

our planet

The magazine of the United Nations Environment Programme — April 2011



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REACHING SUSTAINABILITY

KAREN ELLEMANN
TIME TO TACKLE CHEMICALS

MAANEE LEE
BORROWING THE PRESENT

NANCY JACKSON
CHEMISTRY
AS NATURE DOES IT



CHEMICALS
MANAGEMENT
and marine plastics



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www.unep.org/publications



The Emissions Gap Report

Launched for the Cancun climate meeting, this report spells out what the pledges of Governments might actually mean in terms of putting the world on track to limit global temperature rises. The report is a partnership between over 30 leading researchers at climate modelling institutes across the globe. It spotlights worst-case and best-case scenarios up to 2020 while estimating the emissions gaps likely under various outcomes that will need to be bridged in order to avoid “dangerous” climate change.

Africa Water Atlas

This new publication from UNEP outlines the major challenges facing Africa’s water resources. The *Africa Water Atlas* uses hundreds of “before and after” shots, detailed new maps and satellite images from 53 countries to show the problems facing Africa’s water supplies, such as the drying of Lake Chad and the erosion of the Nile Delta, as well as new, successful methods of conserving water. The Atlas maps out new solutions and success stories from across the continent.

Protecting Arctic Biodiversity: limitations and strengths of environmental agreements

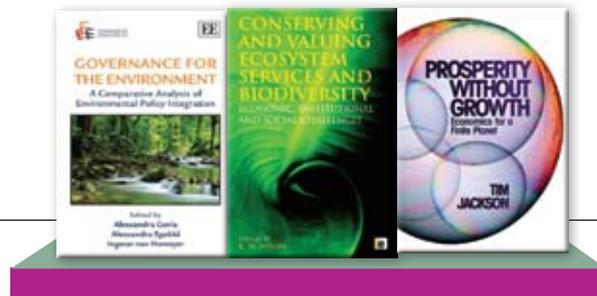
Current warming in the Arctic atmosphere, oceans and on land is contributing to far-reaching and rapid change across the world’s largest eco-region. This report addresses the growing concerns about the region’s vulnerability. It responds to the request by the participants to the Arendal Seminar in 2006, co-organised by UNEP/GRID-Arendal and the Standing Committee for Parliamentarians of the Arctic Region (SCPAR), to examine the limitations and strengths of existing environmental agreements for conserving and protecting Arctic biodiversity and options for improvement.

TEEB Synthesis Report

TEEB (The Economics of Ecosystems and Biodiversity) is an international assessment showcasing the enormous economic value of forests, freshwater, soils and coral reefs, as well as the social and economic costs of their loss. The final report in the TEEB series – *the Synthesis Report* – presents three scenarios: a natural ecosystem (forests), a human settlement (city), and a business sector (mining), to illustrate how the economic concepts and tools described in TEEB can help equip society with the means to incorporate the values of nature into decision-making at all levels.

Environmental Consequences of Ocean Acidification: A Threat to Food Security

This report sheds light on the consequences of rising concentrations of CO₂ in the marine environment on food chains and ecosystems as well as human activities such as tourism and fishing. Rising CO₂ emissions are causing our oceans to become more acidic and posing a greater risk to marine organisms. With around 1 billion people reliant on seafood as their main source of protein, the report also analyses the effects of ocean acidification on global food security.



Governance for The Environment: A Comparative Analysis of Environmental Policy Integration

Edited by Alessandra Gorla, et al. (Edward Elgar)

This book presents a diverse set of perspectives and experience on how to support sustainable development through the integration of environmental issues into various policy sectors. The authors examine existing research on environmental policy integration (EPI) at three levels of policy making: national, regional and local. New and innovative approaches to the study of EPI at these levels of governance are proposed.

Conserving and Valuing Ecosystem Services and Biodiversity – Economic, Institutional and Social Challenges

K. N. Ninan (ed.) with Foreword by Achim Steiner (Earthscan)

This book comprehensively addresses the economic, social and institutional difficulties in conserving biodiversity and the ecosystem services that it provides. It covers a wide range of issues including: biodiversity, ecosystem services and valuation in the context of diverse ecosystems such as tropical forests, marine areas, wetlands and agricultural landscapes; non-timber forest products; incentives and institutions; payments for ecosystem services; governance; intellectual property rights and the protection of traditional knowledge, and climate change and biodiversity.

Prosperity without Growth – Economics for a finite planet

Tim Jackson (Earthscan)

In the advanced economies there is mounting evidence that ever-increasing consumption adds little to human happiness, and it is now clear that the ecosystems that sustain our economies are collapsing under the impacts of rising consumption. Unless we can radically lower the environmental impact of economic activity we will have to devise a path to prosperity that does not rely on continued growth. This book presents a credible vision of how human society can flourish – within the ecological limits of a finite planet.



reflections

ACHIM STEINER

UN Under-Secretary-General and
Executive Director, UNEP

How the international community manages its response to both the challenges and the opportunities presented by chemicals and wastes enters a new era this year.

Over the coming months the three principle treaties in the area — the Basel, Rotterdam and Stockholm conventions — will streamline their operations and actions in new and potentially far-reaching ways. All three will adopt decisions, as part of reform measures, to enhance co-operation and coordination, maximizing their collective impact and so improving human health.

These new governance arrangements will be launched at the Fifth Meeting of the Conference of the Parties to the Stockholm Convention on persistent organic pollutants in Geneva in late April. They will then be agreed at the Rotterdam Convention in the same city in June and the Basel Convention in October in Cartagena, Colombia.

Among many other key issues to be decided at the Stockholm meeting is whether to list endosulfan — an insecticide, more than half a century old and which is banned in at least 60 countries because of health and other concerns. If it is, it will join a catalogue of some 22 persistent organic pollutants controlled under the treaty.

Meanwhile, endosulfan is being considered under the Rotterdam Convention — along with chrysotile asbestos and some other chemicals — for inclusion in the prior informed consent procedure which requires exporting Parties to obtain the support of importing ones for shipments of chemicals listed in its Annex III.

And if endosulfan is added to the Stockholm Convention, the Basel Convention will be requested to draw up waste management guidelines for it.

The example demonstrates how — unlike the past, where decisions might be taken in a vacuum — a more comprehensive and ‘joined-up’ series of actions relating to chemicals and wastes is beginning to get under way.

All this may seem prosaic to an outsider. But it offers an opportunity to align these important treaties in ways that can produce better chemicals and waste management within and beyond national borders.

Similar evolutions — the result of decisions taken by governments in Bali, Indonesia, last year — include appointing a single head to oversee the running of the three treaties and sharing administrative services — which may free-up funds to be invested in more projects on the ground.

These reforms come little more than a year before governments meet for the UN Conference on Sustainable Development (Rio+20) to be held two decades after the Rio Earth Summit that has set the contemporary sustainable development course ever since. Its two themes are Green Economy in the context of poverty eradication and sustainable development and an Institutional Framework for Sustainable Development.

It has long been clear that the growth of multilateral environmental agreements has, in its current configuration, imposed increasing strains and complexity on the compliance and participation of many developing countries.

At the same time, fragmentation can undermine the effectiveness of the overall effort for sustainable development and lead to duplication and a less than efficient use of scarce financial resources.

The chemicals and wastes agenda also echoes the social outcomes of the Green Economy in terms of prospects for decent employment and improvements in human health and well being, which are key elements in the Safer Planet campaign spearheaded by the three treaties.

During UNEP’s last Governing Council, ministers of environment underlined that the status quo — including the existing management and effectiveness of current institutions — was not an option.

Proposals for reforming international environmental governance are now part of the global discussions in advance of the Rio+20 conference next June.

The closer working relationship between the chemicals and waste agreements, and the fresh directions it will bring, offers a way forward to redressing these shortfalls between ambition and action.

They are part of the overall urgency in accelerating and scaling up a definitive and decisive shift towards achieving a low carbon, resource-efficient global economy for all.



JOSÉ MANUEL BARROSO
President,
European Commission

REACHING SUSTAINABILITY

Protecting the health of citizens and our environment, while enhancing competitiveness and innovation: such is the challenge of REACH, the European Union's groundbreaking and holistic regulation on chemicals.

Through REACH – Registration, Evaluation, Authorization and restriction of Chemicals, which entered into force in 2007 – the EU regulates nearly all chemicals, whether handled in industrial or consumer environments.

Chemicals are omnipresent in our daily life, and it is difficult to imagine living without them. We are not always aware of all the benefits they bring. But we also need to ensure that they are safe.





REACH places greater responsibility on industry to manage risks and provide appropriate safety information to professional users and — for the most hazardous substances — to consumers. It applies to the manufacture, placing on the market or use of substances on their own, in mixtures or in articles.

Its registration process asks industry to prove that chemicals are used safely and ensures that manufacturers, workers and citizens know more about the chemicals they are using. Companies must document the safe use of chemicals by sending a dossier to the European Chemicals Agency (ECHA). Those placing most of the total volume of chemicals on the EU market — and the most dangerous ones — have already

filed their registrations to ECHA and the process continues for other substances. Some 25,000 existing substances have been registered, and all new ones must be registered before they are manufactured, imported or used in the EU. Failure to register means that the substance cannot be manufactured, imported or used in the EU.

The approach is based on risk: the more of the chemical that is produced, or the more dangerous it is, the more detailed the dossier must be. Industry can choose the most cost-effective measures to control the risks.

The Agency checks that the dossier is complete, and carries out detailed spot checks on the quality of the information, through a separate evaluation process.

Evaluation can also be conducted to try to clarify whether using a particular substance — selected by the Agency in cooperation with Member States — harms human health or the environment. Substances are evaluated according to priority criteria, considering hazard, exposure and volume.

The information on how to use the chemical safely is circulated down the supply chain, from the manufacturer to purchasers, who in turn pass it to their own customers. Those who use a chemical in their industrial or professional activities have to apply the risk management instructions for dangerous substances which are communicated by the supplier via safety data sheets. They can also contact their supplier to identify how to best control risks.

