IWAS
Brazil
ÁGUA-DF

HELMHOLTZ CENTRE FOR ENVIRONMENTAL RESEARCH – UFZ

The effects of urban structures on water resources

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Final Workshop - Project IWAS ÁGUA DF
Integrated Water Resources Management in Distrito Federal – DF
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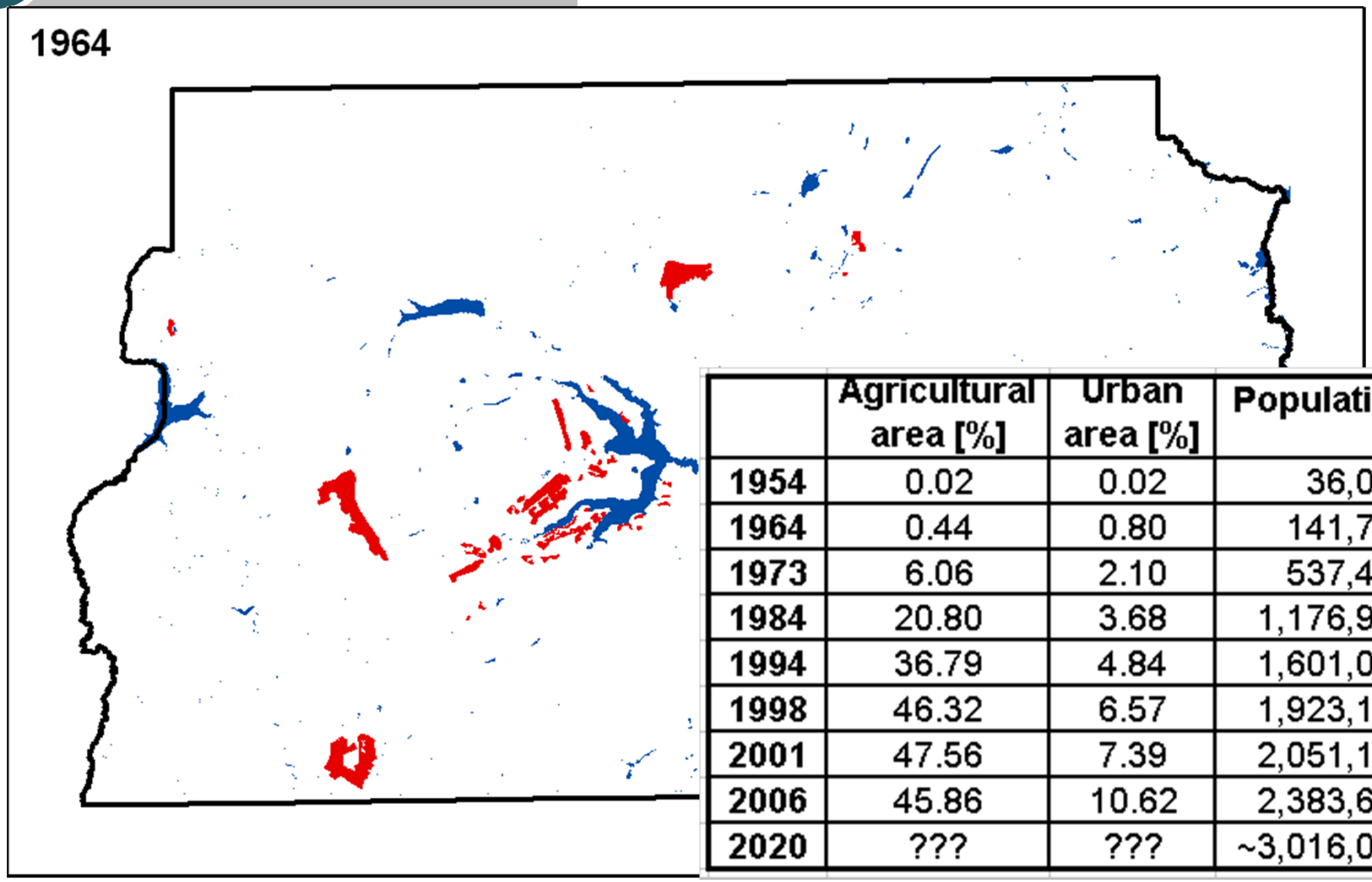
1 Introduction



	Agricultural area [%]	Urban area [%]	Population
1954	0.02	0.02	36,000
1964	0.44	0.80	141,742
1973	6.06	2.10	537,492
1984	20.80	3.68	1,176,908
1994	36.79	4.84	1,601,094
1998	46.32	6.57	1,923,139
2001	47.56	7.39	2,051,146
2006	45.86	10.62	2,383,614
2020	???	???	~3,016,000

