


Monitoring of radioactive substances in the Baltic Sea (HELCOM MORS-PRO)



- ⌘ Implementing the Helsinki Convention on matters related to monitoring and assessment of radioactive substances in the Baltic Sea (HELCOM Recommendation 26/3)
- ⌘ Participation of contracting parties including the EC and IAEA

MORS activities



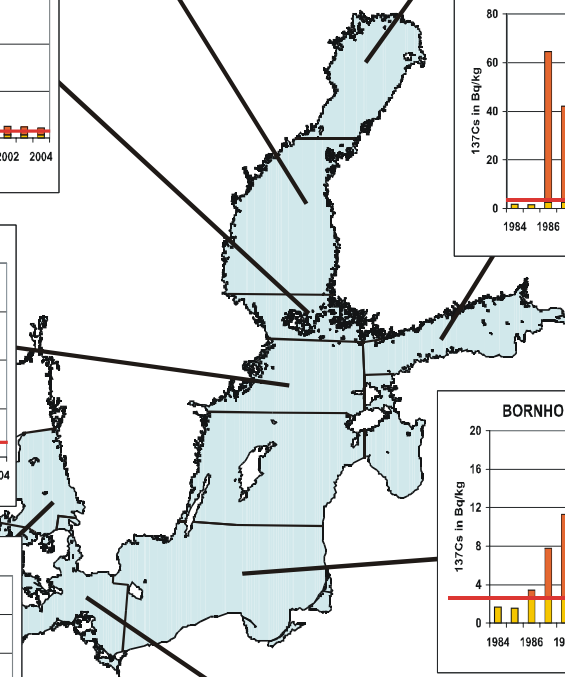
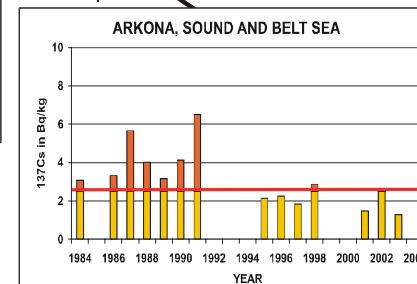
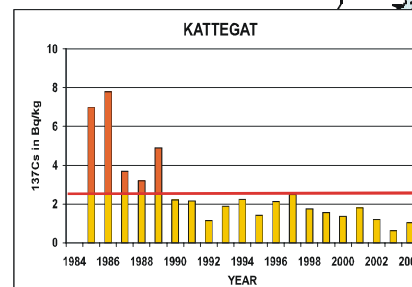
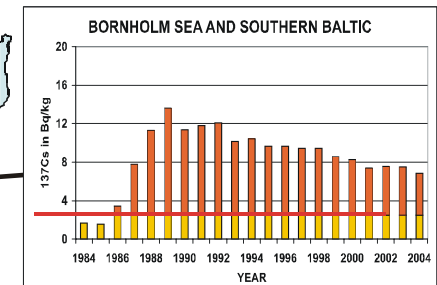
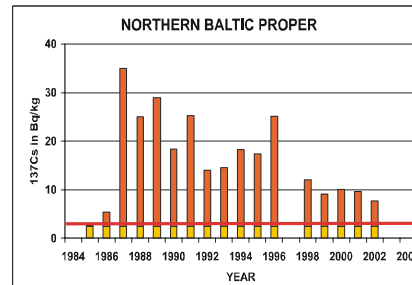
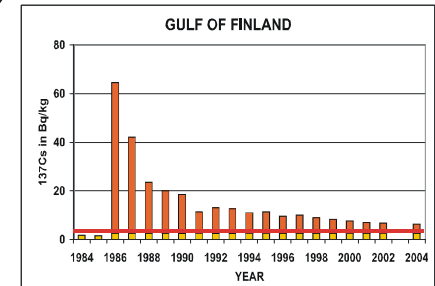
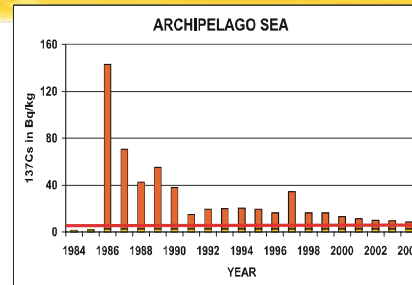
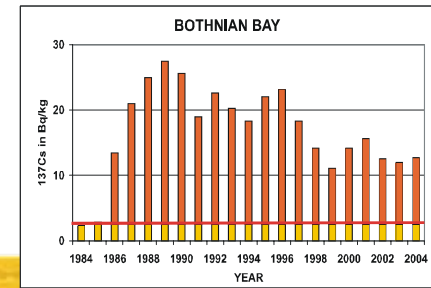
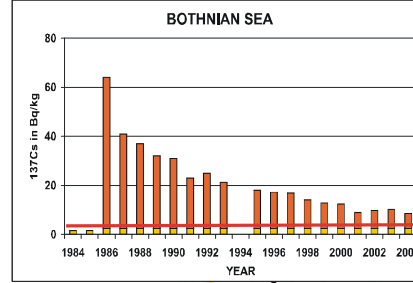
- ⌘ Basic monitoring programmes on radioactive substances;
- ⌘ Data on discharges of radioactivity from civil nuclear facilities;
- ⌘ Data on environmental levels of radioactivity;
- ⌘ Indicator reports on radioactive substances;

