

Energy Indicators for Sustainable Development

Environmental Dimension

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Workshop on Capacity Development for Mainstreaming
Sustainable Development Goals, Targets and Indicators
into Statistical Programmes in Selected Latin American
Countries

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Environmental Dimension

Atmosphere, Water and Land

- **Atmosphere**

- greenhouse gas emissions, linked to climate change
- pollutants that degrade air quality are considered.

- **Water**

- water quality as determined by contaminant discharges.

- **Land**

- soil quality
- deforestation
- waste generation and disposal.

Environmental Dimension

Atmosphere, Water and Land

- **Interlinkages and a holistic approach**
 - Among the dimensions of sustainable development
 - Among and Between specific indicators
- **Atmosphere**
- **Water**
- **Land**

Environmental Indicators

Environmental

Environmental			
Theme	Sub-theme	Energy Indicator	
Atmosphere	Climate Change	ENV1	GHG emissions from energy production and use per capita, per GDP and per unit of electricity
	Air quality	ENV2	Ambient concentrations of air pollutants in urban areas
		ENV3	Air pollutant emissions from energy systems
Water	Water quality	ENV4	Contaminant discharges into liquid effluents from energy systems
Land	Soil quality	ENV5	Concentration of contaminants from energy systems in soils
	Forest	ENV6	Rate of deforestation attributed to energy use
	Solid Waste generation & management	ENV7	Solid waste generation by type per energy produced
		ENV8	Ratio of solid waste properly disposed of to total generated solid waste
		ENV9	Solid radioactive waste generation per energy produced
		ENV10	Ratio of solid radioactive waste awaiting disposal to total generated solid radioactive waste

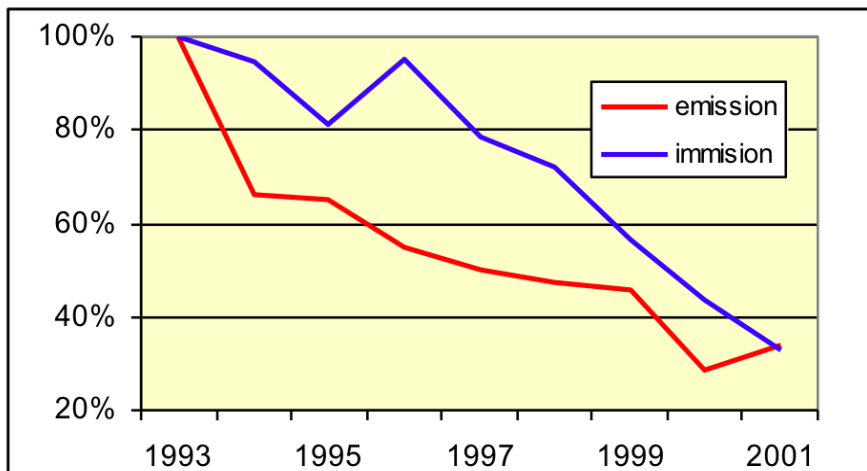
Air Quality

- ENV2 -- Ambient concentrations of air pollutants in urban areas
 - Ambient concentrations of air pollutants such as ozone, carbon monoxide, particulate matter (PM10, PM2.5, total suspended particulate [TSP], black smoke), sulphur dioxide, nitrogen dioxide, benzene and lead
- Data needed
 - Data must include time and spatially representative concentrations, such as mean annual concentrations or percentile concentration
 - Information on site location and type (e.g. industrial or residential area).