1 Introduction

Source: Rene Höfer

2 Objective





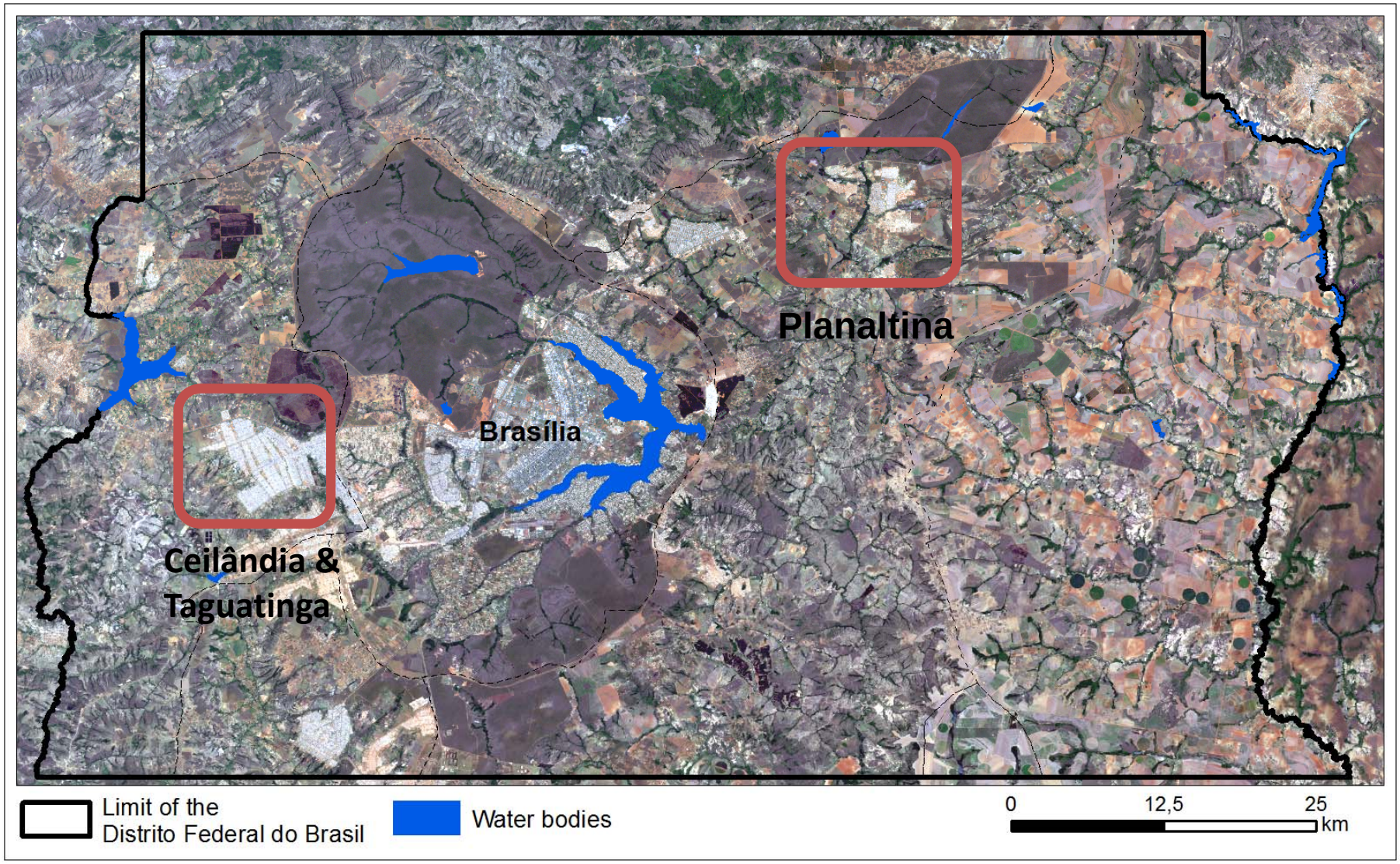
- **Monitoring of the urban area and differentiation of different settlement types**
- **How can Urban Structure Types (UST) help to monitor and represent urban areas?**
- **Which water-relevant parameters can be represented by UST?**