*“REACH’s main benefit
is to identify
and control
the risks of chemicals
more systematically,
thus allowing for appropriate
risk management measures
by industry or,
if necessary,
further regulatory action
by the public authorities.”*

A system of authorization applies to substances of very high concern listed in Annex XIV of REACH. These substances cannot be used or placed on the market unless an authorization has been granted. Substances of very high concern can include ones that are carcinogenic, mutagenic or toxic for reproduction; those having persistent, bioaccumulative and toxic properties or very persistent and very bioaccumulative ones; and those presenting an equivalent level of concern, such as substances with endocrine disrupting properties. There is no tonnage limit. The process includes identifying substances of very high concern and prioritizing them for inclusion in Annex XIV. Once a substance is listed in that Annex, operators wishing to place the substance on the market or use it must apply for an authorization at ECHA. The final decision granting or refusing an authorization is adopted by the Commission, on the basis of the opinions given by the responsible ECHA committees. The intention is to ensure that risks are properly controlled and that these chemicals will be progressively replaced by suitable alternative substances or techniques where these are economically and technically viable.

A substance posing a risk to human health or the environment which needs to be addressed at EU level can also be made subject to a restriction, which may mean prohibiting — or putting any condition on — its manufacture, use or placing on the market, on its own, in a mixture or in an article. The dossier, which gives grounds to adopt a restriction, can be prepared either by a Member State or by the Agency (on request

from the Commission) and contains information on hazards and risks, available information on alternatives and a justification for restrictions at community level, and may also include a socio-economic assessment.

The main tasks of the Agency — which became operational in 2008, and manages REACH’s technical, scientific and administrative aspects — are to handle the registration of chemicals, carry out the evaluation of dossiers and oversee the evaluation of substances ensuring consistency across the EU. It provides guidance to industry and information to the public and plays an important international role through disseminating up information and involvement in United Nations or OECD programmes.

2011 is the International Year of Chemistry, through which the United Nations is celebrating the achievements of chemistry and contributions to the well-being of humankind; REACH fits this political objective perfectly. It applies in all 30 countries of the European Economic Area and foresees means by which companies located outside it can fulfil the registration obligations of importers.

REACH’s main benefit is to identify and control the risks of chemicals more systematically, thus allowing for appropriate risk management measures by industry or, if necessary, further regulatory action by the public authorities. This will help prevent health problems that could be caused by exposure to chemicals, leading to less disease and preventable death, and thus lower costs for national health systems. The benefits will come progressively as more and more substances are phased in. Though quantitative assessment is difficult, the Commission’s 2003 Impact Assessment developed an illustrative scenario which put the health benefits alone in the order of €50 billion over 30 years.

The chemicals industry now benefits from a regulatory system based upon a risk-based approach, which has decision-making with clear deadlines, and results in greater consumer confidence in their products. Users of chemicals will get relevant information on the safe use of substances in their production processes, which will help them to ensure better protection of their workers. Products will be safer for consumers and the environment and competitiveness and innovation will be enhanced which is vital for securing jobs.

I am very proud of REACH, which fully fits into our strategy for “smart regulation”. It is an outstanding example of sustainable development, striking a fine balance between health and environmental aspects on the one hand, and societal and economic ones on the other.

products



Gumboot power

We've seen some intriguing sources of alternative energy for recharging small electronic devices, but these "thermoelectric galoshes" are certainly at the bizarre end of the spectrum. In the sole of each boot of Power Wellies, are thermoelectric modules that convert temperature differences — say the warmth of your foot versus the cold of the ground — into electric voltage. It may be some time before they take off as a serious charging alternative — it takes 12 hours of walking to charge a cell phone for an hour — but nonetheless it's a step in the right direction!
www.ecouterre.com/

Waterpebble

Waterpebble is a clever device that encourages you to use less water each time you shower. It works like this: you place the Waterpebble in the shower near the plughole, and shower as normal. The device monitors water going down the plughole, memorizes your first shower and uses it as a benchmark. Then each time you shower, lights in the Waterpebble light up to indicate the start (green light), when you're half way through (amber), and red (time to stop). Each time you shower Waterpebble fractionally reduces your shower time, helping you to save water without needing to think about it.
www.waterpebble.com/



Emission-free food processor

Absolutely no electricity is used by the Kitchen Machine, the latest in eco-friendly household appliances. It's a food processor that is powered entirely by its human operator. There is a pedal at the bottom of the unit that drives a large flywheel, which spins at up to 400 revolutions per minute and drives a versatile range of cutting devices — a utility mixer, food processor and coffee grinder — which can be attached to the machine's drive shaft. Thanks to the Kitchen Machine, eco-chefs now have emission-free grinding, mixing, chopping and stirring at the tips of their toes.
<http://inhabitat.com>



Eco nappies

It's estimated that 50 million disposable diapers enter landfills each day where they sit for 500 years! So thank goodness for Eenee Eco Compostable Nappies, an innovative zero-waste compostable diaper that is good for your baby and good for the environment. Made from renewable plant-based materials and covered with biofilm, Eenee Nappies are environmentally friendly as well as being super absorbent, breathable and waterproof. They're so good they won a Keep Australia Beautiful Award for Environmental Innovation. Why wasn't this invented sooner?
www.eenee.com



New breath for old blowers

Now that the 2010 Football World Cup is over, what is one to do with the thousands upon thousands of vuvuzelas that trumpeted throughout the tournament? WoZela, an online competition, set out to discover ways to re-use or recycle vuvuzelas — in designs that could be produced by local artisans in order to benefit the community. Out of 100 submissions, the winning entry was a design for big colourful earrings consisting of cross-sections of the long, hollow horn. It narrowly beat other concepts such as Christmas trees, toilet-paper holders, and lamps.
<http://wozela.wordpress.com/>

Carbon-neutral cladding

Polli Bricks is an environmentally friendly and practically sound form of architectural cladding. It is the world's first scalable carbon-neutral recycled polymer cladding and is 100 per cent re-engineered from recycled plastic bottles. Because it is made from locally recycled plastic bottles, it needs no raw materials and has no transport emissions. Polli Bricks are also very cost effective, being a fraction of the cost of other architectural cladding systems. What is more, the system can be illuminated by in-built solar-powered LED lighting. A neat invention that makes a positive contribution to the green economy — and is one of the winners of the 2010 Earth Awards.
www.theearthawards.org





KAREN ELLEMANN

Minister for Environment,
Denmark



TIME TO TACKLE CHEMICALS



Chemicals are important for developing new and innovative technologies and products that add to economic growth and contribute to human welfare through medicines and other useful goods — and the chemicals industry is an important and rapidly growing economic sector.

Yet, at the same time, they affect the state of ecosystems, human health and development — including the achievement of the Millennium Development Goals on poverty, health and environmental sustainability by the year 2015. Mercury in soap, endocrine disruptors in consumer products, persistent organic pollutants in clothes are just a few examples on how chemicals are everywhere. More than 100,000 different chemical substances exist, and we are all exposed to a chemical cocktail in our daily lives.

At the 2002 World Summit in Johannesburg, the world adopted the target that, by 2020, chemicals are to be produced and used in ways that lead to the minimization of significant adverse effects on the environment and on human health. So how are we doing? What are our recent achievements? Do we have the necessary framework in place? And how do we ensure that we can react in an effective and efficient manner to new challenges?

Last year's UNEP Governing Council took a milestone decision in the pursuit of effective regulation on mercury — to start negotiations on a legally binding instrument. Mercury has been of global concern for a long time, especially since the tragic pollution of Minamata Bay in Japan, when a whole community suffered the consequences of high exposure. For Denmark and the other Nordic countries, troubling findings of mercury in the Arctic underscored the problem. Mercury ends up in humans and animals in the region even though it has no production and very limited emissions of the toxic metal. Not surprisingly, Japan and the Nordic countries are

amongst the warmest proponents of global regulation on mercury: this is reflected in the Nordic Council of Ministers' financing of the first Intergovernmental Negotiation Committee (INC) meeting in Stockholm in June 2010 and Japan's funding of the second meeting in Chiba in January this year. I hope and expect that the negotiations will be finalised as planned in 2013. Denmark, which will have the Presidency of the Council of the European Union in Spring 2012 during INC 4 will do its utmost to contribute to that.

The Mercury Convention will complement other global chemicals and hazardous waste conventions which — with the 2006 global chemicals strategy, Strategic Approach to International Chemicals (SAICM) — are key cornerstones for sound chemicals management. SAICM can play a central role. It has a multi stakeholder approach that involves the private sector and encompasses issues of health, environment and worker safety, and can address emerging issues. But it is not a legally binding instrument and at present does not have the support it deserves and needs.

Developments and new knowledge continuously challenge us and show our regulatory regimes to be inadequate. The combined effects from exposure to multiple chemicals are troubling. Combined exposure to endocrine disrupting substances, for example, can cause serious adverse effects at doses where no effects are observed for individual ones. It is no longer a question of whether or not the combination effects of chemicals are relevant in risk assessment — the question is how legislation should address these concerns most appropriately.

Denmark recently conducted a study on the typical combined

exposure for two-year olds. It showed frequent exposure to many different chemicals, mainly through food and indoor air but also through lotions like moisturisers and sunscreens. We decided to act on the findings in a precautionary manner and launched a campaign in 2009 targeting parents with advice on how to minimize the exposure of children through relatively simple measures.

“Improving international chemicals governance needs to be a continuous process that keeps up with the developments in production, consumption and knowledge.”

Though important agreements like SAICM and some conventions are in place — and a new mercury convention is underway — they will not be sufficient. The Stockholm Convention regulates production and use of chemicals, but is limited to persistent organic pollutants. We need a broader regulatory framework for other types of chemicals to deal with future challenges.

The decision in February 2010 — through the “synergies process” — to bring closely together three chemicals and waste conventions (Stockholm, Rotterdam and Basel), was a successful step in the right direction of better coordination and cooperation. The first initiative that successfully contributed to improving international environmental governance from inside the system, the decision helped streamline international chemicals governance and make it more effective

and transparent for governments, businesses and the public.

But we must not stop here. Improving international chemicals governance needs to be a continuous process that keeps up with the developments in production, consumption and knowledge. In our present and future work on new instruments, we must do our best to make them future proof. We must avoid starting from scratch every time there is a need for international action. The agreements or structures we adopt in the future should be designed to make them usable for a wider range of chemicals and type of measures. Of course, any new regulation will still need to be agreed upon in a manner agreeable to all countries as it is today.

