreements being considered for sustainable management of the commons have not yet included equity issues in a formal and measurable way.

Economic losses from weather- and climate-related disasters have increased, but with large spatial and inter-annual variability. Global weather- and climate-related disaster losses reported over the last few decades reflect mainly monetized direct damages to assets, and are unequally distributed. Estimates of annual losses have ranged since 1980



from a few billion to above \$200 billion (in 2010 dollars), with the highest value for 2005 (the year of Hurricane Katrina). Loss estimates are lower bound estimates because many impacts, such as loss of human lives, cultural heritage, and ecosystem services, are difficult to value and monetize, and thus they are poorly reflected in estimates of losses. Impacts on the informal or undocumented economy as well as indirect economic effects can be very important in some areas and sectors, but are generally not counted in reported estimates of losses.

Economic, including insured, disaster losses associated with weather, climate, and geophysical events are higher in developed countries. Fatality rates and economic losses expressed as a proportion of GDP are higher in developing countries. During the period from 1970 to 2008,

over 95% of deaths from natural disasters occurred in developing countries. Middle-income countries with rapidly expanding asset bases have borne the largest burden. During the period from 2001–06, losses amounted to about 1% of GDP for middle-income countries, while this ratio has been about 0.3% of GDP for low-income countries and less than 0.1% of GDP for high-income countries, based on limited evidence. In small exposed countries, particularly Small Island Developing States, losses expressed as a percentage of GDP have been particularly high, exceeding 1% in many cases and 8% in the most extreme cases, averaged over both disaster and non-disaster years for the period from 1970 to 2010.

Soon after Hardin's seminal writing on the tragedy of the commons was published and disseminated, came a very readable, simply written, but profound book called *TANSTAAFL (There Ain't No Such Thing As A Free Lunch)*. As it happens, this was the first book on economics that I read as part of my Master's degree, and it left a deep impact on my mind. I realized and understood the loss of overall well-being and welfare of society as a result of negative externalities or a neglect of the TANSTAAFL principle. Edwin Dolan, the author, very rightly stated, "The task of ecological economics is to figure out how to restructure the economic system so that these hidden costs will be brought out into the open, with the ultimate aim that no one who benefits from the use of the environment will be able to escape without paying in full."

To my mind that is really the essential challenge. How does human society realize that the use of the commons and the services that they provide cannot be treated as a free good? Needless to say, such a principle can be applied and an appropriate price affected to support optimal use of the commons through actions at the global, national or community levels. However, this will only happen if global society understands the TANSTAAFL principle and accepts the fact that the free lunch that we are consuming today is not only impacting negatively on

## HOW DOES HUMAN SOCIETY REALIZE THAT THE USE OF THE COMMONS AND THE SERVICES THAT THEY PROVIDE CANNOT BE TREATED AS A FREE GOOD? NEEDLESS TO SAY, AN APPROPRIATE PRICE AFFECTED TO SUPPORT OPTIMAL USE OF THE COMMONS.

some sections of society at present, but will do so increasingly in the future. The Rio+20 Summit to take place in June of this year would be an important opportunity to turn things around, but much debate, discussion, and dissemination of the scientific and economic truth is required well before this historic event, so that global society is motivated and equipped to move in the right direction.

### Further reading


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IPCC. *Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX)*. ■

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*Our oceans are at the mercy of rapidly developing economies and industrializing nations, which think little before dumping huge quantities of waste into these vast reservoirs of water*