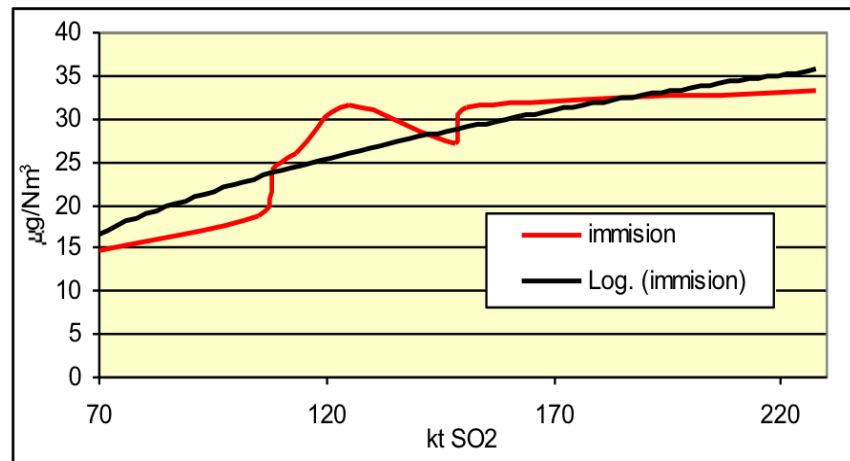
Slovakia – Air Quality Indicators

City of Banska Bystrica

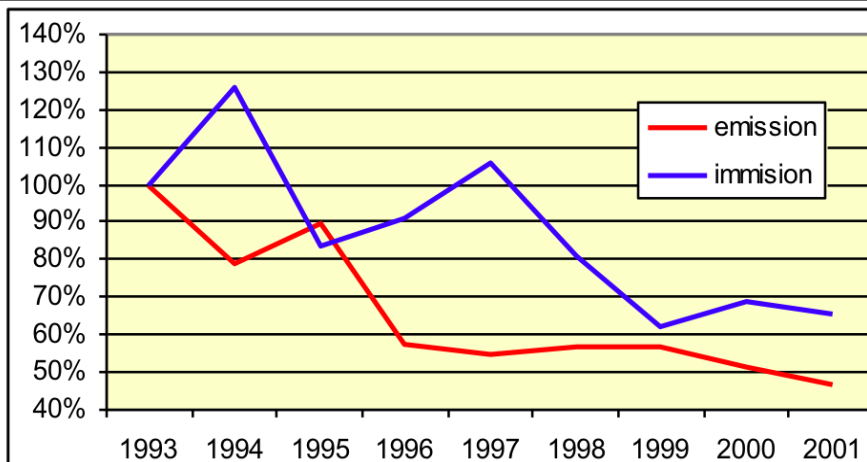
Trends of SO₂ emissions and imissions



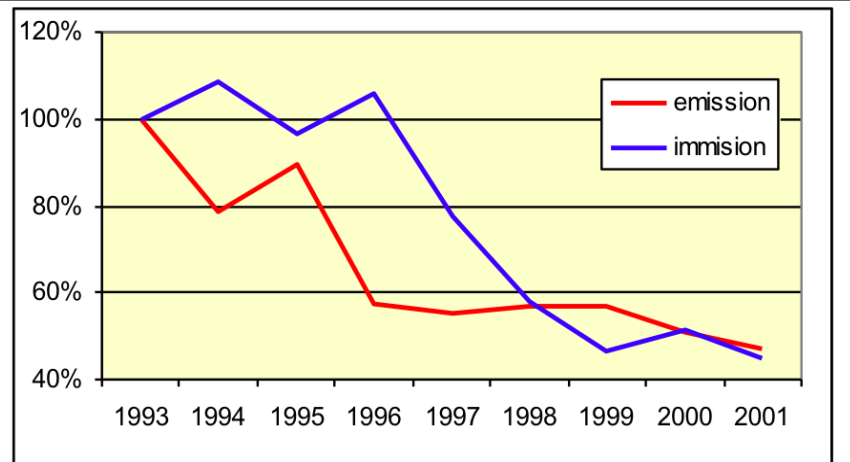
Relation of SO₂ emissions and imissions



Trends of NO_x emissions and imissions



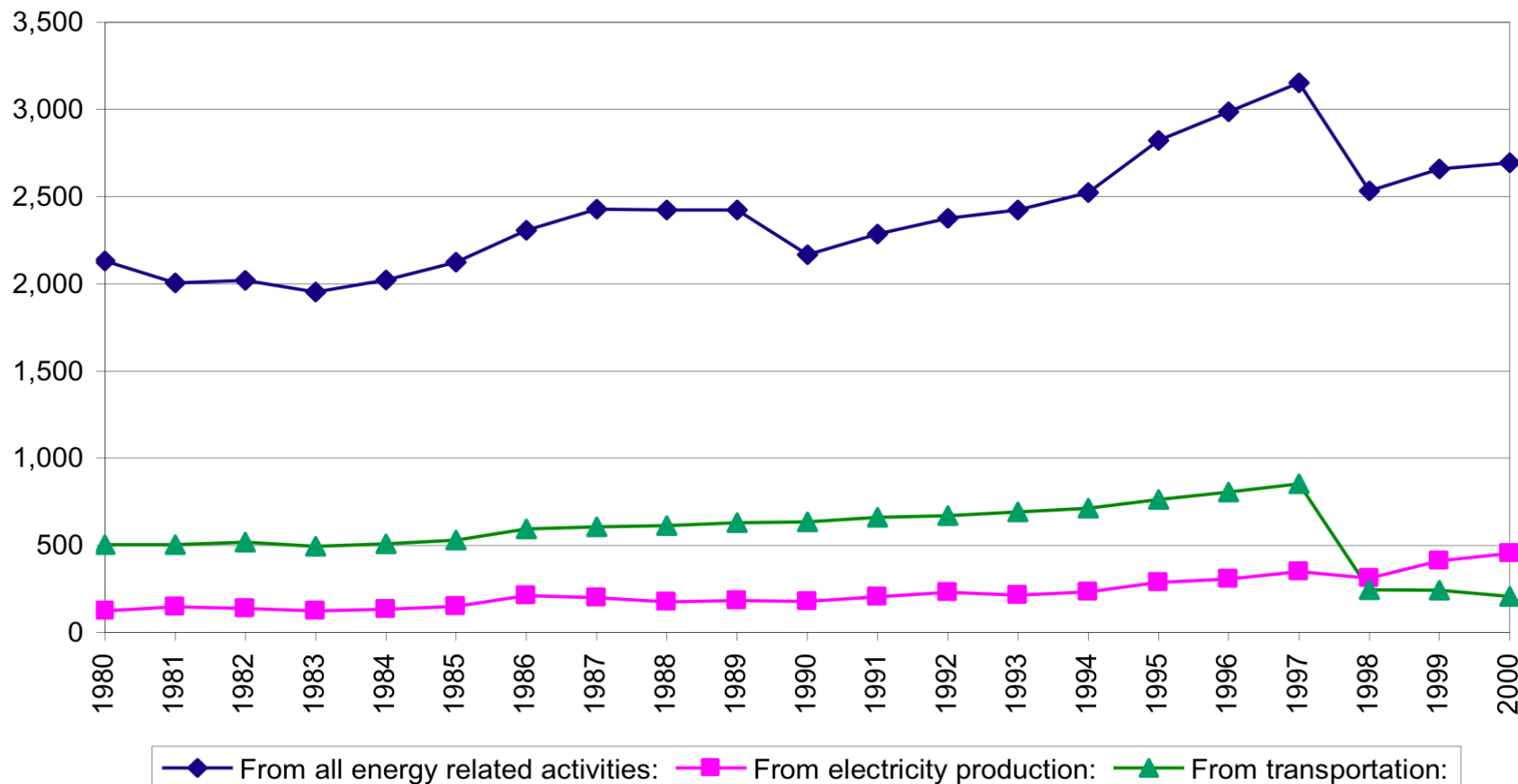
Trends of SP emissions and imissions



