VLAAMSE MILIEUMAATSCHAPPIJ

The Emission Inventory Water

A Planning Support System aimed at reducing the pollution emissions in the surface waters in Flanders

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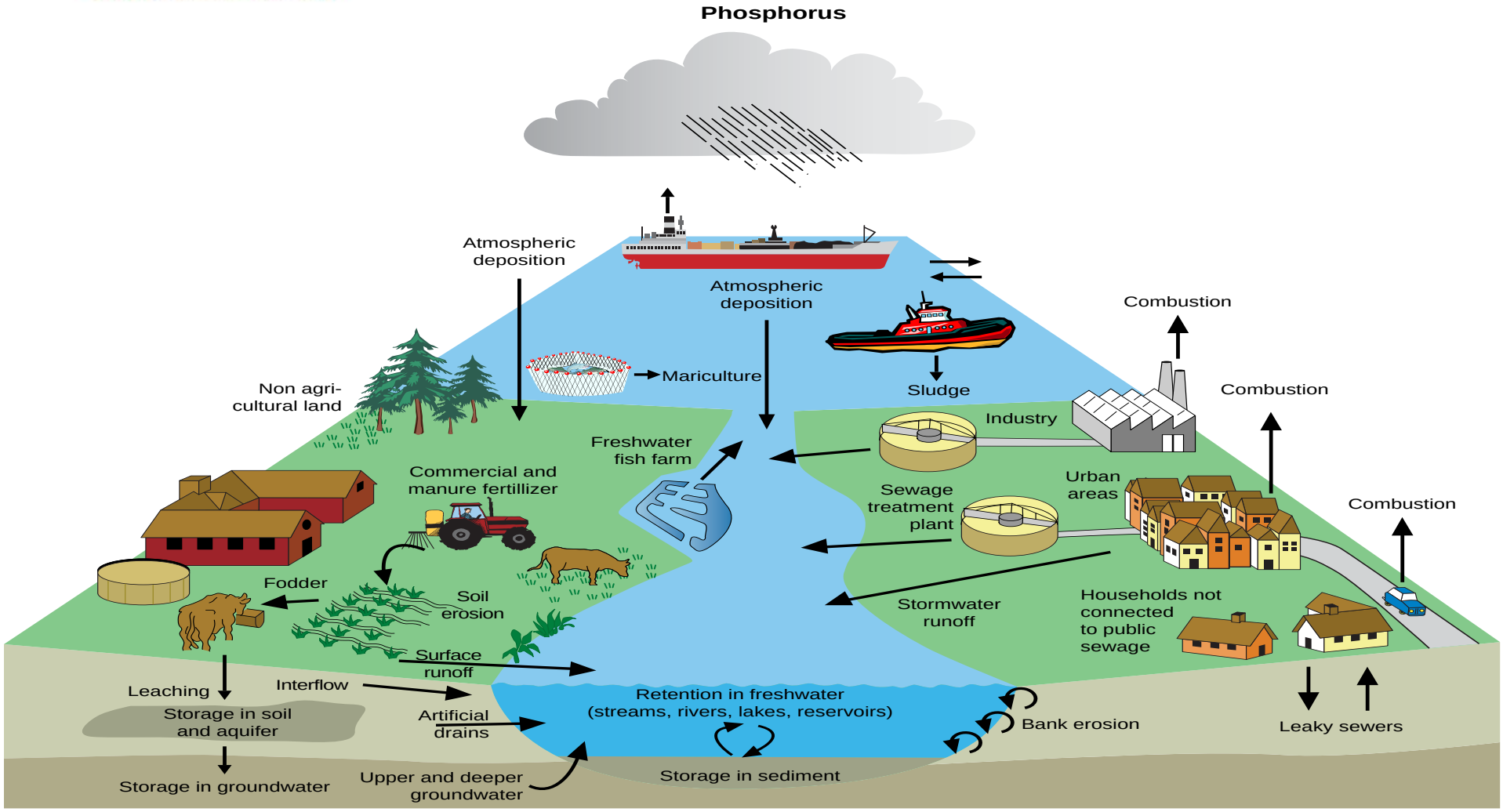
- Conceptual framework and components for the EIW-PSS
- Introducing GIS in the EIW system
- Spatial analysis applied to the building stock
- Planning and policy applications
- Conclusions

