

**SEVENTH FRAMEWORK PROGRAMME**  
**CAPACITIES - ERA.Net RUS: Linking Russia to the ERA**

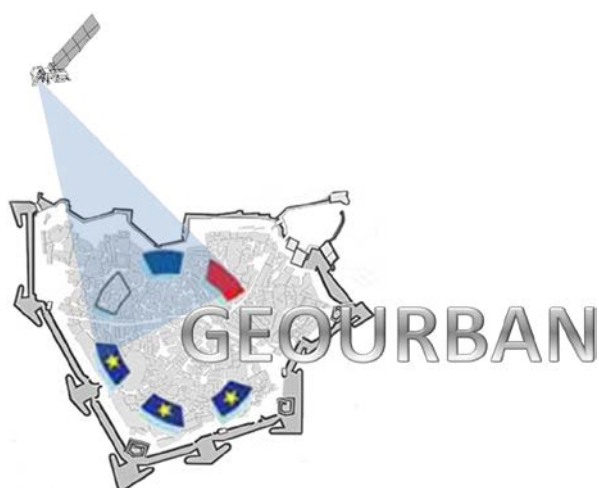


**Contract for:**

**Innovation Project**

***D.4.1***

***EO Products Database (VHR)***



Project acronym: **GEOURBAN**

Project full title: **Exploiting  
Earth Observation in  
sustainable uRBan  
planning & maNagement**

Contract no.: ERA.Net-RUS-033

Date: 30/10/2012

Doc. Ref.: GEOURBAN\_01\_PL\_FORTH

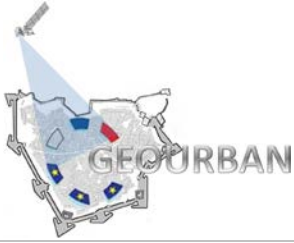
Book Captain: H.Şebnem DÜZGÜN

Contributors: Mahmut ÇAVUR

Issue: 1.0

Deliverable no.: D.4.1

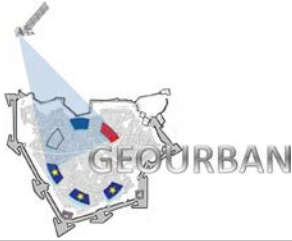
Dissemination: CO



# GEOURBAN

## Document Status Sheet

Issue	Date	Author	Comments
0.0			
0.1			
0.2			
1.0			

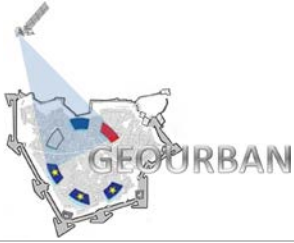


# GEOURBAN

---

## TABLES

<b>TABLE 1. IMAGE PROPERTIES TABLE.....</b>	<b>ERROR! BOOKMARK NOT DEFINED.</b>
<b>TABLE 2. ALGORITHM TABLE . .....</b>	<b>ERROR! BOOKMARK NOT DEFINED.</b>
<b>TABLE 3. PROCESSED IMAGE TABLE. ....</b>	<b>ERROR! BOOKMARK NOT DEFINED.</b>
<b>TABLE 4. IMAGE BAND TABLE.....</b>	<b>ERROR! BOOKMARK NOT DEFINED.</b>
<b>TABLE 5. RAW IMAGE TABLE. ....</b>	<b>ERROR! BOOKMARK NOT DEFINED.</b>
<b>TABLE 6. DELIVERABLE TABLE. ....</b>	<b>ERROR! BOOKMARK NOT DEFINED.</b>
<b>TABLE 7. SATELLITE TABLE.....</b>	<b>ERROR! BOOKMARK NOT DEFINED.</b>

