GIS reference datasets as basis for WISE and object version history
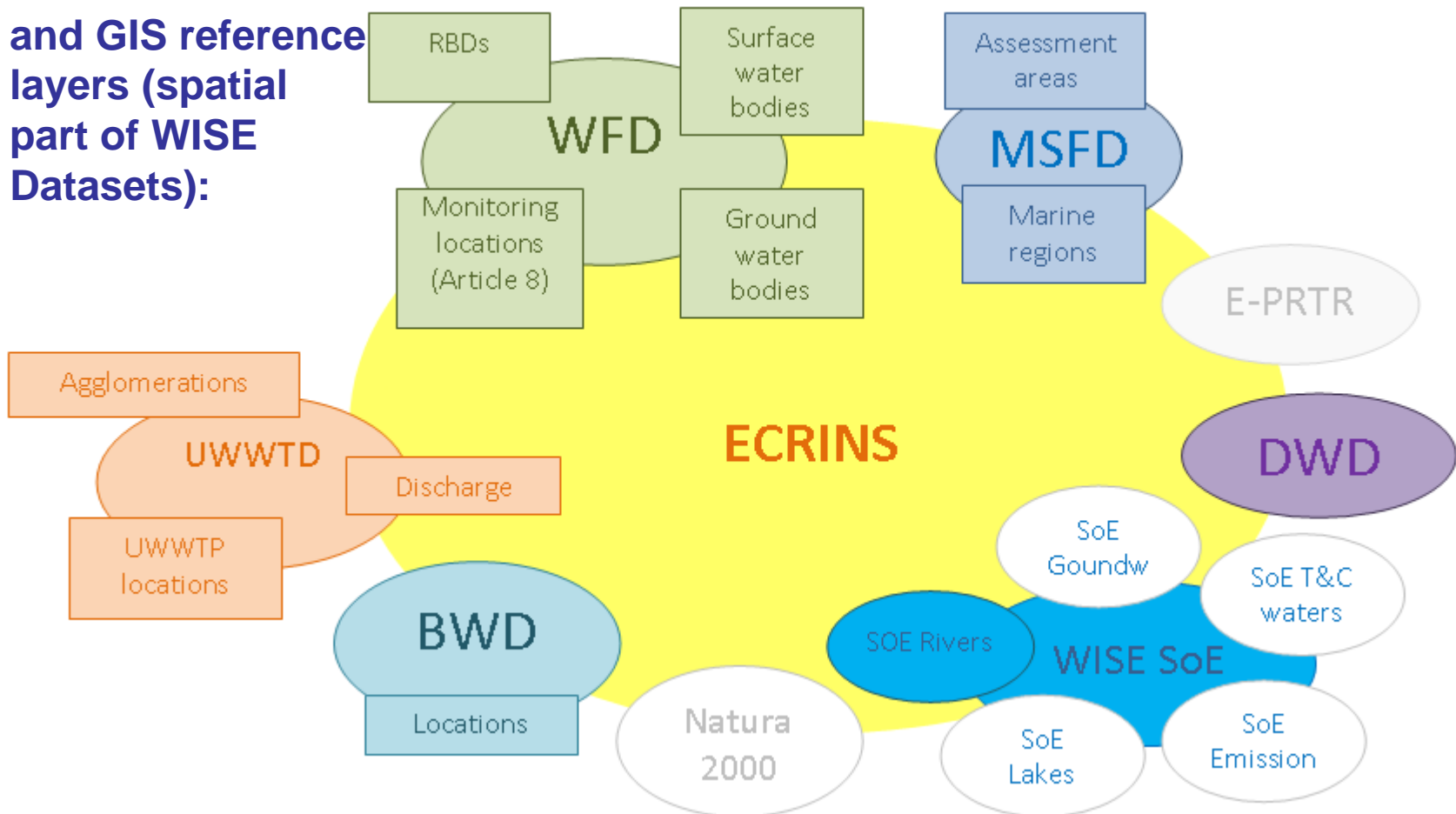
Presenter: Lidija Globevnik

