



Marine Pollution: Status, Trends and Opportunities

Blue Planet Symposium

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College Park, Maryland

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- **Types**
 - Air, Soil, Water & Biota
 - Thermal, Radioactive, Light, Noise
- **Pollution Sources/Causes**
- **Pollution Impacts (Direct & Indirect)**
 - Human Health
 - Ecosystem Goods & Services
- **Monitoring Programmes**
 - Chemical, Biological, Radiological, Microbiological, Population
 - Samples: Substrate (Water, Soil, Sediment or Biota) & Frequency

Waste Management Hierarchy

**Source
Reduction**

Prevent pollution by not creating it in the first place.

**Reuse and
Recycling**

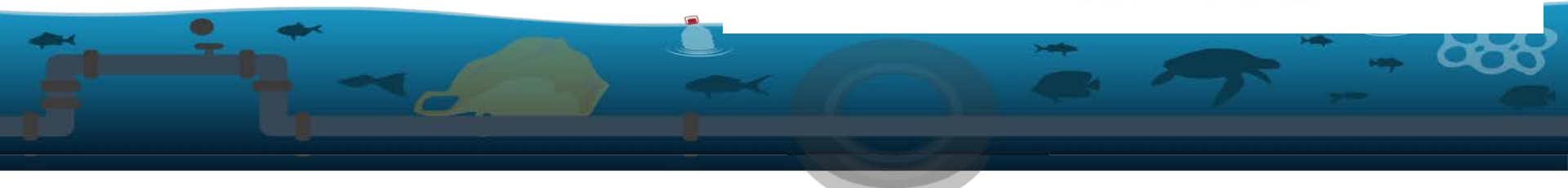
Collect waste materials and reuse or remanufacture.

Treatment

Reduce toxicity and release of pollutants.

Disposal

Control pollution by storing or burying waste.



Open ocean contaminants (rows) and their impact on different species and ecosystems (columns). While there is insufficient information about a number of the impacts, heavy impacts can be identified.

	Humans	Marine mammals	Reptiles	Seabirds	Fish	Invertebrates	Corals	Phyto-plankton
Oil	Probably slight	Moderate	Probably slight	Heavy	Moderate	Probably slight	Probably slight	Probably slight
Debris	Probably slight	Heavy	Heavy	Moderate	Probably slight	Probably slight	Probably slight	Insufficient information
Radioactivity	Probably slight	Insufficient information	Insufficient information	Insufficient information	Insufficient information	Insufficient information	Insufficient information	Insufficient information
Carbon	Probably slight	Moderate	Insufficient information	Moderate	Moderate	Heavy	Heavy	Heavy
POPs	Probably slight	Heavy	Insufficient information	Heavy	Moderate	Insufficient information	Insufficient information	Insufficient information
Nutrients	Insufficient information	Insufficient information	Insufficient information	Insufficient information	Insufficient information	Insufficient information	Probably slight	Probably slight
Mercury	Heavy	Heavy	Insufficient information	Probably slight	Moderate	Insufficient information	Insufficient information	Insufficient information
Noise	Insufficient information	Heavy	Insufficient information	Insufficient information	Moderate	Insufficient information	Insufficient information	Insufficient information

