Stage 2 of the Earthwatch GMES Service Element

– Scaling Up Consolidated GMES Services –

GSELand

Product description

Nonpoint Pollution Scanner

and Logger Services

GIA, Berlin

Brief Service description:

On the basis of conceptual and empirical causal cohesions, qualitative and quantitative land-cover/landuse information and other geohydrological characteristics of the implementation sites are integrated for the purpose of evaluation and quantification of substance emitted from diffuse sources into surface waters[1] of catchments of different sizes.
All service-quantities are calculated as catchment-wide geostatistical means independently from the scale of the analysed catchment structures. The spatial resolution is primarily determined by the level of detail of the catchment delineation. All products of the service portfolio are adjustable to arbitrary hydrological catchment structures with reasonable and documented substructure coding.

Dependent on typical problems or aims for emission analyses 4 product levels are distinguished:

1. Risk Analysis (European NPP-Scanner)
2. Pollution Potentials (Regional NPP-Scanner)
3. Status of Discharge (NPQ-Logger)
4. Analysis of Sources and Scenario Calculation (NPQ-Calculator)

[NPP: Nonpoint Pollution Potentials; NPQ: Nonpoint Pollution Quantities]

All products have a common technical and methodological model baseline (GIS & MONERIS). The minimum common databases of all above products are landcover/landuse information and the boundary geometries of surface water catchments (both as detailed as possible). The different product levels require further input data with spatial / temporal characteristics increasing with product level.

Products 1 and 2 can be characterised as scanning services and are mainly dedicated to the spatial disaggregation / differentiation of the potential emissions from diffuse sources (hot-spot mapping & threshold analyses). They can be applied to entire (transboundary) river basin districts as well as to regional basins.

Products 3 and 4 are to be realised as case oriented projects. Historical, topical and future diffuse charges are quantified on the basis of complete matter balances of the implementation sites for concrete observation periods. If adequate river-load data and emissions from point sources are available, the quantified diffuse emissions are evaluated by verification algorithms.

[1] Within the actual service portfolio the quality of groundwater is no explicit target, but a transfer parameter between charge within the catchments and the status of the surface water bodies.

Detailed description

1. Risk analysis (European NPP-Scanner):
Main goal is to enable homogeneous (comparable) estimates of emission characteristics, compromising independence of national/regional databases with reasonable differentiation at a wide range of catchment scales. The primary basis are European-wide homogeneous basic data sets and consistent longterm hydrometeorological framework conditions. The necessary European-wide basic data sets are pre-processed components of the service (MONERIS geodatabases) or are to be drawn from European databases.
Preconditions/ focus of the product: Provision, systematisation and homogenisation of catchment structures. Qualification and further enlargement of the MONERIS geodatabase of smallscale (european) model variables.

2. Pollution Potentials (Regional NPP-Scanner):
For the emission potential analysis essential parts of the ‚European database' are to be substituted by (best available) regionally differentiated data sets. The catchment areas (surface water bodies) are characterised by summaric potential of diffuse emissions and the emission potentials for different pathways *at mean hydro-meteorological conditions*.
Preconditions/ focus of the product: conceptual homogenisation of model parameters coming from nominally equivalent but conceptually differing regional basic data sets.

3. Status of discharge (NPQ-Logger):
For verifiable quantification of diffuse matter discharges in balanceable hydrological systems, analyses of potentials are concretised to hydro-meteorological, qualitative and quantitative landcover/landuse conditions for specific time slots. Additionally discharges from point sources in the implementation sites are integrated into the discharge balances. For comparative status analyses (emission development in time) runoff-adjusted scenarios are conducted.
Preconditions/ focus of the product: Census of emissions from point sources. Quantification and runoff-adjustment of measured substance loads. Non-typical catchment characteristics may require additional investigation.

4. Analysis of sources and scenario calculation (NPQ-Calculator):
Additionally to the typical pathway-oriented differentiation the estimated emissions from diffuse sources are further differentiated and spatially mapped onto areas with different real ore modeled landcover/landuse characteristics or developement.
Preconditions/ focus of the product: specification and/or prognosis of landcover/landuse changes, concerning distribution *and* intensity, in the region of invetigated SWB-catchments or basins. Investigation and/or climatological trend-prognosis of hydro-meteorological boundary conditions.