Introduction

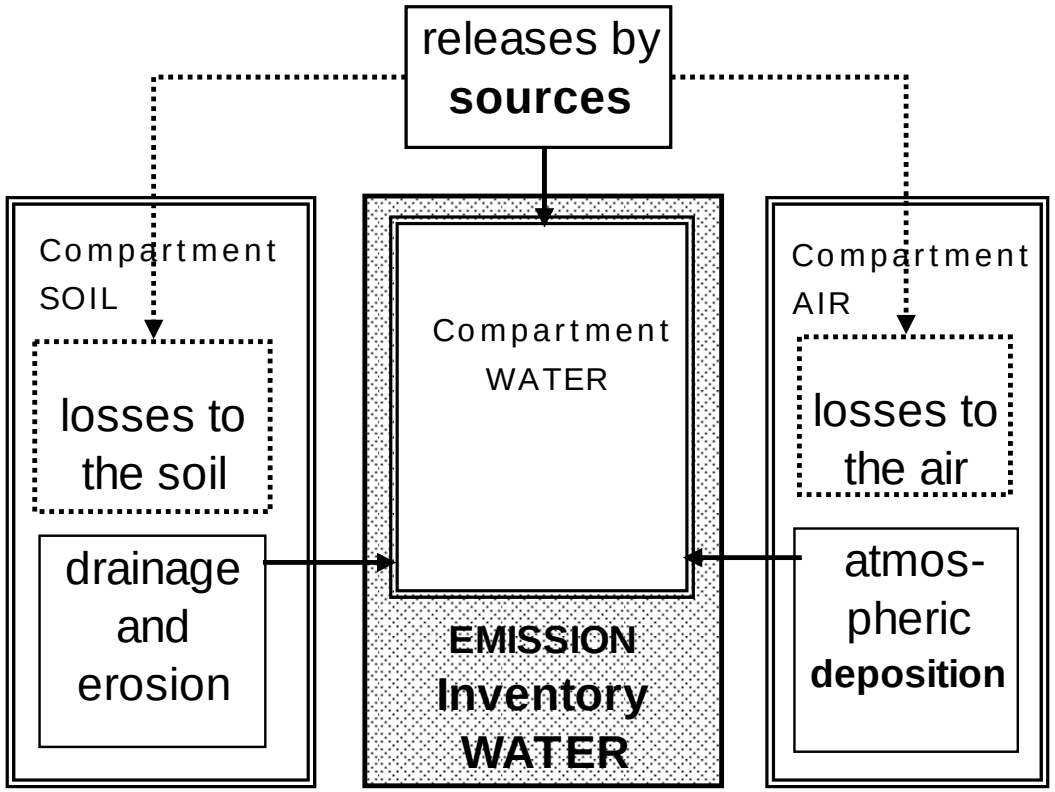
- **Relation with EU Directives**
  - Water Framework Directive
  - Urban Waste Water Treatment Directive (UWWTD)
  - European Pollutant ReleaseTransfer Register (E-PRTR)
- **Scope**
  - Determine significant emission sources
  - Monitor compliance with reduction programmes
- **What's new**
  - Generic character for all water pollutants (nutrients as wel as hazardous substances) and all sources (point and diffuse)
  - Explicit geographical analysis at high resolution
  - Relation between source and sink