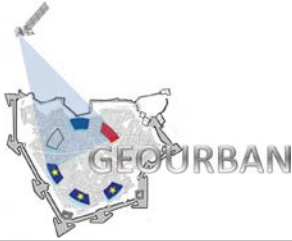


# GEOURBAN

---

## FIGURES

FIGURE 1. THE DATABASE DESIGN FOR VHR EO PRODUCTS.. .....9

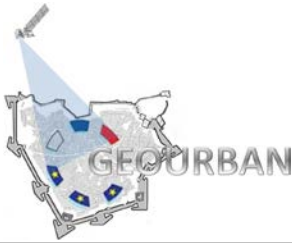


# GEOURBAN

---

## Table of Contents

DOCUMENT STATUS SHEET .....	2
ISSUE .....	2
DATE .....	2
AUTHOR .....	2
COMMENTS.....	2
TABLES .....	3
FIGURES .....	4
TABLE OF CONTENTS .....	5
1. WORKPACKAGE OVERVIEW.....	6
1.1. PURPOSE OF THE DOCUMENT .....	6
1.2. DEFINITIONS AND ACRONYMS .....	6
2. DESCRIPTION OF EO DATA AND PRODUCTS.....	7
3. DESIGN FOR EO PRODUCTS DATABASE.....	8



# GEOURBAN

## 1. WORKPACKAGE OVERVIEW

WP4 includes **micro-scale applications** in the GEOURBAN case studies. Although previous research projects have already addressed the use of very high spatial resolution (VHR) EO data in urban planning and management, **WP4** represents a unique attempt to collect an integrated VHR EO dataset (including IKONOS, Quickbird, WorldView, RapidEye, and TerraSAR-X images) for selected case studies and properly exploit it for generating an **Earth Observation Products Database** suitable for computing a subset of the EO-based indicators identified in WP3. The development of novel EO data analysis techniques is beyond the scope of GEOURBAN, therefore state-of-the-art methods are used to derive specific products from raw EO data. In addition to the final database, a detailed report on each target product as well as the techniques used to generate each of them is provided. WP4 provides design of database for better sharing of VHR data processing outputs. **WP4** presents conceptual database design which involves modeling the relations between the raw EO data, EO-based indicators and EO products obtained from processing of high resolution of the EO raw data.

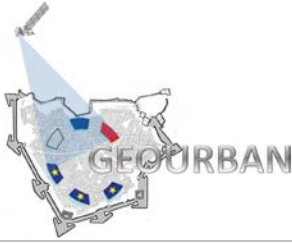
### 1.1. Purpose of the document

This document is the **Earth Observation Product Database** of the GEOURBAN (Exploiting Earth Observation in Sustainable Urban Planning & Management) Project. It contains description of the conceptual database design for GEOURBAN product database.

### 1.2. Definitions and acronyms

#### **Acronyms**

Primary Key	(PK)
Foreign Key	(FK)



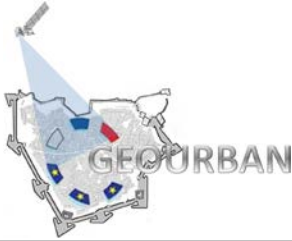
# GEOURBAN

## 2. DESCRIPTION OF EO DATA AND PRODUCTS

The final Earth Observation Products Database is derived by means of suitable image processing algorithms applied to the available VHR raw data and represents the basis for computing the indicators to be then used in the framework of GEOURBAN. This is carried out for three selected case studies, namely Basel, Tyumen and Tel Aviv. Table 1 lists the VHR EO data available for each case study and the corresponding list of target products.

Table 1. EO data and products for GEOURBAN case studies

Case Study	Available EO Data	Spatial Resolution		Spectral Resolution	Target Products
		Panchromatic (m)	Multispectral (m)		
Basel	Quickbird	0.61	2.5	B,G,R, NIR	Land use/land cover maps including water, grass, tree, bare land, road and built-up
	TerraSAR-X	1		X-Band	Urban settlements map (i.e., urban footprint)
Tyumen	RapidEye		6.5	B,G,R,Red Edge, NIR	Land use/land cover maps including different types of urban settlements
	TerraSAR-X	1		X-Band	Urban settlements map (i.e., urban footprint)
	Combined analysis of RapidEye and TerraSAR-X data.				Percent impervious surface map
Tel Aviv	RapidEye		6.5	B,G,R,Red Edge, NIR	Land use/land cover maps including water and different types of urban settlements



# GEOURBAN

As one can notice from Table 1, target EO products mainly include land use/land cover maps for specific information classes as well as surface features computed over the entire study area. All of them are provided both in raster (in GeoTIFF format) and vector (shape files) formats using WGS84 datum. The algorithms used for obtaining different target EO products as well as related indicators are described into details in the following GEOURBAN deliverables:

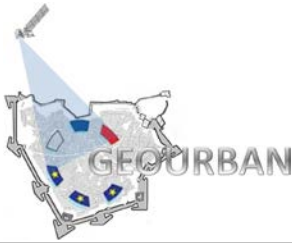
1. D.2-Urban Planning Requirements relative to EO
2. D.3-EO-based Indicators Development
3. D.4.2- EO Data Analysis Protocol (VHR)

## 3.DESIGN FOR EO PRODUCTS DATABASE

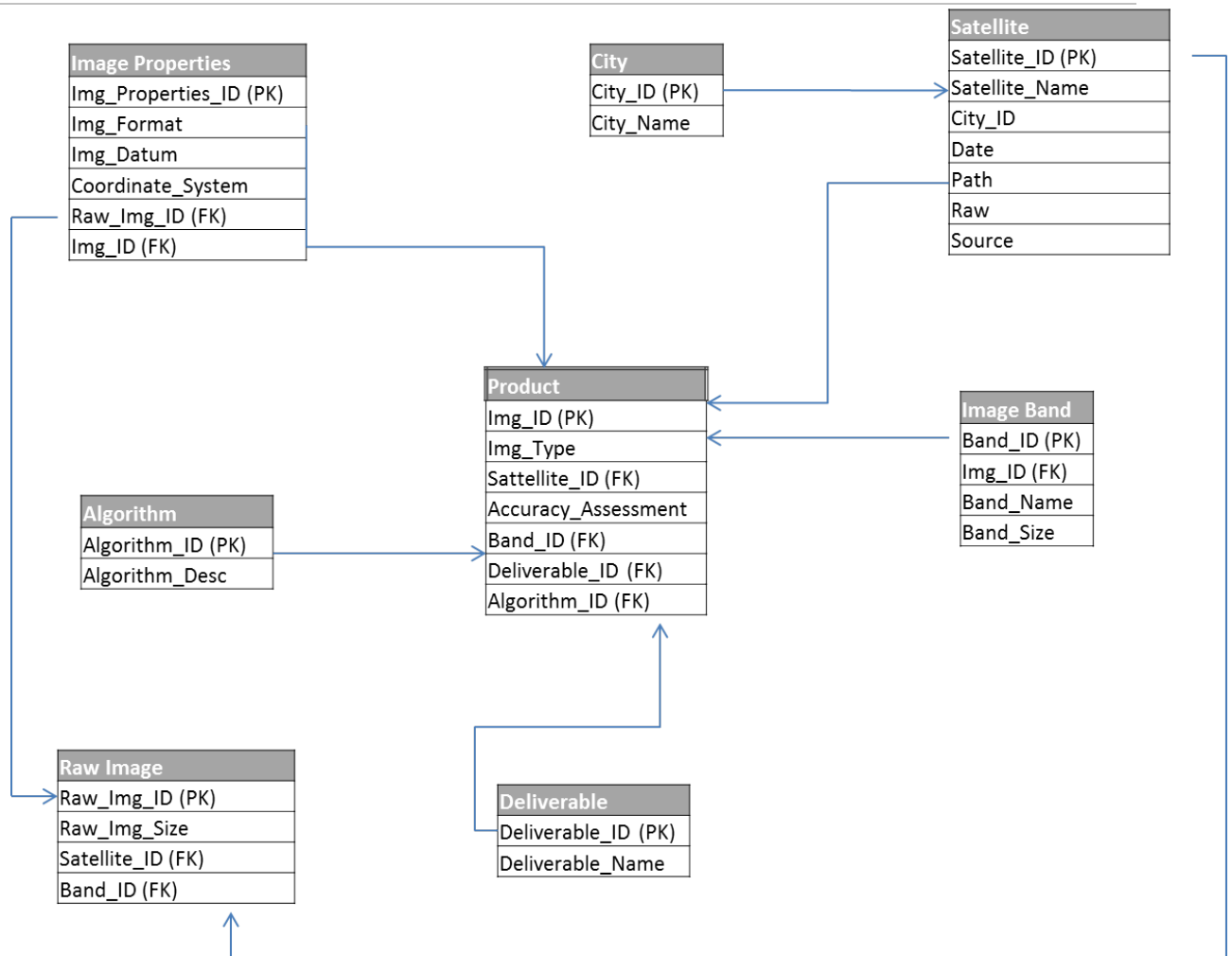
For each of the target products listed in the previous section a relational database is considered. The structure is presented in Figure 1. As it can be seen from Figure 1 there are eight tables, namely:

- image properties
- algorithm
- product
- satellite
- city
- image band
- raw image
- deliverable



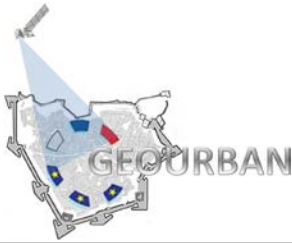


# GEOURBAN



**Figure 1. The Database Design for VHR EO Products.**

Primary key (PK) and foreign key (FK) attributes of the eight tables with their attributes are also listed in Figure 1. Image properties table contains data related to the obtained raw VHR data. Algorithm table provides the description of the algorithm used for processing the VHR data. Product table contains the properties of the processed VHR raw data. Satellite table constitutes information related to the satellite sensor from which the VHR raw data is obtained. City table involves the list of case study sites. Image band table lists the band of VHR data. Raw image table contains attributes of VHR raw data. Finally the deliverable table provides related deliverable which includes documents describing VHR raw data processing steps.



# GEOURBAN

Image Properties Table involves six attributes namely identity of the image properties (Img\_Properties\_ID), which is primary key (PK), image format (Img\_Format), datum (Img\_Datum), coordinate system (Coordinate\_system), identity of raw image (Raw\_Img\_ID) and identity of EO product (Img\_ID), which is obtained by processing the raw image. The attributes of Raw\_Img\_ID and Img\_ID are the foreign keys (FK) of the Image Properties Table.

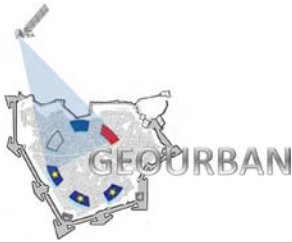
Algorithm Table has two attributes like identity of the algorithm used for processing the EO raw data (Algorithm\_ID), which is PK of the table and description of the algorithm (Algorithm\_Desc) used to obtain EO product.

Product Table, which represents the data of EO product, consists of seven attributes. Identity of the processed image product data is given by Img\_ID, which is the PK of the table. Size of the processed raw image or EO product is presented by Img\_size. Accuracy assessment values are included with the attribute of Accuracy\_Assessment. Rest of the attributes in the table are FK of the table, which are the PK of the other tables.

Satellite Table has seven attributes. The primary key for the table is Sattellite\_ID and it indicates identity of satellite data from which the raw image is acquired. Name of the satellite is expressed with the Sattellite\_Name attribute. The case study city in relation to the obtained image is represented with City\_ID attribute. As the names implies, the attributes of Date, Path and Raw are the related attributes for the obtained satellite image. The attribute of source depicts information related to the satellite image like related websites or other documents.

City Table has two attributes which are City\_ID and City\_Name. City\_ID is the primary key of this table and provides the identity of the data related to this table. As the name implies, City\_Name is the name of the case study.

Image Band Table indicates the bands of the image and its properties. Since there are more than one band for VHR images, the band properties should be included in the



# GEOURBAN

database. Identify of the band data is represented by Band\_ID attribute which is the PK of the table. Band\_Name, which is band name of the image and Band\_Size, which is band size of the image are the other attributes of the table. Img\_ID is the FK of the table.

Raw Image Table consists of four attributes, two of which are FK of the table, namely Sattellite\_ID and Band\_ID. Raw\_Img\_ID is the PK of the table and provides the identity of of the raw image data. The size of the raw image is presented by the attribute of Raw\_Img\_Size.

Finally, Deliverable Table involves data attributes related to the identity of deliverable (Deliverable\_ID), which is PK and name of the deliverable associated with the EO product.

The conceptual database design provided in this deliverable forms the backbone of the database to be implemented in WIS of GEOURBAN. It provides systematic management of the obtained VHR data.