

Reversing the effects of climate change

This is the fight we can only begin to win by changing our own country first. Bangladesh must become a leader in the struggle to reverse global warming, not just a half-hearted follower as we are now. We must get our politicians to recognise the problem and its significant consequences, work to change them, and then put pressure on the rest of the world to do the same.

ENGR. M. MOHSIN ALI

THE problem of global warming is perhaps the most serious threat this country -- and the world at large -- has ever faced. This problem goes beyond petty differences, problems of economy, social issues, even beyond international conflicts and the war on terrorism. We are talking about the survival of multiple species on Earth, including part of the human race.

Action must be taken now in order to reverse the effects of global climate change, both by direct action and by informing others of its seriousness. This needs to be accomplished on four levels. First, on the personal/family level; second on the local and regional level; third, on the national-political level; and finally, internationally. All four of these levels must occur simultaneously.

The first level: Personal and family

Each of us must make energy saving changes in our lives, and convince our family and friends to do the same, so each of us takes personal responsibility for reducing our own CO2 footprint on the planet. How can we expect others to change, if we don't follow our own advice? We have an opportunity to lead by example. First, we must educate ourselves on the problem, and the steps we, personally, can take to solve it.

Simple steps, like lowering our thermostats in winter, and raising them in summer; replacing regular light bulbs with compact fluorescent bulbs; using less hot water; insulating your home; turning off (and unplugging) electric devices not in use; walking, biking, carpooling or taking public transportation when possible; buying products that use less packaging material; buying locally grown foods and shopping at local farmer's market; buying organic foods; keeping our automobile tires well inflated and the engine well maintained; and, of course, recycling, can make a significant difference.

We can go even further than that. When we need to replace an appliance, let's choose one with an energy star label. When it comes time to buying a new car, let's look for a hybrid one (or one that runs on alternative fuels, like E85). If it's available in your area, switch to green power that uses renewable resources like solar and wind to provide electricity to your home - or if you can afford it, install your own solar panels on your home. Whenever you get a chance, plant a tree.

The second level: Local and regionals

We need to take what we do at home out into our community. Take these same energy saving tools to work or school. Not only inform and educate your coworkers about the climate crisis, and the things they can do to help, but encourage change in the workplace or school itself.

Attend city council meeting, and write to the mayor and council members voicing your concerns and encouraging the switch to renewable energy. Work to break down the regulatory barriers that are preventing a wider transition to energy sources like solar, wind and biomass.

Make your voice heard wherever you go. Bring it up in any clubs, groups and organisations you may belong to. If you lead any children's groups (scouts, guides, etc.) incorporate what you have learned in your activities and lessons, make sure the next generation will carry on with this fight.

On a personal level, we can direct our monetary investments to companies that are environment friendly and/or into companies, programmes and products that are trying to address environmental/climate issues.

The third level: National-political

Now we get to making big changes. To do this, we all have to become politically active. I don't mean just vote. I'm talking about contacting your local govt and national representatives (national assembly) on every issue that relates to the environment and has an effect on climate change. Call them. Do it so much that they will remember your name. This can't be done by just a handful of people; it needs to be done by everyone. You may feel that it takes up too much time, that you don't have the time to spare, but you need to find it if you really want to make a difference. Democracy is not easy.

Keep yourself informed and educated about the issues and bills/resolutions that are being voted on so that you can speak or write intelligently about the subject. When you write or call, be concise. Convey all the information you need to in a clear, short message. A long rambling email would probably be largely ignored. For this to be effective, we must become louder and harder to ignore the oil and auto lobbies.

We must draw their attention away from the myth and distraction of hydrogen technology, which will not be available, cost-effective or viable for decades, and point out the technology that is available, and cost effective, now: hybrid engines, solar/wind power etc.

We must convince those MPs who work for us to pass broad, sweeping legislation. The kind that would make a significant difference. For example, have all cars, from all automakers selling in Bangladesh, to be hybrids by 2015; The technology is already there to put a hybrid in any size vehicle (Toyota has small, and mid-size cars as well as SUVs and mini-vans that operate with hybrid technology -- even if all of them are not currently being sold in the market).

We have to get our politicians to lead the oil industry into redefining itself. To help it move from "the Oil Industry" to "the Energy Industry". Our politicians have to guide them to develop alternatives to oil. We must guide our politicians to lead the oil industry into the future.