Conceptual framework

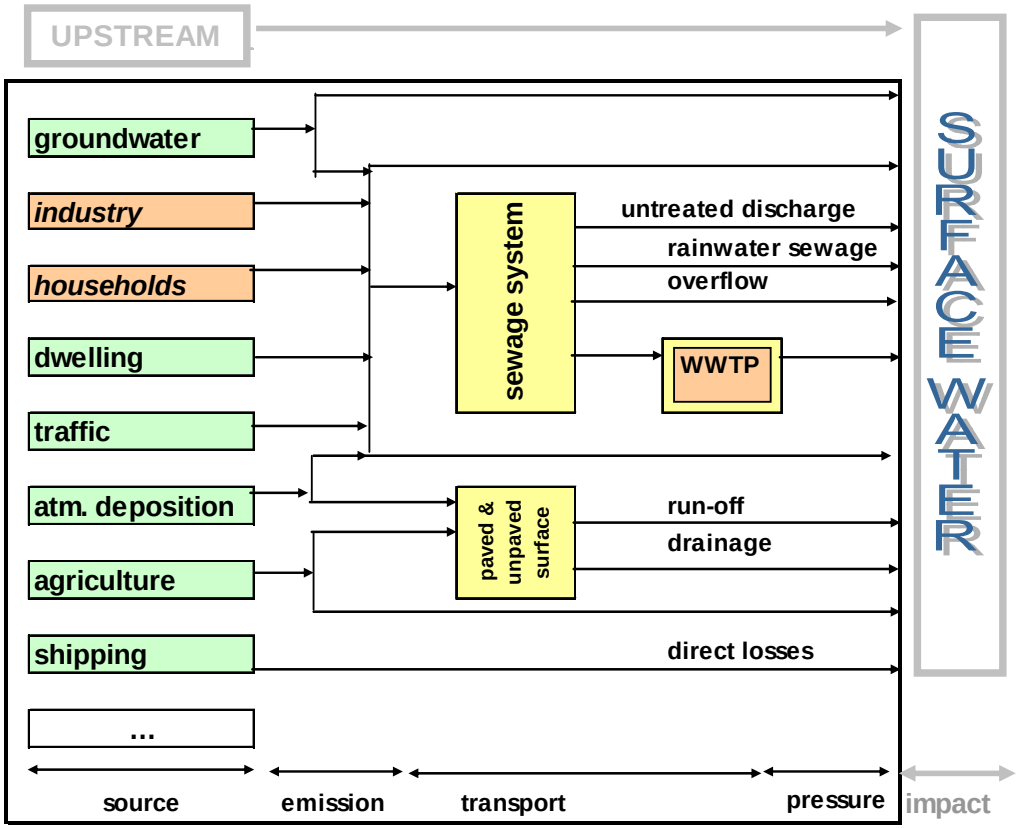


The Emission Inventory Water Planning Support System

Conceptual framework
Definition of the system domain

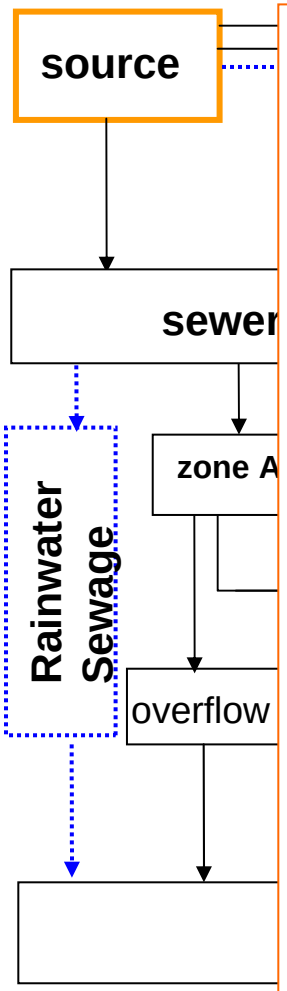


Functional scheme of the EIW-PSS emission sources and pathway



The Emission Inventory Water Planning Support System

Material Flow scheme of the EIW-PSS



- Point and diffuse sources
- Stakeholder classification
- Calculation of the Gross Emission Value (GEV)