More MORS activities



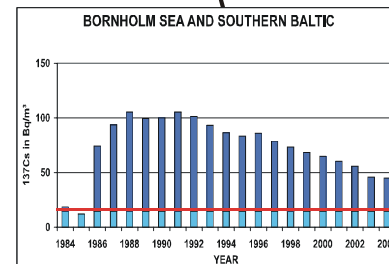
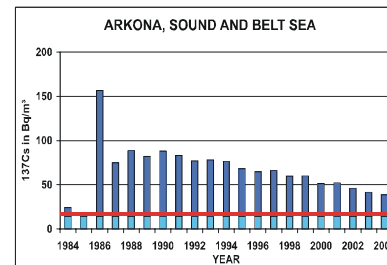
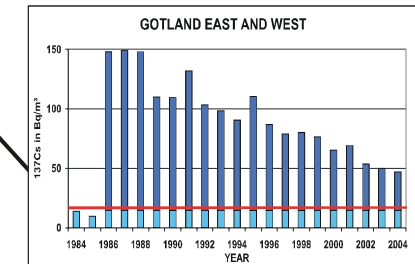
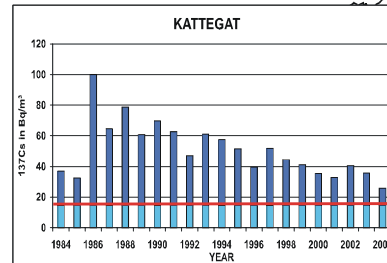
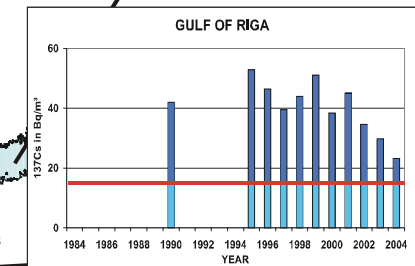
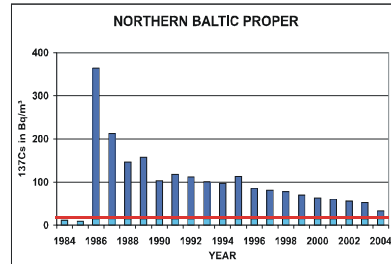
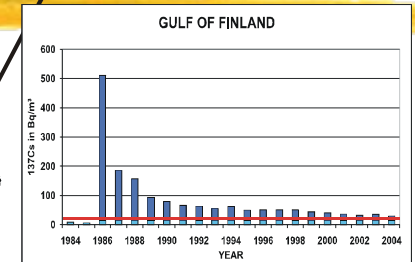
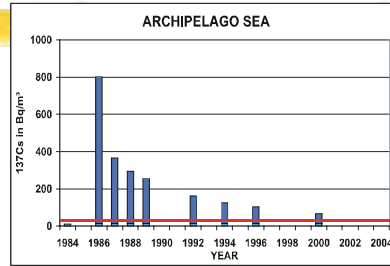
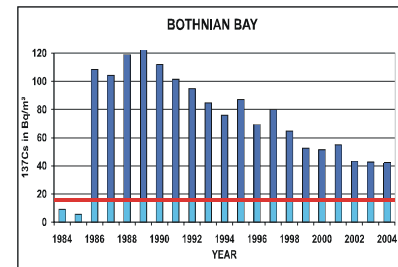
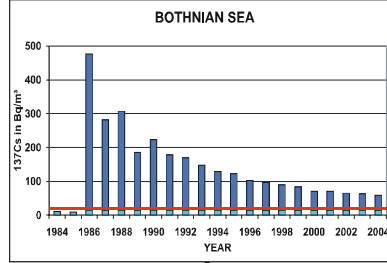
- ⌘ Sediment baseline study (spatial distribution of radionuclides in the Baltic Sea sediments);
- ⌘ Periodic assessment on radioactivity in the Baltic Sea 1999-2006;
- ⌘ Annual intercomparison exercises on seawater, sediments and biota and annual validation of the data submitted to the HELCOM databases;
- ⌘ Follow trends of export of radionuclides from the Baltic Sea to the North Sea and vice versa;
- ⌘ Thematic reports

Indicators: Cs-137 in herring muscle 1984-2004



■ ¹³⁷Cs concentration above target value
■ ¹³⁷Cs concentration below target value
— Target level = 2.5 Bq/kg