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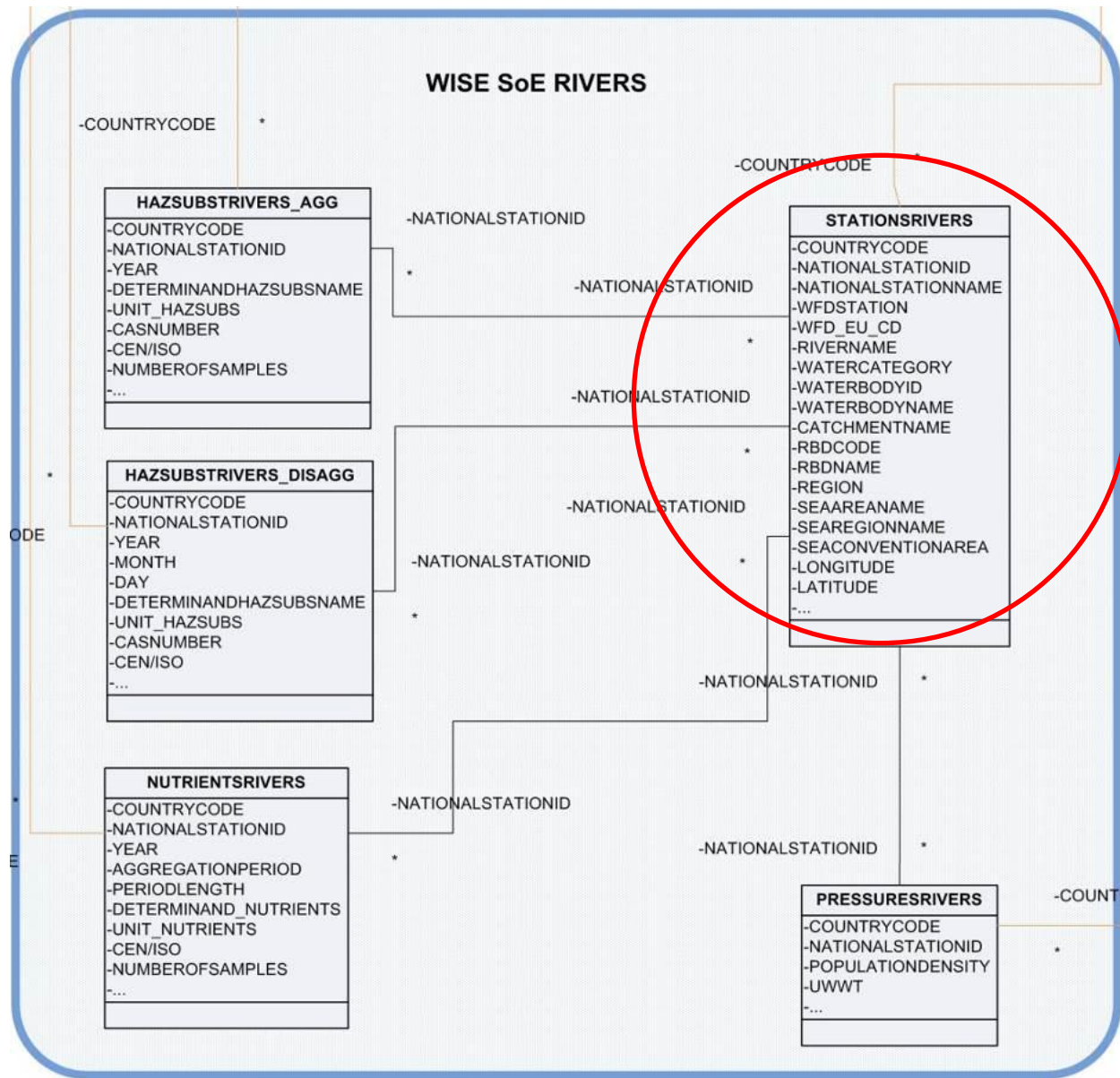Inland, coastal, marine waters

Introduction:

- GIS reference layer spatial platform for building connectivity (relations) of SoE and Water Directives data
- GIS reference layer spatial base for WISE core data set model (interlinkage of tabular data in WISE)
- **GIS reference layers: spatial data from**
    - Water Framework Directive (WFD)
    - Bathing Water Directive (BWD)
    - Urban Waste Water Treatment Directive (UWWTD) and
    - Drinking Water Directive (DWD)
    - WISE SoE Rivers
    - WISE SoE Lakes
    - WISE SoE T&C Waters
    - WISE SoE Emissions
    - WISE SoE Biology
- Basic hydrographic spatial reference:
    - European Catchments and Rivers Network System (ECRINS)