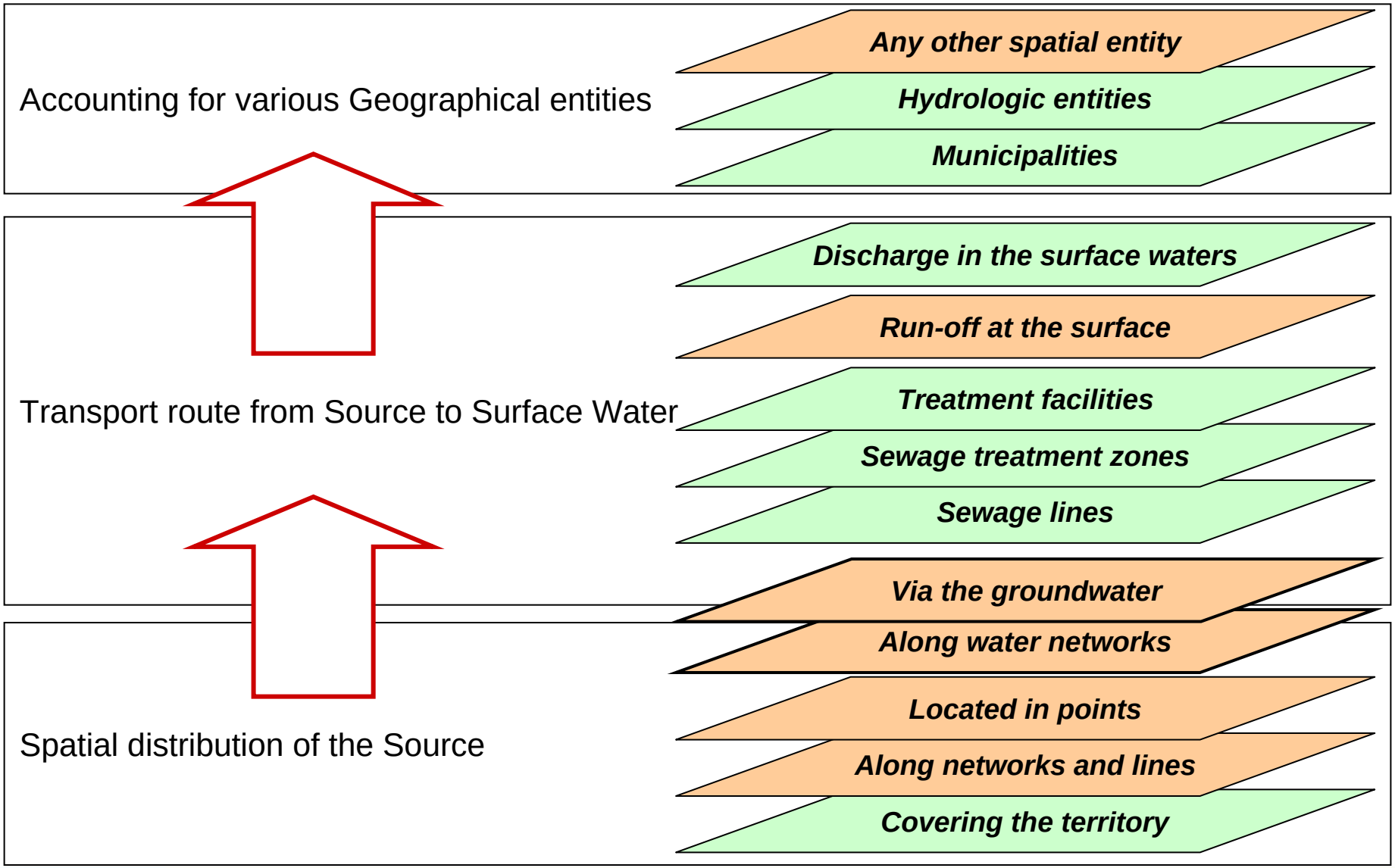
Emission Factor (EF)