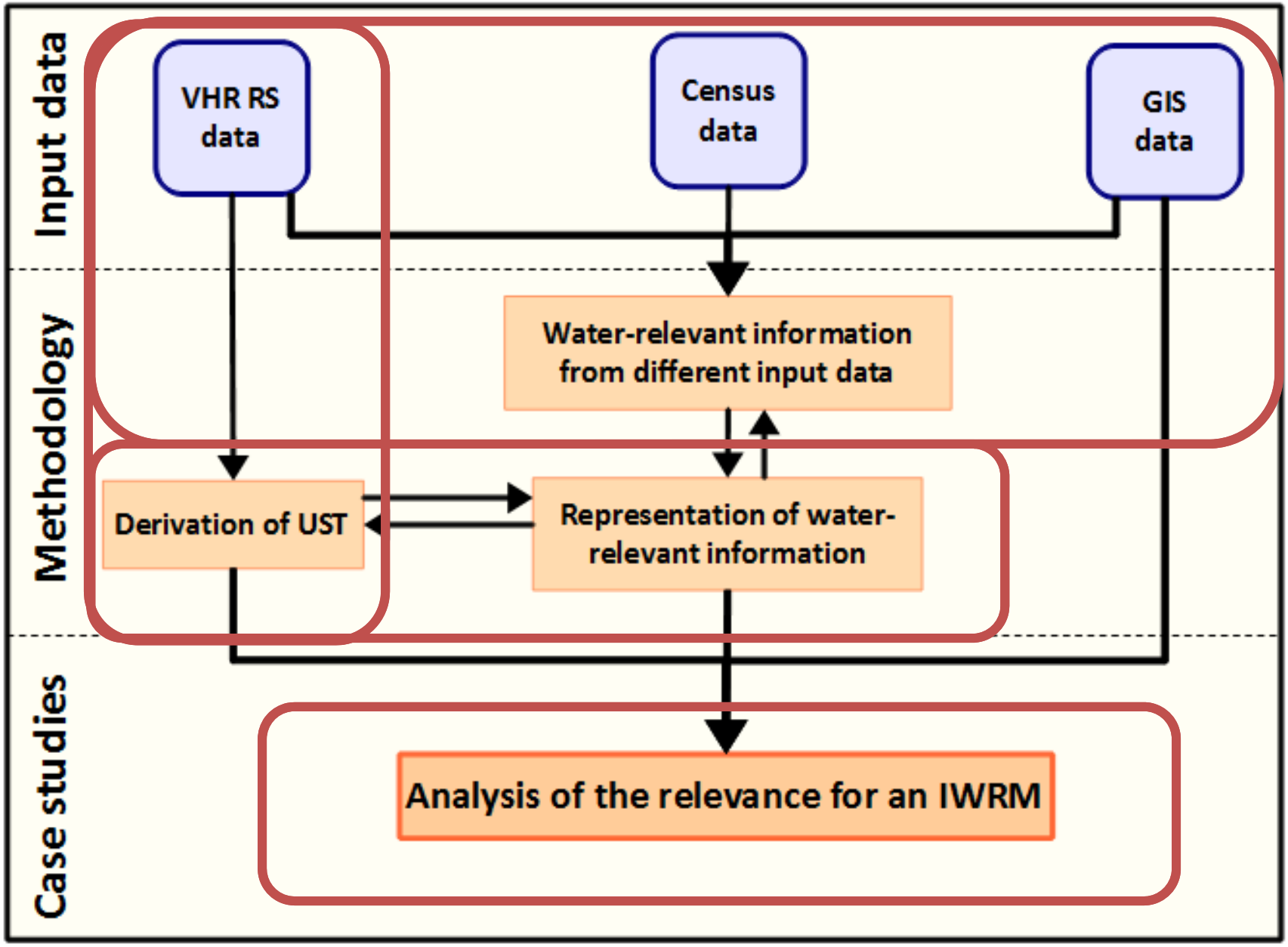


Source: Rene Höfer

3 Methodology



3


Input data
Methodology
Case studies
VHR RS data
Census data
GIS data
Water-relevant information from different input data
Derivation of UST
Representation of water-relevant information
Analysis of the relevance for an IWRM

3 Methodology

Urban Structure Types are:

spatial indicators that help to divide and differentiate the urban fabric into open and green spaces, infrastructure, and building complexes so that their typical characteristics such as physical, functional and energetic factors can be identified.

after Wickop et al. 1998, Böhm 1998 & Breuste et al. 2001

3 Methodology

UST	Parameters	
RH 5 – medium density	location	Sector T Planalto
	building structure	concrete 1 and 2
	lotsize	from 25(
	impervious surface	from 50
	green area	low
	runoff	very hig
	urban water infrastructure	WS, WC
	water consumption	from 20(
	income	low to a
	legal status	legal
	description	building swimmi houses construc

Visual example

UST Detail

3 Methodology

UST	Parameters	Characterisation	Visual example	UST Detail
RH 5 – medium density	location	Sector Traditional - Planaltina, Paranoa, Vila Planalto, Guara		
	building structure	concrete (roof - ceramic), 150 m^2 - 250 m^2, 1 and 2 storeys, residential		
	lotsize	from 250 to 500 m²		
	impervious surface	from 50 to 75%		
	green area	low		
	runoff	very high		
	urban water infrastructure	WS, WC, DS, S		
	water consumption	from 200 to 300 l/inhab*day		
	income	low to average		
	legal status	legal		
	description	building size: heterogeneous, with few swimming pools and small yards. Some houses with asbestos tiles and partly constructed using clay		