- Relations with:
    - European Pollutant Release and Transfer Register (E-PRTR) and
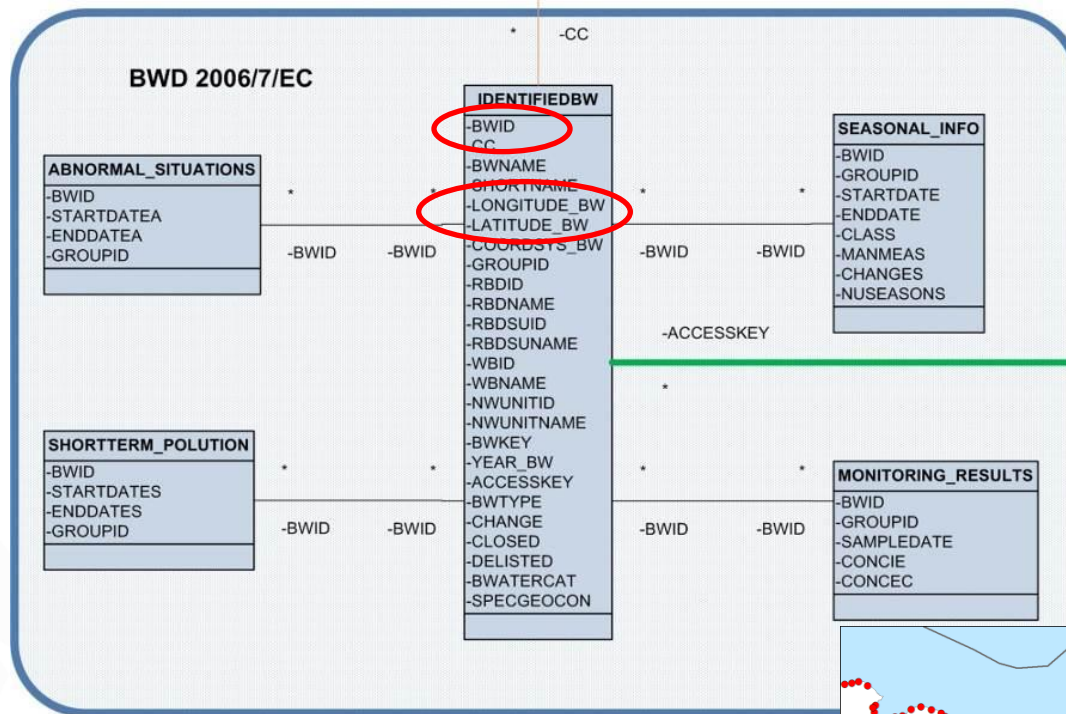   - Natura2000 datasets

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WISE Datasets and GIS reference layers (spatial part of WISE Datasets):

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WISE Dataset: SoE Rivers

WISE SoE RIVERS

HAZSUBSRIVERS_AGG
- COUNTRYCODE
- NATIONALSTATIONID
- YEAR
- DETERMINANDHAZSUBSNAME
- UNIT_HAZSUBS
- CASNUMBER
- CEN/ISO
- NUMBEROFSAMPLES
- ...

HAZSUBSRIVERS_DISAGG
- COUNTRYCODE
- NATIONALSTATIONID
- YEAR
- MONTH
- DAY
- DETERMINANDHAZSUBSNAME
- UNIT_HAZSUBS
- CASNUMBER
- CEN/ISO
- ...

NUTRIENTSRIVERS
- COUNTRYCODE
- NATIONALSTATIONID
- YEAR
- AGGREGATIONPERIOD
- PERIODLENGTH
- DETERMINAND_NUTRIENTS
- UNIT_NUTRIENTS
- CEN/ISO
- NUMBEROFSAMPLES
- ...

STATIONSRIVERS
- COUNTRYCODE
- NATIONALSTATIONID
- NATIONALSTATIONNAME
- WFDSTATION
- WFD_EU_CD
- RIVERNAME
- WATERCATEGORY
- WATERBODYID
- WATERBODYNAME
- CATCHMENTNAME
- RBDCODE
- RBDNAME
- REGION
- SEAAREANAME
- SEAREGIONNAME
- SEACONVENTIONAREA
- LONGITUDE
- LATITUDE
- ...

PRESSURESRIVERS
- COUNTRYCODE
- NATIONALSTATIONID
- POPULATIONDENSITY
- UWWT
- ...

- COUNTRYCODE
- NATIONALSTATIONID

WISE Dataset: BWD

BWD 2006/7/EC

IDENTIFIEDBW
-BWID
-CC
-BWNAME
-SHORTNAME
-LONGITUDE_BW
-LATITUDE_BW
-COORDSYS_BW
-GROUPID
-RBDID
-RBDNAME
-RBDSUID
-RBDSUNAME
-WBID
-WBNAME
-NWUNITID
-NWUNITNAME
-BWKEY
-YEAR_BW
-ACCESSKEY
-BWTYPE
-CHANGE
-CLOSED
-DELISTED
-BWATERCAT
-SPECGEOCON

ABNORMAL_SITUATIONS
-BWID
-STARTDATEA
-ENDDATEA
-GROUPID

SEASONAL_INFO
-BWID
-GROUPID
-STARTDATE
-ENDDATE
-CLASS
-MANMEAS
-CHANGES
-NUSEASONS

SHORTTERM_POLUTION
-BWID
-STARTDATES
-ENDDATES
-GROUPID

MONITORING_RESULTS
-BWID
-GROUPID
-SAMPLEDATE
-CONCIE
-CONCEC

-ACCESSKEY

One location has

1) **unique ID – to which all reported data are related to**

2) **spatial data**

Location = Spatial object (point)

Baltic Sea

- ● Coastal/transitional waters bathing monitoring
- ▲ River bathing monitoring
- ■ Lake bathing monitoring
- ▢ RBDs