Impact

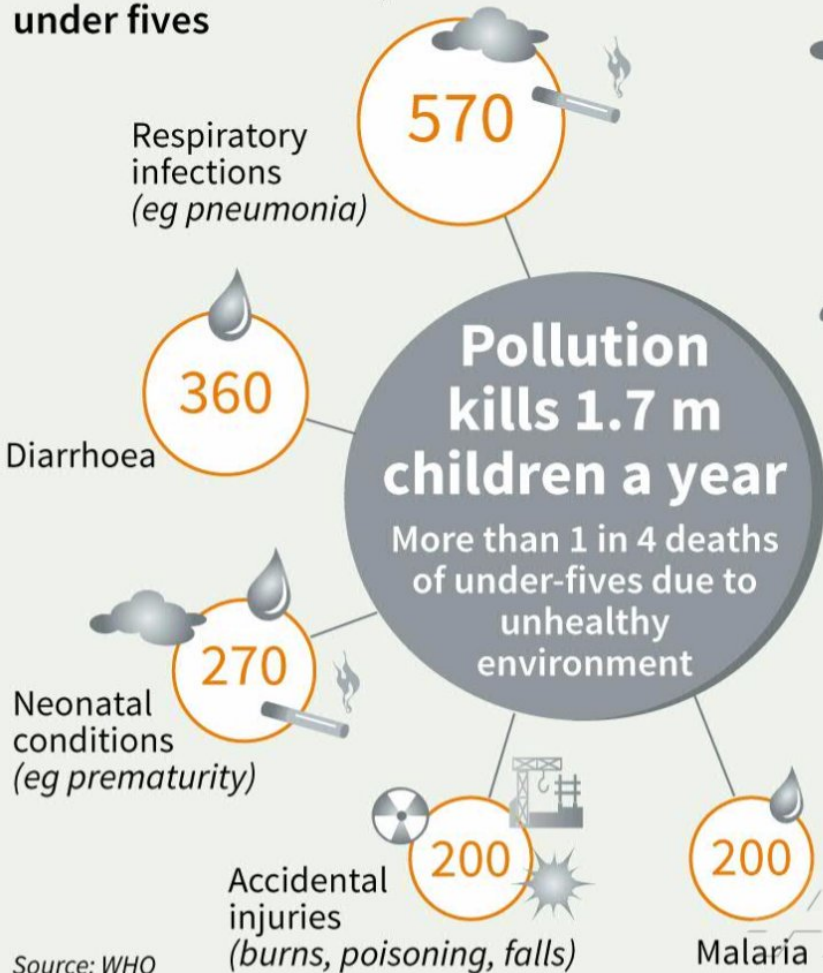
- Insufficient information
- Probably slight
- Moderate
- Heavy

HOUSTON:
WE HAVE A **POLLUTION** PROBLEM



Pollution and excess nutrients from agriculture and untreated sewage have increased roughly threefold from pre-industrial levels.(UNEP)

Thousands of deaths, under fives



Source: WHO

Selected causes

- Air pollution
- Inadequate water, sanitation
- Second-hand smoke
- Ultra-violet radiation
- Human-built environment
- Hazardous waste

COST OF PLASTIC WASTE



COST OF MARINE LITTER



- **Coral reefs:** USD 36 billion in global tourism per year.
- A single plastic particle can absorb up to **1,000,000** times more toxic chemicals than the water around it
- **Wetlands:** USD 925 billion per year

The world loses
US\$ 260 billion
per year due to inadequate **water supply** and **poor sanitation**





Part

1 pollution sources and the YES

The ocean drives economic activity and trade for 38 percent of the global population that lives within 100 kilometers of the sea. (World Bank)

0.16 to 0.42 million tons of land-based sources of plastic entered the Caribbean Sea in 2010 & estimated to increase to 0.29–0.79 million metric tons per year by 2025.
(Jambeck et al. 2015)



