



Pollution: Setting the Research Agenda

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What do Scientists want to know?

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*)?





What do I want to know?

So.....

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*)?

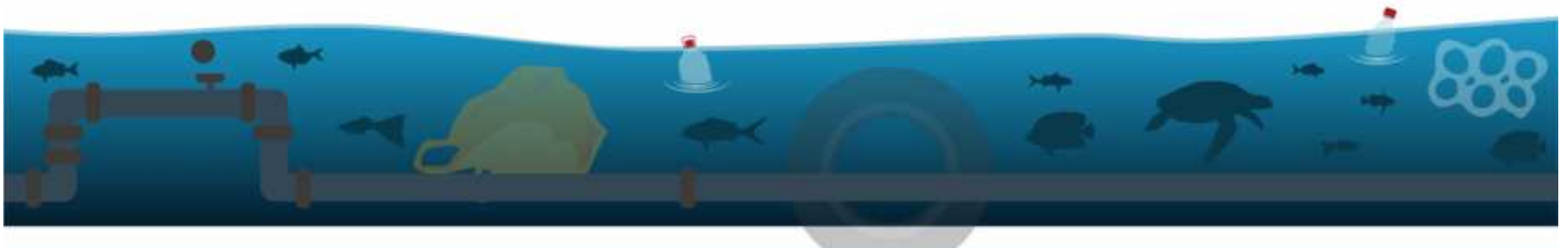




What do politicians want to know?

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

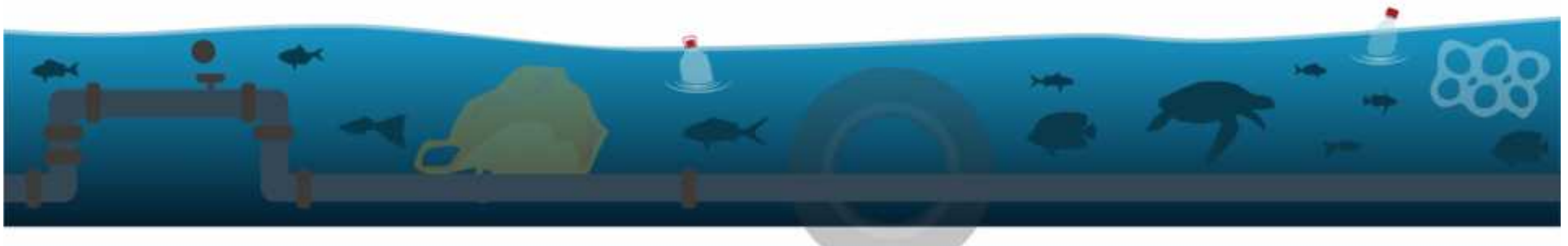
How much will it cost to fix the problem (or make it go away)?