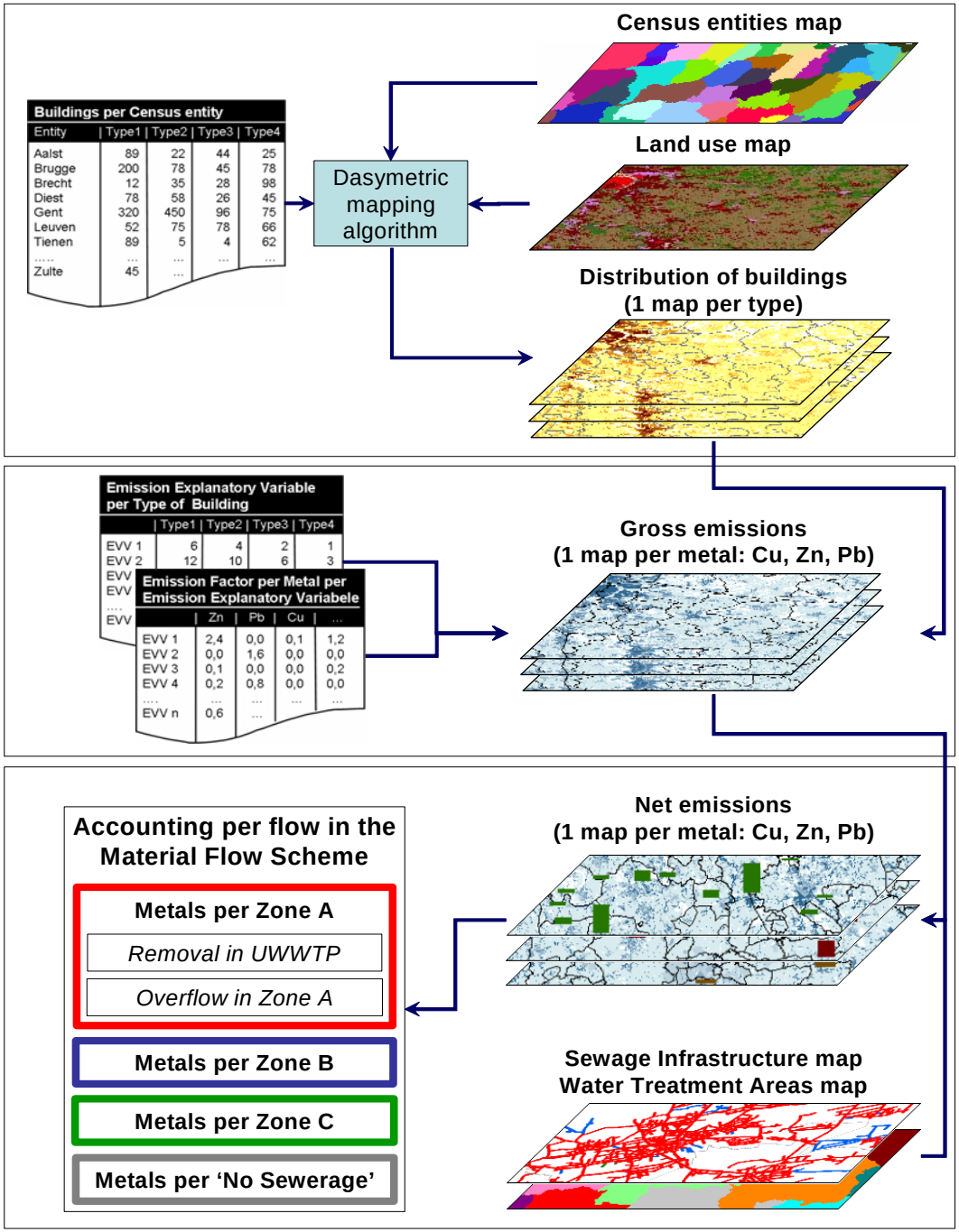
X

Emission Explanatory Variable (EEV)

legend:
UTD : untreated discharge
WWTP : wastewater treatment plant

Introducing GIS in the EIW system




Census entities map
Buildings per Census entity
Entity | Type1 | Type2 | Type3 | Type4
Aalst 89 22 44 25
Brugge 200 78 45 78
Brecht 12 35 28 98
Diest 78 58 26 45
Gent 320 450 96 75
Leuven 52 75 78 66
Tienen 89 5 4 62
....
Zulte 45 ...
Dasymetric mapping algorithm
Land use map
Distribution of buildings (1 map per type)
Emission Explanatory Variable per Type of Building
| Type1 | Type2 | Type3 | Type4
EVV 1 6 4 2 1
EVV 2 12 10 6 3
EVV
EVV
.....
EVV
Emission Factor per Metal per Emission Explanatory Variabele
| Zn | Pb | Cu | ...
EVV 1 2,4 0,0 0,1 1,2
EVV 2 0,0 1,6 0,0 0,0
EVV 3 0,1 0,0 0,0 0,2
EVV 4 0,2 0,8 0,0 0,0
EVV n 0,6
Gross emissions (1 map per metal: Cu, Zn, Pb)
Accounting per flow in the Material Flow Scheme
Metals per Zone A
Removal in UWWTP
Overflow in Zone A
Metals per Zone B
Metals per Zone C
Metals per 'No Sewerage'
Net emissions (1 map per metal: Cu, Zn, Pb)
Sewage Infrastructure map
Water Treatment Areas map