Flexible structures that recognize the obvious fact that new initiatives are likely to become relevant in the future will be the best approach, for example, in the negotiations on the mercury convention.

A strengthened regime can only be achieved if we can raise awareness and specific knowledge on how closely chemicals are intertwined in all aspects of sustainable development. I therefore welcome UNEP's preparation of a Global Chemicals Outlook, exploring such aspects as the costs of inaction, as well as Green or sustainable chemistry and Green growth. I hope the Global Chemicals Outlook will help raise awareness, and thereby gain support, from governments, the business sector and other stakeholders. This is absolutely essential if the benefits of chemicals are to be reaped without compromising health and the environment.

The United Nations has declared 2011 the International Year of Chemistry and many meetings related to chemicals management will take place during these twelve months. It is now time to tackle chemicals.



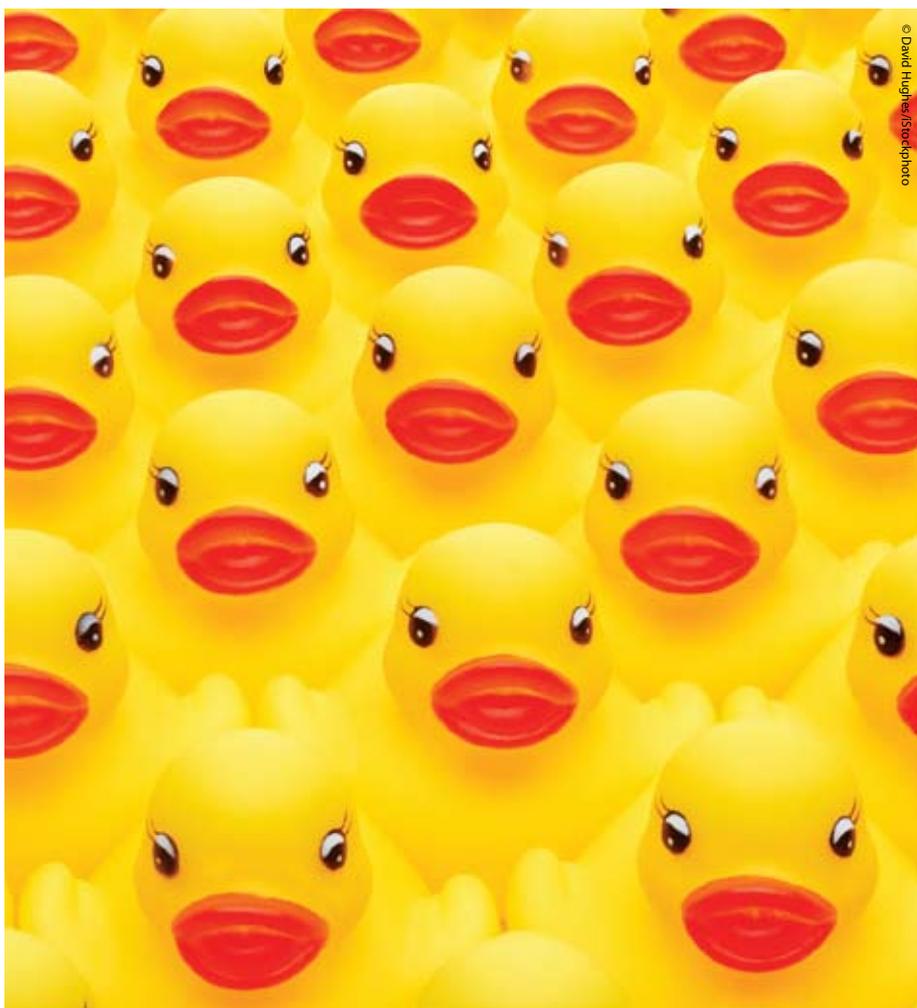
MAANEE LEE

Minister of Environment,
Republic of Korea

Borrowing the future

One day, repeating to myself the title, “Our Planet”, I looked up at the night sky. Scientists say it takes several, even thousands of years, for starlight to reach our planet Earth. The twinkling stars we now see may have already disappeared. Like starlight taking a long time to reach us, the long dormant consequences of environmental factors can often suddenly appear.

This is true of chemicals. They have been a major driving force behind industrial development and much-improved human well-being — but quite a few have become a threat. DDT (Dichloro-Diphenyl-Trichloroethane), for instance, was hailed in the 1940s as a miraculous insecticide and its discovery was rewarded with the Nobel Prize. But it was banned after thirty years of use after its negative impact on the environment, bioaccumulation and other side effects were revealed. So the chemicals of today cannot simply be praised for the convenience they bring to us: they can be like a black box, possibly containing negative secrets.



Given their potential toxicity, their efficacy must be raised and their hazards reduced through chemicals safety management. The 2002 World Summit on Sustainable Development resolved on assessing and managing hazardous chemicals sustainably in compliance with the precautionary principle and considering the safety of future generations, with the goal of using and producing them by 2020 in ways that do not lead to significant adverse effects on human health and the environment.

In accordance with such global efforts, many governments are shifting toward management policies based on the precautionary principle in a bid to assess the hazards and risks of all chemicals in use, and to restrict or ban those with negative impacts on the human body or ecosystems. The EU's REACH (Registration, Evaluation, Authorisation and Restriction of

Chemical substances), which came into effect in June 2007, has taken the lead. Japan, China and many other countries have also institutionalized precautionary regulations for using hazardous chemicals in industrial raw materials or products.

The Korean Government intends to expand the range of its management from around 4,000 new chemicals to all 40,000 or so in use, advancing existing hazards management to a long-term risk management system where the effects on future generations are considered. To lay a legal foundation, it is planning to enact the 'Act on Registration, Evaluation and Restriction of Chemicals' this year.

Recognizing that children are most vulnerable to dangers from chemicals, the government has focused on protecting their health. A

“A comprehensive strategy for children’s environmental health declared in 2006 sets out the environmental safety management standards to ensure that there is no use of hazardous substances, such as lead and arsenic, in such places as playgrounds, child-care facilities and schools.”

comprehensive strategy for children’s environmental health declared in 2006 sets out the environmental safety management standards to ensure that there is no use of hazardous substances such as lead and arsenic in such places as playgrounds, child-care facilities and schools. The strategy also stipulates that there should be hazards assessments to protect health from hazardous materials like heavy metals and phthalates found in such children’s products as baby goods, stationeries and toys: highly hazardous goods for children are to be banned from production, distribution and use. The third WHO International Conference on Children’s Health and the Environment — held in Korea in 2009 with attendees from 54 different countries — helped strengthen awareness on hazardous chemicals’ impact on children and on assessing them. It adopted the Busan Declaration, recommending that information on impacts on children’s health should be included in national action environmental health plans.

Responses to imminent threats follow instinct: those to potential ones depend on reason. We, as members of the global society, should join in sustainably managing chemicals so that they really benefit future generations. Just as starlight may take a hundred years to reach the Earth, the present we live in is borrowed from them.

Chemistry

as nature does it



NANCY JACKSON

President,
American Chemical Society

© Michał Puzewski/Stockphoto

“Green chemistry”, says Dr John Warner, “is the science and innovation of creating a material that has a minimal impact on human health and the environment”. One of the world’s leading experts in the field, he adds that it requires “the chemist to consider the downstream implications related to toxicity and environmental impact.”

The founder of the Warner Babcock Institute for Green Chemistry, Dr Warner and fellow chemist Paul Anastas — the assistant adminis-

trator of the US Environmental Protection Agency’s (USEPA) Office of Research and Development — outlined twelve key principles in their seminal book *Green Chemistry: Theory and Practice*. Chief among them is the premise that it is better to prevent waste than to treat or clean it up after it has been created.

The principles call for the design and use of safer and more energy-efficient chemicals, solvents, and chemical synthesis, and recommends

that products be designed for degradation so that at the end of their function they break down into innocuous substances and do not persist in the environment.

Put it simply, green chemistry, also called sustainable chemistry, is akin to working in the same way as Mother Nature. In nature chemistry is carried out at ambient temperatures and ambient pressures using available renewable resources: photosynthesis is a prime example. There is intense global interest.

The American Chemical Society's (ACS) Green Chemistry Institute aims to enable and catalyze its implementation — and that of green engineering — into all aspects of the global chemical enterprise. Working with industry, educators and students, it has 25 international chapter affiliates helping promote green chemistry through educational outreach in their countries.

When I attend chemistry conferences, particularly in the developing world, it is obvious that there is a strong interest in green chemistry everywhere. My travels and collaborations with colleagues in Southeast Asia, the Middle East, and North Africa always include discussions about educating students in it and a desire to work together in research in this area. Professors know that students are drawn to study chemistry by a wish to create a sustainable future. Green chemistry is a tool for sustainable development, the most important and popular goal of the chemists I have met in developing countries.

Professor Joseph M.D. Fortunak from Howard University in Washington, D.C. described in the *Tropical Journal of Pharmaceutical Research* how a professor from Kenya's Moi University told a workshop in Johannesburg: "Green chemistry is a good idea. But Africa has many burdens, including poverty, war, and the epidemics of HIV, malaria, and tuberculosis. Green chemistry is a priority only if it helps address these issues." His response was to "propose that the strongest justification for green chemistry in Africa is precisely the opportunity to address the differences between rich and poor in access to technology and creating sustainable economic development."

The problems green chemistry can address affect every person on our planet. It has the potential to allow us to protect Earth's environment and the health of its inhabitants and help us preserve its precious and dwindling natural resources. It can help create a global sustainable economy and is a necessary tool for achieving the U.N. Millennium Goals.

The 1990 Pollution Prevention Act is viewed as the catalyst for green chemistry in the United States. The USEPA launched a Green Chemistry Program shortly after it passed, and is a longstanding partner of the ACS Green Chemistry Institute in promoting the practice and its principles.