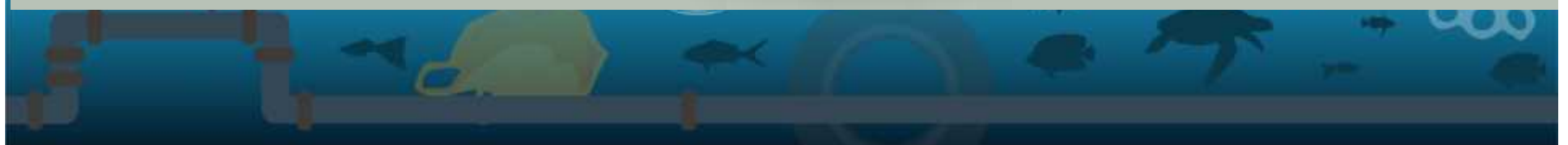
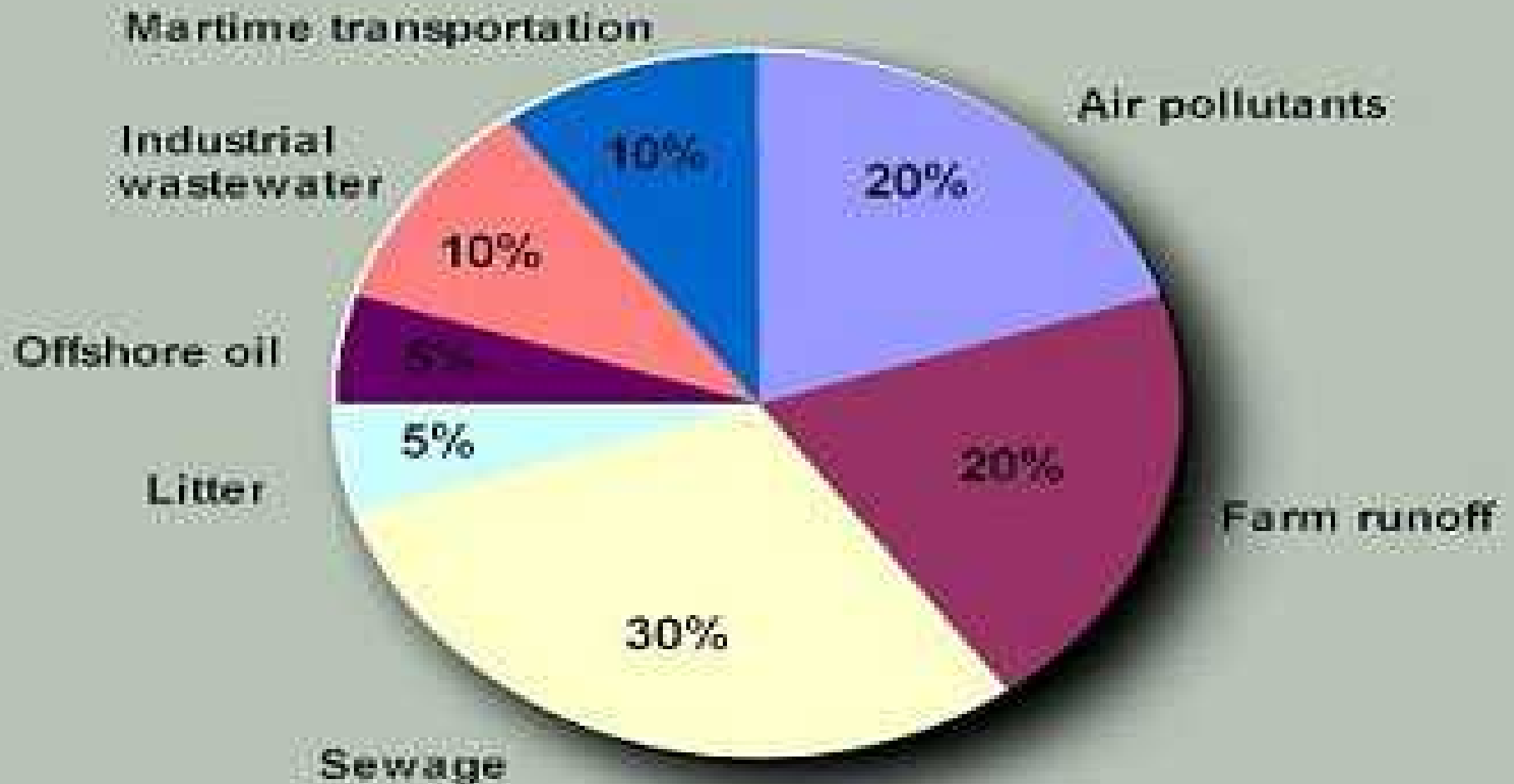


The Pollution Story

- **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



Pollutants Entering the Oceans





Sources & Types

Direct or Point Sources

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

Indirect or Non-Point Sources

- Agrochemical Run-off
- Sediment

Pollutants

- Metals, Pesticides, Pathogens, Oil, Nutrients

Identify the sources of pollution in this diagram





We cannot manage what we cannot measure

- Why do we need pollution monitoring programmes?
 - Research
 - Compliance
 - Evaluation
- Quality Data
- Research & Laboratory Capacity
- Methodology – Quality Assurance & Control
- Epidemiological Studies

Monitoring Water Quality





What do you care about?