Pollution sources & types

Direct or Point Sources

- Domestic Wastewater (Sewage)
- Solid Waste
- Industrial Effluent/Emissions

Indirect or Non-Point Sources

- Agrochemical Run-off
- Sediment

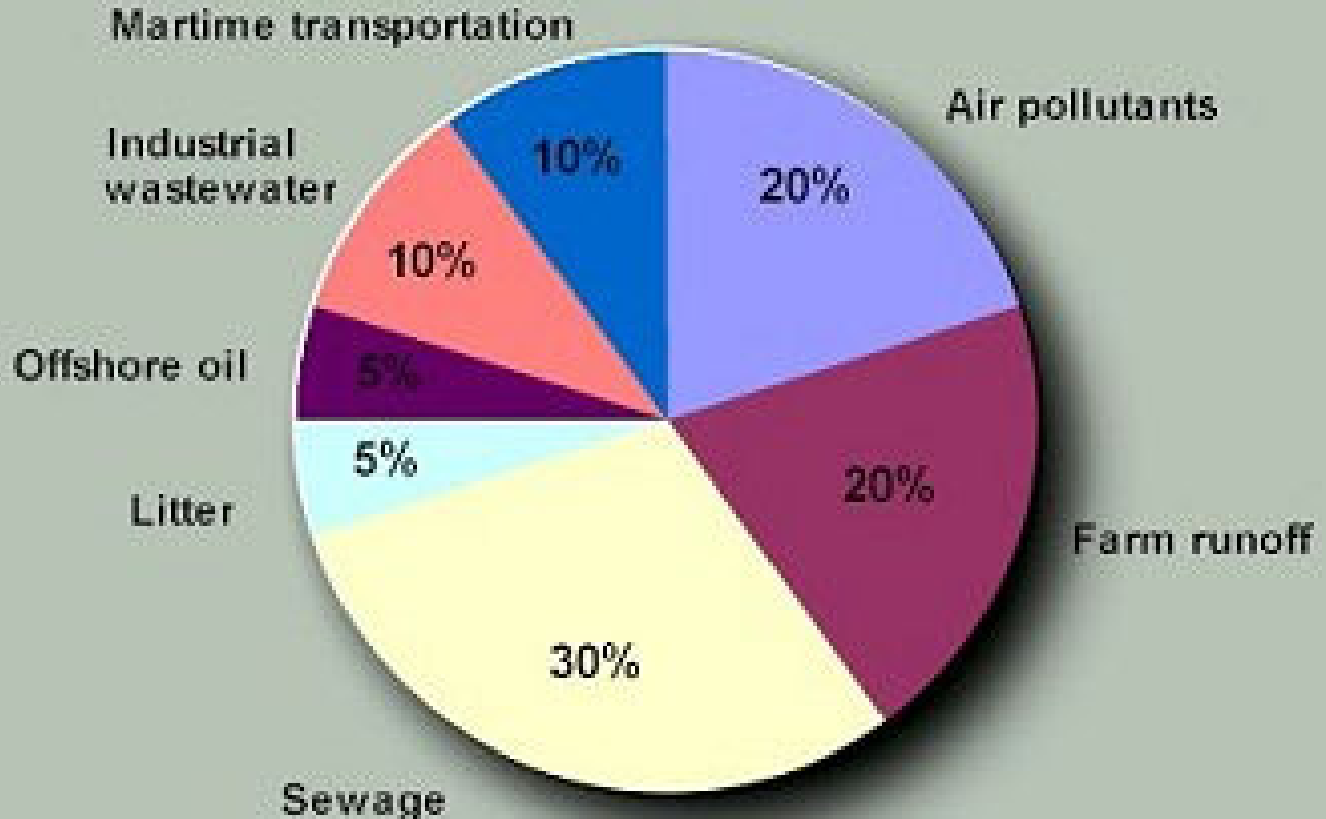
Pollutant Types

- Metals, Pesticides, Pathogens, Oil, Nutrients

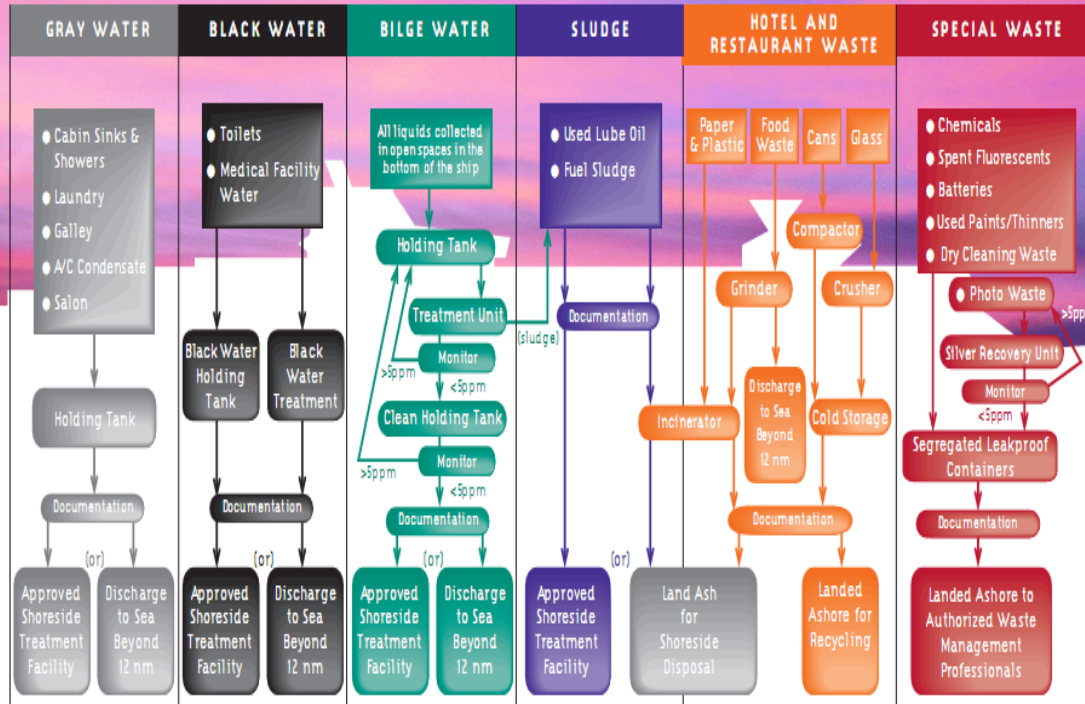
Pollution: Land-based sources

75-80% of marine pollution comes from land-based sources & activities

Pollutants Entering the Oceans



WASTE STREAM OPERATIONAL CONTROLS



Pollution: shipping

Contributes 20-30% of marine pollution

Seaborne trade is growing at an annual rate of 3 to 4 percent to 2030.(OECD)





more pollution than ever

The quantity of pollutants: plastics, wastewater, nutrients produced are increasing worldwide