WISE Dataset: UWWTD

URBAN WASTE WATER TREATMENT DIRECTIVE

Location = Spatial object (point)

Legend:
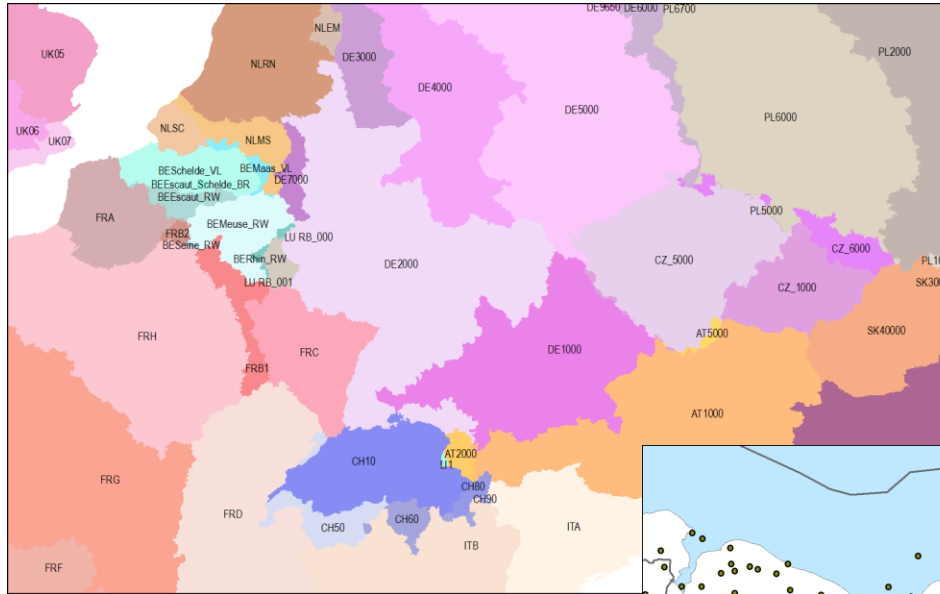- Agglomerations
- UWWTPs
- Discharge points
- RBDs