- 75% of marine pollution comes from land based sources
- Diarrhoeal diseases kill 2,000,000 children & cause 900,000,000 episodes of illness p.a.
- Less than 35% of solid waste goes to landfills & 2/3 or 275,000 tonnes daily ends up in rivers/Caribbean Sea
- A single plastic particle can absorb up to 1,000,000 times more toxic chemicals than the water around it
- Oil tankers transport an average of 5,000,000 barrels of crude oil per day in the Wider Caribbean Region
- Some marine species such as corals, conch, oysters and sea urchins are highly sensitive to ocean acidification and will be more susceptible to predation and damage
- In the last 20 years, cruise ship tourism has quadrupled worldwide; with 58% of the world's cruise ship passengers occupying the Caribbean cruise industry





Contaminants of Emerging Concern

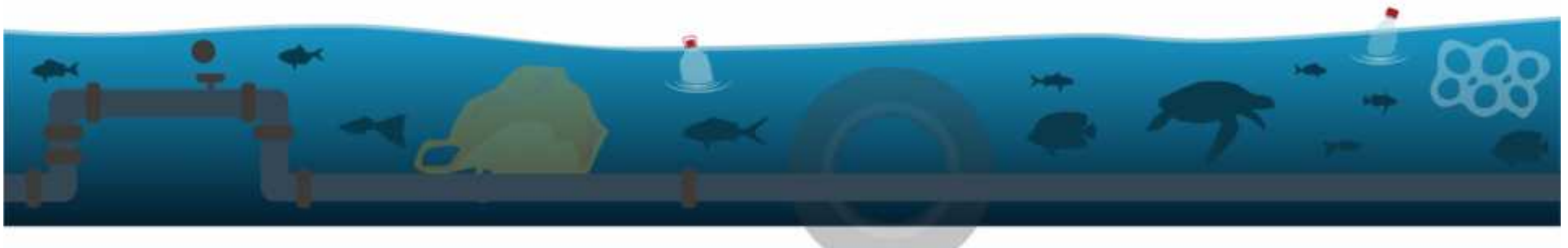
- Ocean Acidification
- Endocrine Disruptors (ECDs)
- Hormones, Drugs & Pharmaceuticals
- Synthetic Pesticides
- Microplastics
- Personal care products (PCPs): sunscreen
- Lack of standardized methodologies
- Lack of national/regional criteria and/or standards
- Lack of studies on toxicity impacts on human health & in tropical environments





S.O.S – Same old Story

- Outdated policies, laws & regulations
- Lack of funding
- Poor enforcement of existing regulations
- Land use & spatial planning
- Lack of data & information – cost of pollution
- Industry not willing to comply (incentives, regulations)





S.O.S – Same old Story

- Limited capacity for monitoring (lab & field)
- Lack of national data sharing policies
- Data not being used to guide decision making, policy setting & policy evaluation
- Research data too abstract – not grounded in national/regional development agenda
- Lack of knowledge about new technologies & products
- Lack of enabling environment for innovation





Linking Pollution to Policy & Decision Making

- Environmental Impact Assessment (EIAs)
- Environmental Audits (EAs)
- Strategic Environmental Assessments (SEAs)
- Pollutant Inventories
- Pollutant Discharge Permits
- Pollutant Characterization
- **Focus on Human Health**