Globally 2,000,000 tonnes of sewage, agricultural and industrial wastes enter waterways daily. (UNEP)

Global tourism is growing at an annual rate of 4 percent to 2025 and much will be coastal and ocean tourism (OECD,2016)

POLLUTION
DIRECTLY IMPACTS
REVENUE
GENERATING
SECTORS &
HUMAN HEALTH



SHIPPING



TOURISM





POLLUTION

MULTIPLE

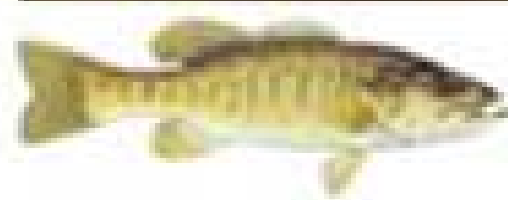
STRESSOR

Wastewater:
Freshwater, Nutrients,
Pathogens, Endocrine
Disruptors, Sediments,
Heavy Metals

17% of households in the Caribbean are connected to an acceptable sewage treatment system. (PAHO)

Emerging contaminants of concern

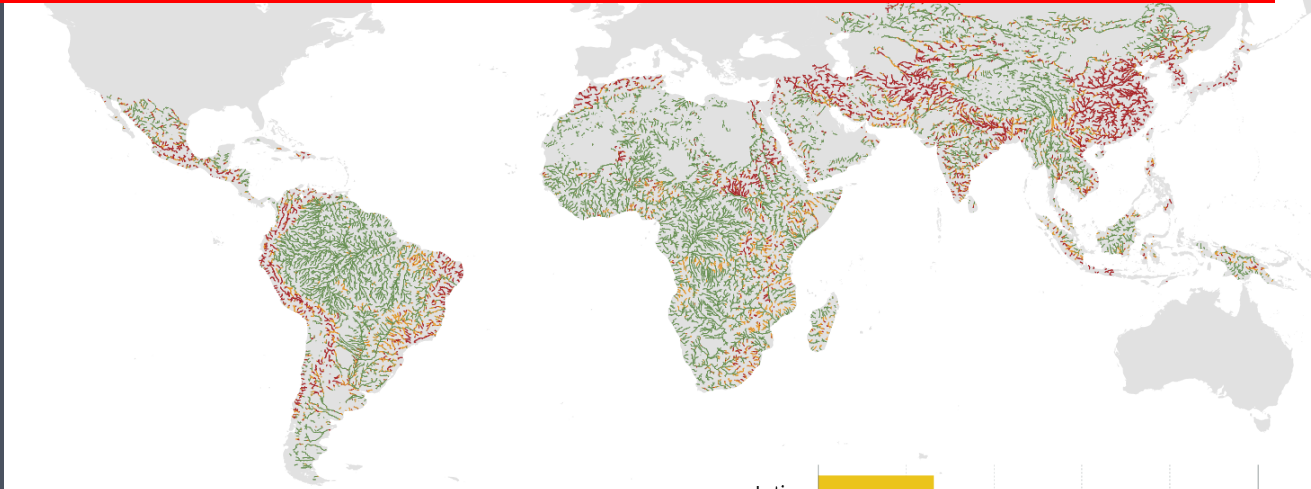
Endocrine Disruptors
(ECDs)
Hormones, Drugs &
Pharmaceuticals,
Synthetic Pesticides.
Microplastics,
Personal care products
(PCPs): Sunscreen