Indicators: Cs-137 in surface seawater 1984-2004



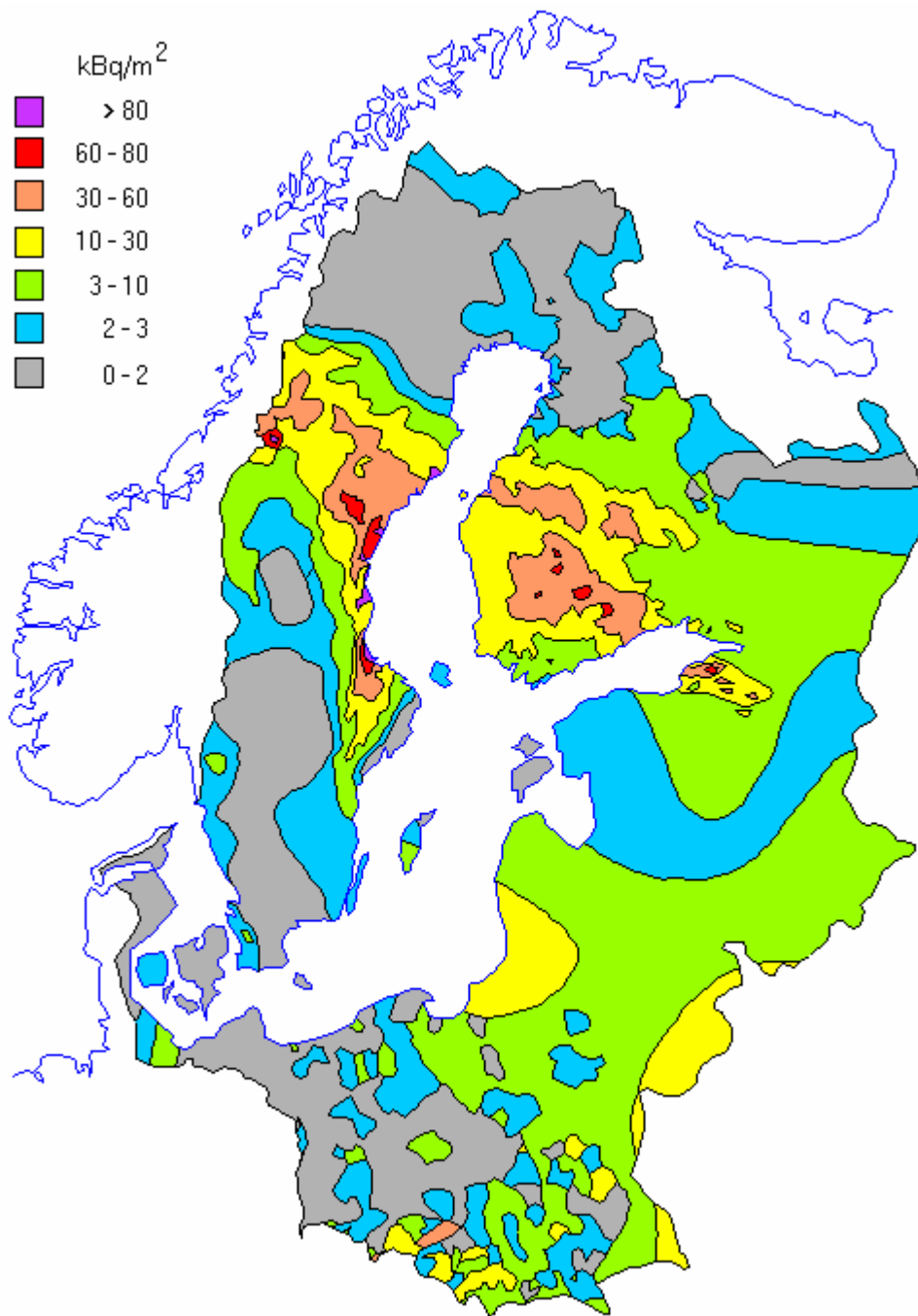
■ ¹³⁷Cs concentration above target value
■ ¹³⁷Cs concentration below target value
— Target level = 15 Bq/m³

MORS-PRO Sediment baseline study 2000-2005



- ⌘ Improve inventory estimates of man-made radionuclides in Baltic Sea sediments
- ⌘ Include areas with limited data
- ⌘ Consider the radionuclides Cs-137, Sr-90, Tc-99, Np-237, Pu-239+240, Am-241