The fourth level: International

This one will be the hardest. Writing to our representatives will not have as strong an effect on the problems occurring in other countries, because the voices of our lawmakers carry about as much weight on the international stage as our individual voices carry in our own country.

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The writer is a freelance contributor.

Protecting the ozone layer

MOHAMMAD REAZUDDIN

HUMANKIND in the twenty-first century continues to face global challenges that transcend geographical borders and the limits of time. Yet in the international community's response to the threatened destruction of the Earth's stratospheric ozone layer, we find an encouraging story, as governments world-wide continue to work for the protection of the ozone layer with political commitment, through a streamlined institutional arrangement and a pragmatic approach to combat a global problem. The conclusion in 1985 of the Vienna Convention for the Protection of the Ozone Layer, followed in 1987 by the Montreal Protocol on Substances that Deplete the Ozone Layer, were the starting points of global co-operation in the matter.

Importance of ozone layer

Life on earth has been safeguarded for thousands of years because of a life-protecting ozone layer in the atmosphere. This layer is situated in stratosphere at ten to fifty kilometers above the earth surface. A pungent pale blue poisonous gas called ozone exists in this layer. Ozone is a molecule made up of three oxygen atoms. This layer, composed of ozone, acts as a shield to protect the earth from the harmful ultraviolet radiation of the sun. The ozone layer protects us from the harmful effects of solar ultraviolet (UV) rays. Higher incidence of UV-B radiation adversely affects the plant and animal life of the earth and quality of air. Depletion of ozone layer is associated with developing of skin cancer, eye damage and suppression of immune system in human body. Crop production and aquatic-marine food chain is also affected from ozone layer depletion.

In 1974, a scientific research pointed out that ozone layer had been in a process of gradual depletion due to the continuous emission of chlorofluorocarbons (CFCs) in the atmosphere which are used in the Refrigeration industry. When CFCs are released to the atmosphere they reach the stratosphere and are split by ultraviolet B radiation, and this process sets highly reactive Chlorine and Bromine atoms free. These Chlorine and Bromine atoms act as destroying agents of ozone molecules i.e. ozone is broken in to Oxygen and forms Chlorine Monoxide and a free high-energy Oxygen atom. By this way a single Chlorine atom can destroy up to 100,000 ozone molecules.

Bromine compounds also play a key role in destroying the Ozone layer. Some chemical compounds like Nitrous Oxide and other Nitrogen compounds also have a damaging effect on the Ozone layer.

Montreal protocol and measures

Although the first CFCs were invented in the twenties of the last century it took about half a century for the humankind to realise the environment-degrading consequences of the use of these chemicals.

It is heartening that, globally, the use of CFCs will be reaching a zero level in the stipulated period (by 2010), through various measures, countries have undertaken as per obligation under the Protocol, depending on their national circumstances. The success story of the Montreal Protocol, an international environment diplomacy has proved possible because science and industry have been able to develop and commercialise alternatives to ozone depleting chemicals.

However, once the scientific evidence about the ozone depleting potential of these chemicals was established in mid-seventies, it took less than a decade and a half to put in place an effective global system overseeing a time-bound programme for complete elimination of their use. Montreal Protocol on Substances that Deplete the Ozone Layer was signed in 1987 for the protection of ozone layer through control of the use of ozone depleting substances. It obligates to take the control measure on the production and consumption of ozone depleting substances e.g., chlorofluorocarbons, halons, carbon tetrachloride, methyl bromide and methyl chloroform within a timeframe.

At the heart of the Montreal Protocol lies the control measure it imposes on the production and consumption of ozone-depleting substances. It may be mentioned here that, Ozone Depleting Substances are largely produced and consumed in developed countries. It has, hence, been agreed under the Protocol that developed nations should be the first to phase-out CFCs, carbon tetrachloride and methyl chloroform by 1st January 1996, halons by 1st January 1994 and hydrochlorofluorocarbons by 1st January 2030. For special needs of developing countries with an annual consumption of less than 0.3 kg per capita, Montreal Protocol allows them to phase out CFCs, Halon and Carbon tetrachloride from 1 January 2010 and Hydrochlorofluorocarbon from 1 January 2040. Bangladesh falls under this category of countries.