Characteristics of UST

Urban water infrastructure
sewer connection
septic tanks

Water consumption
sewage water value

Impervious surface
runoff / infiltration

Sewage water parameters

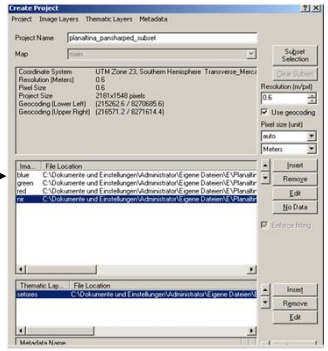
connection rate
population equivalent

effluent value
misconnections

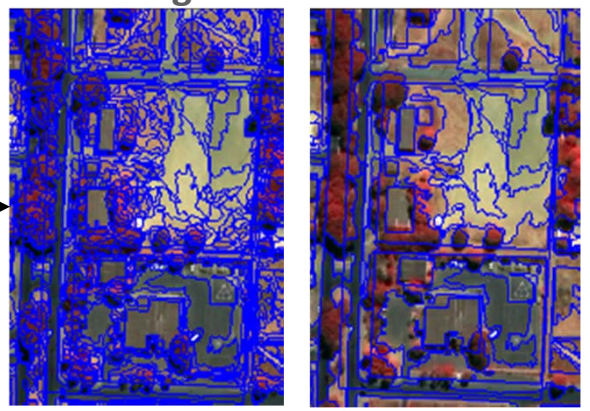
percolation potential

Data acquisition/ pre-processing

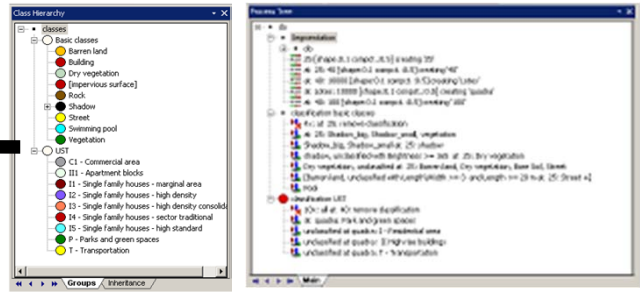
Create project (eCognition)



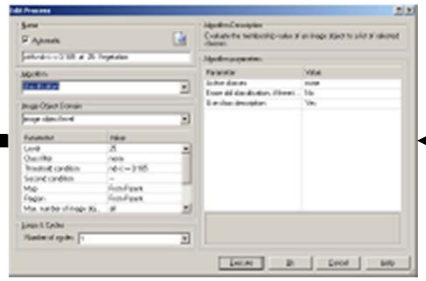
Multiresolution segmentation



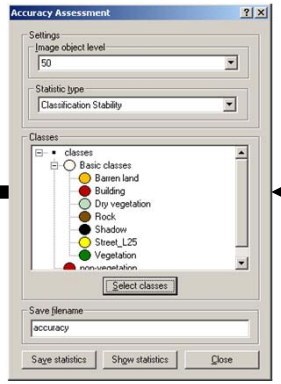
Development of rule set and classification key