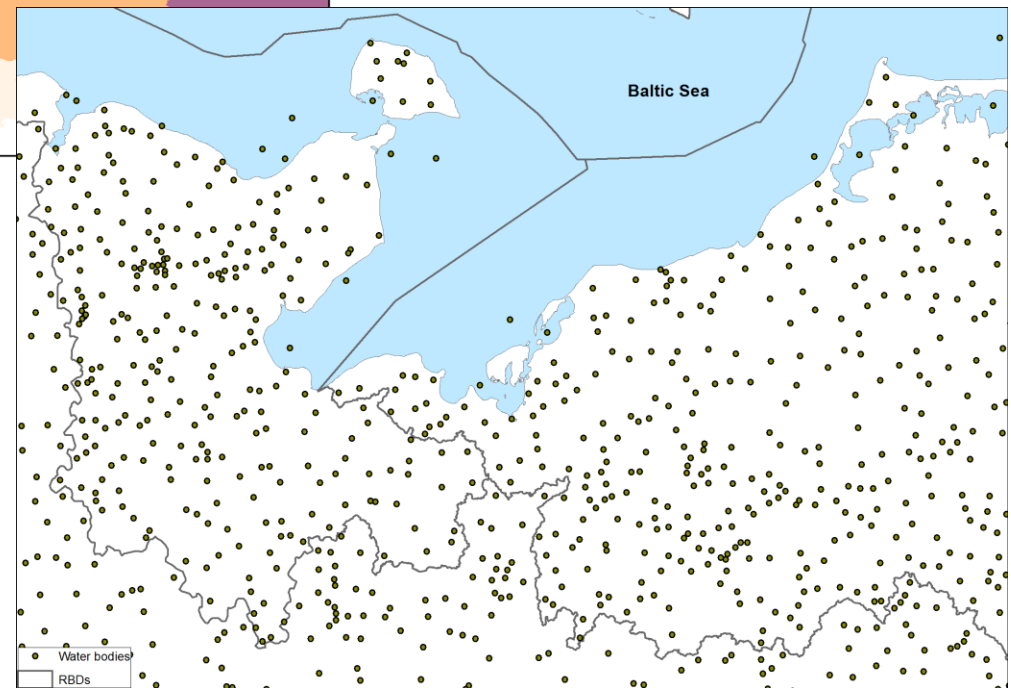Baltic Sea
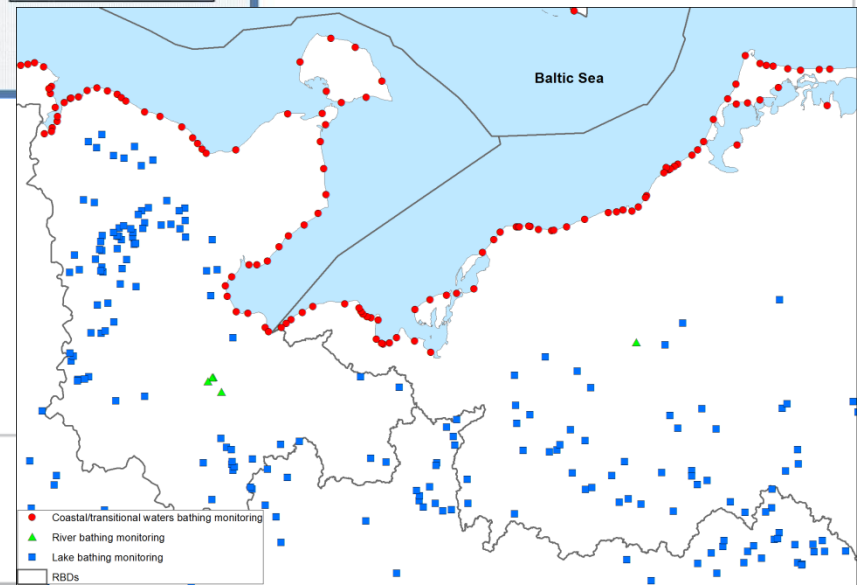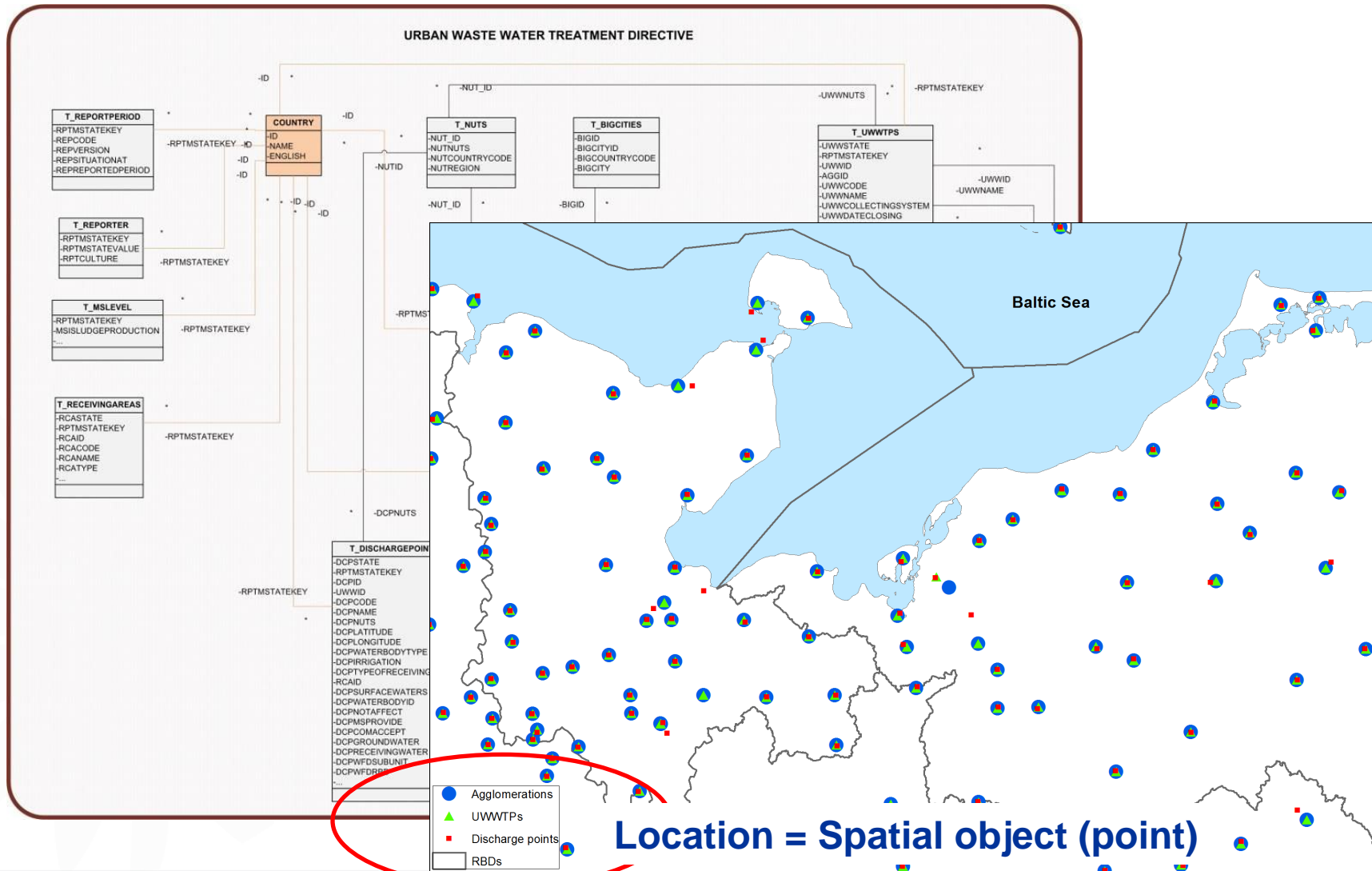
WISE Dataset: WFD

Spatial objects of WFD: River Basin Districts (RBDs).