'Essential uses' for which no alternatives have yet been identified are exempt from the controls; the main exemption is currently for CFCs for use in Metered Dose Inhalers for asthma.

Protocol provides for a financial mechanism to meet the incremental cost of the developing countries in phasing out ODS. The parties accordingly established the Multilateral Fund as an interim mechanism in 1990 and in its final form in 1992. Industrialised country parties contribute to the Fund according to the standard UN scale of assessment. The Multilateral Fund has its own Secretariat in Montreal and is directed by its Executive Committee, comprising representatives of seven developing and seven industrialised countries selected by the annual meeting of the parties to the Protocol. The Multilateral Fund operates through four implementing agencies, UNDP, UNEP, UNIDO and the World Bank.



Bangladesh situation

Bangladesh accessed to the Montreal Protocol on 2nd August 1990 and ratified its subsequent amendments. It established an "Ozone Cell" in the Department of Environment. It undertook a reconnaissance study on import and consumption of ODSs in 1993.

From the survey, it was revealed that bulk of the CFCs were used in Aerosol sector and the other major users of CFCs include, air-conditioner, refrigerator, cold storage, fire extinguisher, chemical industries, garments industries, pest-control etc., where refrigeration and air-conditioning are the second biggest. As ACI was the lone manufacturing company using CFCs in its aerosol production and accounted for 60 percent of the total consumption of CFCs in the country, the government with assistance of Montreal Protocol fund undertook the conversion to CFC free technology at ACI Bangladesh Ltd. The conversion was completed in 2002. Bangladesh achieved 60 percent reduction in its ODS consumption through this single act.

In addition to that, during 2000 to 2005 a series of other projects were implemented to reduce consumption of CFCs in the refrigeration and air conditioning sector. The projects include "Recovery and recycling of refrigerants and good practices in

refrigeration." For controlling import of ozone depleting substances, "Ozone Depleting Substances (Control & Prohibition) Rules 2003" have been enacted. Apart from these, various promotional and fiscal measures have also been undertaken by the government to discourage import of CFC and encourage import of CFC free appliances. Under good practices in refrigeration projects around 1000 technicians have been trained on good practices and recovery and recycling.

Last year, Bangladesh has made its National Phase-out Plan targeting Zero import of CFCs in 2010. While Ozone Cell in the Department of Environment is engaged in the implementation of the National Phase-out Plan, it is faced with a serious problem in the Metered Dose Inhaler (MDI) sector. There are four Pharmaceutical Companies currently engaged in the production of MDI in the country and meeting the local demand for protection of health of millions. The estimated requirement of CFCs for these companies to produce Metered Dose Inhaler is currently around 80 metric ton which is almost equal to Bangladesh's allowable CFC consumption quota for 2007. It may be mentioned here that under the obligation of the Protocol Bangladesh is pledge bound to reach zero level of CFC consumption by 2010 through gradual reduc-

tion of its consumption. Now, if all allowable CFCs we use in MDI sector, how can the country meet its demand for CFCs in the refrigeration sector? This is a big dilemma, the country is faced with.

CFC phase-out challenge on account of MDI consumption has been recognised quite early in Bangladesh. Since 2004 it has raised its concern on MDI sector in all the fora under Montreal Protocol and finally in the last Meeting of the Parties held in New Delhi, November 2006, it made a strong plea to defer until 2010, consideration of the compliance status of Bangladesh in relation to control measures for CFCs used in the production of Metered Dose Inhalers and demanded financial and technical assistance from the Protocol fund for the conversion of MDI production line in our four pharmaceuticals to CFC-free technology.

Due to proper home work, pre-communication with other parties explaining Bangladesh situation before the meeting, hard work and lobbying during the meeting, Bangladesh received an overwhelming support of the parties, specially from the developing countries, as they also face similar problem, but could not make such a strong case. It has been a milestone achievement for Bangladesh in an international negotiation, as never in the past, the Meeting of the Parties of the Montreal Protocol took such a decision to defer consideration of compliance status, which it has done for Bangladesh.