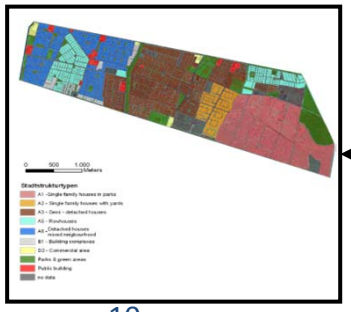
Performing classification



Accuracy Assessment



Result



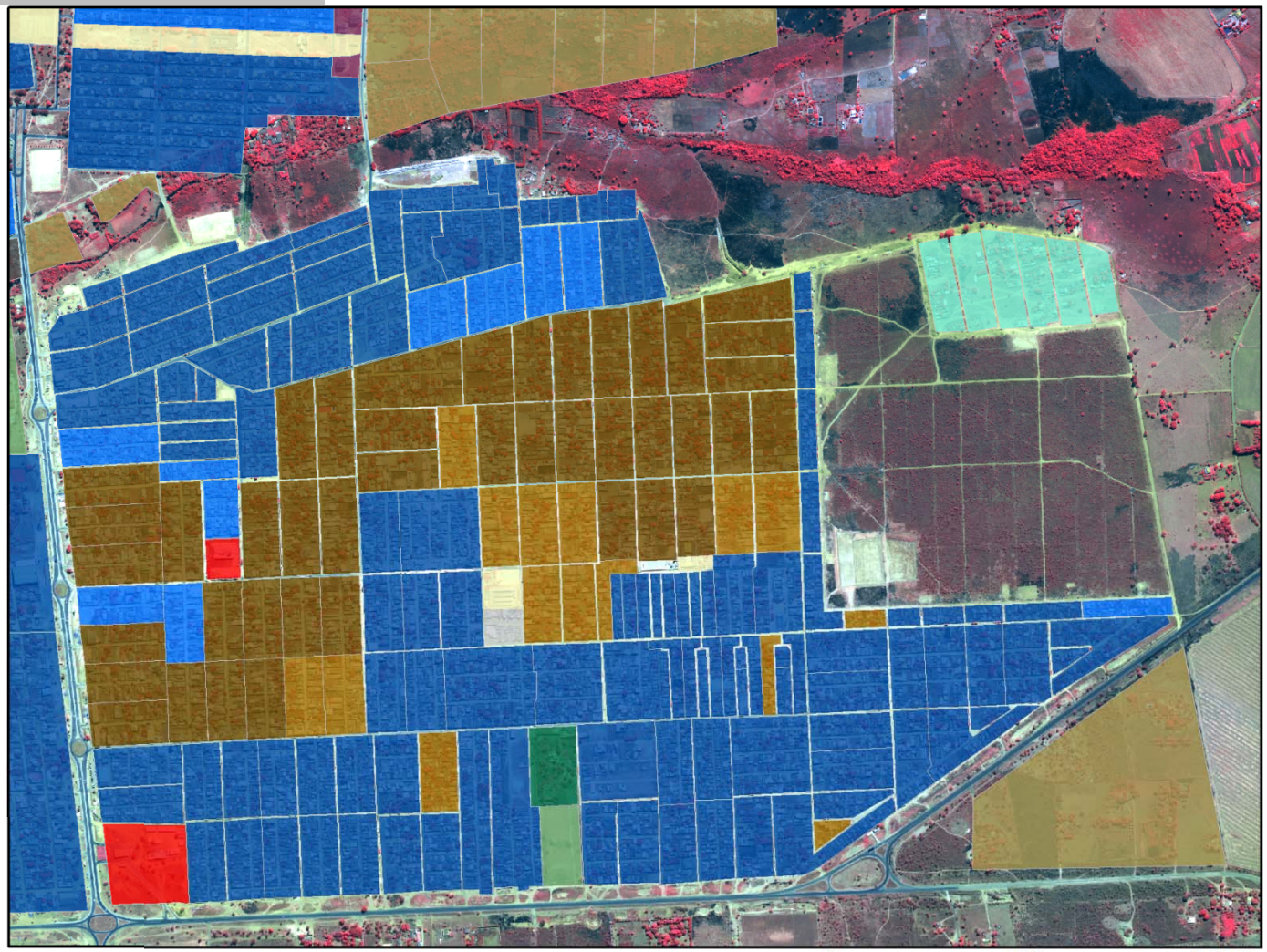
3 Methodology

- **Statistical representation**
- **Analyzed variables**:
  Population density, household density, water supply, sewage disposal, waste disposal, amount of impervious surface, vegetation, bare soil ...
- **Difficulties:** different spatial units

- **Advantage:** Very high **temporal resolution**
  (10 years ⟺ 16 day)

