

# **GHSL Data Packages**

## **Instructions for data access. V1.0**

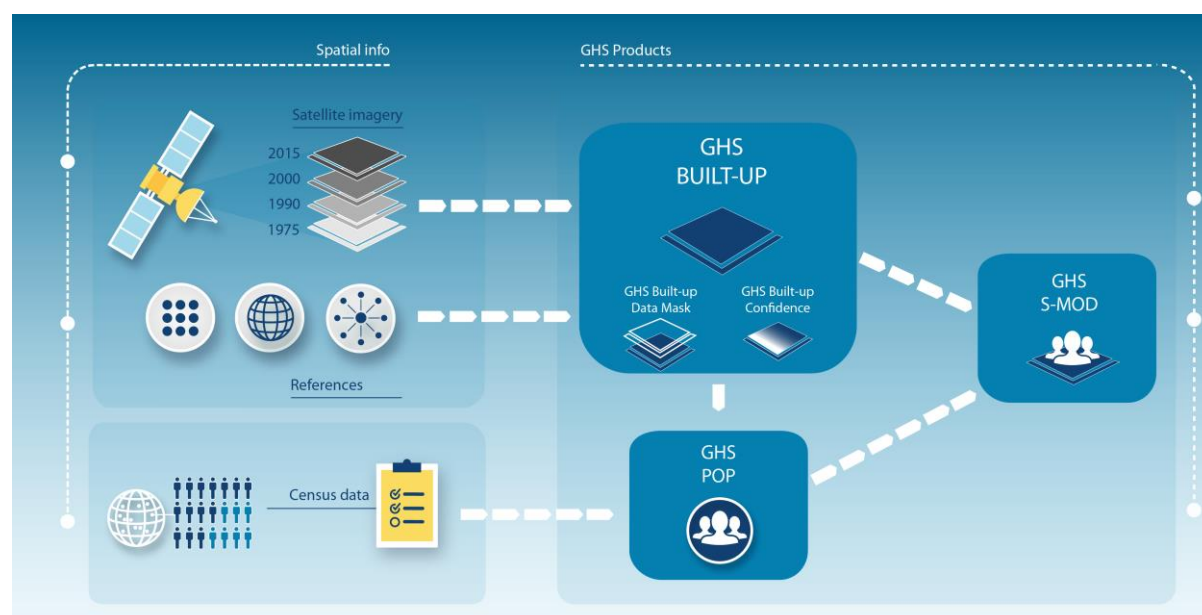
**Disaster Risk Management**  
**Space, Security & Migration, JRC-ISPRA EC**  
**Last update: 27 Oct 2016**

### **WHAT IS THE PURPOSE OF THIS DOCUMENT?**

This document has been created for GHSL data users, and accompanies the data packages of GHSL data collection published through JRC Open Data repository.

### **HOW IS THE DATA COLLECTION ORGANISED?**

The GHSL data packages (GHS-BUILT, GHS-POP and GHS-SMOD) belong to the family of GHSL products.



### **WHERE CAN I GET THE GHSL DATA?**

**JRC Open Data Portal**  
**GHSL web page**

<http://data.jrc.ec.europa.eu/collection/GHSL>  
<http://ghsl.jrc.ec.europa.eu/>  
<http://ghslsys.jrc.ec.europa.eu/>

### **IS THERE ANY POINT OF CONTACT?**

Yes, please use the following email: [ghsl-data@jrc.ec.europa.eu](mailto:ghsl-data@jrc.ec.europa.eu)

### **HOW CAN I GET THE GHSL DATA?**

The GHSL can be downloaded for free. No registration is needed.

### **WHAT ARE THE USE CONSTRAINTS?**

The GHSL has been produced by the EC JRC as open a free data – Reuse is authorised, provided the source is acknowledged. For more information, please read the use conditions ([European Commission Reuse and Copyright Notice](#)).

## HOW CAN I OPEN THE FILES?

The dataset can be opened by means of GDAL-compatible GIS/Remote Sensing tools, such as **QGIS (open source software)** or **ArcGIS (commercial software by ESRI)**.

## WHAT CAN I DO WITH THE GHSL DATA?

Examples of main applications and uses of the GHSL are:

- Comparison of settlements in a consistent way
- Monitoring the implementation of international frameworks
- Empowering communities and building trust in data and analyses.