What it means: Bangladesh now shall be able to import CFCs to its requirement till 2010. During that period, assistance shall be provided to those companies, who produce MDI's using CFCs to convert their production lines to non-CFC technologies. Ozone Cell in the Department of Environment responsible to deal this matter is now currently engaged to develop a transition strategy towards addressing the anticipated problems in this sector in consultation with all stakeholders with cooperation from UNDP and UNEP.

Conclusion

It is heartening that, globally, the use of CFCs will be reaching a zero level in the stipulated period (by 2010), through various measures, countries have undertaken as per obligation under the Protocol, depending on their national circumstances. The success story of the Montreal Protocol, an international environment diplomacy has proved possible because science and industry have been able to develop and commercialise alternatives to ozone depleting chemicals. Finally, it can be said that the Montreal Protocol is working, and the ozone layer depletion from the Protocol's controlled substances is expected to begin to ameliorate with the next decade or so.

The author is a Director of the Department of Environment in charge of Planning, Research and International Conventions.

We alter ecosystems more to our peril than profit

DR MA BASHAR

ENVIRONMENTAL disaster is grouped into two categories -- natural and man made. Earthquakes, flooding, hurricanes, tornadoes, tsunamis and volcanoes etc. are the causes of natural disasters. On the other hand, desertification, deforestation, exotic species introduction, environmental degradation, biodiversity loss, overexploitation of resources etc. are considered as man made disasters. Human activities are often responsible for doing harm to the environment. It is evidenced that altering ecosystem is one such at that takes environment towards disaster.

In analysis of ecological studies, it is found that human activities are seriously corrosive in altering ecosystem in four basic ways: They are (a) selectively destroying species; (b) importing new species; (c) destroying habitats; and (d) introducing xenobiotics. The present article deals with the introduction of exotic species that causes harm to our biodiversity and does alter various ecosystems quickly and colossally. Ecosystem is the phenomenon of interaction between biotic and abiotic factors in a certain area of the biosphere. Both biotic and abiotic factors are equally responsible for maintaining an ecosystem in its soundness. If for any reason, biotic factors remain insufficient or overpopulated and/or lacking in functioning because of suppression, then interaction there will be disproportional and the entire ecosystem will be threatened to be altered. This situation occurs very often when exotic species are introduced in a new habitat or in a new biogeographical area.

The introduction of new plant species accidentally or intentionally, into an area can have both positive and negative effects. Plants that colonise an area may be more successful than the indigenous flora, and eventually the introduced species may begin to dominate the vegetation. The changes may be advantageous, for example by providing a new food supply, or they may reduce soil erosion. The introduction of the rhododendron shrub from the Himalayas into many parts

of Europe is an example of just how successfully an introduced plant can become established. Rhododendron bushes are helpful in stabilising slopes, but they are very difficult to eradicate once established.

Importation of new species has occurred throughout history and prehistory as humans have roamed over the globe. Not all importations are deliberate, and not all are deleterious. Deliberate importations usually considered beneficial include the introduction of the potato and tomato to Europe. Similar advantages accrued from the introduction of most food crops and ornamental species to the Americas: rice from China via Europe. We take these importation for granted, since we have "always" lived with them.

Many, but not all, of the most destructive deleterious introductions have been accidental, such as the introduction of the Colorado potato beetle and the highly allergenic ragweed to Europe. Accidental importations also include Dutch elm disease, which was brought into the United States from Europe on shipments of elm products. The beetle that transmits the disease was initially fought with massive applications of insecticides, leading to secondary effects on suburban ecosystems. Another accidental import, the Russian thistle (*Salsola kali tenuifolia*), probably arrived and moved across the United States with threshing equipment.

Deliberate importations that are now considered harmful have had varied rationales. Many occurred because a species was considered aesthetically pleasing. The English sparrow was imported by a romantic who wished to bring to the New World all the birds mentioned by Shakespeare. A single reference to starlings (Dachschlager, 1990) led him to import this species, which proved successful enough to be a major competitor to native species.

Deliberate introductions are also made for seemingly sound economic reasons and become deleterious because they prove to have unforeseen environmental consequences. One dramatic example is the gypsy moth (*Portheia dispar*). Its importer wished to produce cheaper silk by creation of a hybrid

Introduced species firstly hamper the phenological stages (for plants) and the stages of life cycle (for animals) of the endemic species. Secondly they reduce the functioning of the organisms in-situ and their respective trophic level. Thirdly, population of endemic species is seriously threatened for extinction. Fourthly, ecosystem of harbouring exotic species becomes weak. Fifthly, alteration of the ecosystem is established on a permanent pattern.