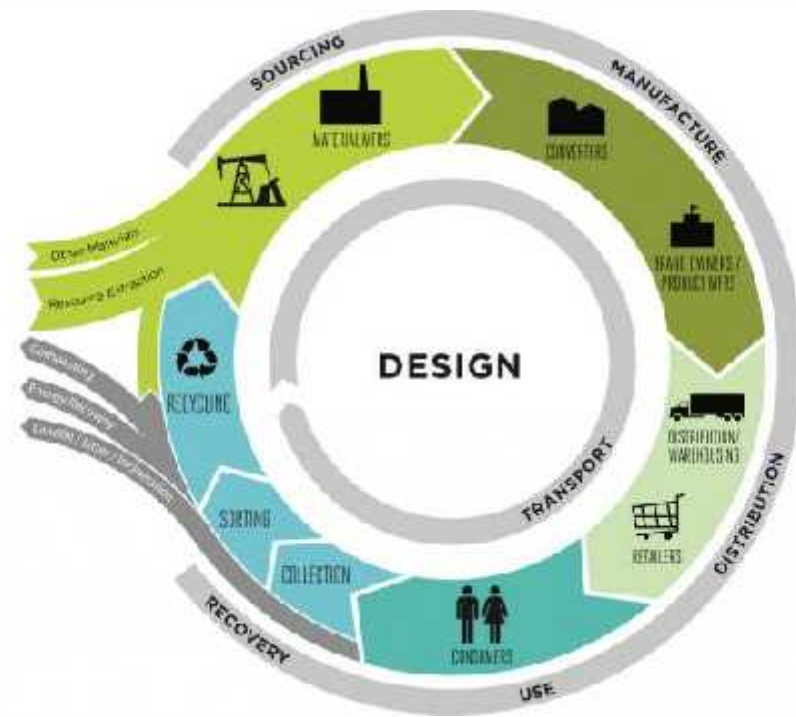




Paradigm Shift & New Research Needs

- Cleaner Production
- Clean Technologies
- Waste as a Resource
- Sustainable Production & Consumption

- Circular Economy
- Green Economy
- Green Jobs
- Green Chemistry



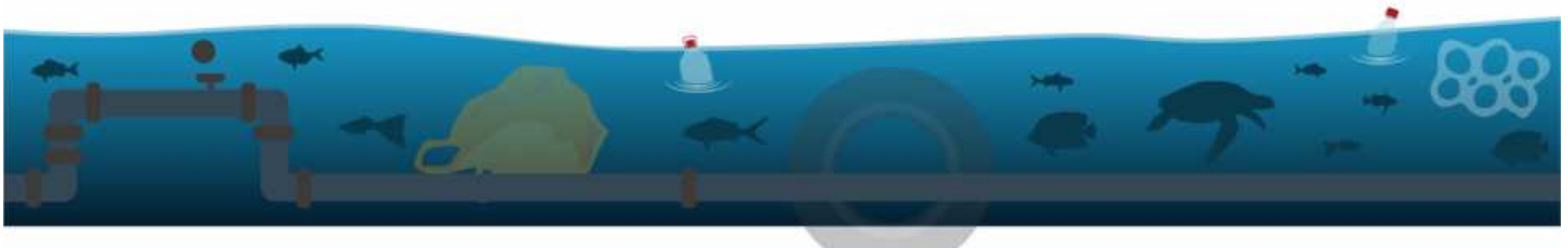
Private Sector & Industry





It's all about Communication

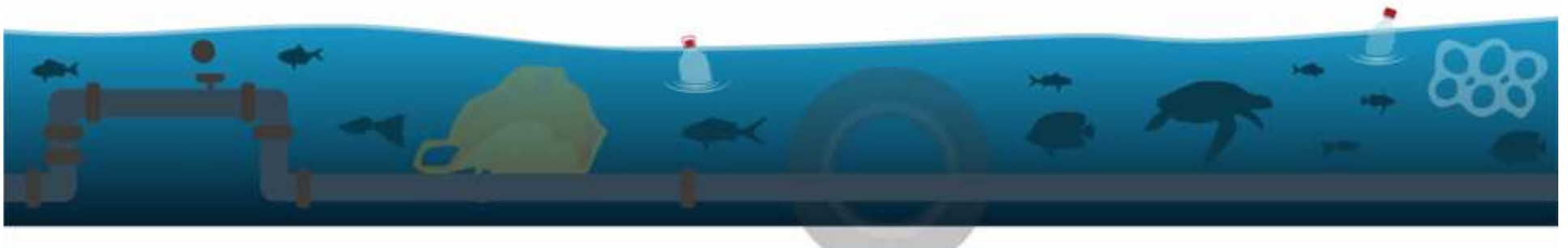
- What are policy questions scientists need to respond to?
- What is the time frame for the decision-making process? **Yesterday!**
- What are the best entry points: Tourism, Industry, Climate Change, Health, Fisheries, SDGs, Job Security?
- How do we analyse & interpret data in a more integrated manner (economic, social & environmental – Ecosystem based approaches)?