4 Results

- **Spatial resolution**

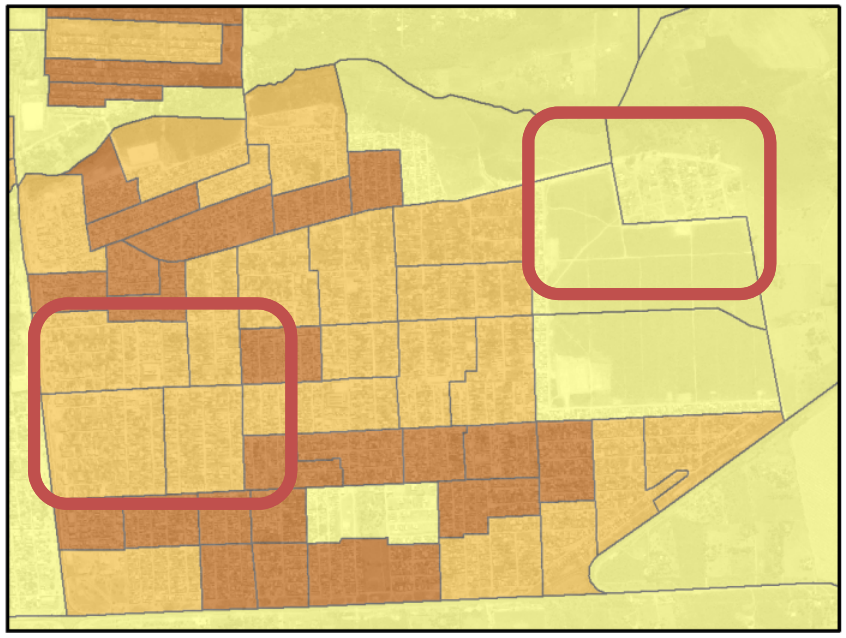


4 Results

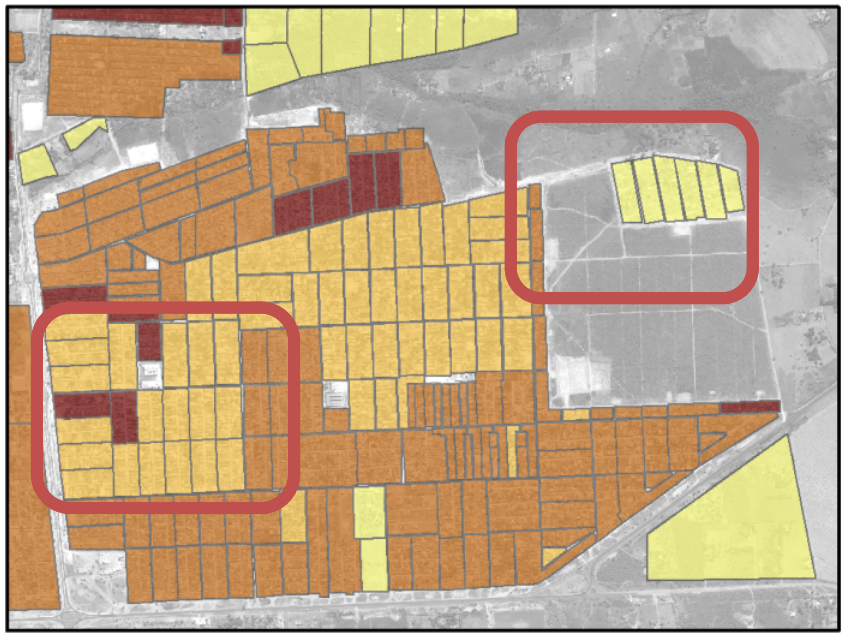
- Spatial resolution

Population density

(A) - Census data



(B) - Urban Structure Types



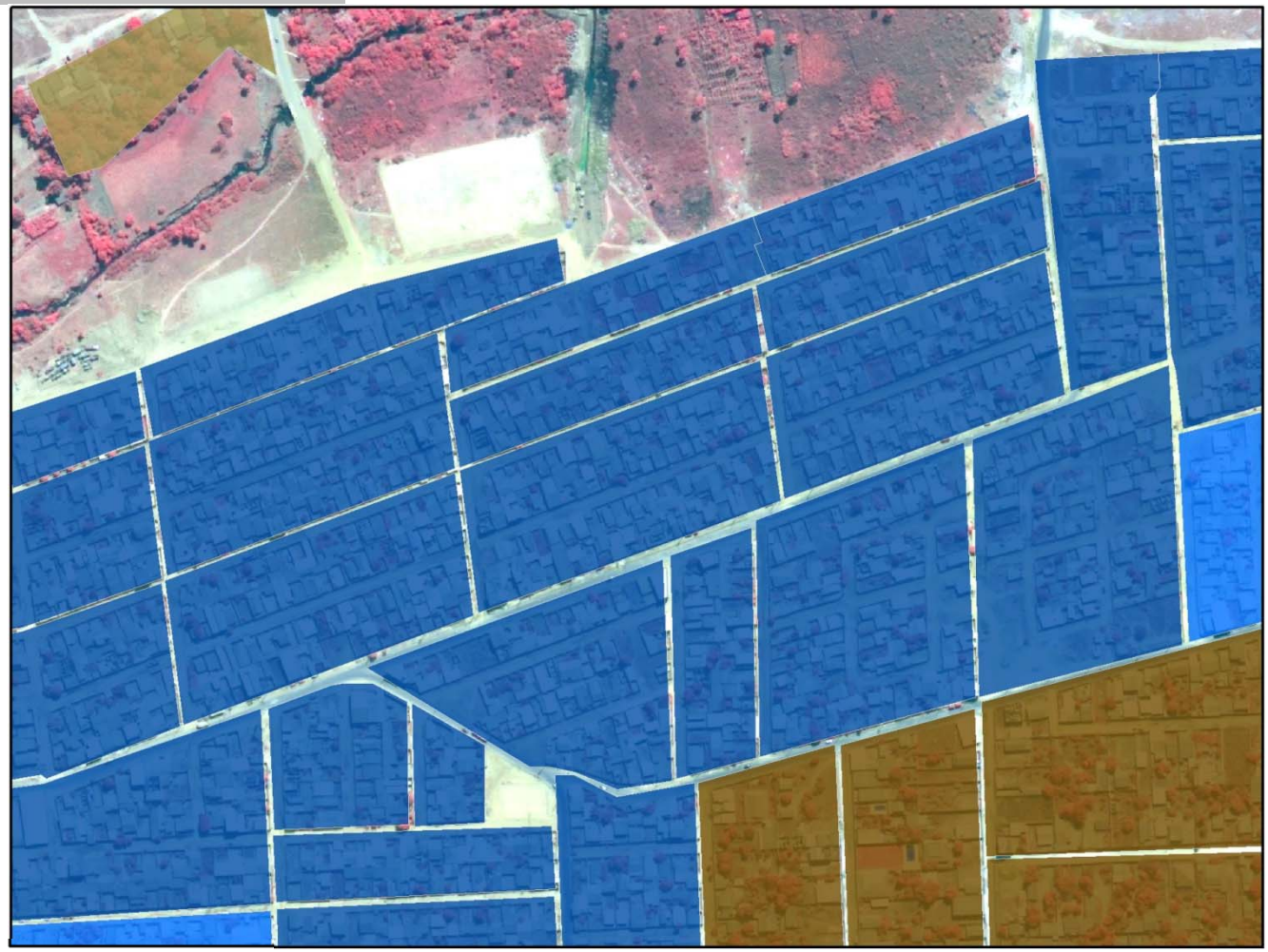
0 500 1.000
m

[inhab/km²]

