

# THE ANALYSIS OF GROUNDWATER QUALITY PROBLEMS IN BALTIC SEA REGION COUNTRIES

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Riga 2012. 30. 01.



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# Introduction

- ❑ Groundwater is a largest freshwater reservoir in the Baltic Sea region countries. One of the current problems in region is agricultural farming.
- ❑ Groundwater interacts with surface water (lakes, rivers, ditches) and drainage water quantitatively and qualitatively. Development and contamination of one part commonly affects the other part of hydrological cycle.
- ❑ The use of nitrogen fertilizers in agriculture is one of the main factors which contributes surface water and groundwater contamination with various types of nitrogen.
- ❑ The use of nitrogen and phosphorus compounds for intensive agricultural farming is significant source that affects groundwater quality in Baltic Sea region countries.



# Research Field

- ❑ The aim of the presented study is to analyze current agricultural impact on groundwater quality in the Baltic Sea region and give guidance and recommendations for better international cooperation based on Europe Union directives.
- ❑ The main task is to compare the current situation of groundwater quality in three Baltic Sea region country sub-regions and define the development scenarios.



# Materials and Methods

- 1) Based on geographical, agro hydrological, and agro climatic conditions Baltic Sea region countries are divide in three sub-regions:

Three sub-regions are:

- Baltic States (Estonia, Latvia and Lithuania);
- Nordic states (Finland and Sweden);
- West states – (Germany, Poland and Denmark).