Key parameters to be assessed:

Comparable (homogeneous) estimates of nutrient emissions to SWB and basins throughout Europe

Detection of hotspot subcatchments and comparison of pollution intensities throughout large catchments.

Product features:

Content
Homogeneous nonpoint pollution parameters related to european and regional catchment polygons.
Input data sources
Interpreted LULC; WFD-catchment-polygons; spatial and statistical data related to landcover/landuse intensities and hydrogeological and hydrometeorological catchment properties
Methodology
GIS-based NutrientQuantificationTool of MONERIS-class
Geometric resolution (Scale)
Catchment sizes from SWB (surface water body) scale to RBD (river basin districts) scale
Geographic projection / Reference system
Fitting the underlying catchment polygons
Geometric accuracy (positioning scale)
Dependent on underlying catchment polygons
Thematic accuracy (in %)
20-50 %
Up-date frequency
Maximum yearly , otherwise on demand
Base data topicality (how old are base data for production)
Availability of actual catchment boundary polygons
Delivery format
PDF (integrated Map-Images, statistics …), GIS-files (ARC-Info, shp) on demand

Data type
tables, vector, raster

Service features

Customer service
User interface
Potentially: IMS Interface
Medium
on-line
Delivery reliability

At levels 2-4: dependent on regional basedata availability
Delivery time
after full basedata availability: 2 weeks at scanning levels ; 1 month at logging levels
Archive
European NP-Potential-Database (to be established)

Annex

At service levels 3, 4 intensive cooperation with european and regional authorities and data holders is required to supply necessary basedata.

The services should be checked for integrability with european geodatabases for selected base-data input.

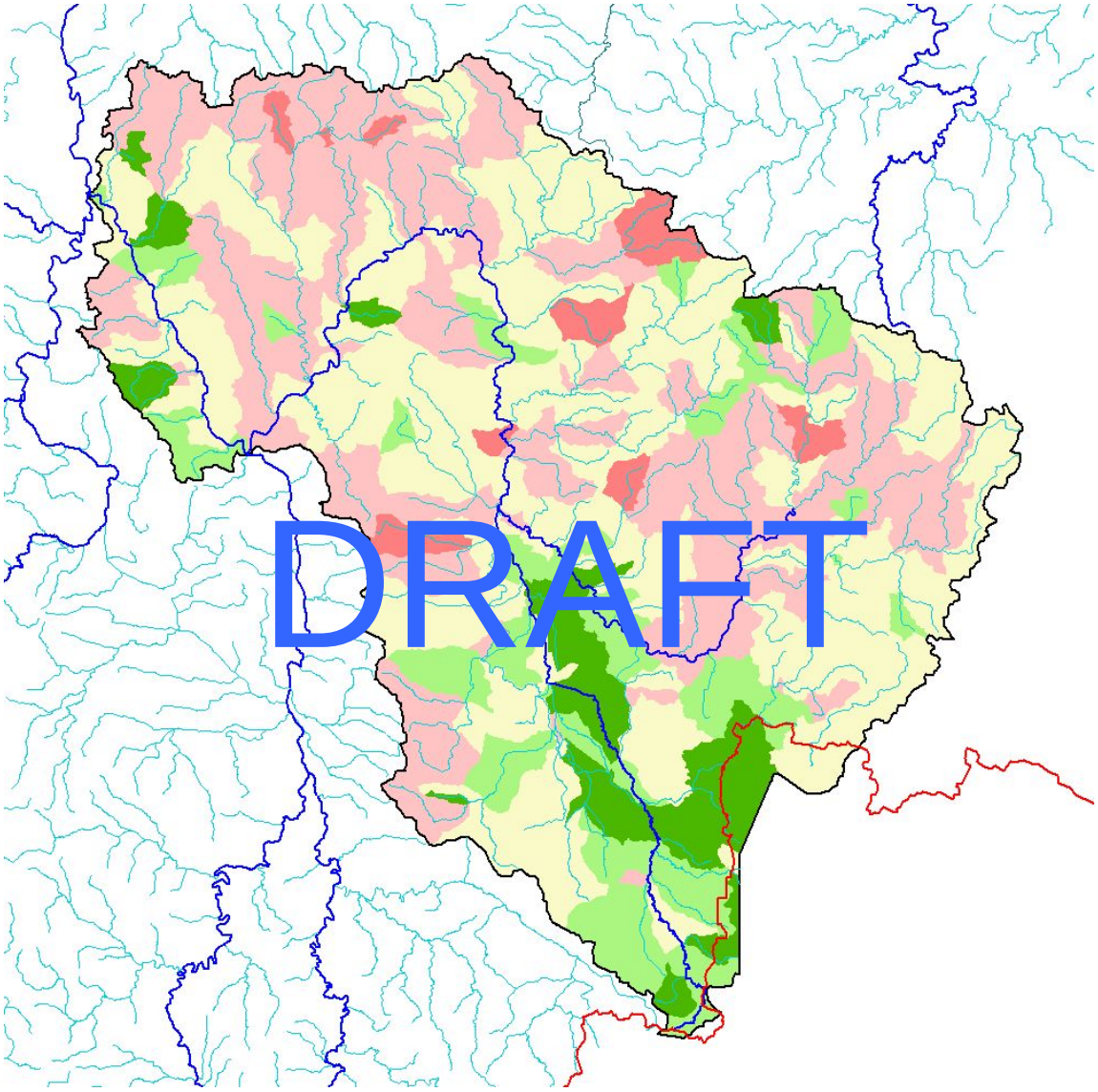
The following pages depict examples of the NPP Scanner service on the level of