GIS applied to the building stock sector

Step 1: Spatial distribution of the building stock

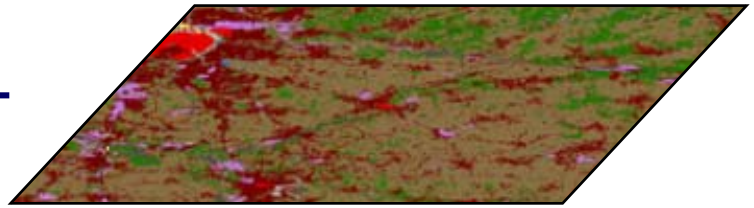
Census entities map

Buildings per Census entity

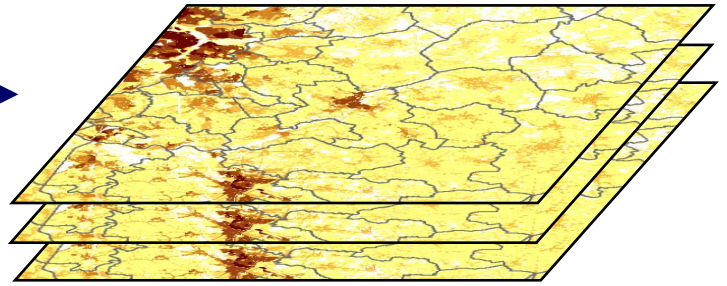
Entity	Type1	Type2	Type3	Type4
Aalst	89	22	44	25
Brugge	200	78	45	78
Brecht	12	35	28	98
Diest	78	58	26	45
Gent	320	450	96	75
Leuven	52	75	78	66
Tienen	89	5	4	62
.....	...	...	...	...
Zulte	45	...		

Dasymetric mapping algorithm

Land use map



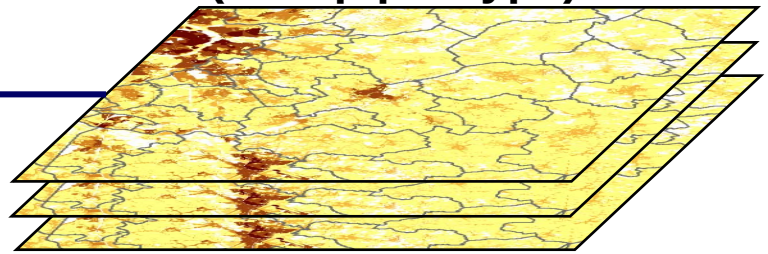
Distribution of buildings (1 map per type)



GIS applied to the building stock sector

Step 2: Generating gross emission maps

Distribution of buildings
(1 map per type)



GEV

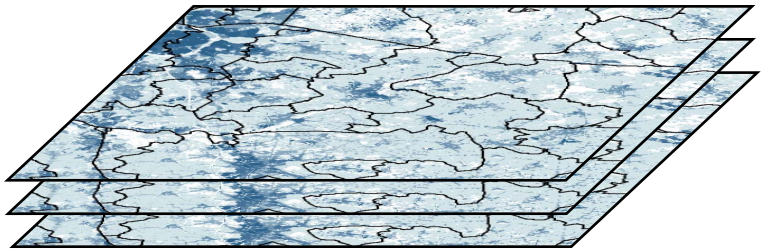
Emission Explanatory Variable per Type of Building

	Type1	Type2	Type3	Type4
EVV 1	6	4	2	1
EVV 2	12	10	6	3
EVV				
EVV				
....				
EVV				

Emission Factor per Metal per Emission Explanatory Variabele

	Zn	Pb	Cu	...
EVV 1	2,4	0,0	0,1	1,2
EVV 2	0,0	1,6	0,0	0,0
EVV 3	0,1	0,0	0,0	0,2
EVV 4	0,2	0,8	0,0	0,0
....	...	...	...	...
EVV n	0,6	...		

Gross emissions
(1 map per metal: Cu, Zn, Pb)



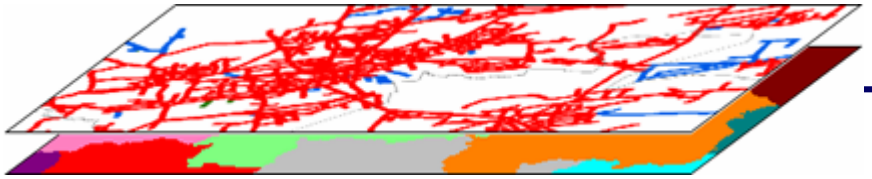
Step 3: Transporting the emissions from source to sink and accounting

Accounting per flow in the Material Flow Scheme

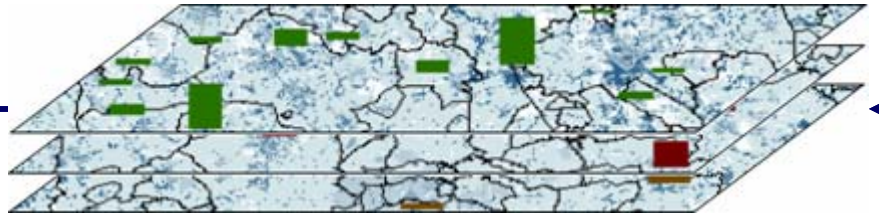
- **Metals per Zone A**
  - *Removal in UWWTP*
  - *Overflow in Zone A*
- **Metals per Zone B**
- **Metals per Zone C**
- **Metals per 'No Sewerage'**