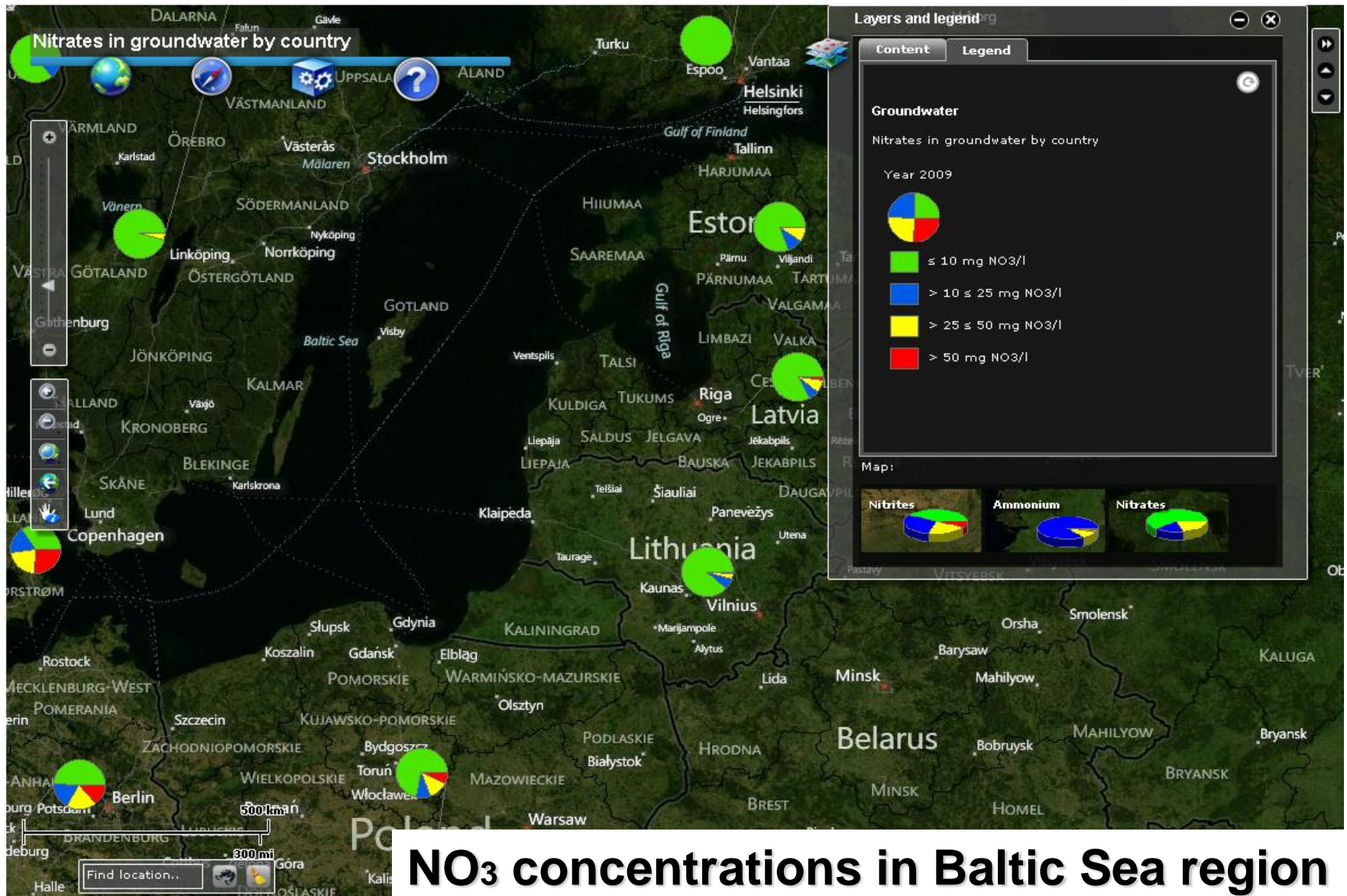
# Materials and Methods

- 2) Europe Union (EU) countries have set following restrictions for agricultural farming:
  - ☐ Water framework directive (2000/60/EC);
  - ☐ Nitrate directive (91/676/EEC) (threshold value  $\text{NO}_3$  (Nitrate) = 50mg/l);
  - ☐ Groundwater directive (80/68/EEC);
  - ☐ Code for Good agricultural practice;
  - ☐ Each country has defined vulnerable zones to control contamination for groundwater and surface water.
- 3) Research results are based on Shared Environmental Information System (SEIS), European Environment Agency (EEA), The Statistical Office of the European Union (EIROSTAT) and European Environment Information and Observation Network (EIONET).





# Results



## $\text{NO}_3$ concentrations in Baltic Sea region



# Results



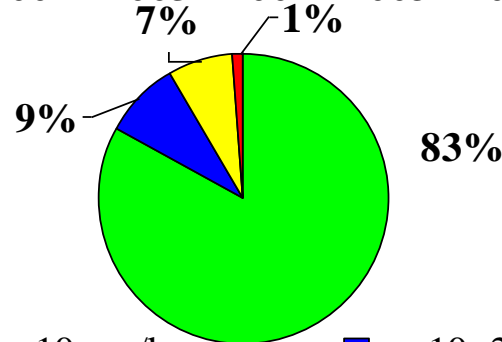
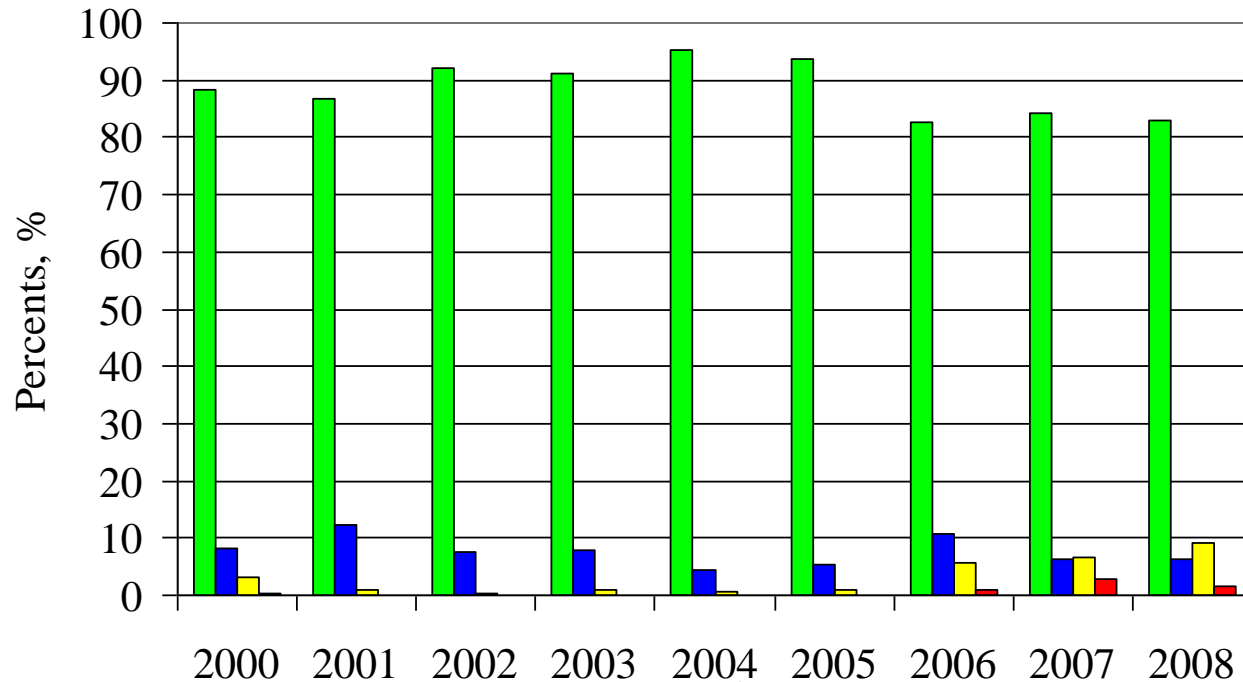
## Vulnerable zones in Baltic Sea Region