Spatial objects of WFD:

- Water Bodies (SWBs, GWBs)

- WFD stations (monitoring stations)
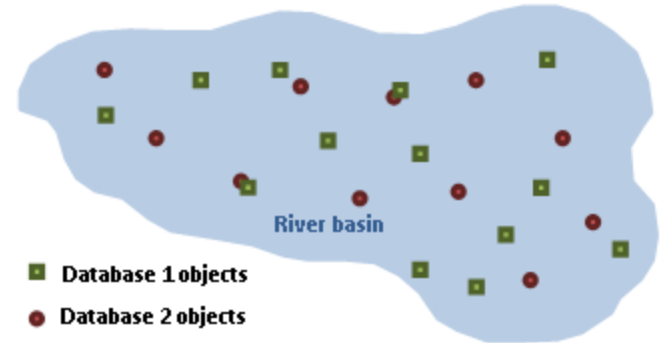
Spatial objects: points, polygons

Connectivity of datasets – via GIS reference layers

- In each WISE dataset there are one or more spatial objects for which data are reported (chemical, hydrological and biological parameters, water quality aggregates, water quality classes, other descriptive data etc.).

- **To keep consistency of data reported, the unique IDs of the spatial objects should not change along the time series.**

- **To build connectivity between datasets (to relate datasets) we must use same object IDs in WISE datasets and WISE GIS reference layers**

- It is not the case always since changes permanently occur in regard to:

  – reporting frequency (yearly, 2-year, 4-year, 6-year, 12-year basis)

  – during QA/QC; due to consistency needs;

  to existing objects (recodified, location changed, "reshaped"); also new objects are introduced.

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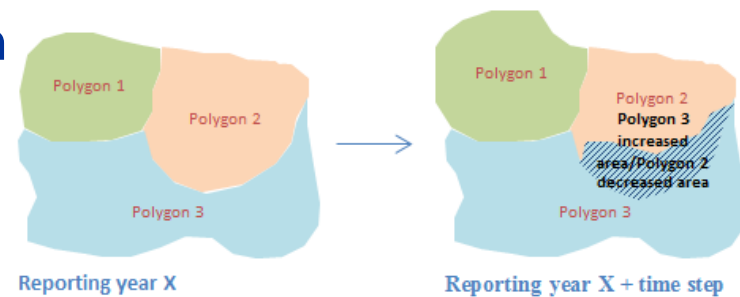Inland, coastal, marine waters

Examples:

1) Most spatial objects in WISE datasets are points.

- Objects from different datasets lie within a common spatial extent (RBD, country) or even present the same monitoring location.

- Nevertheless, the majority of them do not have same coordinates and objectID.

2) Polygonal spatial objects (i.e. RBDs) can change their forms (graphics). Point objects that were within Polygon 2 may fall into graphically changed Polygon 3.
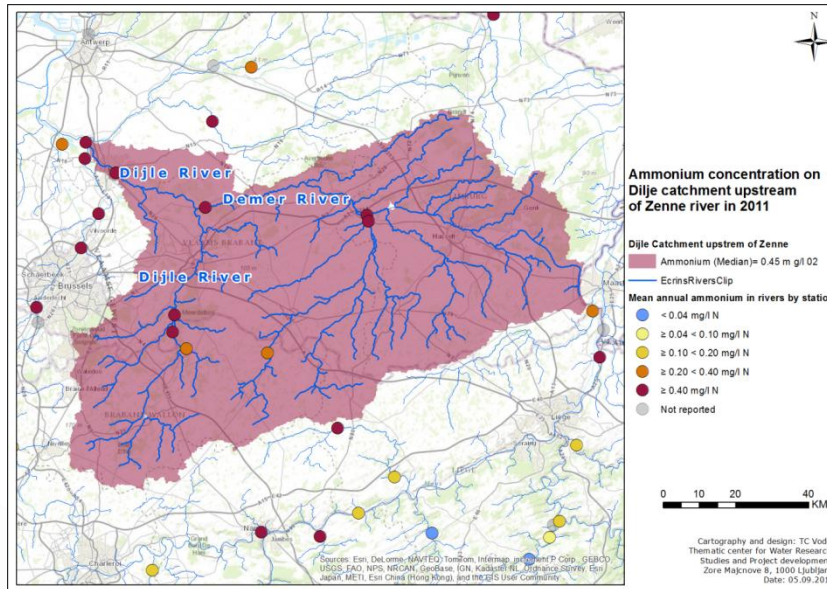