Air Quality

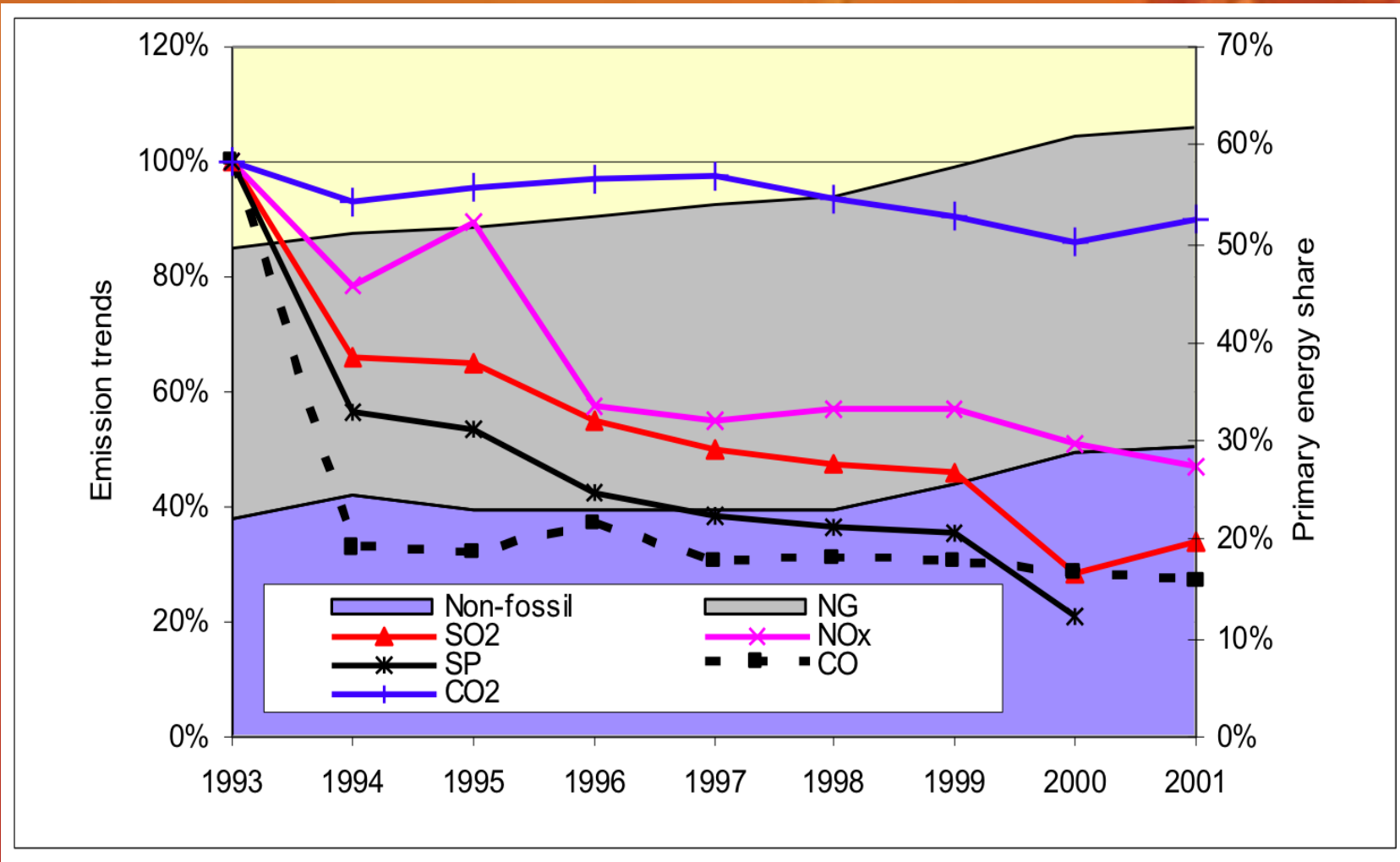
- ENV3 -- Air pollutant emissions from energy systems
 - Emissions of air pollutants from all energy-related activities including electricity production and transportation.
 - Such as sulphur oxides (SO_x) and nitrogen oxides (NO_x); ozone-forming gases (ozone precursors), such as volatile organic compounds (VOCs), NO_x and carbon monoxide (CO); and fine particulates
- Data needed
 - Quantities of emissions of air pollutants from all energy-related activities, particularly from the electricity production and transportation sectors.
 - Proposed denominator for a normalized indicator: Unit of gross energy use.

Brazil -- Annual SO₂ emissions, 1980-2000, (kt)