ESF projekts „Starpnozaru zinātnieku grupas un modeļu sistēmas izveide pazemes ūdeņu pētījumiem”

Līguma Nr. 2009/0212/1DP/1.1.1.2.0/09/APIA/VIAA/060

<http://www.eea.europa.eu/themes/water/interactive/soe-wfd/nid>

# NO<sub>3</sub> concentrations in groundwater in Baltic States: changes and current situation



■ <10 mg/l

■ >=10 <25 mg/l

■ >=25 <50 mg/l

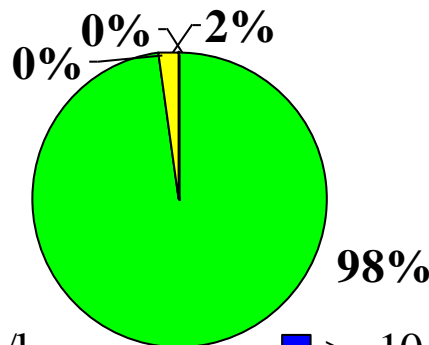
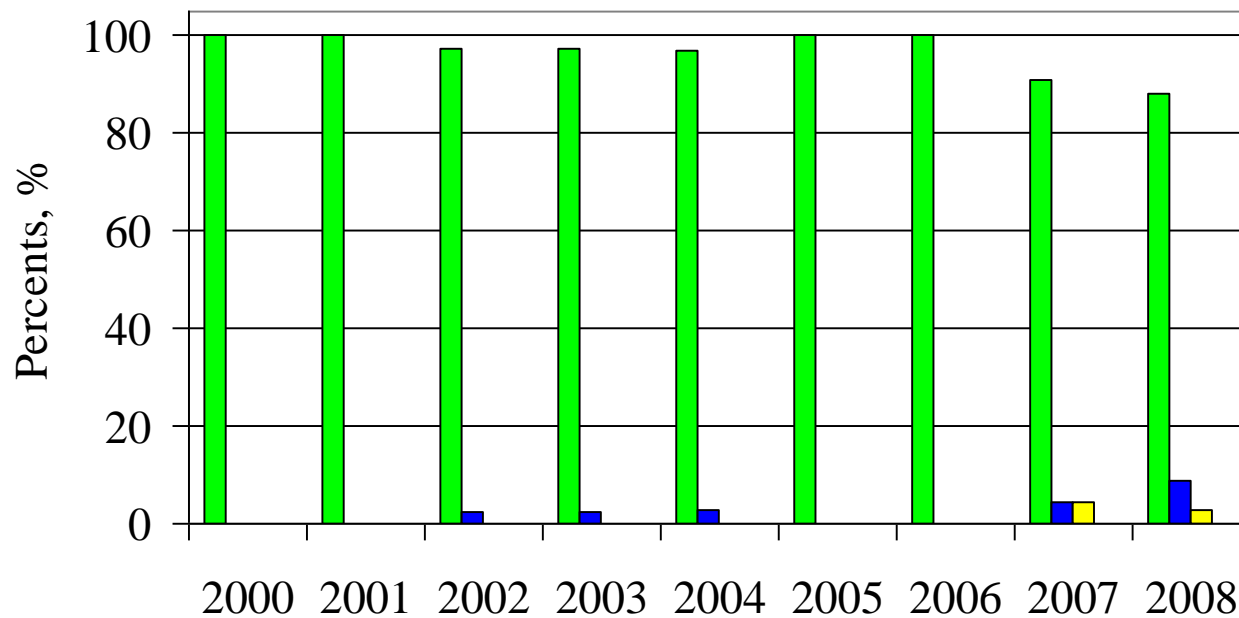
■ >=50 mg/l