Each year, the US EPA presents its prestigious Presidential Green Chemistry Challenge Awards to recognize and promote innovative chemical technologies that prevent pollution and have broad applicability in industry. Last year one went to Clarke, a global company which focuses on mosquito control, which developed a way to encapsulate spinosad — an environmentally safe pesticide that is not normally stable in water — in a plaster matrix: this allowed it to be released slowly in water and control mosquito larvae, a huge concern in places such as Africa where malaria is ever-present. The new product, Natular™, does not persist in the environment and is not toxic to wildlife.

Many of the awards are for pharmaceutical work. Last year Merck and Codexis were recognized for the green synthesis of sitagliptin — the active ingredient in Januvia™, a treatment for type 2 diabetes — through a process that

"Green chemistry

is a good idea.

But Africa has many burdens,

including poverty, war,

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malaria, and tuberculosis.

Green chemistry is a priority only

if it helps address these issues."

reduces waste, improves yield and safety, and eliminates the need for metal catalysts.

Green chemistry has seen great progress in the past 20 years and scientists are continuing to look for ways to incorporate it into their research. Industry leaders are responding to consumers' demands for products and manufacturing processes with less impact on the environment and human health. And government leaders are hearing from citizens who expect them to take strong action against companies that produce unnecessarily hazardous materials and byproducts.

Will this groundswell of public support continue? There is no doubt that green chemistry is critical to the sustainability of our planet and key to environmentally responsible progress for all its citizens. As Dr. Paul Anastas, who is also a former director of the ACS Green Chemistry Institute, puts it: "Everybody wins with green chemistry. We can have a vibrant economy and a healthier environment because of the use and development of innovative and sustainable technologies." That will be true for years to come.

I hope that in 2011, the International Year of Chemistry, even more public attention can be focused on the vitality and value of green chemistry and its potential to benefit both present and future generations.

PASSING THE POISONOUS PARCEL



PRITI MAHESH

Project Manager Toxics Link, India



11 a.m.: In a small room in the bylanes of Silampur in East Delhi, Aslam is busy breaking open computers. He's been doing this work for years at this recycling hub and knows exactly which parts are valuable and need to be separated. His tools are at hand; hammer, screwdriver, pliers and blowtorch.

He shares this 6 feet by 8 feet workplace with three other teenage boys. They work 10 hours a day, for a meagre US\$3-5 each. Aslam's friend Sabir is using a blowtorch to

remove the so-called 'jewels' (such as capacitors and integrated circuits) from the circuit boards. The small, poorly ventilated room immediately fills up with fumes, making the boys uncomfortable, but they wipe their eyes and carry on. They know these fumes. They inhale them everyday. What they don't know is that they contain lead, a poison that is permanently damaging their lungs and kidneys.

4 p.m.: In Tilla Shabazpur, a small village on the Delhi-Uttar Pradesh

border, Suresh is busy trying to extract precious metals from printed circuit boards, using chemical poisons like concentrated nitric and sulphuric acid, caustic soda, mercury and arsenic. His wife Kajal works in the same unit and, with a couple of other women, is scraping paint off circuit boards that have been dipped in caustic soda solution for a few hours. Her hands are a chequered map of cuts and bruises, from prolonged metal scraping and caustic soda exposure. Her back hurts from the bent posture she's

“Low-cost, poor working conditions and cheap labour makes recycling a lucrative business: no one accounts for the environmental or health costs involved.”

been holding for long hours every day. The couple’s two children, aged 3 and 4, are playing within this informal recycling junkyard, strewn with drums filled with acid, caustic soda and waste. The family has no idea of the toll that the chemical cocktail inhalation they inhale every day is taking on their health and vital organs.

This is the daily story not just of Aslam, Shabir, Suresh, Kajal and their families, but of thousands like them working around India. More than a hundred thousand people are employed in these informal junkyards, mainly concentrated in and around large cities. Men, women and children, spend 10 to 12 hours a day in this toxic environment, trying to salvage components or

materials from discarded Electronic and Electrical waste (E-waste), with little or no knowledge of the hazards hidden in such junked equipment as computers, televisions and mobile phones. And lead, mercury, cadmium and chromium, BFRs (flame retardants used in plastic) and other harmful substances — all present in E-waste — contaminate the environment as well as jeopardise health.

Around 50 million tonnes of E-waste are generated worldwide each year, the larger share in the developed nations of Europe and North America. Growing economies like India and China produce relatively small amounts now, although this is expected to grow manifold in the next few years. They are also hugely concerned about illegal dumping. In all, it is estimated that as much as a third of all E-waste generated in EU countries and the United States ends up on their shores by legal or illegal means.

In India, it is mainly processed by people like Aslam and Suresh — predominately migrants to cities like Delhi, Mumbai, Bangalore and Kolkata, in search of livelihoods. The rudimentary recovery processes include physical breaking and segregating hazardous components, open burning, and melting and heating lead and mercury-laden components. Residues and effluents are released into open drains or nearby vacant land, leading to water and soil contamination. The large

numbers of women and children engaged in these activities are even more vulnerable to exposure. Low-cost, poor working conditions and cheap labour makes recycling a lucrative business: no one accounts for the environmental or health costs involved.

The main reason for such unsound domestic waste management practice is the absence of a clear and well-enforced E-waste policy: domestic electronics and electricals producers are able to shy away from taking any responsibility for the toxic waste that they have a clear role in creating. This is also responsible for the illegal imports of E-waste into India and for the cross-border dumping often carried out in the garb of charity and under the guise of bridging the ‘digital divide’ between developed and developing nations.

The picture is certainly bleak, but there are some grounds for hope. Civil society organizations have been campaigning hard on two fronts; to put an end to the cross-border toxic trade, and to introduce extended producer responsibility — under which producers are made responsible for their products right to the end of their lives — so that E-waste is better managed in India. But until these initiatives bear fruit, the brunt of this onslaught will continue to be borne by the environment and the vulnerable segments of our society, labouring away in the dark alleys of E-waste recycling.

▼ *Melting lead, Moradabad, India*



UNEP at work

UNEP undertakes a wide range of activities in promoting and facilitating the development and uptake of clean technology. Here are a couple of recent examples. For further examples of UNEP's climate change work visit: www.unep.org/unite/30Ways



New legal weapon to combat Caribbean marine pollution

The Caribbean Sea is a natural resource of great importance. It is home to a diverse population of species, it supports tourism, fisheries, transportation, trade and recreation, and forms the lifeblood of Caribbean Small Island Developing States.

Alas, its fragile, vulnerable coastal and marine ecosystems are under threat from human activities. Over 80 per cent of the Caribbean Sea's pollution originates from land-based sources, and over 75 per cent of domestic wastewater enters the Sea untreated.

Since 1992, UNEP has facilitated discussions between Governments and regional experts to address these problems. As a result, in 1983, 28 countries adopted the only legally binding regional agreement for the protection and development of the marine environment in the Wider Caribbean Region – the Cartagena Convention. The Convention's three technical protocols promote biodiversity conservation, oil spills prevention and reducing land-based sources of pollution.

The Protocol Concerning Pollution from Land-Based Sources and Activities (LBS Protocol), adopted in 1999, is considered by many to be the most significant agreement of its kind – it establishes regional effluent limitations for domestic water and requires countries to institute national plans to address non-point sources of pollution. The LBS Protocol formally entered into force in 2010.

The Protocol has already catalysed the development and implementation of several national and regional projects on integrated management of watersheds and coastal areas, reducing pesticide run-off in Central America, and developing a prototype regional fund for wastewater management.

This work has been led by the Caribbean Environment Programme and Convention Secretariat, which come under the auspices of UNEP's Regional Seas Programme.

www.cep.unep.org



NOWPAP – Aiming for a litter-free north-west Pacific

The northwest Pacific region features coastal and island ecosystems with spectacular marine life and commercially important fishing resources. The region is also one of the most densely populated parts of the world, resulting in enormous pressures and demands on the environment.

The wise use, development and management of the marine and coastal environment in this important region is at the heart of UNEP's North-west Pacific Action Plan (NOWPAP). The Plan aims to secure the region's sustainability for future generations while achieving long-term benefits for the human populations living there.

Addressing marine litter is one of NOWPAP's key initiatives. In 2005 NOWPAP commenced its Marine Litter Activity, which resulted in the development of a Regional Action Plan on Marine Litter. Since 2008 the implementation of this action plan has been underway in cooperation with local Governments and authorities and other partners.

The marine litter activities have created a positive impact in the region by building awareness and prompting actions to address marine litter in the NOWPAP member countries. Results include improved national legislation, establishment of national marine litter programmes, the implementation of international coastal cleanup campaigns and workshops, development of guidelines and technical reports on preventing and collecting marine litter, and the establishment of a monitoring database.

NOWPAP, the full name of which is The Action Plan for the Protection, Management and Development of the Marine and Coastal Environment of the North-west Pacific Region was adopted in 1994 as a part of Regional Seas Programme, and it contributes to one of UNEP's signature initiatives, the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities.

<http://www.nowpap.org/>



Turning the toxic tide

It is one of the first rules that you learn as a child: if you make a mess you need to clean it up. Later in life we learn that it is better to never make a mess at all. These lessons apply to E-waste — the leftovers from electronic and electrical equipment — globally one of the fastest growing types of hazardous waste.

UNEP has estimated that upwards of 40 million tonnes of E-waste are generated worldwide every



KUMI NAIDOO
.....
Executive Director,
Greenpeace International

year. But it doesn't have to be this way — not if policy-makers, responsible manufacturers and

informed consumers join together to solve the problem.

E-waste is classified as hazardous waste due to the many toxic ingredients it contains — including heavy metals and harmful, persistent chemicals — with the potential to pollute the environment and damage human health when it is processed, recycled or disposed of. It affects most acutely populations in developing countries, where people

are exposed to toxic chemicals from E-waste dumped near their homes.

For the past five years Greenpeace has campaigned around the globe to press leading electronic companies and policy-makers to turn back this toxic tide. The campaign has been very effective and we are seeing remarkable progress, but there is a lot still to do to safeguard communities.

The problem is being addressed through two tracks: legislation and company policy. The European Union, Japan, South Korea, Taiwan and several US and Canadian states have introduced laws making producers responsible for their products at the end of their lives. Similar legislation is being developed in some non-OECD countries, including China, India, Thailand and Argentina. We need less talk and more action from governments on this vital issue.