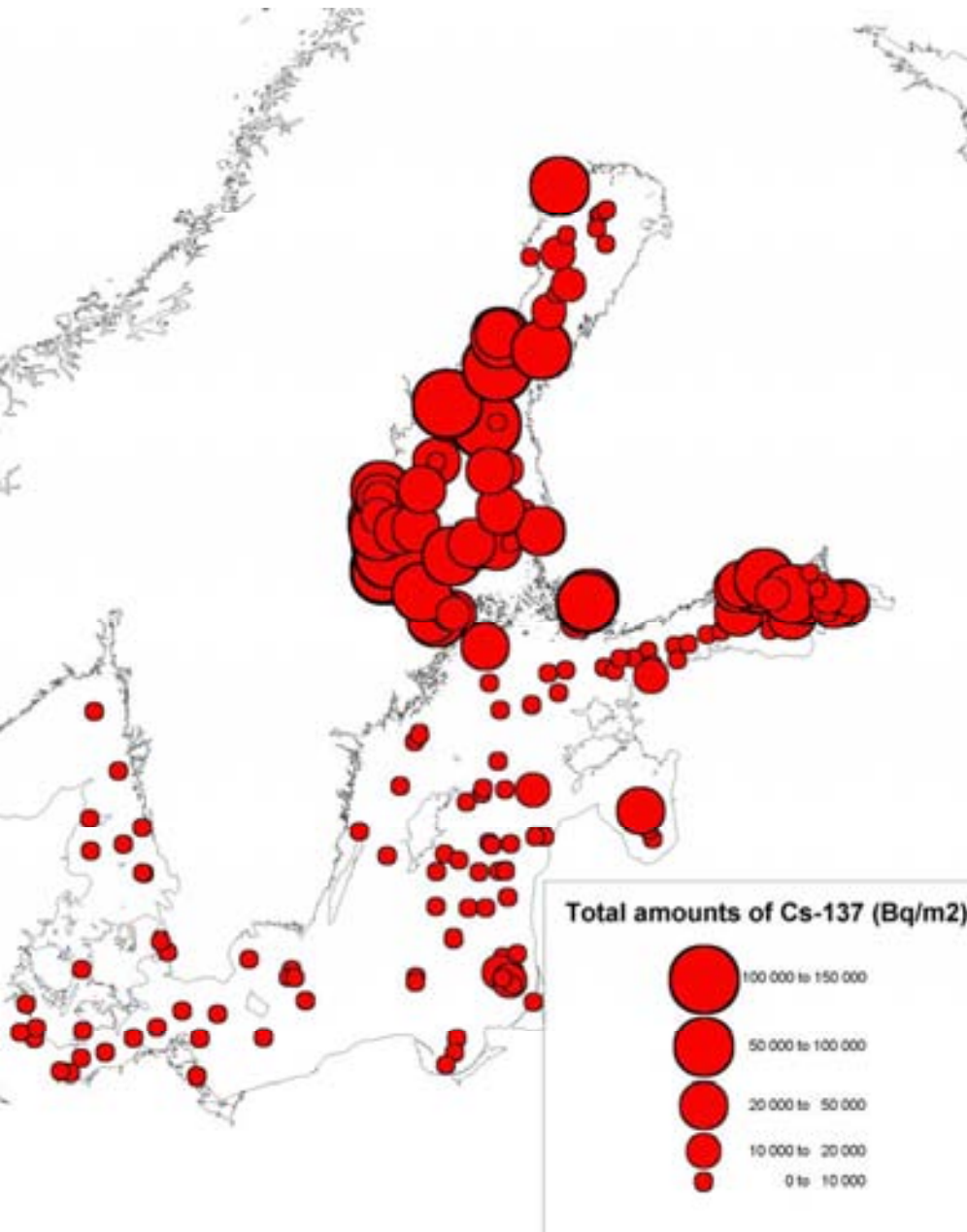
Chernobyl Fallout



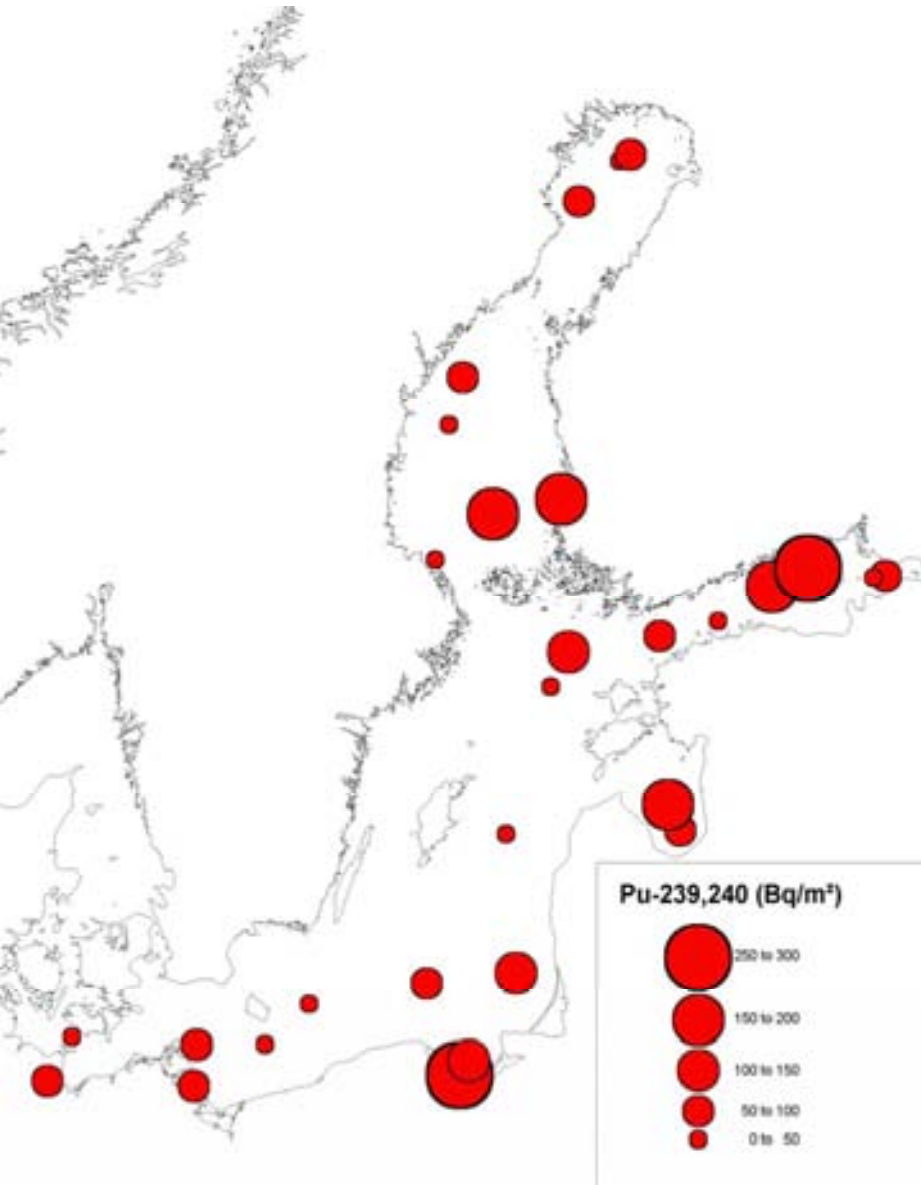
⌘ Atmospheric fallout of Cs-137 over the Baltic Sea area following the Chernobyl accident in 1986