Data source: EEA





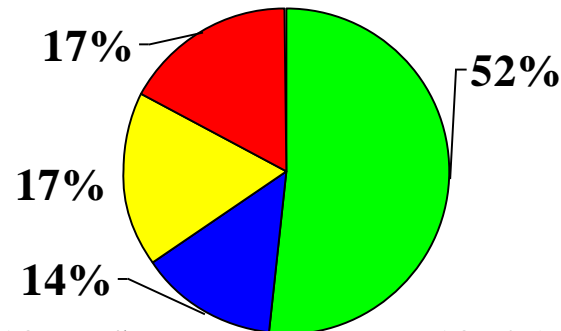
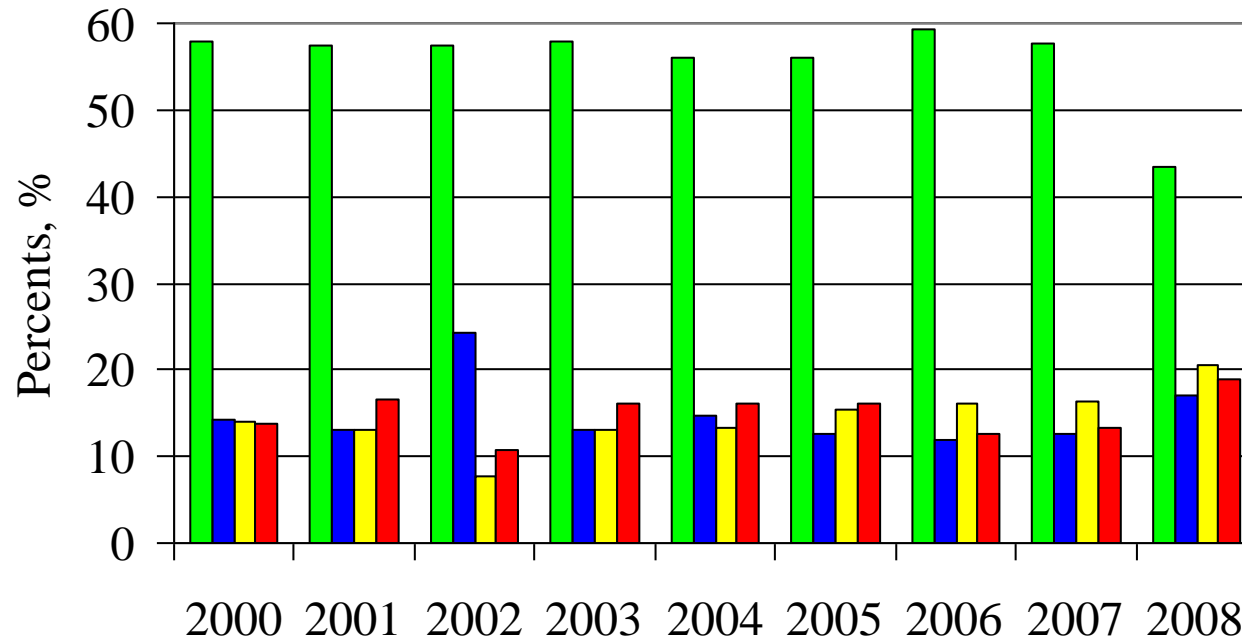
# NO<sub>3</sub> concentrations in groundwater in Nordic states: changes and current situation