70% of wastewater from high income countries is treated, 38% in middle-income. 28% in lower middle-income and 8% from low-income countries. (PAHO)

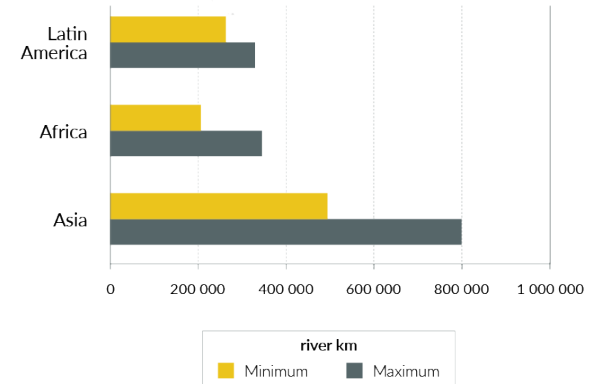
degradation of water quality

Severe pathogen pollution affects around one-third of all river stretches in Latin America, Africa and Asia, putting the health of millions of people at risk



February 2008-2010
FC [cfu/100ml]

- Not computed
- Low pollution (=200)
- Moderate pollution (200<x=1000)
- Severe pollution (>1000)



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Source: UNEP (2016)

More than 75% of the Caribbean's coral reefs are threatened by land and marine-based pollution. (UNEP)



Part 2 Challenges and barriers

What are the major pollutants (*types*)?

Where are they coming from (*sources*)?

Why is this pollution taking place (*drivers*)?

How much pollutants enter the environment (*pressures*)?

How long do these pollutants last (*persistence*)?

When will these pollutants become a problem to human health & the environment (*toxicity*)?

Enquiring
Scientists

want to know



What is the cost of the pollution damage
(*economic, social, political - votes*)?

How much will it cost to fix the problem (or
make it go away)?

Enquir ing
pol it icians

want t oknow

What is the level of pollution (*status*)?

How are pollutants affecting me & my family
(*impacts on human health, biodiversity &
ecosystem goods & services*)?

*Are pollutants acute and/or chronic in their toxicities
and for which organisms?*

Do they biomagnify and/or bioaccumulate?

*How much risk is posed & from what activity e.g.
bathing, diving, breathing, eating?*

What is (should) the government be doing
(*response*)?

Enquir ing
minds

want t oknow

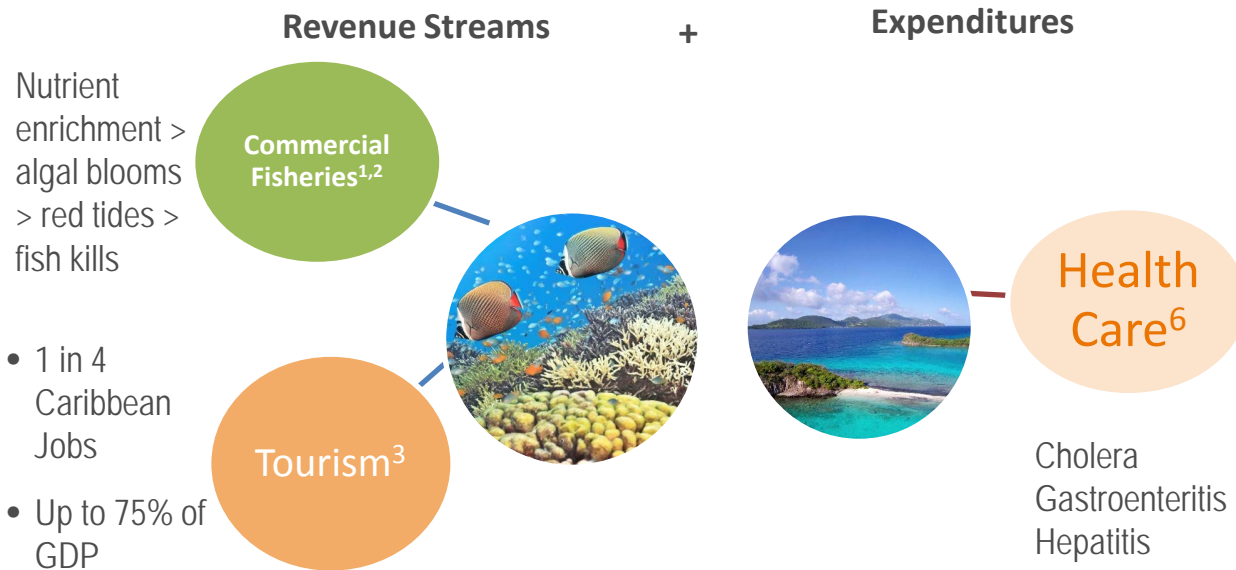
Estimates show wetland tourism to be worth US\$ 925billion/yr (GEF)
Coral reefs generate \$36 billion/yr in global tourism spending annually (GEF)
1 to 1.4 million marine species supply several medicines and drugs (World Bank 2016)