The EU implemented legislation on Restriction of Hazardous Substances (RoHS) in July 2006. This bans the use of some substances in electrical and electronic products to facilitate safer recycling, but did not address the use of PVC plastic or that of all brominated flame retardants (BFRs) in electronics. Both are a major source of chemical byproducts from discarded electronics, and RoHS must be strengthened to phase them out. Most recycling and disposal takes place in developing nations where there is no safe infrastructure and little to no worker and environmental protection laws.

That same year, Greenpeace developed a strategy to change the consumer electronics sector from the inside out. We decided to use

“UNEP has estimated that upwards of 40 million tonnes of E-waste are generated worldwide every year. But it doesn’t have to be this way — not if policy-makers, responsible manufacturers and informed consumers join together to solve the problem.”

its competitiveness to get leading brands to vie with each other to produce the greenest products — and to inform consumers about which companies scored the best.

We used our Guide to Greener Electronics, a quarterly report card for the consumer electronics industry. The initial results of the first Guide were hardly inspiring: the biggest names in electronics failed their first global exam on their green credentials. Only Dell and Nokia achieved a barely respectable score, while Apple, Motorola and Lenovo finished at the bottom of the class.

We therefore launched a Green My Apple campaign. Enthusiasts around the globe made it clear that while they loved their Macs, they wanted them to be available in green. The firm eventually listened to its customers and set out to change its products.

The 16th edition of our Guide was published in October, and we see strong evidence for many of the types of the transformative change we hoped for when we began our campaign. We are now witnessing

a real race to the top. Apple, Nokia and Sony Ericsson have begun to phase out the most toxic substances from their products, and — eager to not fall behind — other companies have begun to follow their lead, sometimes with a bit of friendly encouragement from Greenpeace.

Now, many companies, including Acer, Hewlett Packard, Philips and the Indian firms Wipro and HCL are offering smart phones, computers, monitors and televisions which are free of the most toxic chemicals, including PVC plastic and BFRs.

There are similar gains in product energy efficiency, and in companies embracing the concept of final responsibility for their products by offering more opportunities for them to be taken back, conveniently and without charge. This is especially crucial in areas outside the EU that do not yet have E-waste collection laws.

We have continued to expose illegal E-waste shipments and pushed for stronger laws in the EU, India, and the Americas. Our supporters have joined the chorus for change — as have allied organisations around the globe.

While there is still plenty of room for improvement — most importantly in making longer lasting products and protecting the health and safety of electronics workers — campaigners and the electronics industry are in many ways no longer that far apart. Governments now need to catch up and do their part to safeguard vulnerable communities. Until the problem is solved, Greenpeace will continue to push both corporate boardrooms and global capitals for a rapid end to E-waste pollution.

message on a bottle



DAVID DE ROTHSCHILD

Founder,
Adventure Ecology

We are placing an ever-growing, devastating set of plastic fingerprints on our natural world. Every single molecule of plastic ever manufactured — except for a very small percentage that has been incinerated — still exists somewhere in our environment. Most apparent and shocking is the plastic waste now scattered across the surfaces and depths of our planet's oceans.

For me the reality of the situation kicked-in back in 2006 when I came across a UNEP publication: "Ecosystems and Biodiversity in Deep Waters and High Seas." The report pointed out that there were

46,000 pieces of floating marine debris on or below every square mile of our ocean, with the problem particularly acute in certain areas. The most notorious — labelled the "Eastern Garbage Patch" — is a swirling gyre in the North Pacific twice the size of Texas, where researchers found six pounds of plastic litter for every pound of plankton. This and four other enormous gyres of swirling trash cover approximately 40 percent of our planet's surface.

As much as 90 to 95 percent of the total amount of marine debris is plastic, which, unlike organic compounds, doesn't biodegrade.



Plastic is impervious to enzymatic breakdown and literally jams up the code of nature. The very durability that renders it so useful to humans also makes it incredibly harmful to all natural life cycles in every ecosystem worldwide, it has a double effect on fish, marine mammals and birds.

First is ingestion of plastic, as by the majestic and now endangered albatross. The Laysan Albatrosses that nest on Kure Atoll and Oahu Hawaii get it worst. Researcher Lindsay Young of the University of Hawaii found “so many small plastic toys in the birds from Kure Atoll...that we could have assembled a complete nativity scene with them.” Almost half of the 500,000 albatross chicks born every year on Midway are thought to die from consuming plastic fed to them by their parents. One was found to have 306 pieces of plastic in its belly.

The second major issue, toxicity transference, is even more ominous. Plastic photo-degrades in the open

ocean, beginning to breakdown into simpler compounds without ever actually disappearing. The resulting tiny pellets — called nurdles or ‘mermaid tears’ — sponge up fat-soluble compounds like PCBs, DDT, and a host of herbicides and pesticides present in diluted quantities in the ocean. Plastics also have a nasty affinity for oil.

Small amounts of these chemicals work their way up the food chain from filter feeders through to the fish fingers on the kitchen table. So, all over the world, children and adults are unwittingly exposing themselves to low levels of toxicity.

Plastic and other marine debris is also smothering beaches — especially those in the path of a swirling garbage patch. Currents that drag rubbish into the gyres also shoot it out. The 19 islands of the Hawaiian archipelago, for instance, receive massive quantities of trash, some of it decades old. Some beaches are buried under 5 to 10 feet of refuse: others are riddled with fine granules of “plastic sand.”

“If we can shift the perception of plastic from waste to a valuable resource we can slow, and in some places even reverse, the environmental damage.”



© Sergey Kamskiy/Shutterstock



© The Plastiki

In October 2006 the US government established the Northwestern Hawaiian Islands Marine Monument to try to quell the rising tide of debris. Congress passed legislation to increase funding for trash removal and ordered several government agencies to expand cleanup efforts.

Yet people studying the issue point to an overall lack of viable solutions. Trawling the oceans for trash would be impractical and costly and would ultimately harm plankton and other marine life. Cleaning up the north Pacific gyre alone would involve clearing a section of ocean spanning the area of a continent and extending 100 feet below the surface. Managing the waste on land, where fully 80 percent of ocean debris originate, is more feasible and exponentially more effective.

But it doesn't have to be this way. If we can shift the perception of plastic from waste to a valuable resource we can slow, and in some places even reverse, the environmental damage. Meeting this challenge can be an adventure — an honest-to-goodness, swashbuckling adventure like the Plastiki voyage across the Pacific last year on a boat made of 12,500 discarded plastic bottles.

The Plastiki expedition tried to focus on more than the destination. Our journey and viewpoint created a platform for smart thinking — and a place where everyone acknowledged nobody is as smart as everybody. We strove to cultivate a community of thought leaders, designers, engineers, and scientists that recognized their role as being part of a holistic system in which

every individual action creates a reaction — and realised that we need to stop and realise the devastating impact of our ever-increasing human fingerprints.

Together is the only way we can move forward and create the necessary solutions for our oceans and our planet — so we can stop apologizing to the million sea birds and 100,000 marine mammals unnecessarily killed, and to the children already asking why no-one is reacting.

For some this will mean lobbying companies and communities to find alternatives to plastic packaging. Or it might entail getting governments to expand recycling programs and accommodate bio-plastics in the market place.

But the Plastiki looked to inspire a sea change, if you will, in how we view waste and integrate it back into the web of life. This starts with recognizing there isn't a place called 'away,' and involves nurturing and directing inquisitiveness toward inventing smart ways to design and use everyday materials. We took the plastic bottle, which symbolizes what's wrong with dumb thinking, and turned it into a platform of hope by showing it can be an effective and useful resource.

The Plastiki was not just about voicing of problems, but about articulating and acting upon solutions. If a plastic bottle can become a boat, and that boat can forge its way into the collective imagination of people everywhere, then who knows what else is possible with a little curiosity, imagination, and time to innovate. One day, maybe, we could dream for more than just the survival of our oceans.

www.theplastiki.com

awards and events

2011 INTERNATIONAL YEAR OF FORESTS



The United Nations General Assembly proclaimed 2011 the International Year of Forests (IYF). The IYF is a unique opportunity to increase public awareness of the key role of forests and sustainable forest management in building a greener, more equitable, sustainable future. The official launch of the Year took place at United Nations Headquarters during the 9th session of the United Nations Forum on Forests in January. For more information about IYF and UNEP's activities, see

www.un.org/forests/

NAGOYA PROTOCOL

In late 2010, after close to 20 years of discussion and debate, Governments from across the globe agreed to a new treaty to manage the world's economically central genetic resources in a far fairer and more systematic way. The approval to establish an International Regime on Access and Benefit Sharing of Genetic Resources (ABS) came on the last day of the Convention on Biological Diversity meeting in October in Nagoya, Japan. The treaty, lays down basic ground rules on how nations cooperate in obtaining genetic resources from animals, plants and fungi.

www.cbd.int



Convention on
Biological Diversity

THE EARTH AWARDS 2010

A revolutionary artificial foam that captures and converts the sun's energy more effectively than living organisms — and is a means of making biofuel — was the grand prize winner of The Earth Awards 2010. Other category winners included: Earth Tiles, which empower people in the world's poorest and most remote areas to build their own sustainable homes with natural resources; and Polli Bricks, a cost-effective form of cladding, which is the world's first scalable carbon-neutral recycled polymer architectural cladding, 100 per cent re-engineered from recycled plastic bottles. The Earth Awards encourage designers, innovators and consumers to find new ways to build a new economy.

www.theearthawards.org



ARISTOTLE ONASSIS INTERNATIONAL PRIZE FOR THE PROTECTION OF THE ENVIRONMENT 2010



Friends of the Earth Middle East (FoEME) is the winner of the inaugural Onassis Prize for the Protection of the Environment. FoEME was awarded the 250,000 euro prize in November for its longstanding work in maintaining the River Jordan as a vital natural resource for all people living within the borders of Israel, Palestine and Jordan, and for contributing to the understanding between peoples in this sensitive area. The Onassis prize is a new biannual award for outstanding contributions towards protecting and improving the environment, including sustainable use of energy.

www.onassis.gr

THE 5TH INTERNATIONAL MARINE DEBRIS CONFERENCE



This conference took place from 20 to 25 March, 2011, in Honolulu, Hawai'i, bringing together 440 participants representing some 38 countries. Conference participants — researchers, natural resource managers, policymakers, industry representatives, and the non-governmental community — refined and endorsed by acclamation the Honolulu Commitment, which outlines 12 actions to reduce marine debris. Participants and a group of rapporteurs also worked

to revise the Honolulu Strategy, a framework strategy to prevent, reduce, and manage marine debris. The conference was co-organized by The U.S. National Oceanic and Atmospheric Administration and UNEP and allowed sharing of strategies and best practices to assess, reduce and prevent the impacts of marine debris through workshops, field trips, technical and policy sessions, poster presentations, and panel discussions.