Data source: EEA



# NO<sub>3</sub> concentrations in groundwater in West states: changes and current situation



<10 mg/l

>=25 <50 mg/l

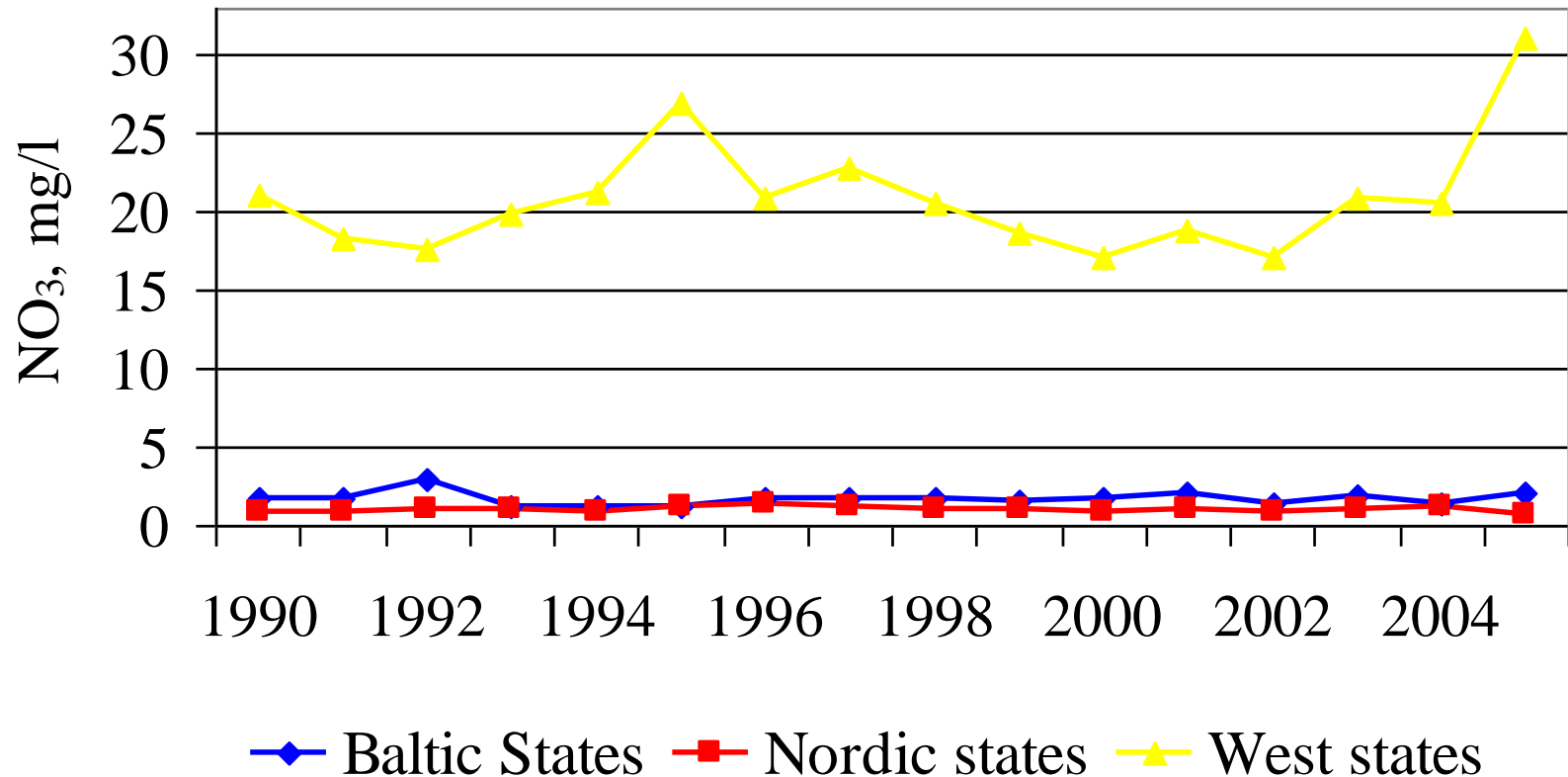
>=10 <25 mg/l

>=50 mg/l

Data source: EEA

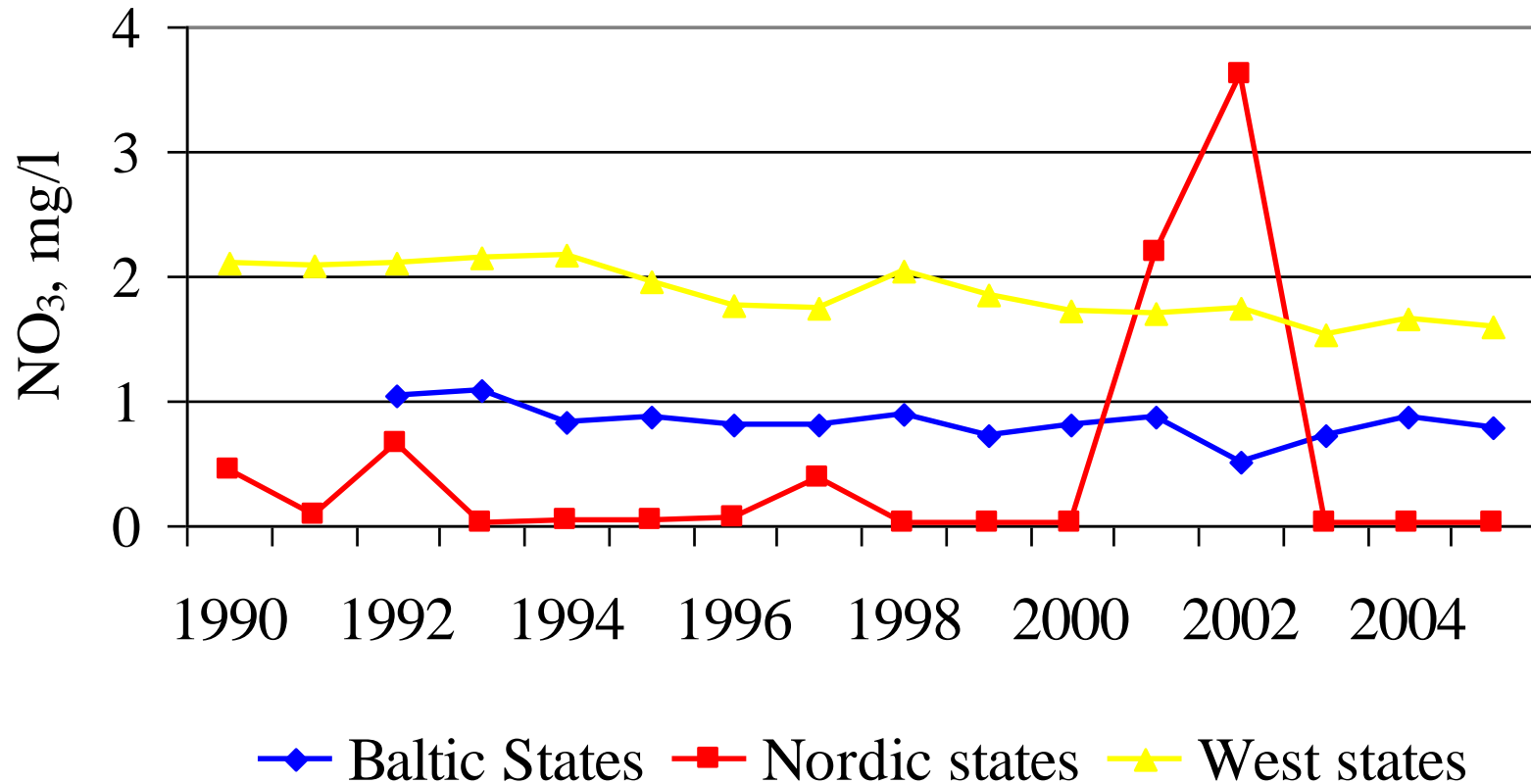


# NO<sub>3</sub> concentrations in groundwater in Baltic Sea region countries



Data source: EEA

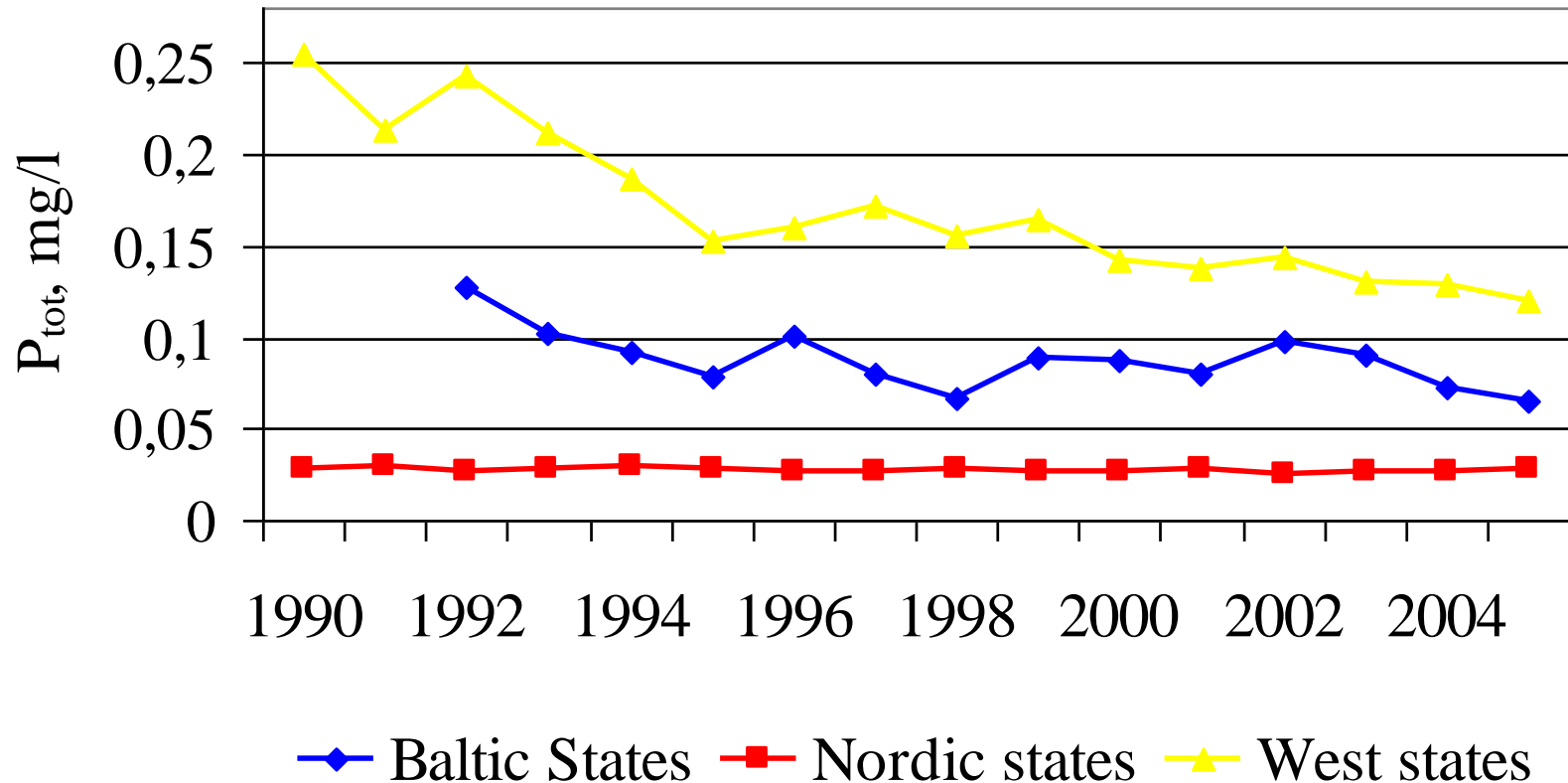
# NO<sub>3</sub> concentrations in surface water in Baltic Sea region countries



Data source: EEA



# $P_{\text{tot}}$ concentrations in surface water in Baltic Sea region countries



Data source: EEA

# Conclusions

- ❑ Nitrate concentrations in surface water and groundwater depend from amount of agricultural farming intensity and territory. The nitrate concentration level is higher if agricultural area is larger.
- ❑ Three Baltic Sea sub-regions are compared and was observed that the best surface and groundwater quality is in Nordic states, than follow Baltic States, but most polluted waters are in West states.
- ❑ Results show that groundwater quality deteriorate in all Baltic Sea region countries. It could be explained with water sampling improvement or agricultural farming intensity increase.



# Conclusions

- ❑ Necessary to develop regional monitoring network and information system based on EEA data base for each country.
- ❑ In state level insure objective data input from each country in regional data base and to improve collaboration between states and responsible institution.





**THANK YOU  
FOR ATTENTION!**