Slovakia – Air Quality

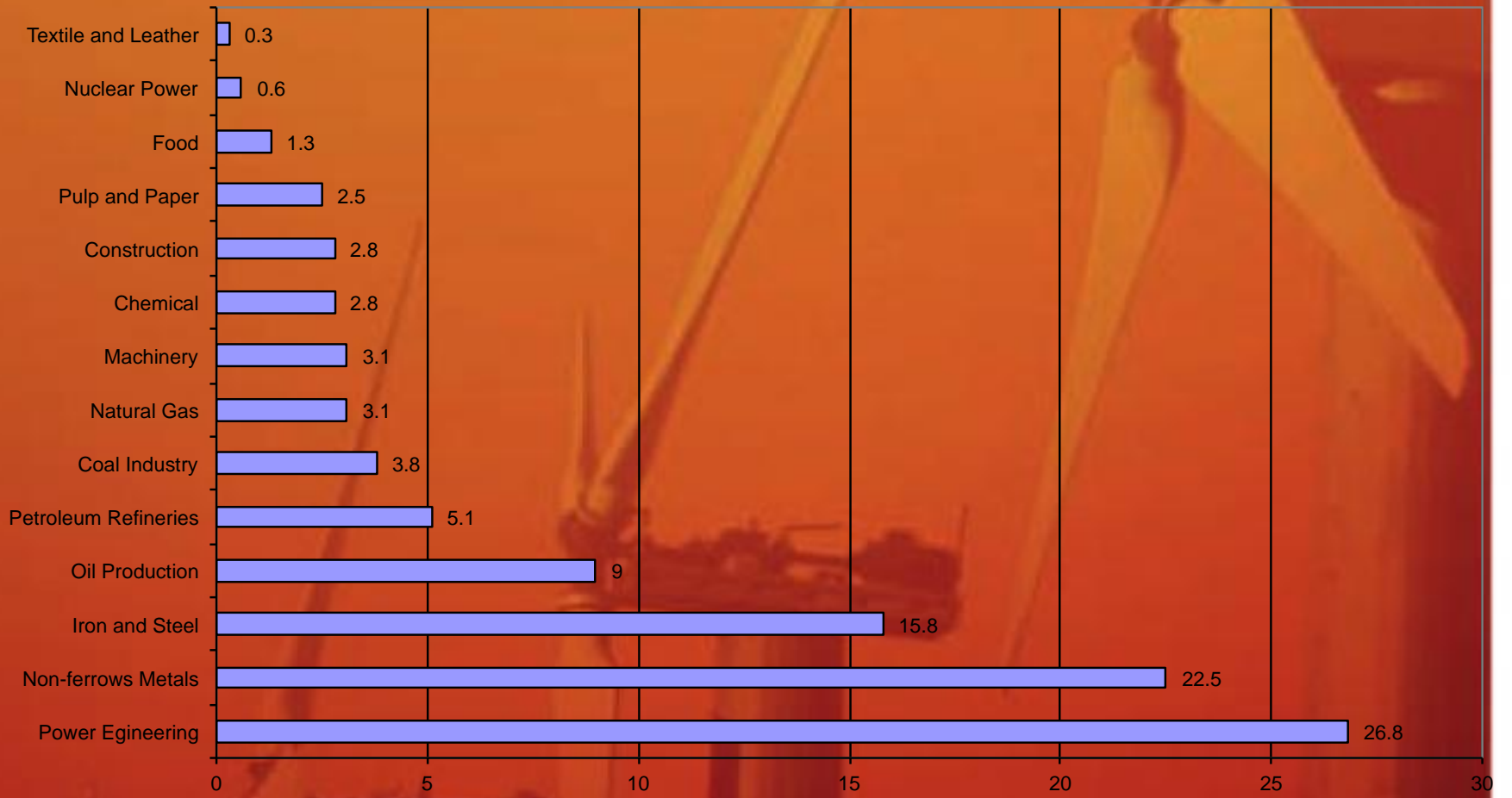
Primary energy mix and emission trends



Russia

Industrial structure of air pollutant emissions in 1999, %

Fig 7.



Including SO_x, CO, NO_x, CH₄, VOC and Particulates
Source: State report on the environment, Moscow 2000

Water Quality

- **ENV4-1 -- Contaminant discharges in liquid effluents from energy systems**
 - Contaminant discharges in liquid effluents from all energy-related activities, including the discharge of cooling waters, which can raise the temperature of the watercourse
- **Data Needed**
 - Either (i) quantities of pollutants discharged from all energy-related activities, particularly from coal mining and oil extraction
 - or (ii) monthly or annual average site-specific concentrations of each of the pollutants.

Water Quality

- ENV4-2 -- **Oil discharges into coastal waters**
 - Total accidental, licensed and illegal disposal of mineral oil into the coastal and marine environment
- Data Needed
 - Estimates of oil input to coastal areas and seas from the main sources of oil disposal.

Land -- Soil Quality

- **ENV5 -- Soil area where acidification exceeds critical load**
 - Soil area where damage could occur due to acidification levels that exceed critical loads
- **Data Needed**
 - Critical load values for total acidity of sulphur and nitrogen, combined with acid deposition values, in order that exceedance values can be produced showing the area of soil where critical loads are being exceeded.
 - Countries should make clear the data validation processes for the emissions, deposition and critical load determinations that are used as the basis for the development of the indicator.

Land -- Deforestation

- **ENV6 -Rate of deforestation attributed to energy use**
 - Annual change in the amount of natural and plantation forest area tracked over time that could be attributed to using wood as a fuel for energy purposes
- **Data Needed**
 - The total forest area of a country, including plantations, at different yearly intervals
 - fuelwood production or use
 - the annual total forest fellings

Land – Solid Waste Generation and Management

- **ENV7 -Ratio of solid waste generation to units of energy produced**
 - Amount of solid waste (excluding radioactive waste) produced annually from activities related to the extraction and conditioning of primary fuels, and waste produced in thermal power plants, expressed as weight of waste per unit of energy produced
- **Data Needed**
 - production of waste at source
 - primary energy production
 - output from refineries
 - electricity generated from fossil fuels and other combustible fuels.