River basin

- ■ Database 1 objects
- ● Database 2 objects

Polygon 1

Polygon 2

Polygon 3

Reporting year X

Polygon 1

Polygon 2
Polygon 3 increased area/Polygon 2 decreased area

Polygon 3

Reporting year X + time step

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3) Connectivity: WFD GIS reference layer and WISE SoE dataset

- SoE station can also be reported as WFD station;

-Water body can also be reported (SoE station lie on water body or represents quality of water body; or lie on catchment area of water body…contry specific approach)

Country Code	Number of SoE stations 2007	Number of reported SoE stations 2012 (SoE)	Number of SoE stations that are also WFD stations (attribute of SoE station reported or added later by data manager)	Number of Water Bodies as reported in WISE SoE 2012 (attribute "WaterBodyID"))	"WaterBodyID" matched with "SurfaceWaterBody Code" in WFD database
AL	30	57	not relevant	not relevant	not relevant
AT	287	290	32	191	0
BA	53	71	0	15	0
BE	60	299	296	299	63
BG	110	117	105	95	91
CH	8	26	not relevant	not relevant	not relevant
CY	9	33	31	31	31
CZ	72	73	56	0	0
DE	151	267	265	260	255
DK	42	42	42	0	0
EE	53	234	136	234	118
ES	1514	3297	262	3005	993
FI	231	308	197	213	0
FR	1939	1948	1610	1640	1619
GB	204	2348	729	2346	262
GR	94	135	0	0	0

… …t Workshop / 19.9.2013
Authors: Lidija Globevnik (TC VODE) and Miroslav Fanta (CENIA)

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4) Coupling SoE ,WFD data and UWWTD data via ECRINS river basin GIS reference layer

SoE stations on the Dijle catchment upstream of Zenne river (coloured by Total Ammonium concentration categories)

Water Bodies (green), urban waste water treatment plants (black) and discharge points (magenta)

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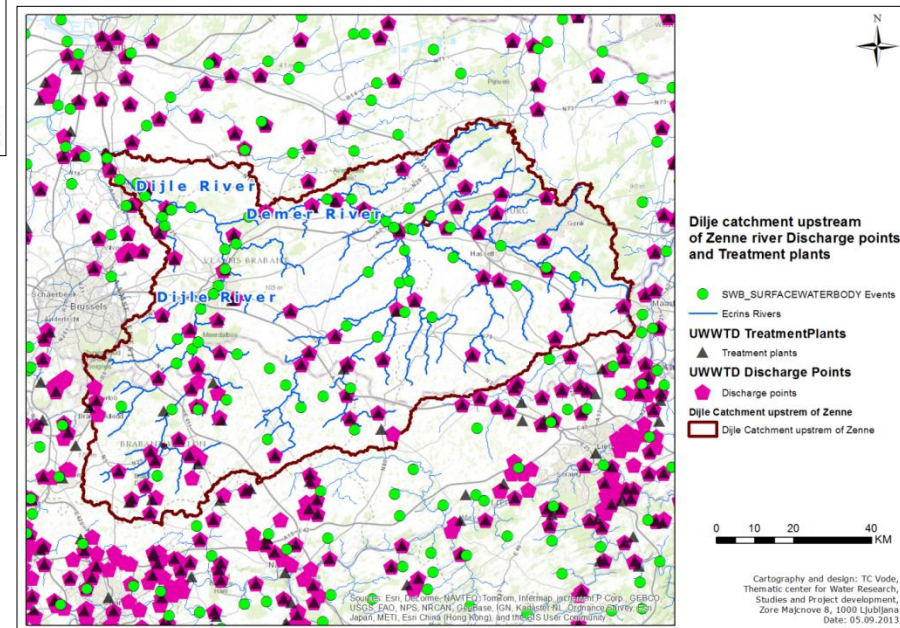
Coupling GIS reference layers and WISE datasets

- Unique IDs between spatial objects of GIS reference layers and WISE datasets are not developed yet.

  (For example, one could not always connect SoE stations and or bathing water location with water bodies or/and ECRINS river basin to SoE river stations through common identifier. Nevertheless, connection to RBDs were mostly reported and/or build by data managers).

- To build connectivity datasets should be related to same objects (with unique IDs):

  a) relations can be reported

  b) relations are build using GIS-supported spatial operations (relevant for datasets with different objects such as: UWWTD - BWD; SOE – BWD; SOE – UWWTD).

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Coupling GIS reference layers and WISE datasets (cont)

- According to the current results of analyses, interlinking of datasets can be based on identifiers of **River Basin Districts** in the case of relatively minor corrections of the reported data, which can be reached within 1-2 reporting periods.

- Interlinking based on identifiers of **water bodies or monitoring stations** cannot be taken into account without significant completion and corrections of the datasets.