<http://www.5imdc.org/>

SEED AWARDS 2010



A novel solar device that turns waste heat into electricity in rural China, a Ugandan business that manufactures stationery from agricultural waste, a bamboo bicycle project in Ghana and a South African hand-held laundry device that saves water are among the 30 winners of the 2010 SEED Awards. The SEED Awards recognize inspiring social and environmental entrepreneurs whose businesses can help meet sustainable development challenges. By helping entrepreneurs to scale-up their activities, the SEED Initiative, hosted by UNEP, aims to boost local economies and tackle poverty, while promoting the sustainable use of resources and ecosystems.



www.seedinit.org



BEWARE MERMAID'S TEARS

© Science Faction/Corbis

About 70 per cent of the surface of our planet is ocean. We depend on it to regulate the climate, as a source of food, for transport, and as a place to enjoy, especially along the coast. We have also tended to regard it as a convenient place to dispose of our unwanted waste. The type of waste we produce, and the way in which we dispose of it, reflect a combination of technological advances, the increasing demands of a growing population, economic growth and attitudes towards stewardship of the environment. The acute impacts of such marine pollution are relatively easy to demonstrate, but longer-term or more chronic effects — such as those caused by plastic debris, micro-plastic particles and the contaminants they may carry — can be very difficult to identify and quantify.

Plastics began being produced at an increasingly industrial scale midway through the 20th century, and scientists began reporting the spread of plastic debris in the oceans from the early 1970s. Many plastics are buoyant and very durable, and their debris is common on coastlines worldwide. Several assessments by UNEP and others — and many local and international beach ‘clean-up’ campaigns — have helped raise awareness of the problem and reduced local impacts, for a time.



PETER JOHN KERSHAW

Principal Research Scientist, Environment & Ecosystems, Centre for Environment, Fisheries and Aquaculture Science, Lowestoft, UK

Plastic, including discarded or lost fishing gear, threatens marine life, and much discarded plastic ends up on the seabed. There have also been media reports of mid-ocean ‘garbage patches’ and ‘floating islands’ of plastic debris, ‘as big as Texas’ or ‘twice the size of France’. Most of this debris consists of relatively small fragments, or micro-plastics, distributed through the upper few metres of the ocean, concentrated in five regions known as convergence zones or ocean gyres, as a result of known oceanographic processes.

It is generally assumed that the problem is increasing, but we lack reliable and comprehensive estimates of the material’s sources, quantities, distribution, fate and effects. Some of the most comprehensive studies have indicated no change in the quantities of debris in the ocean surface, but we are largely ignorant of the eventual fate of what enters the ocean every year.

Micro-plastics — defined as any plastic particle less than 5mm in diameter, which can readily be ingested by an organism — mostly arise from the breakdown of larger fragments. Others consist of plastic resin pellets — used as a raw material in the plastics industry, and sometimes referred to as ‘Mermaid’s Tears’ when found on the beach — which reach the ocean through poor waste management and accidental losses in transport. Industry moves to reduce these have been partially successful, but the pellets already released will persist for many years to come. A third, more recent, source arises from the use of plastic micro — and nano — particles in such products as toothpaste and hand cleaners, which are not retained by wastewater treatment so end up in the ocean.

Particles may damage or block an animal’s digestive tract or other organs, depending on its lifestyle and the quantities involved. Even more worryingly plastics can absorb persistent organic pollutants (POPs), such as PCBs and DDT, concentrating them by up to a million times before being ingested. And nano-sized particles can cross cell membranes and may have additional impacts, though this is an issue of great scientific uncertainty.

There are many different types of plastic but only a limited number are produced in very large quantities: polyethylene, polypropylene, polyvinyl chloride, polystyrene, polyamide (nylon) and polyethylene terephthalate (PET), used for the ubiquitous soft drinks bottles. Per capita use of plastic is predicted to reach 140 kg per year in North America and Europe, and 36 kg per year in Asia by 2015.

There have many advantages for the change. Switching from glass to plastic food containers, for example, or using a greater proportion of plastic in cars and planes, reduces emissions of CO₂ from transport. Life-cycle analysis shows that plastic single-use shopping bags can have a lower environmental impact than paper ones, in terms of energy and resource use. But, while a paper bag will disintegrate rapidly in seawater, the plastic bag will remain intact for much longer and will pose a threat to sea life. There are many reported examples of turtles, seals and whales dying as a result of ingesting plastic bags, perhaps mistaking them for jelly fish or another food.

'Bio-degradable' plastics, whose use is growing can appear to be greener —

“There are many reported examples of turtles, seals and whales dying as a result of ingesting plastic bags, perhaps mistaking them for jelly fish or another food.”

but the claims can be misleading. In many cases, the plastic will not truly degrade (i.e. reduce to carbon dioxide, methane and water) unless it is subject to the temperature and chemical conditions found in an industrial compostor — quite unlike those in the ocean. Some 'degradable' plastic bags are designed to disintegrate into smaller pieces, which will be just as persistent. Bio-plastic produced from crops, once polymerised, can have the same durable properties as material made from petrochemicals. And promoting so-called 'bio-

degradable' plastics may cause people to show even less willingness to improve waste management. Clear labelling and applying proper testing standards are critical.

Developed countries generally have the technical know-how to manage waste effectively, but there is often a lack of coordination or willingness in local government and industry to bring this about. The results are very patchy, with several European countries recycling or re-using (for example by burning for energy) over 80 per cent of waste plastic while in others the figure is less than 25 per cent. In developing countries, infrastructure is often lacking and managing plastic waste has to compete with other demands for limited resources.

Plastic pollution may gradually become less of a problem if waste is considered a valuable resource — for recycling, re-use or energy generation — and if people accept more personal responsibility for the waste they generate. This would require political commitment and investment — and an integrated approach from politicians, the plastics industry, major users of plastics, retailers, user groups and the general public.



people

VANDANA SHIVA

Philosopher, environmental activist and eco-feminist — a true environmental guru — Dr. Vandana Shiva is highly sought after as an adviser to Governments around the world on environmental matters and defending the developing country poor. She has authored more than 20 books and over 500 papers in leading scientific and technical journals. Among her many notable achievements was the creation in India in 1991 of Navdanya, “Nine seeds”, a national movement to protect the diversity and integrity of living resources, especially native seed, and to promote organic farming and fair trade. Navdanya has a membership of more than 70,000 farmers, and its efforts have resulted in conservation of more than 2,000 rice varieties. She is the recipient of numerous high-profile environment awards, including UNEP’s Global 500 Roll of Honour.

PHILIPPE COUSTEAU

In the footsteps of his legendary grandfather, Captain Jacques-Yves Cousteau, Philippe Cousteau is an indefatigable advocate for the conservation of the Earth’s marine and freshwater environments. He is continuing the work of his father and grandfather in a variety of avenues. He is also the CEO of EarthEcho International, the non-profit organization he founded with his sister to empower youth to take action that restores and protects the planet’s water environments. Mr. Cousteau is a high-profile documentary filmmaker and media presenter. Among many other environmental endeavours, Cousteau serves on several boards — such as the The Ocean Conservancy and Marine Conservation Biology Institute — and is a member of the Smithsonian Institution’s Ocean Initiative Council. In 2009 he was one of the faces fronting UNEP’s Seal the Deal campaign.



POORAN DESAI

“One Planet Living” is the simple, yet powerful concept at the heart of Pooran Desai’s international initiative to make truly sustainable living places around the world. Mr. Desai is CEO of Bioregional, an “entrepreneurial charity” that helps housing developers make “One Planet Communities” places where living and working within a fair share of our planet’s resources is easy, attractive and affordable. Bioregional is a sustainability advisor to property developers throughout the lifetime of a construction project, guiding them on the 10 One Planet principles covering areas such as energy demand and generation, waste, transport, water use, materials, food, equality and heritage. Bioregional started in the United Kingdom and currently has award-winning and endorsed projects in the USA, UK and Portugal, with others emerging in South Africa, China, Australia and Canada.



YUYUN ISMAWATI

For over a decade Yuyun Ismawati and her Indonesian non-governmental organization (NGO), the Bali Fokus Foundation, have worked prolifically on pollution control and prevention and sustainable development issues. In Bali, a premier tourist destination, concerns about over-consumption of natural resources and unregulated waste disposal prompted Ms. Yuyun to pressure major hotels to reduce solid waste and improve their recycling efforts. Her promotion of “green tourism” became a model that has been successfully replicated in several other resort towns. Bali Fokus produced a handbook for eco-auditing hotels, and has conducted a national workshop for NGOs on solid waste management. Ms. Yuyun helped to craft Indonesia’s first-ever bill on waste management and the country’s strategy on climate change issues. She won the Goldman Environmental Prize in 2009.

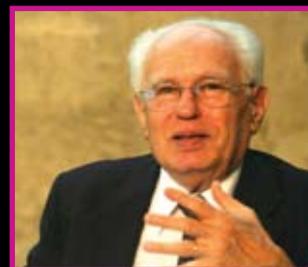


JOCHEN ZEITZ

At the age of 30, Jochen Zeitz was appointed Chairman and CEO of PUMA in 1993 becoming the youngest Chairman in German history to head a public company. As a visionary and a leader in the corporate social responsibility (CSR) movement he introduced an innovative corporate approach in 2008 – PUMAVision. In April 2010, Mr. Zeitz launched a comprehensive sustainability programme aimed at making PUMA the most desirable and sustainable sports lifestyle company. PUMA has a close relationship with UNEP having been the first major sportswear company to join the Climate Neutral Network in 2009, and having been a leading partner in the “Play for Life” campaign to support the 2010 International Year of Biodiversity. In October 2010, he was appointed Chief Sustainability Officer for the PPR Group . Outside his corporate life, Zeitz founded the non-profit Zeitz Foundation which aims to maintain or improve the integrity of ecosystems through the balance of conservation, community, culture and commerce.