Seriously - Communication

- How do we transform data into meaningful information?
- How do we package & communicate this information?
- What about citizen science & traditional knowledge?
- Who are our champions? – Trusting the information
- Need to understand the social science - drivers of attitudinal & behavioural change
- What does it mean for the private sector?

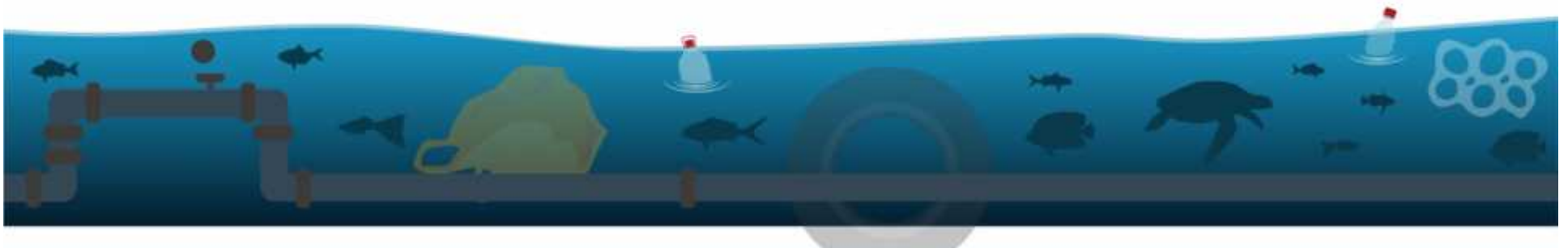




Our work at UNEP CEP

LBS & Oil Spills Protocols: Regional Partners (RACs/RAN)

- CEP Technical Reports: Assessment of Pollutant Loads & Impacts; Hot Spot Assessments; Technology Transfer
- Pollution Fact Sheets
- Caribbean Platforms on Marine Litter (GCFI), Wastewater (CWWA) & Nutrients