- Update of the datasets needs central management by EEA and active access from countries

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Spatial datasets needed in future

- Some tabular data reported by countries belong to objects which are not spatially defined (e.g. water supply zones in Drinking Water Directive reporting) or are spatially represented as point objects (agglomerations reported under UWWTD, river water bodies). In the future, reporting obligations might include this kind of spatial objects. This needs further discussion on how to report and store this data (for example, which database should be used for each of new datasets)

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Methods for tracking object data history

- Point objects and attributes (WISE core datasets):
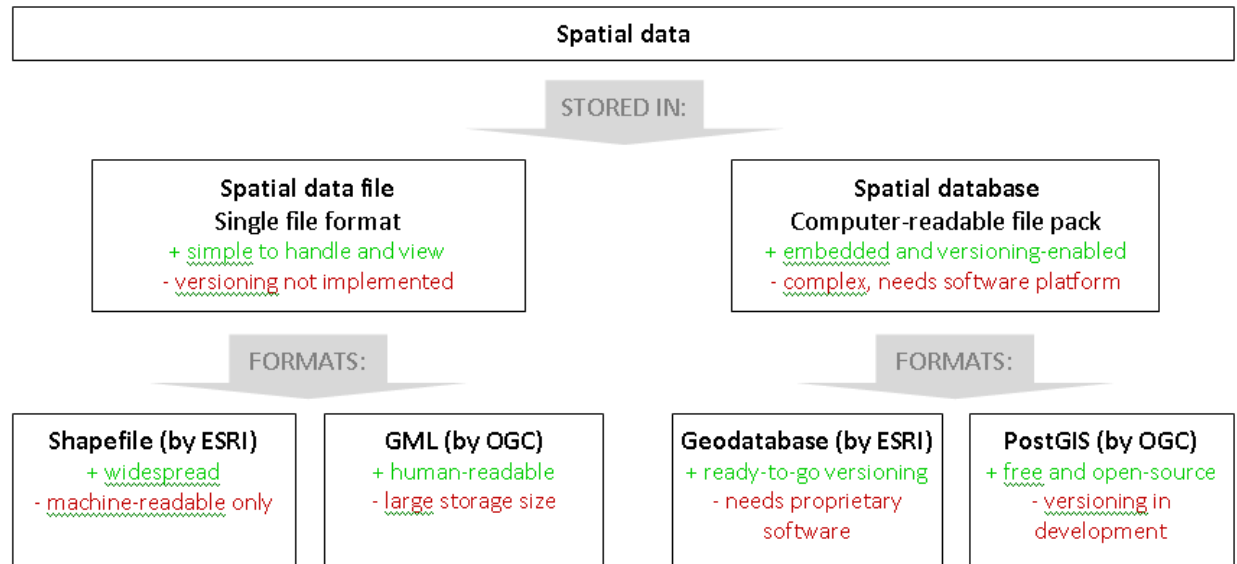 - Method 1: each "original table" gets corresponding "tracking table"

original table:

id	timestamp	BWID	BWName	BWaterCat	etcicm_remarks
3883	2013-02-07 09:47:40	DKBW1568	Øreodden	C	corrected BWaterCat from L to C

tracking table:

id	timestamp	BWID	BWName	BWaterCat	etcicm_remarks
3883	2013-01-09 11:22:30	DKBW1568	Øreodden	L	

  - Method 2: only one tracking table is formed for all original tables
  - Method 3: no tracking table- all changes stored in original tables
- Spatial data including point objects (GIS reference layers)

Spatial data

STORED IN:

Spatial data file Single file format + simple to handle and view - versioning not implemented	Spatial database Computer-readable file pack + embedded and versioning-enabled - complex, needs software platform

FORMATS:

Shapefile (by ESRI) + widespread - machine-readable only	GML (by OGC) + human-readable - large storage size	Geodatabase (by ESRI) + ready-to-go versioning - needs proprietary software	PostGIS (by OGC) + free and open-source - versioning in development

Reporting of spatial data in a distributed/decentralised system

- It is being planned by DG ENV and EEA to start the distributed/decentralised reporting with the reporting of spatial data (WFD RBDs, water bodies, monitoring stations etc.) with the aim of having always the newest version of the spatial data available at European level. This requires an agreement with countries on the procedure using web feature services and INSPIRE rules.

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Questions to NRCs

- **Data quality**: What is the QA/QC procedure in your country before data reporting?

- **Help with subsequent (data manager) QA/QC:** Is it possible to provide further data on how same spatial objects, represented by different unique IDs, should be connected (providing old and new IDs)? Why and how often are stations' IDs being changed? What methodology is used to define a station as new (e.g. how far it has to be from nearby monitoring location on the same river)?

- **Metadata providing:** Which methods are used for data changes tracking in your country?

- **Distributed/decentralised reporting:** Have you established this in your country already for INSPIRE compliant spatial water data? If yes, how has this been implemented?

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