- <= 4000
- > 4000 - 9000
- > 9000 - 14000
- > 14000

4 Results

- **Thematic resolution**

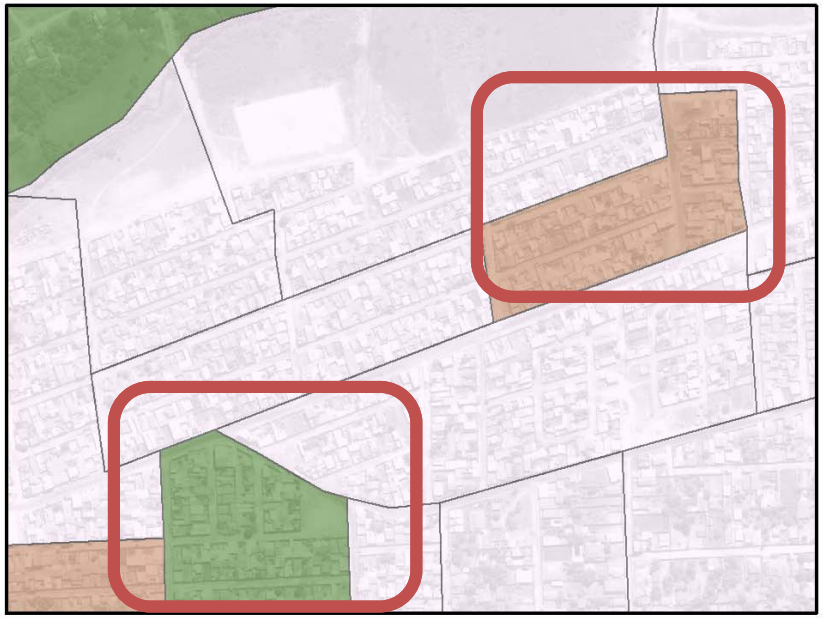


4 Results

- **Thematic resolution**

Amount of households using rudimentary cesspits

(A) - Census data



(B) - Urban Structure Types

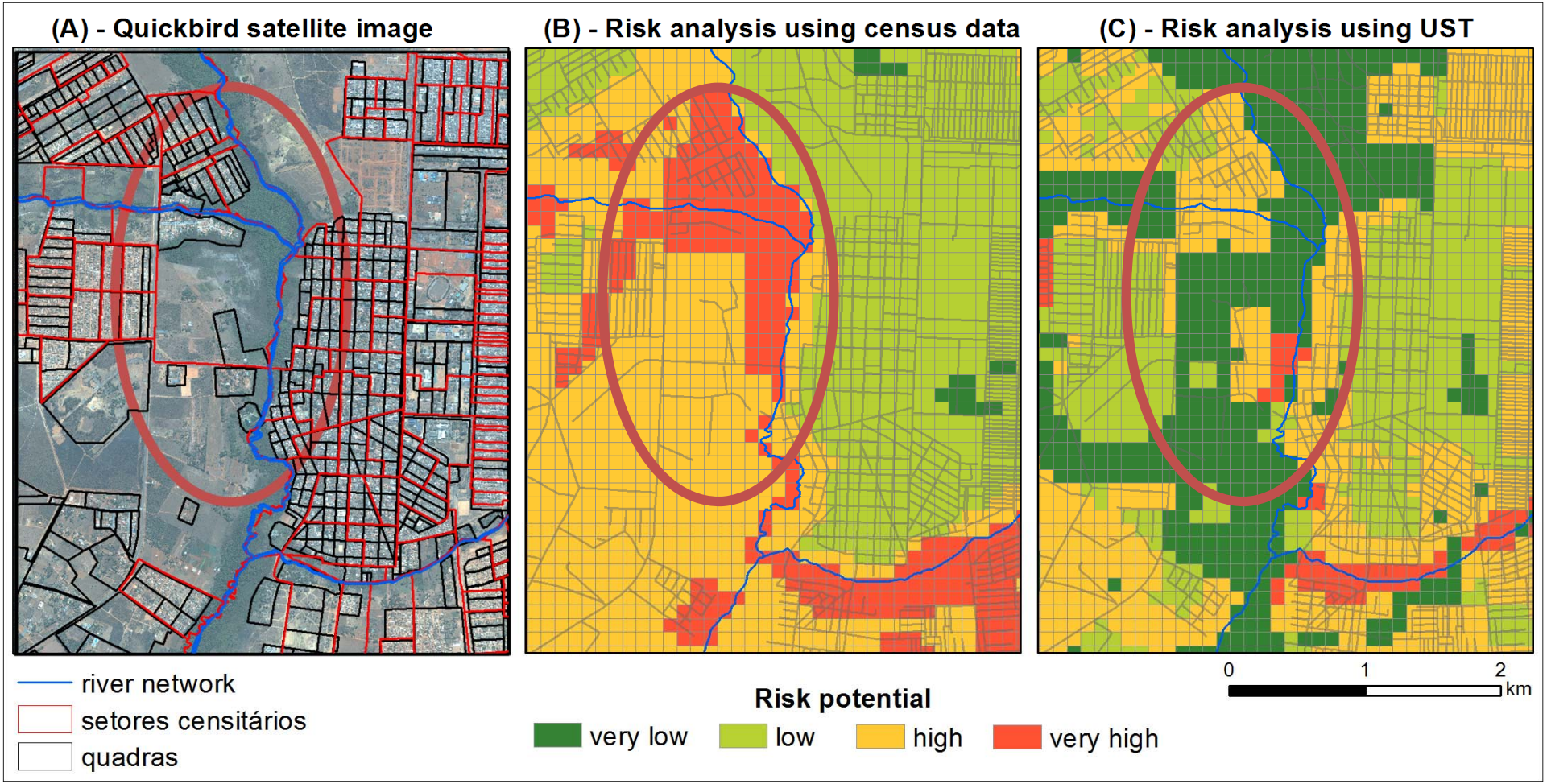
[in %]