Red Piranha (Pygocentrus natterii), a Brazilian origin species, has been introduced from Thailand.

with the silk moth (*Bombyx mori*) that would not require a diet of mulberry leaves. In the latter goal he succeeded. But when the gypsy moth escaped from his laboratory, it proved to eat an unrestricted diet of most of the hardwoods of the Northeast. Itself distasteful to almost all predators, and relatively resistant both to insecticidal control and to efforts at natural control, it ravaged the forests for 100 years. Only in 1988 did a fungal disease, introduced decades ago in a seemingly forlorn effort to control the moth, take hold.

Similarly praiseworthy aims accompanied the kudzu vine (*Pueraria lobata*) to the United States. It was imported as an alternative source of fodder for cattle on marginal land. Although cattle will eat kudzu if they are starving, they prefer almost any other fodder. The vine cannot be controlled by limited foraging and is not readily controlled at all. In fact, it does very well in warm climates and is choking many fields and forests in the southern United States.

In some cases, the intended purpose of a deliberate importation is achieved successfully but is no longer desired. The Melaleuca tree (*Melaleuca quinquenervia*) was originally imported to Florida by botanists who sought a species that would aid in draining the Everglades, the swampy grassland that once covered much of the Florida peninsula. The Melaleuca is native to Australia, transpires large quantities of water, and adapted exuberantly to the Everglades. Since its importation, however, the Everglades have been shrinking due to extensive canalisation of northern and central Florida, to increase agriculture, and to draining of land for residential purposes. Many ecologists fear that the Everglades are doomed and that the best one can expect is that the National Park Service can salvage small islands to remind us of their original glory.

Somewhere between planned introductions and truly accidental "hitchhikers" are the careless introductions that thrive beyond expectation because they have no natural

enemies in their new home. Remarkable havoc has been wreaked in Australia by rabbits, which overran large tracts of semiarid pasture, eating most of the forage of both sheep and native animals. In the United States, descendants of the prospectors' burros are thriving in the Grand Canyon, at the expense of native sheep and other grazers that compete for the same scarce forage. Among plants, prickly pear cactus (*Opuntia* spp.) in Australia and Klamath weed (*Hypericum perforatum*) in the northwestern United States grew at the expense of pasture grasses.

The opening of the Suez Canal in 1869 joined two biogeographical provinces: the Mediterranean and the Indian Ocean realms -- allowing over 250 Red Sea species to migrate through the canal and colonise the Mediterranean. Of particular concern in recent times is the proliferation of the Red Sea jellyfish, *Rhopilema nomadica*, along the Levant coast in the southeast part of the Mediterranean (Spanier and Gail, 1991). The first specimen found in the Mediterranean area was in 1977 off the coast of Israel, but by the summer of 1990 an almost continuous belt of jellyfish was present along the northern coast of Israel. The proliferation of jellyfish has had significant impact on local fisheries, causing damage to fish nets; in Haifa Bay, shrimp trawling nearly ceased during July 1990. Intake pipes for the cooling systems of coastal power plants became clogged. The numbers of holiday-makers using beaches dropped dramatically because of concern over the painful stings inflicted by the jellyfish.

In Bangladesh, biodiversity is running under 'double sided' characters. One side of the character is the 'species richness'. Still number of species is very high in Bangladesh forests and in aquatic ecosystems.

Another side is that, the population size of the existing species is very low almost in all the cases. The double sided characteristic bears hopefulness in the way that if the species richness could be started to be preserved immediately then the biodiversity could be used both for the economic benefit and the environmental soundness. On the other hand, low population size in the species is risky for taking the entire species to the extinction. So, maximum species are at the seriously "threatened" stage. This is the negative side of the double sided characteristics. It is to be realised that, all species conservation strategies must be taken up immediately without any delay. Otherwise, species richness will fall very soon and both forest and aquatic ecosystems in the country will have negative impact on the human population.