Part 3 Opportunities and the sustainable development agenda

THERE IS NO GREEN WITHOUT BLUE

We Must Consider the Cost...



The Caribbean Sea generates more than US\$3 billion annually from tourism and fisheries.⁴

Points of Exposure

Consumption – Fish & Shellfish¹
 Drinking Water – Groundwater, Surface Water⁶
 Recreational Waters – Swimming, Snorkeling, Diving⁶
 Airborne – Red Tides²



The 2030 agenda

For sustainable development

SDG Target 6.3: By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally

SDG Target 14.2: By 2025, prevent and significantly reduce marine pollution of all kinds, particularly from land-based activities, including marine debris and nutrient pollution

Global & Regional Frameworks

Sustainable Development Goals

Global Conventions

Global Platforms

Regional Seas Programmes, Projects & Platforms

The Cartagena Convention as a regional MEA addresses several different coastal & marine environmental threats affecting the countries of the Wider Caribbean Region.



WIDER CARIBBEAN REGION

Cartagena Convention

Adopted in 1983

Entry into force 1986

25 Parties



Pollution from Oil Spills

Adopted in 1983
Entered into force in 1986
25 Parties



Specially Protected Areas & Wildlife (SPAW)

Adopted in 1990
Entered into force in 2000
16 Parties



Land Based Sources and Activities of Marine Pollution (LBS)