- <= 25
- > 25 - 50
- > 50 - 75
- > 75

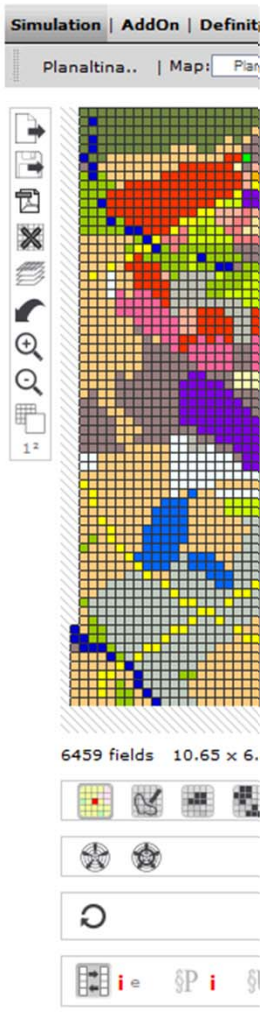
0 125 250 m

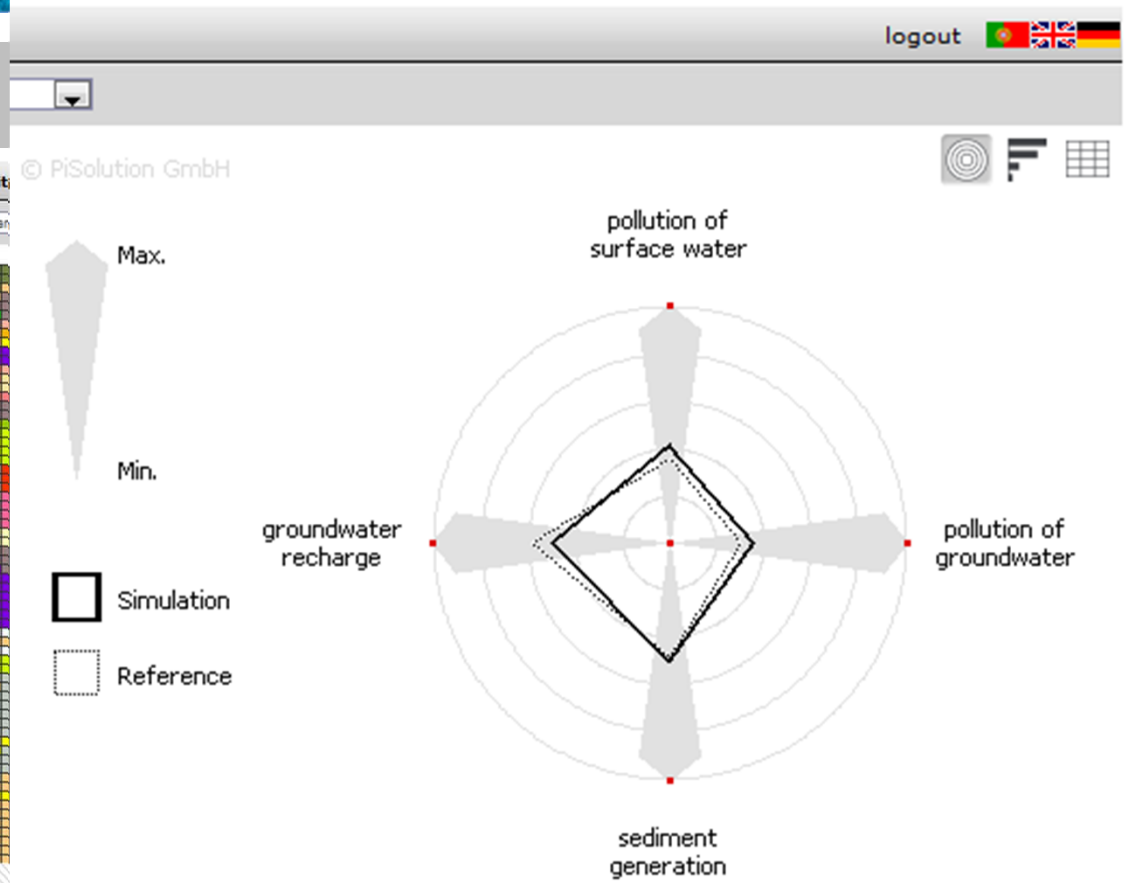
4 Results

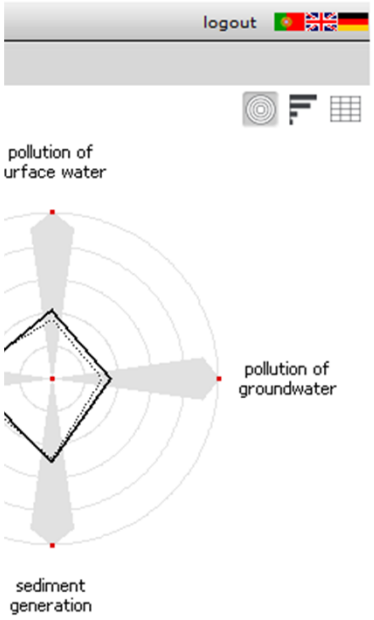
- **Application**



4


Simulation | AddOn | Definit
Planaltina.. | Map:
6459 fields 10.65 x 6.


logout
© PiSolution GmbH
Max.
Min.
Simulation
Reference
pollution of surface water
groundwater recharge
pollution of groundwater
sediment generation
start condition
Region Overview
results:
Scenario_1
05.29.2013
1 - 1 [1]


logout
pollution of surface water
pollution of groundwater
sediment generation
start condition
Region Overview
results:
Scenario_1
05.29.2013
1 - 1 [1]

5 Conclusion and Outlook

- **Urban Structure Types:**
  - **represent water-relevant parameters and can be used to estimate impacts of urbanization processes on water resources**
  - **support multi-temporal monitoring and planning measures**
  - **main benefits: high spatial and temporal resolution, time and cost effective classification**
- **Application of UST in modeling, scenario development, risk assessment**

Thank you for your attention

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