Gross emissions
(1 map per metal: Cu, Zn, Pb)

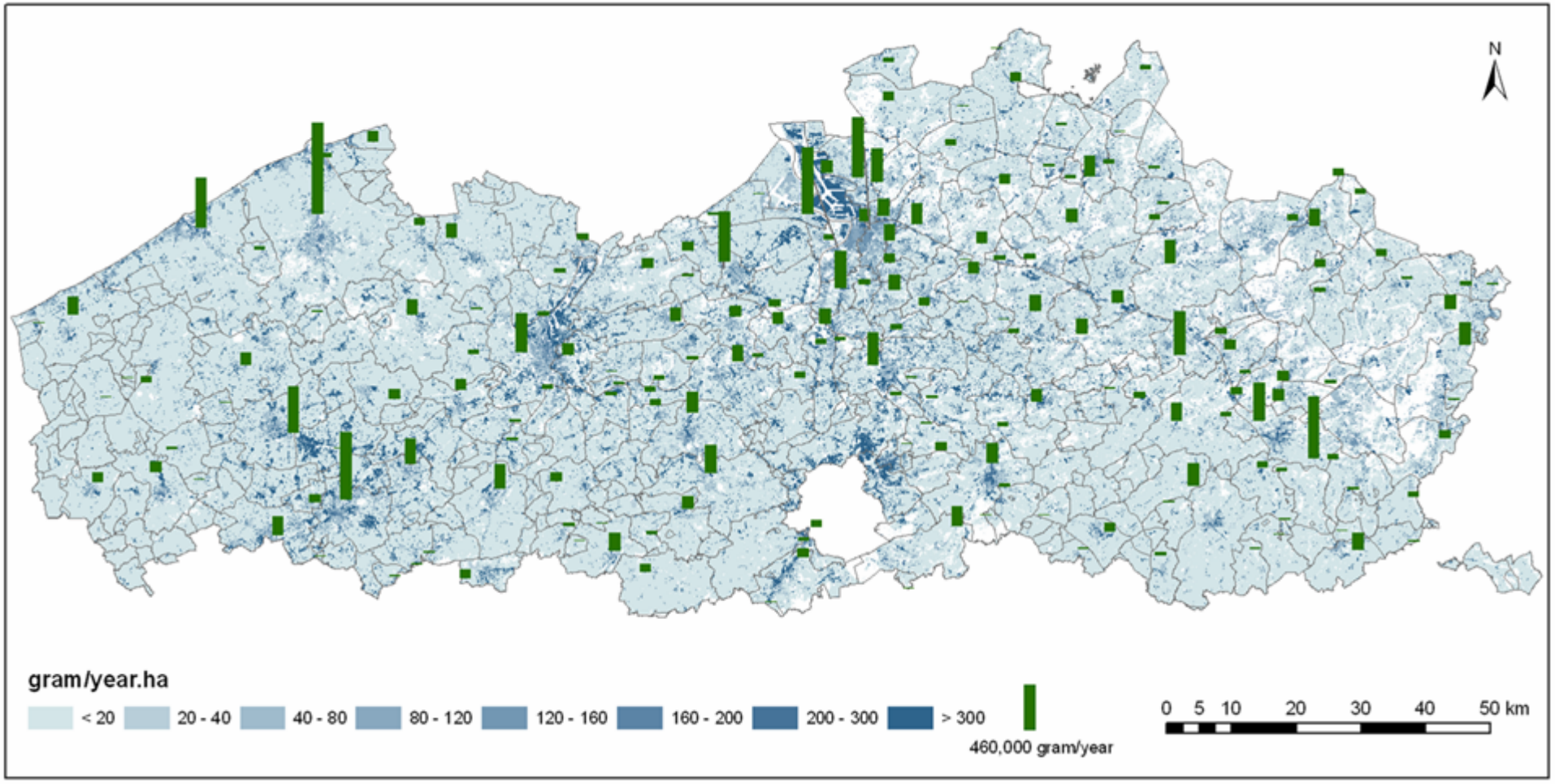
Sewage Infrastructure map
Water Treatment Areas map