Adopted in 1999
Entered into force in 2010
13 Parties

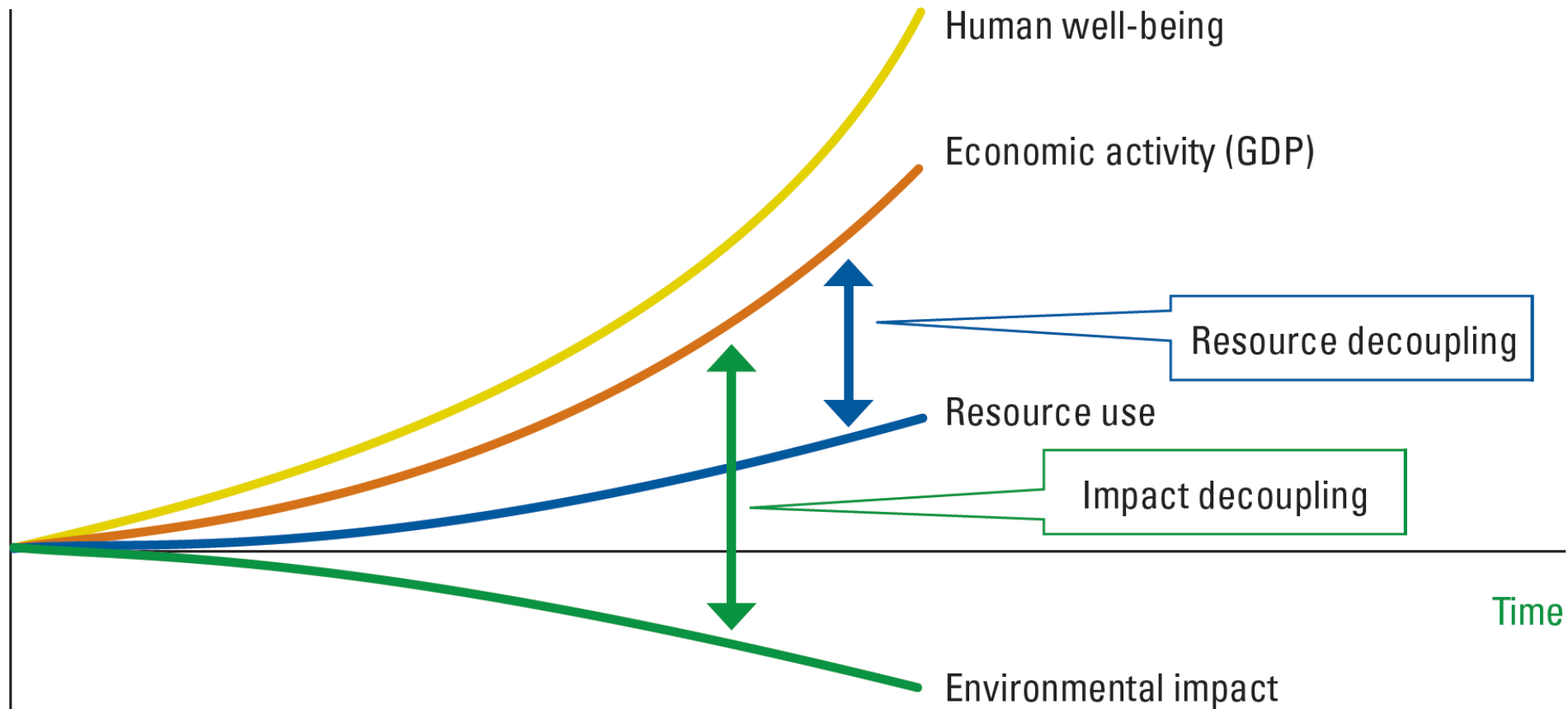


The three Protocols to the Convention identify additional obligations for the protection and development of the Caribbean Sea further reducing negative impacts to the coastal and marine environment