ANNA CUMMINS AND MARCUS ERIKSEN

Late last year Anna Cummins and Marcus Eriksen and the crew of the *Sea Dragon* embarked on the first expedition across the southern Atlantic to research plastic pollution. The pair are co-founders of the 5 Gyres Institute, a non-profit organization committed to research and education about marine plastic pollution. The 4,100 mile Rio-to-Cape Town voyage — the latest in a series of expeditions to each of the Earth’s five sub-tropical ocean gyres — found plastic pollution in every one of the 70 surface samples taken. By examining fish they caught along the way, the crew is furthering its research into whether humans are being harmed by eating fish that have ingested plastic debris contaminated with persistent organic pollutants such as DDT and PCBs. The expedition is run in collaboration with the Algalita Marine Research Foundation and Pangaea Explorations. 5 Gyres is a partner in UNEP’s Safe Planet campaign.



FATIMA JIBRELL

Few people have worked as prolifically for grassroots environmental causes as Fatima Jibrell, whose work focuses on organizing women and protecting diminishing natural resources in Somalia. Ms. Jibrell is Executive Director of Horn Relief, which campaigned to reduce Somalia’s illicit and environmentally devastating charcoal trade. She is also the co-founder of the Sun Fire Cooking organization, which has been instrumental in providing solar cookers and training to villagers in rural Somalia; and is the coordinator of the Resource Management Somali Network, which includes environmental groups throughout the Horn of Africa. Her many other accomplishments include reduction of soil erosion through the promotion of rock dams, and speaking out against the degradation of the Somali marine environment. She won the 2002 Goldman Environment prize and the 2008 National Geographic Society Buffett Award for Leadership in African Conservation.

JOSÉ GOLDEMBERG

With Rio+20 on the horizon, it is fitting to acknowledge Professor José Goldemberg, who was the acting Minister of Environment for Brazil in 1992 during the seminal United Nations Conference on Environment and Development held in Rio Janeiro, Professor Goldemberg, a leading expert on energy and environmental issues, has authored many technical papers and books on nuclear physics, the environment and energy, including the acclaimed collaborative work entitled *Energy for a Sustainable World*. He served as Chairman of the Editorial Board (1998-2000) and a lead author of the United Nations Development Programme’s *World Energy Assessment*. Professor Goldemberg has held various ministerial positions with the Brazilian Government and is currently Secretary for the Environment of the State of São Paulo, Brazil.



GWYNNE LYONS

Director, CHEM
(Chemicals, Health and
Environment Monitoring) Trust

Pollutants with passports

Everyone is contaminated with chemicals. They arise from pollution of food and, increasingly in consumer products, from which they can be inhaled, absorbed through the skin, or ingested via hand to mouth contact. Food is the main source of many contaminants, including industrial chemicals that have built up in the food chain, pesticides and those leaching from packaging.

The ability of some contaminants to build up in fat and bio-accumulate up the food-chain means that high concentrations have been found in some foods considered beneficial for health, including oily fish and cod-liver oil. Breast milk is also contaminated, although mothers should be reassured that it remains healthier than bottle feeding.

Thankfully, some progress is being made in reducing the contamination of the food-chain. The Stockholm Convention on Persistent Organic Pollutants is slowly addressing persistent, bio-accumulative and toxic chemicals that travel on air and ocean currents, building up in the food web far from their place of release. Klaus Toepfer, UNEP's former Executive Director, called these pollutants 'travellers without passports'

Contaminants that travel 'with passports', that is those that are used in the formulation of some consumer products, are also a growing safety

issue. They too get transported long distances — in exported products. Every day, tonnes of manufactured goods and crops are loaded onto ships and planes and taken across the globe. Indeed their components may be made in different parts of the world, making it difficult to know what all the constituent chemicals in products may be.

There is, rightly, concern about the potential long-term health effects of cumulative exposure to a plethora of chemicals, especially as babies in the womb are particularly vulnerable. There may be less awareness in developing countries than in developed ones, but hopefully, action taken to safeguard consumers will also protect the health of workers and families in the countries where products and their components originate.

Unsafe consumer products can have tragic consequences, but companies have an interest in safety as recalls are immensely costly, involving setting up systems to take back products and refund customers, damage to the company's reputation, the potential for large fines for breaching safety standards and the costs of possible court cases and compensating customers. Recent examples include the recall by a well-known toy company of plastic toys, sold under major brand

“Every day, tonnes of manufactured goods and crops are loaded onto ships and planes and taken across the globe. Indeed their components may be made in different parts of the world, making it difficult to know what all the constituent chemicals in products may be.”

names, because they were decorated with paint containing lead, a neurotoxicant. Lead in children's jewellery and novelty drinking glasses has also resulted in costly product recalls and such incidents indelibly tarnish the reputations of companies and brand names.



Imported leather sofas containing sachets of the anti-mould chemical, dimethyl fumarate (DMF), added during manufacture, have damaged the health of European consumers. A British court has ordered well known retailers that sold them to pay millions of pounds in compensation to customers who suffered skin rashes, burns and rheumatic pains, while the European Commission has ordered DMF to be banned from consumer products. Other products falling foul of required standards, include imported kitchenware containing such chemicals as the suspected cancer causing substance, formaldehyde.

Exporting companies need to know the legislation in destination countries and astute ones will also keep an eye on likely future legislative developments, because failure to anticipate future regulations can result in companies suddenly losing market share.

In the EU, the current spotlight is on bisphenol A (BPA), which can

leach into food from polycarbonate babies' feeding bottles and food cans. The European Commission has announced a forthcoming ban of polycarbonate babies' bottles, and as more research comes forward legislative controls may spread to cover other BPA-related products. Consumers find out what is happening in other parts of the world via the internet. If there is sufficient concern for the EU to act on BPA, parents elsewhere might well ask whether their children need better protection.

Companies that trade internationally need to be able to react to consumer concerns and legislative changes. They need to have systems in place to track chemicals in their supply chains and to monitor the latest scientific findings about which chemicals cause harm. And corporate sustainability reports should address chemical use alongside energy, recycling and waste in order to keep the issue prominent throughout the company.

Until a chemical is finally banned there will always be at least one company with a vested interest in continuing to use it. So it is perhaps not surprising that industry seldom accepts without a struggle that any particular substance poses risks. And it can use very forceful tactics — including lobbying and recourse to the courts — in its attempts to resist impending regulatory action. Regulators need to be tough to ensure that they do not fail the public, keeping health protection paramount and refusing to bow to industry pressure or bribery.

Science is rarely black and white, so regulatory judgements nearly always have to be based on a weight of evidence. Companies and countries must commit to a precautionary chemicals policy, which acknowledges that action should be taken even when even when the risk is uncertain but there are ominous scientific warning signs. And companies should act responsibly, test their chemicals for safety and replace those most likely to cause harm with safer substitutes.



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verbatim

Li Lina, Peking University graduate and member of YOUNGO, the youth constituency of the United Nations Framework Convention on Climate Change.

“Everything on the Antarctic continent was pretty amazing, and amazingly pretty.”

Marcie Smith, co-chair of SustainUS, climate action youth group, presenting a model to encourage delegates at Cancun to move from quarrelling to cooperation.

“We’re doing this because our future is at stake.”

Graham Slater, the lead author of a study that found polar bears are likely to lose out to grizzly bears in fierce competition for food as climate change drives the two species closer together into shared habitat.

“Things look pretty bleak for the polar bear, if current trends continue.”

Anote Tong, Kiribati President, about the vulnerability of his low-lying country to a rise in ocean levels.

“In some parts of the island you throw a stone and you actually hit the other side of the island, so there is no inland.”

Greenpeace, in a statement after the Nagoya Protocol agreement.

“Alarm bells have been ringing for decades, and developed nations have been hitting the snooze button by delaying both action on and funding for environmental protection.”

Robert Zoellick, President of the World Bank, speaking at the 2010 UN conference on biodiversity.

“For economic ministries in particular, it’s important to have an accounting measure they can use to evaluate not only the economic value but the natural wealth of nations.”

Jim Leape, Director General of WWF International, on the Nagoya Protocol.

“This agreement reaffirms the fundamental need to conserve nature as the very foundation of our economy and our society.”

numbers

1,000,000

Dollars donated by actor Leonardo DiCaprio toward saving tigers from extinction
— Reuters

3,200

Tigers live in the wild, down from 100,000 a century ago — Reuters

800,000,000

Number of homes that could be powered by the winds of the US Atlantic coast
— Climate Wire

50

Percentage cut in current extinction rate; the target of the 2010 Nagoya Protocol
— New York Times

30

Percentage of illnesses attributed to the environment in the African continent
— Angola Press (Luanda)

1 to 10

The targeted percentage increase in area of protected oceans by 2020 under the new Nagoya Protocol — Guardian

2,000,000,000

Dollars pledged by Japan for biodiversity conservation in association with the Nagoya Protocol — Guardian

40,000,000,000

Likely dollar cost of the Gulf of Mexico oil spill — Reuters

3,000,000,000

People who could lose access to clean water supplies if global temperatures rise by 4°C — Guardian (UK)



Chemicals management: useful links

This page contains links to websites from Governments, international organizations, non-governmental organizations, businesses, media and other groups from around the world to help you research issues related to chemicals management. We have compiled these links from our own review of the vast amount of information available on the Internet to help you to find the most relevant sources for your research. *Our Planet* magazine does not, however, endorse the viewpoints of any of the groups to which we link, and we cannot guarantee the accuracy of the information posted on these sites. Rather, we hope to provide you with a broad range of opinions and perspectives.

www.unep.org

Harmful Substances and Hazardous Waste

www.unep.org/hazardoussubstances/

Harmful substances and hazardous waste is one of UNEP's six priority thematic areas of work, promoting international activities related to the sound management of chemicals, chemical safety and providing countries with access to information on toxic chemicals.