Risk Analysis.

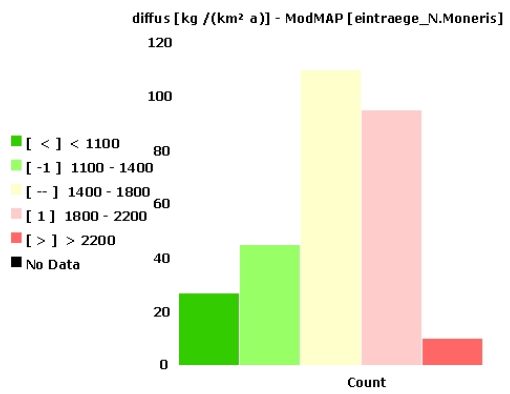
Classified distribution of NP - parameters

Service region: Vltava from Luznice to us Otava

Service parameter: 'N_diffus' (Level: Risk analysis)

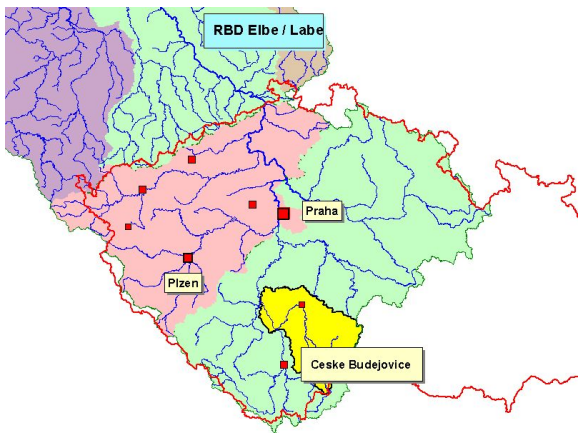


Regional service parameter statistics



Count of processed units (SWB) in STD-DEV classes

Location index of service region

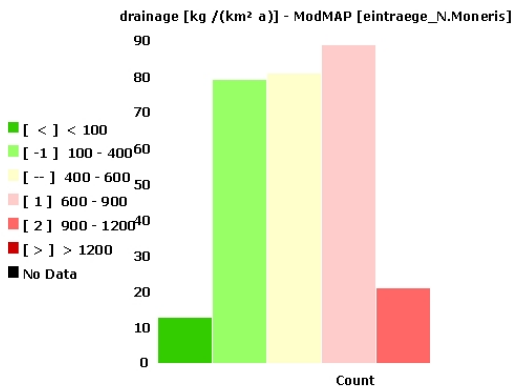


Referenced distribution of NP - parameters

Service Region: Vltava from Luznice to us Otava

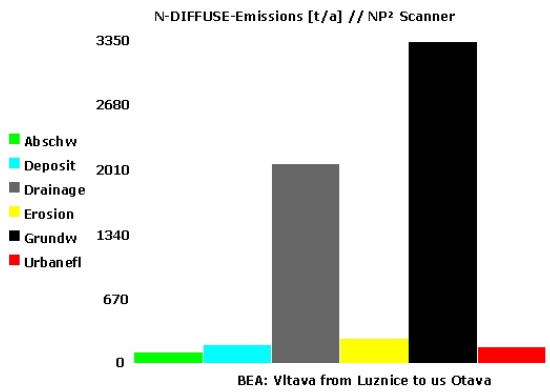
Service parameter: 'N_drainage' (Level: Risk analysis)

