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Wider Impacts of Fertilizer and Plastic Pollution on Oceans Top This Year's Priority Issues in UNEP Year Book

UNEP Year Book 2011 Spotlights Urgent Need for Fundamental Green Economy Shift

26th Session of UNEP Governing Council/Global Ministerial Environment Forum 21-24 February

Nairobi, 17 February 2011. Massive amounts of phosphorus—a valuable fertilizer needed to feed a growing global population—are being lost to the oceans as result of inefficiencies in farming and a failure to recycle wastewater.

Phosphorus pollution, along with other uncontrolled discharges, such as nitrogen and sewage, are linked with a rise in algal blooms which in turn harm water quality, poison fish stocks and undermine coastal tourism.

In the United States alone, the costs are estimated to be running at over US\$2 billion a year, indicating that globally and annually the damage may run into the tens of billion of dollars.

At the same time there is also growing concern over the impact of billions of pieces of plastic, both large and small, on the health of the global marine environment.

New research suggests that the plastic broken down in the oceans into small fragments — alongside pellets discharged by industry—may absorb a range of toxic chemicals linked to cancer and impacts the reproductive processes of humans and wildlife.

Experts say both phosphorus discharges and new concerns over plastics underline the need for better management of the world's wastes and improved patterns of consumption and production.

The two issues are spotlighted as among key issues —deemed persistent, re-emerging or newly emerging— in the United Nations Environment Programme’s (UNEP) Year Book 2011 which is being presented today in advance of the annual gathering of the world’s environment ministers opening on 21 February.

Achim Steiner, UN Under-Secretary General and UNEP Executive Director, said: “Science is central for assisting governments to prioritize action on persistent and emerging challenges—indeed emerging issues will be a key theme over the next 15 months as ministers prepare for the crucial Rio+20 conference in Brazil next year.”

“The phosphorus and marine plastics stories bring into sharp focus the urgent need to bridge scientific gaps but also to catalyze a global transition to a resource-efficient Green Economy in order to realize sustainable development and address poverty,” he added.

“Starting here—at UNEP’s Governing Council/Global Ministerial Environment Forum—we will begin global and regional consultations on a short-list of key scientific challenges that need to be addressed in order to aid that transition and assist governments at Rio+20,” said Mr. Steiner.

“The focus will also be on the solutions and opportunities. Whether it is phosphorus, plastics or any one of the myriad of challenges facing the modern world, there are clearly inordinate opportunities to generate new kinds of employment and new kinds of more efficient industries,” he added.

“Ones that bring more intelligent management, a recycling imperative to transforming waste and its environmental and health impacts from a serious problem into a valuable resource and keep humanity’s footprint within planetary boundaries,” he added.

Phosphorus—the Waste of a Precious Agricultural Resource

The UNEP Year Book 2011 has highlighted phosphorus, demand for which has rocketed during the 20th century, in part because of the heated debate over whether or not finite reserves of phosphate rock will soon run out.

An estimated 35 countries produce phosphate rock with the top ten countries having the highest reserves being Algeria, China, Israel, Jordan, Russia, South Africa, Syria and the United States.

New phosphate mines have been commissioned in countries such as Australia, Peru and Saudi Arabia and countries and companies are looking further afield, including on the seabed off the coast of Namibia.

Some researchers are suggesting that the consumption of phosphorus globally is in the medium to long term unsustainable and that peak production, with a decline afterwards, could occur in the 21st century.

Others disagree. The International Fertilizer Development Centre recently revised upwards estimates of reserves from around 16 billion tonnes to 60 billion tonnes—at current production rates, these could last 300 to 400 years. The United States Geological Survey also recently adjusted their estimates to 65 billion tonnes. Nevertheless, proponents of the peak phosphorus theory argue that even if the timeline may vary, the fundamental issue, that the supply of cheap and easily accessible phosphorus is ultimately limited, will not change.

The Year Book calls for a global phosphorus assessment to more precisely map phosphorus flows in the environment and predict levels of economically viable reserves.

According to the Year Book, the global use of fertilizers that contain phosphorus, nitrogen and potassium increased by 600 per cent between 1950 and 2000.

It adds that population growth in developing countries and increased levels of dairy and meat in the global diet are likely to increase fertilizer use further.

“While there are commercially exploitable amounts of phosphate rock in several countries, those with no domestic reserves could be particularly vulnerable in the case of global shortfalls,” the Year Book notes.

Further research is also needed on the way phosphorus travels through the environment in order to maximize its use in agriculture and livestock production and cut wastage while reducing environmental impacts including on rivers and oceans.

- Currently humans consume—via food—around only a fifth of the phosphorus mined with the rest retained in soils or released to the aquatic environment.
- Over the last 50 years concentrations of phosphorus in freshwaters and land has grown by at least 75 per cent.
- The estimated flow of phosphorus to the marine environment from the land is now running at around 22 million tonnes a year.