UNEP Chemicals Branch

www.chem.unep.ch/

UNEP Chemicals works to protect humans and the environment from adverse effects caused by chemicals throughout their lifecycle, and hazardous waste. It is the focal point of UNEP activities on chemicals issues and the main catalytic force in the UN system for concerted global action on the environmentally-sound management of hazardous chemicals.

Strategic Approach to International Chemicals Management (SAICM)

www.saicm.org/

SAICM is a policy framework to foster the sound management of chemicals. It supports the achievement of the goal agreed at the 2002 Johannesburg World Summit on Sustainable Development of ensuring that, by the year 2020, chemicals are produced and used in ways that minimize significant adverse impacts on the environment and human health.

Chemical Information Exchange Network

<http://jp1.estis.net/communities/cien/>

This is a network that helps communication and collaboration among various stakeholders responsible for the environmentally sound management of chemicals, and a framework that helps access to and exchange of chemical information that supports national decision-making and the implementation of multi-lateral environmental agreements (MEAs).

Reducing Risk from Mercury

www.unep.org/hazardoussubstances/Mercury/tabid/434/Default.aspx

This site has information on UNEP's Mercury Programme, which has been working to address mercury issues since 2003.

The Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA)

www.gpa.unep.org/

The GPA is designed to be a source of conceptual and practical guidance for national and/or regional authorities for devising and implementing sustained action to prevent, reduce, control or eliminate marine degradation from land-based activities.

Persistent Organic Pollutants (POPs)

www.chem.unep.ch/pops/

POPs are chemical substances that persist in the environment, bio-accumulate through the food chain, and pose a risk of causing adverse effects to human health and the environment.

Division of Technology, Industry and Economics (DTIE)

www.unep.fr/en/about/index.htm

Ensuring environmentally-sound management of chemicals and reducing pollution, are, among other things, key objectives of UNEP DTIE.

Environmental Agreements

The Stockholm Convention

www.pops.int/

The Stockholm Convention is a global treaty to protect human health and the environment from persistent organic pollutants (POPs).

The Basel Convention

www.basel.int/

The Basel Convention is a global treaty for environmentally sound management (ESM). Its aim is to protect human health and the environment by minimizing hazardous waste production whenever possible.

The Rotterdam Convention

www.pic.int/

The Rotterdam Convention made it legally binding for exporters to obtain the prior informed consent (PIC) of importers before proceeding with the trade of hazardous substances.

Multilateral Organizations

Inter-organization Programme for the Sound Management of Chemicals (IOMC)

www.who.int/iomc/index.html

The International Programme on Chemical Safety (IPCS)

www.who.int/pcs/index.htm

Chemical Forums

Information Exchange Network on Capacity Building for the Sound Management of Chemicals (INFOCAP)

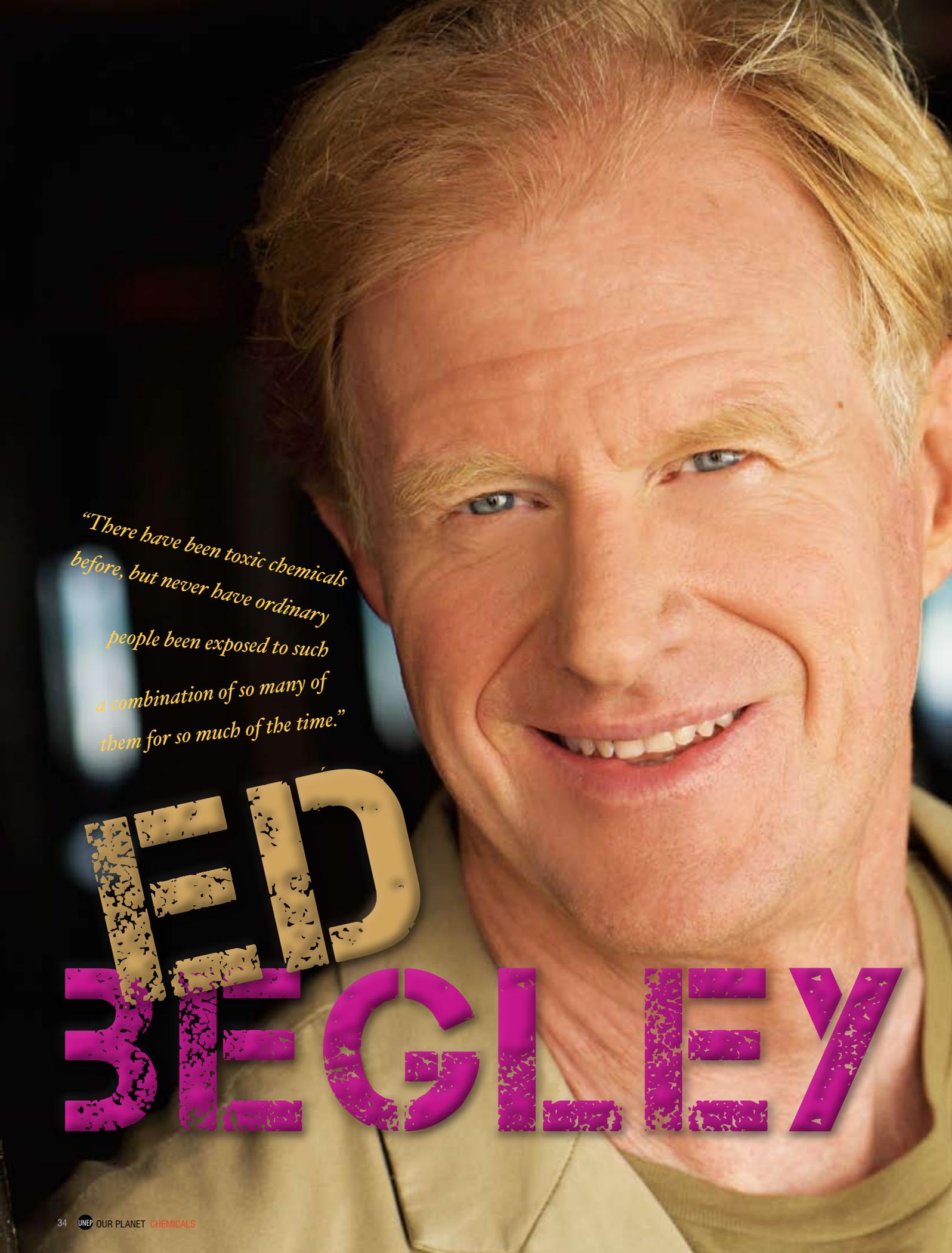
www.who.int/ifcs/infocap/index.htm

International Network for Environmental Compliance and Enforcement (INECE) Forums

www.inece.org/forums.html

Occupational and Environmental Medicine Internet- Mail List

<http://dmi-www.mc.duke.edu/oem/occ-env-.htm>



*"There have been toxic chemicals
before, but never have ordinary
people been exposed to such
a combination of so many of
them for so much of the time."*

3ED 3EGLLEY

Don't tell Kermit the frog, but it's quite easy being green in Hollywood these days: stars vie with each other to establish their environmental credentials. But Ed Begley started living sustainably and campaigning for change decades before it became fashionable.

Best known for playing the intern, Dr Victor Ehrlich, in the television series, *St Elsewhere* – for which he was nominated for an Emmy in six successive years – he has been a committed activist for over four decades. "I started in 1970 after 20 years of living in smoggy Los Angeles" he told *Our Planet*. "That year the first Earth Day came along and said 'We gotta clean up the smog'. It was like 'Hell, yeah'".

His father – the son of Irish immigrants – had died a few days previously and Begley also wanted "to do something to honour him. He never used the word 'environmentalist' but he was one. He turned off the lights, turned off the water, saved string and tinfoil".

He says: "I decided to make a difference in every part of my life. Forty-one years on, it's still working." He powers his home with solar energy and owns a windmill in the desert that produces more energy than he needs, making him "carbon negative". He even provides the electricity to make his toast each morning by riding an exercise bicycle (15 minutes pedalling per serving). He harvests rainwater and recycles grey water from his home, and has established a drought-tolerant garden of native Californian plants.

A vegetarian, he bicycles and uses public transport whenever possible, and drives an electric car when it isn't. He recycles so much, that years he ago cut his trash down to "about a glove compartment's worth a week." Now that he's married and has a child it has inevitably grown, but only to about three times that modest amount.

He has also tried to avoid using toxic chemicals since the 1970s and now participates in UNEP's Safe Planet Campaign for responsibility on hazardous chemicals and waste, because he is worried about "the vast amount of toxic chemistry that we all come into contact with every day".

As a post-war 'baby boomer', he points out, he is a member of "the first generation to live life in a sea of chemistry that is new to our bodies. There have been toxic chemicals before, but never have ordinary people been exposed to such a combination of so many of them for so much of the time.

"Suddenly we were getting exposed to perchloroethylene a lot because we are doing more dry-cleaning, we're sleeping on polyurethane mattresses, we're pumping gas with benzene and ethylene dibromide in it, and we are eating food contaminated with pesticides and herbicides. So many young people are getting cancer. That did not happen when I was young."

The most comprehensive study ever undertaken into human exposure to chemicals – which examined 2,400 people in the United States – found more than 200 chemicals in their bodies, he adds. Among them were some of "the most dangerous known to life on the planet: dioxins, mercury, DDT and a host of other toxic pollutants that travel far and bury deep in our bodies". As part of the Safe Planet Campaign he has given some of his own blood to be analysed for its chemical content, and promises to make the results public.

He stresses that he is "not a chemophobe", emphasizing that many chemicals have brought great benefits. But he says people should "have the opportunity to make a non-toxic choice". The need is "to begin to get rid of the chemicals we do not need and to move towards a less toxic environment. We can stop hazardous chemicals and wastes flowing into our lives with awareness and action. These harmful substances do not belong in us".

JNIR.



www.unep.org/ourplanet