Land – Solid Waste Generation and Management

- **ENV8 - Ratio of solid waste properly disposed of to total generated solid waste**
 - Amount of waste generated by the energy sector that has been properly disposed of, expressed as a percentage of the volume of total solid waste produced by the energy sector
- **Data Needed**
 - Data on the production of waste at source
 - quantities delivered to waste treatment and disposal facilities..

Land – Solid Waste Generation and Management

- **ENV9 -- Ratio of solid radioactive waste to units of energy produced**
 - Radioactive waste arisings from nuclear fuel cycles or other fuel cycles per unit of energy produced.
 - Waste arisings destined for disposal in solid form are classified and categorized according to national definitions or as proposed here.
 - These quantities consider all radioactive wastes from energy fuel cycles, including mining, milling, energy generation and other related processes.
 - This indicator represents a set of indicators that includes one for each type of radioactive waste

Land – Solid Waste Generation and Management

- ENV9 -- **Ratio of solid radioactive waste to units of energy produced (cont.)**
- Data Needed --The volumes of the various radioactive waste types arising annually:
 - High-level radioactive waste (HLW).
 - low- and intermediate-level radioactive waste, long lived (LILW-LL)
 - Low- and intermediate-level radioactive waste, short lived (LILW-SL)
 - Spent fuel arisings
 - Radioactive waste from non-nuclear processes and activities.

Land – Solid Waste Generation and Management

- **ENV10 -- Ratio of solid radioactive waste awaiting disposal**
 - Accumulated quantities of solid radioactive waste awaiting near- surface or geological disposal from all steps in the nuclear and non-nuclear fuel cycles.
 - These quantities include all radioactive wastes originating from energy fuel cycles, including mining, milling, energy generation and other related processes.
 - Radioactive wastes in solid form are classified and categorized according to national definitions or as proposed here.
 - This indicator represents a set of indicators that includes one for each type of radioactive waste
- **Data Needed**

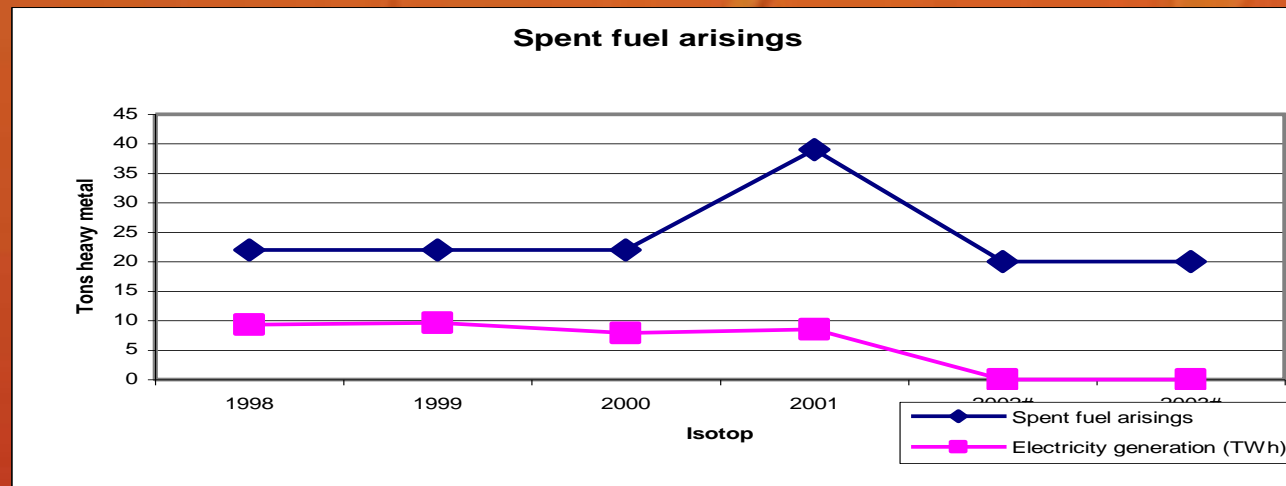
Land – Solid Waste Generation and Management

- ENV10 -- **Ratio of solid radioactive waste awaiting disposal (cont.)**
- Data Needed -- The accumulated quantities of the various radioactive waste types generated and awaiting proper disposal
 - High-level radioactive waste (HLW)
 - Low- and intermediate-level radioactive waste, long lived (LILW-LL)
 - Low- and intermediate-level radioactive waste, short lived (LILW-SL)
 - Spent fuel
 - Radioactive waste from non-nuclear processes and activities

Mexico

Generation of radioactive waste from nuclear power production, 1998-2003

near power fuel cycle chain



* The graph not included the isotope H-3 because it is out of the range