Regional service parameter statistics



Count of processed units (SWB) in STD-DEV classes

Service region summary



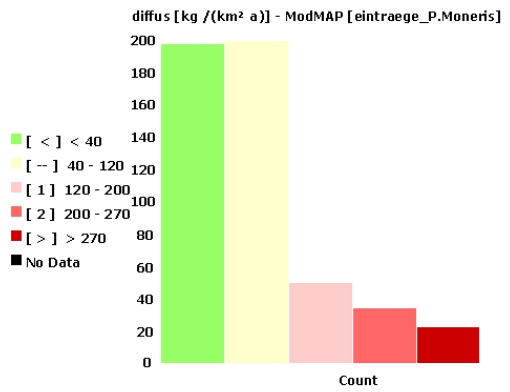
Summary Service: 'N_DIFFUS-RISK

Classified distribution of NP - parameters

Service region: Vltava from Otava to us Sazava

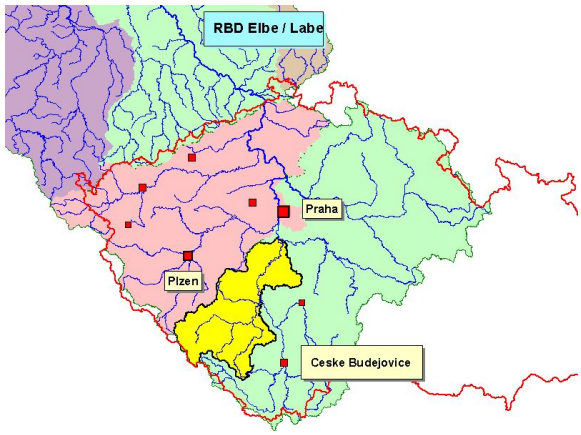
Service parameter: 'P_diffus' (Level: Risk analysis)

Regional service parameter statistics



Count of processed units (SWB) in STD-DEV classes

Location index of service region

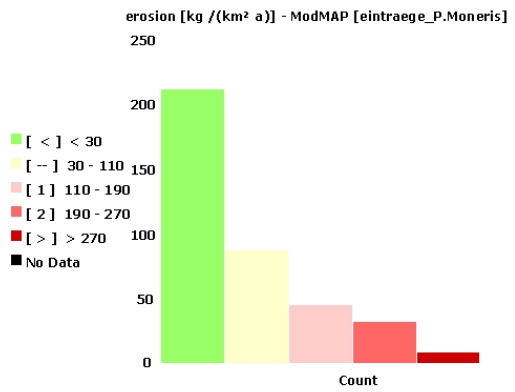


Referenced distribution of NP - parameters

Service Region: Vltava from Otava to us Sazava

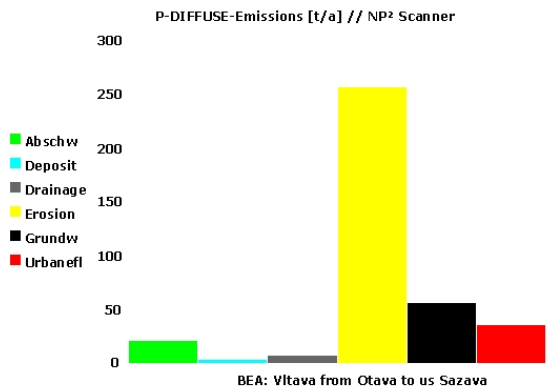
Service parameter: 'P_erosion' (Level: Risk analysis)

Regional service parameter statistics



Count of processed units (SWB) in STD-DEV classes

Service region summary



Summary Service: 'P_DIFFUS-RISK