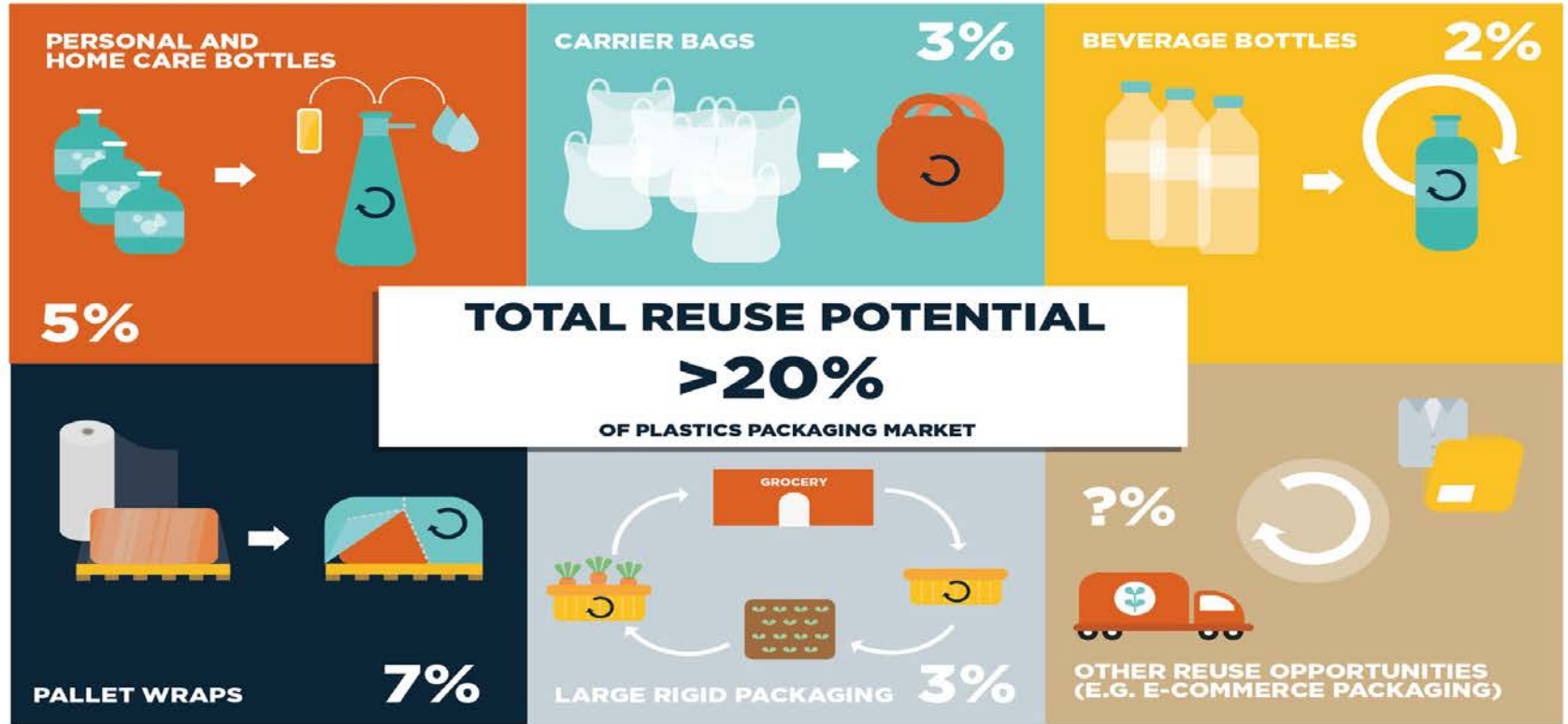


International
Resource
Panel

TWO ASPECTS TO DECOUPLING GROWTH IN RESOURCE USE AND ENVIRONMENTAL IMPACTS



A USD 10 billion reuse opportunity for plastic packaging





HEADLINE MESSAGE



“With concerted action, there is significant potential for increasing resource efficiency, which will have numerous benefits for the economy and the environment”



330 km³ of municipal wastewater produced globally each year can irrigate 40,000,000 hectares (15% of all irrigated land) or power 130,000,000 households through biogas generation.



Part

4

CREATING AN ENABLING
ENVIRONMENT FOR CHANGE

1. POLICY, LEGAL & REGULATORY FRAMEWORK

Lack of incentives, regulations, policy & enforcement on pollution is one of the main challenges particularly for developing countries



3. MINIMIZING RISKS to PEOPLE and the ENVIRONMENT

The most vulnerable populations, especially women and children, in developing countries are exposed to the negative impacts of pollution





4. BUILDING CAPACITY and KNOWLEDGE

Capacity building, research and development to monitor sources, levels & impacts of pollutants on human health & the environment, assess the financial costs of these impacts, & select and use most appropriate technologies & solutions

02/23/2009

5. PROMOTING ATTITUDINAL & BEHAVIORAL CHANGE

Reducing pollution requires a change of attitudes & behaviour & provision of viable alternatives

- Avoid:** Consumption & Production
- Shift:** Waste to Value
- Improve:** Design, Treatment & Processes



Take home messages

Deforestation, unplanned development, poor agricultural practices, discharges of domestic and industrial wastewater, solid waste, toxic chemicals, off shore exploration, dumping at sea, and atmospheric deposition all contribute to pollution of the coastal and marine environment and it is increasing.

1. Pollution **increasing** worldwide
2. Pollutants discharged **without adequate treatment**
3. Affordable (**innovative**) treatment options are available but policy, legal & regulatory frameworks are weak
4. Polluting activities have multiple impacts from different components & require multisectoral, integrated, ecosystem-based responses
5. Sustainable source of energy, nutrients & other recoverable **by-products**
6. In a circular economy, reuse and by-product recovery can generate new **business opportunities** while helping finance pollution reduction services
7. The costs of reducing pollution are outweighed by **benefits** in terms of human health, socioeconomic development & environmental sustainability
8. Generate data, transform into information for evidence-based decision making
9. Improve understanding of drivers of attitudinal & behavioural change: Pollution is preventable

Thank you

UN 
environment



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