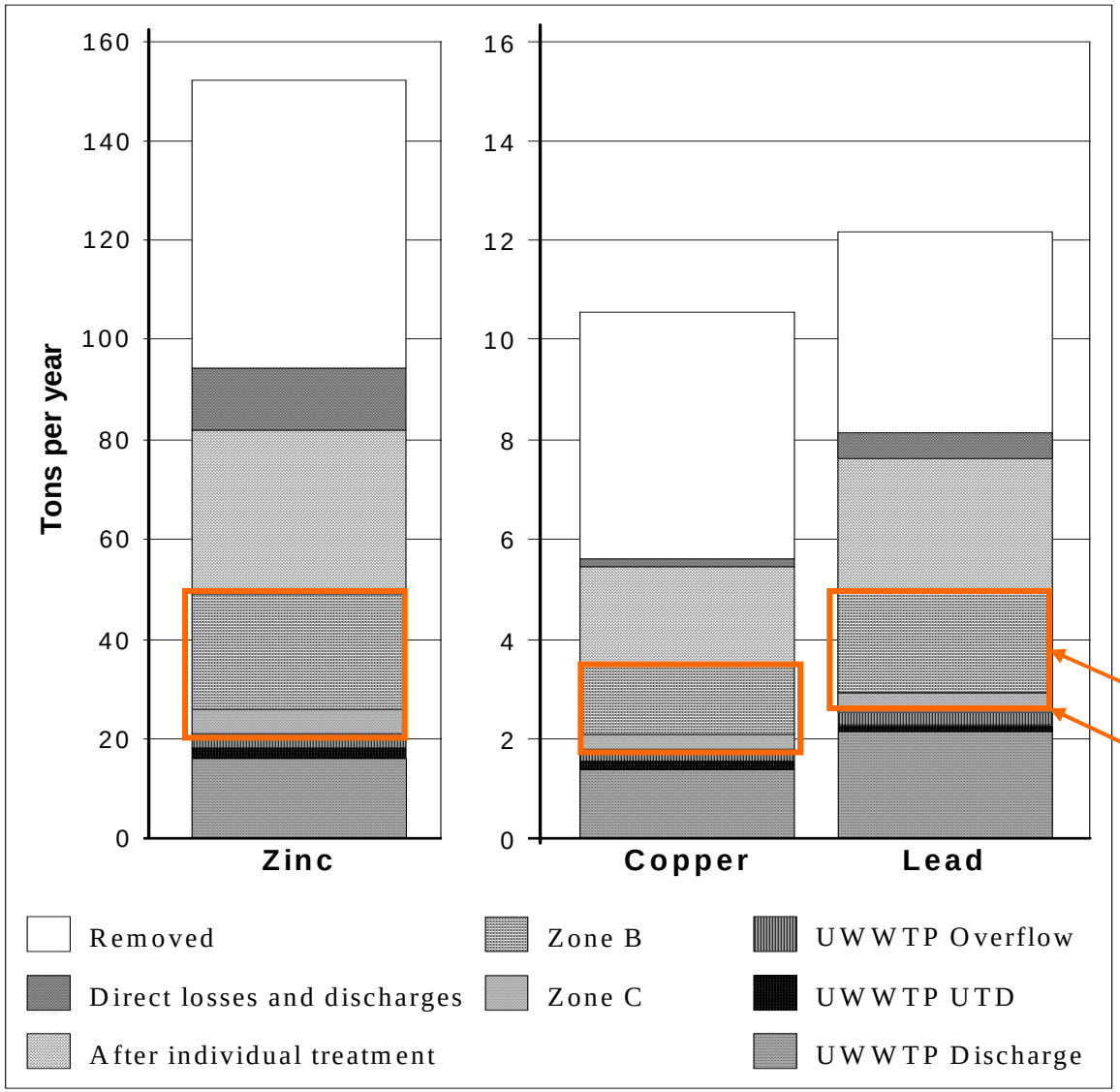
Net emissions
(1 map per metal: Cu, Zn, Pb)



Net emissions of zinc due to the corrosion of the building stock



Planning and policy applications



Quantification of the heavy metals in the nodes of the material flow scheme

Reduction to attain after optimalisation of the sewer system

Planning and policy applications

Zinc 1998 – 2005: more gross emissions, less net emissions

Conclusions

- **EIW-PSS calculates emissions from source to sink**
  - Monitoring and reporting
  - Scenario, planning and policy assessment
- **Developped as a prototype**
  - Emissions of heavy metals caused by corrosion in the building stock
- **The strength of the system**
  - The explicit geographic approach
  - The generic character of the framework and methodology allowing further development to complete sources, pathway and pollutants