Cs-137 in Sediments

Total amounts of Cs-137 (Bq/m²) at different sampling stations



Pu-239+240 in Sediments



- ⌘ Total amounts of Pu-239+240 (Bq/m²) at different sampling stations

Radionuclide Inventories in Baltic Sea Sediments

⌘ Man-made radionuclides

☒ Cs-137: 2100-2400 TBq

☒ Sr-90: 26 TBq

☒ Pu-239+240: 15 TBq

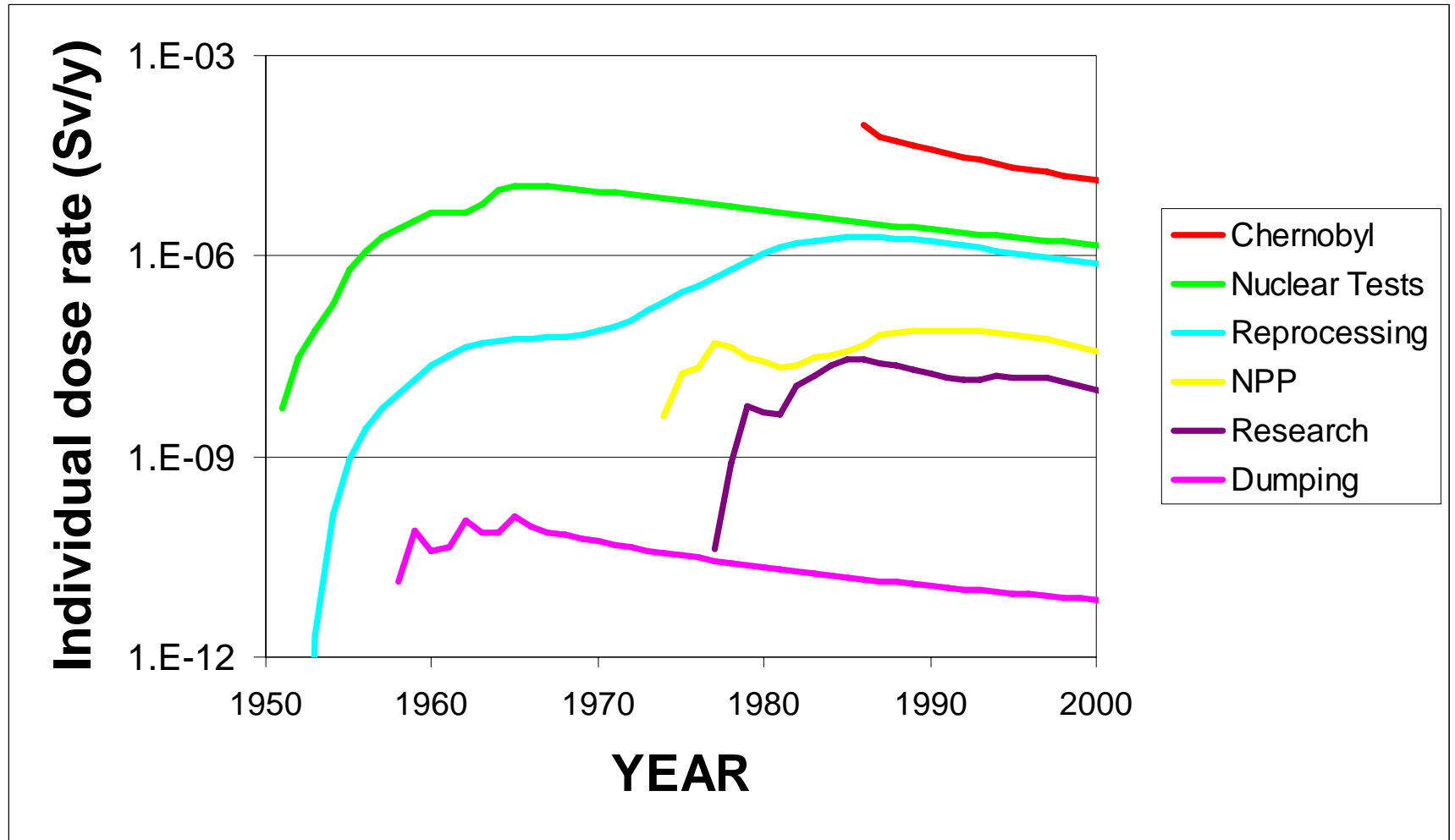
☒ Np-237: 0.02 TBq

⌘ Natural radionuclides, 0-10 cm

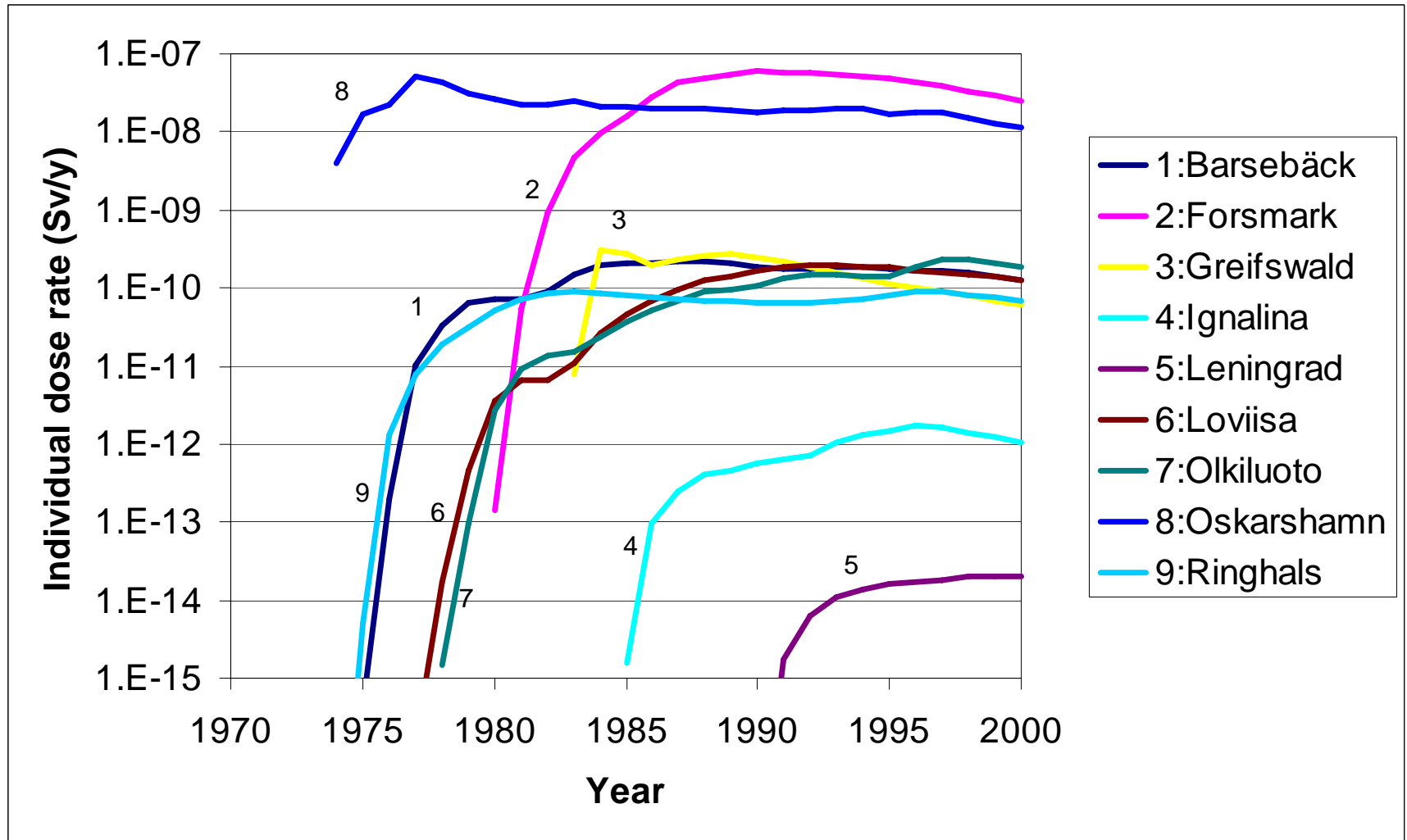
☒ K-40: 8500 TBq

☒ Ra-226: 420 TBq

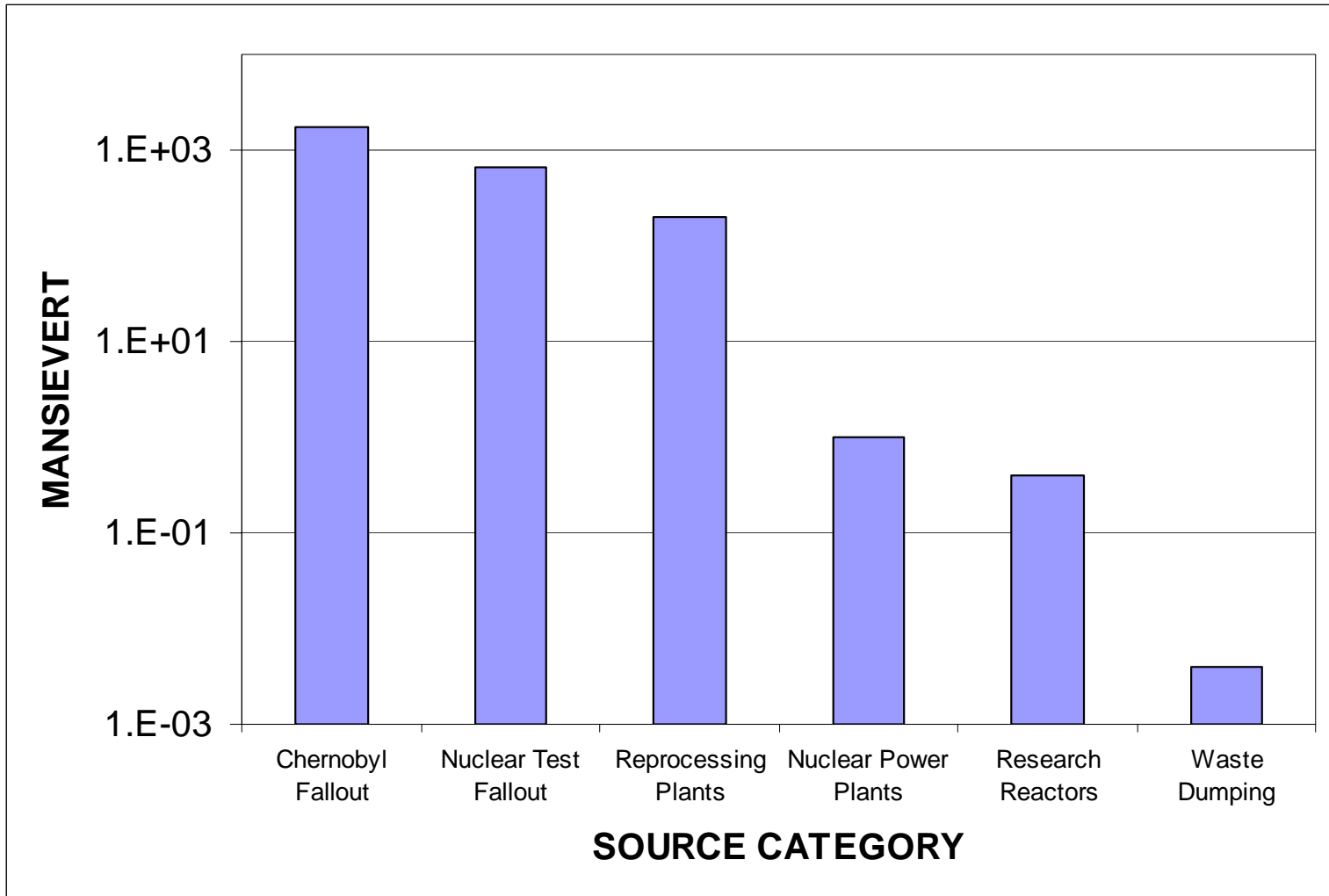
Doses to Critical Groups in the West Baltic Region