The Year Book points to the enormous opportunity of recycling wastewater: in the megacities of the developing world up to 70 per cent of this water—laden with nutrients and fertilizers such as phosphorus—is discharged untreated into rivers and coastal areas.

- Sweden, for example, aims to recycle 60 per cent of the phosphorus in municipal wastewater by 2015.

Other measures to reduce discharges include cutting erosion and the loss of topsoil where large quantities of phosphorus are associated with soil particles and excess fertilizers are stored after application.

- In Africa soil losses are running at close to 0.50 tonnes per hectare a year and in Asia it is even higher, at almost 1.70 tonnes per hectare per year.

Land management measures include contour ploughing; contour planting of hedgerows on steep slopes and applying mulches and planting cover crops and other vegetation on land.

Boosting recycling rates at phosphate rock mines can also assist in conserving stocks and reducing discharges to local water systems.

Marine Plastics—A New Toxic Time Bomb?

The second emerging issue highlighted in the Year Book 2011 is a need for more intensified research on the impact of plastics entering the oceans.

Scientists are becoming concerned not only about the direct damage to wildlife, but the potential toxicity of some kinds of materials called microplastics.

These are tiny pieces smaller than five millimeters in length discharged as pellets by industry or formed as a result of bigger pieces of plastic broken down by, for example, wave action and sunlight.

The exact quantities of plastics, including microplastics entering or forming in the oceans from the land-based discharge—but also from shipping and fishing boats— is unknown.

What is known is that per capita consumption of plastics, from packaging to plastic bags and from industry to consumer goods, has been rising sharply.

- In North America and Western Europe each person now uses around 100kg of plastic materials annually—this is likely to increase to 140kg by 2015.
- People in rapidly developing countries in Asia each use around 20kg of plastic per year—this is set to grow to about 36kg by 2015.

Currently recycling and re-use rates vary enormously even among developed countries.

In Europe recycling rates of plastics for energy generation ranged from 25 per cent or less in several European countries to over 80 per cent in Norway and Switzerland.

Previous concerns about plastics included damage and death of wildlife after becoming entangled.

There is also concern about wildlife eating plastics often in mistake for food. Albatrosses, for example, may mistake red plastic for squid, similarly turtles confuse plastic bags for jellyfish. Young sea birds of some species may suffer poor nutrition if they feed on too much plastic, mistaken as food.

But the Year Book flags a new and emerging concern termed “persistent, bio-accumulating and toxic substances” associated with plastic marine waste.

Research indicates that the small and tiny pieces of plastic are adsorbing and concentrating from the seawater and sediments a wide range of chemicals from polychlorinated biphenols (PCBs) to the pesticide DDT.

“Many of these pollutants including PCBs cause chronic effects such as endocrine disruption, mutagenicity and carcinogenicity,” reports the Year Book.

“Some scientists are concerned that these persistent contaminants could eventually end up in the food chain, although there is great uncertainty about the degree to which this poses a threat to human health and ecosystem health,” it adds.

Species such as swordfish and seals—which are at the top of the food chain—are cited as potentially vulnerable. These are also species consumed by humans.

A recent survey of PCB concentrations in pellets washed ashore has been carried out at 56 beaches in nearly 30 countries.

- The highest concentrations were found in plastic pellets in the United States, Western Europe and Japan—the lowest in tropical Asia and southern Africa

The Year Book chronicles a range of existing and new initiatives, guidelines and laws aimed at reducing plastic and other waste discharges.

These range from the UN’s International Convention for the Prevention of Pollution from Ships to UNEP’s Global Programme of Action for the Protection of the Marine Environment from Land-based Activities.

The Year Book calls for better enforcement of such rules, better consumer awareness and behavioral changes and improved support for national and community-based initiatives.

There is also an urgent need for improved and more innovative monitoring of plastic throughout the marine environment given that real gaps remain in understanding the ultimate fate of these materials.

There is evidence that some plastics are not floating but sinking and piling up on the seabed.

“Plastic debris has been observed on the ocean floor from the depths of the Fram Strait in the North Atlantic to deepwater canyons off the Mediterranean coast—much of the plastic that has entered the North Sea is thought to reside on the seabed,” says the Year Book.

It also calls for phasing in changes in the collection, recycling and re-use of plastics. “If plastic is treated as a valuable resource, rather than just a waste product, any opportunities to create a secondary value for the material will provide economic incentives for collection and reprocessing,” the Year Book points out.

Notes to Editors

The UNEP Year Book 2011 is available at www.unep.org/yearbook/2011

It can be purchased through Earthprint www.earthprint.com

UNEP’s Green Economy Initiative is at www.unep.org/greeneconomy

A Transition to a Green Economy: Pathways to Sustainable Development and Poverty Eradication will be launched at 10.00AM GMT on 21 February 2011

The United Nations Conference on Sustainable Development 2012, known as Rio+20, is at <http://www.uncsd2012.org/>

The 26th Session of the UNEP Governing Council/Ministerial Environment Forum is at <http://www.unep.org/gc/gc26/>

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