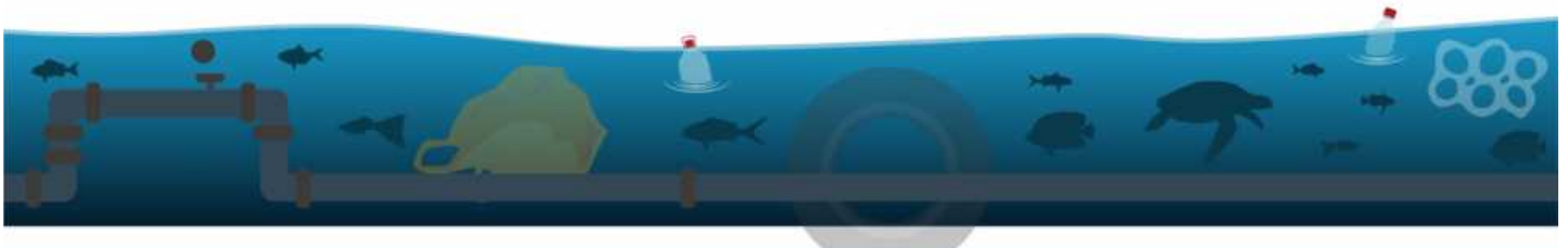




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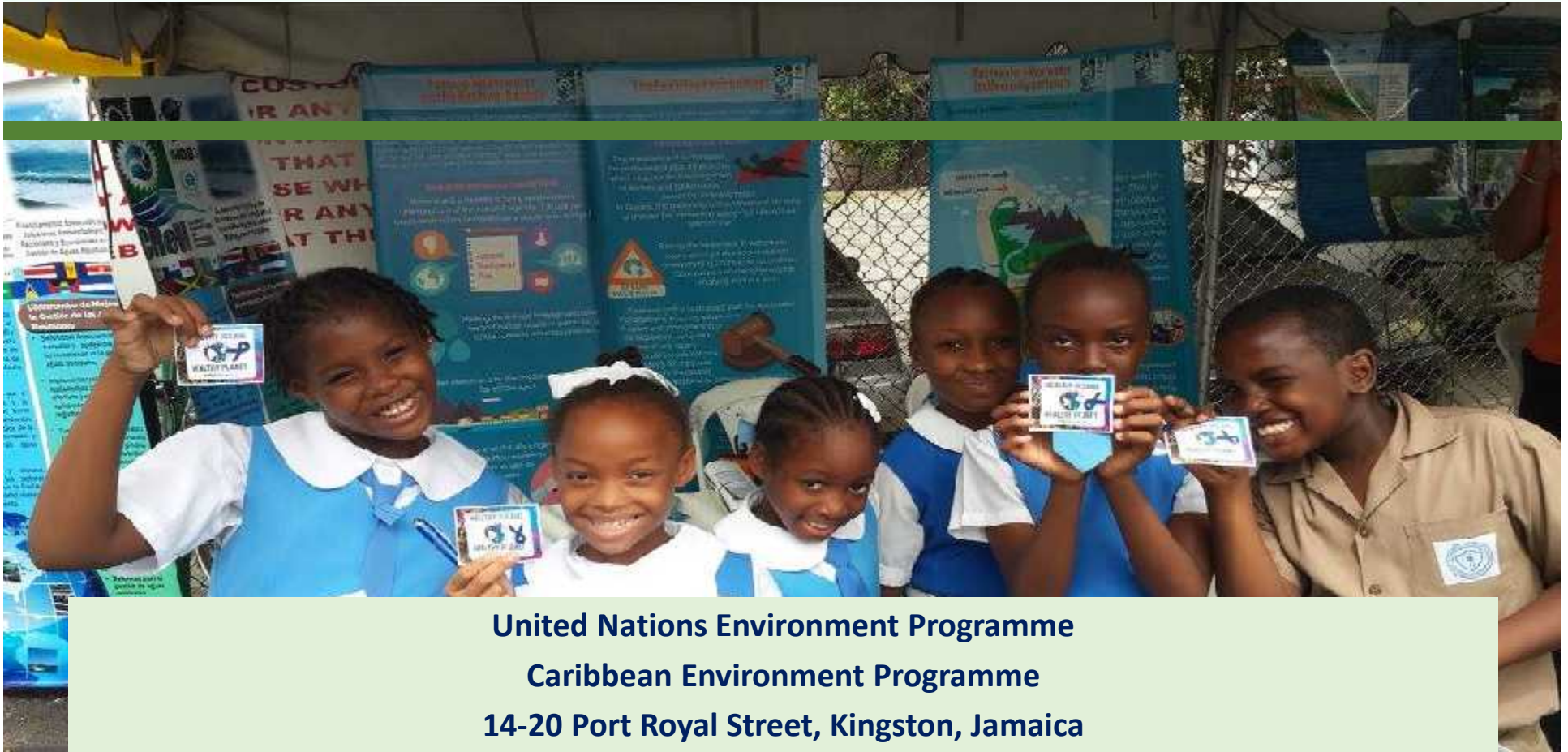
LBS & Oil Spills Protocols: Regional Partners (RACs/RAN)

- GEF Projects: Policy & Legal Reforms, Lab Capacity Building, Model Legislation, Training
- Regional Frameworks: Action Plan on Marine Litter
- National Programmes of Action for Pollution
- Media can be an ally: Media Briefs, Toolkits etc.





This is whom it is all about



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