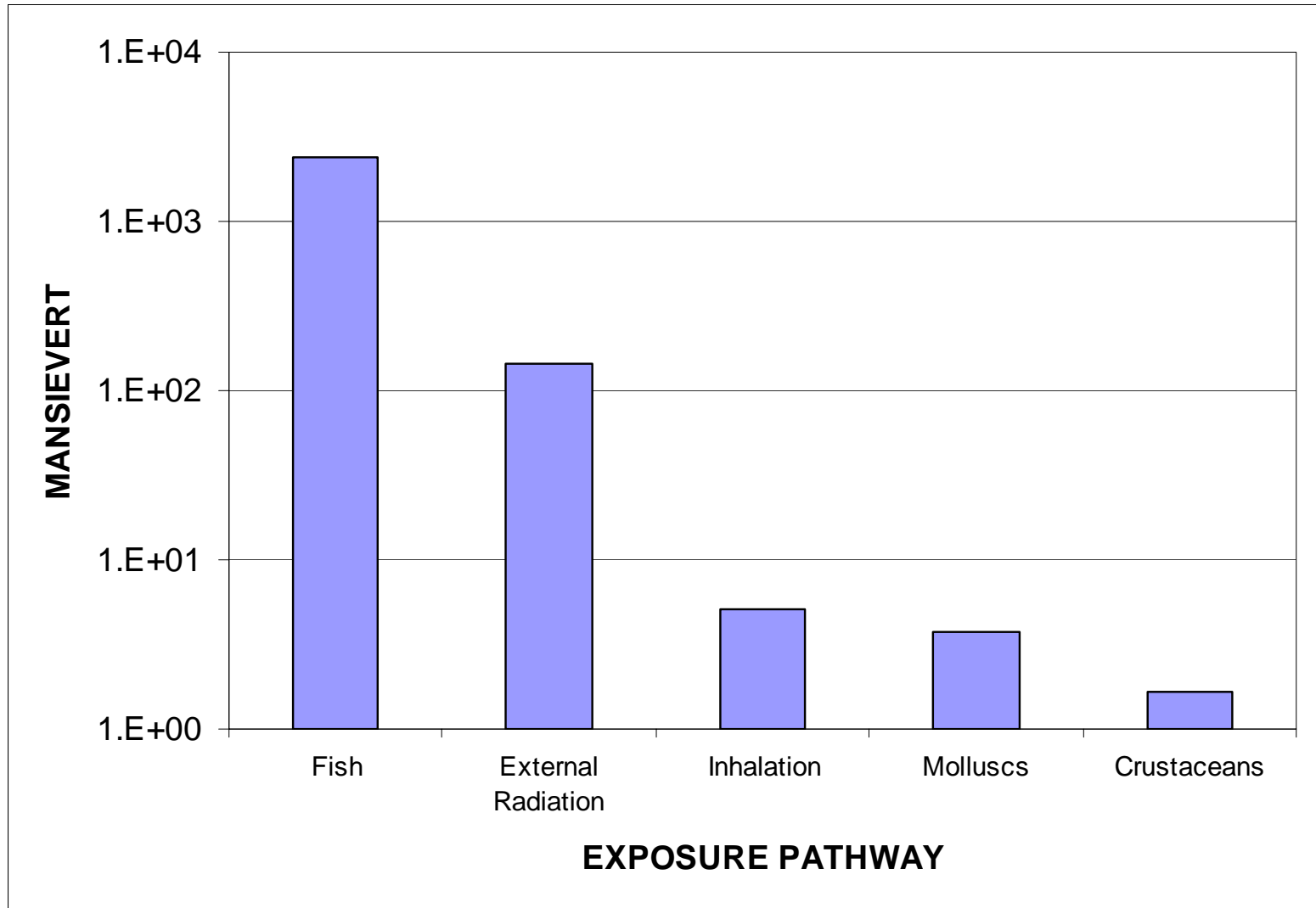
Doses to Critical Groups in the West Baltic from NPP



Collective Dose



Collective Dose



Doses from natural radioactivity



- ⌘ Typical levels of Po-210 in the Baltic Sea:
 - ☒ fish 0.8 Bq/kg
 - ☒ crustaceans 20 Bq/kg
 - ☒ molluscs 30 Bq/kg
- ⌘ Annual dose to individuals from critical group: 0.7 mSv
- ⌘ Annual collective dose: 400 manSv

Conclusions



- ⌘ The radiological impact on man from man-made radioactivity in the Baltic Sea 1950-1996 is low compared with that from natural radioactivity
- ⌘ Maximum individual annual doses from man-made radioactivity are about 30% of doses from natural sources
- ⌘ The collective impact from man-made radioactivity is about 2600 manSv (67% Chernobyl, 25% weapons fallout, 8% reprocessing, and 0.04% nuclear facilities in the Baltic Sea)