In Bangladesh, some plant and animal species have been introduced from different countries. These exotic species have hampered endemic species both in their population dynamics and in the position of their trophic levels. At the same time, in many cases the importation has opted for changing ecosystem. In the aquatic ecosystem, the major introduced species those have changed a lot the ecosystem are African magur (*Clarias garipinus*) and red Piranha (*Pygocentrus natterii*). In the terrestrial ecosystem the species are *Tectona grandis* (Shagun), *Acacia* spp. *Eucalyptus* spp. and *Swietenia mahagoni*.

It is obvious that the introduction of exotic species changes the ecosystem and affect endemic species severely. The forest areas of our country from Karer Hat to Teknaf in the Chittagong division has been dominated by the population of garzon (*Dipterocarpus turbinatus*) tree as canopy layer since long; and it is endemically sustained also for long time. The garzon forests have

got some important characters for maintaining the three layers of vegetation. These three layers of vegetation is the endemic characteristic of our forest in connection with the typical rain forests of the south Asian region. First layer of vegetation is with the soil surface and does not come up to the height of more than one meter. They are mainly the grasses and the members of Zingiberaceae family. They keep the soil surface wet. This layer is the suitable shelter for microbes' growth and sustainability. It supports the second layer of vegetation and also the third canopy layer. Second layer of vegetation is the vegetation of man height level in the forest. This layer is above the first layer of vegetation and called 'Jungle' in the forest. The layer is comprised of vines, grubs, hedges and shrubs plants. These provide enough shades, protection and make favourable conditions for the plants and microbes growth of first layer of vegetation. Third layer is the canopy layer of typical Garzon population or the population with other related trees. Third layer protects the grubs, vines, shrubs and hedges. During the variation of the season in a year or because of seasonality changes, the leaves fall on the ground and the fallen leaves provide enough organic deposition for the growth of both first and second layer of vegetation. In this way the entire typical forest ecosystem in the endemism sustains and survives in a normal and usual situation.

Change occurs when *Acacia* spp. and *Eucalyptus* spp. and other exotic plants are planted in the forest areas as stated above. Because when these trees are planted in the garzon dominated areas, the first and second layers of vegetation are seriously hampered. This change in the first and second vegetation layer desynchronises the establishment of trophic levels in the forest ecosystem. For example, no undergrowth vegetation are seen in the forest where Shagun, *Eucalyptus* and *Acacia* have been planted.

In the aquatic ecosystem diatoms, algae and other aquatic plants act as producers and as first trophic level. Some of them are called phytoplankton. Zooplanktons like Daphnia, Cyclops and Cypris

depend on diatoms and act as second trophic level (first consumer). As Chironid larvae and other insect larvae feed on the above zooplanktons, they are treated as the third trophic level (2nd consumer). In typical aquatic ecosystem of our country (like pond ecosystem), fishes like shingi (*Heteropneustes* spp.) feed on the chironomid larvae keeping them in the status of fourth trophic level (3rd consumer). The carnivorous fishes of our endemic nature like Chital (*Notosterus* spp.) and Boal (*Walog* spp.) feed on the fishes of fourth trophic level and attain the status of fifth trophic level (fourth consumer). In our typical aquatic ecosystem (pond ecosystem) the energy-flow and ecological pyramids are arranged in this pattern.

When African magur (*Clarias garipinus*) and Red Piranha (*Pygocentrus natterii*) are introduced to the ecosystem they drastically consume without maintaining the chronology of the ecological pyramid-patterns in an ecosystem. These introduced species drastically reduce the population of animals of all trophic levels and create ecological hazard for the population of all other aquatic animals and many other aquatic plants also.

Eventually now-a-days, true endemic magurs in the standing water ecosystem of our country is tremendously reducing. Presently, in the fish market, true endemic local magur (*deshi magur*) is nearly absent. This is the another side to be considered as the reason to alter this ecosystem as a whole.

It is to be noted that introduced species firstly hamper the phenological stages (for plants) and the stages of life cycle (for animals) of the endemic species. Secondly they reduce the functioning of the organisms in-situ and their respective trophic level. Thirdly, population of endemic species is seriously threatened for extinction. Fourthly, ecosystem of harbouring exotic species becomes weak. Fifthly, alteration of the ecosystem is established on a permanent pattern.

Dr-MA Bashar is Professor, EBBL-Department of Zoology, University of Dhaka