## WHAT CAN I DOWNLOAD?

**Three main type of products:**

- built-up (GHS-BUILT)
- population (GHS-POP)
- city model (GHS-SMOD)

**Format:** the grid data are distributed as raster files in TIF format. The ZIP files contain raster files together with pyramids (i.e., TIF and OVR files).

**Coverage:** globe

**Temporal resolution:** 1975, 1990, 2000, 2015

**Resolution:**

Type of product	Details	38m	250m	1km
GHS-BUILT	Built-up grid	yes	yes	yes
	Quality information on remote sensing data availability (data mask grid)	yes	no	no
	Quality information on built-up presence (confidence grid)	yes	no	no
GHS-POP	Population grid	no	yes	yes
GHS-SMOD	Settlement model grid	no	no	yes

## HOW SHALL I CITE THE DATA?

The dataset citations can be found at JRC Open Data portal.

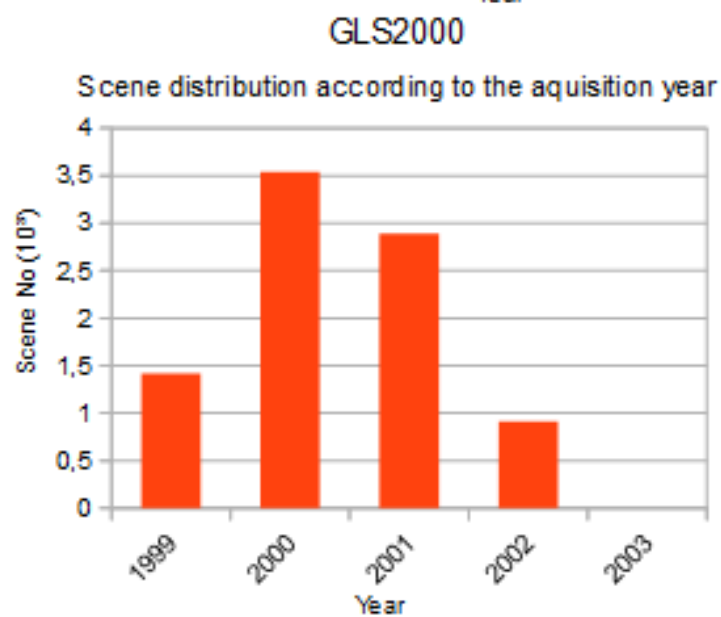
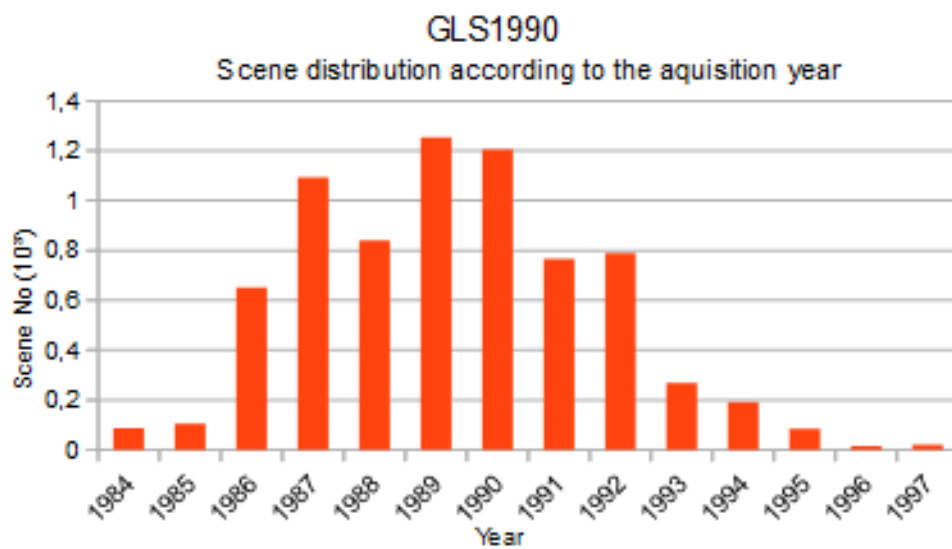
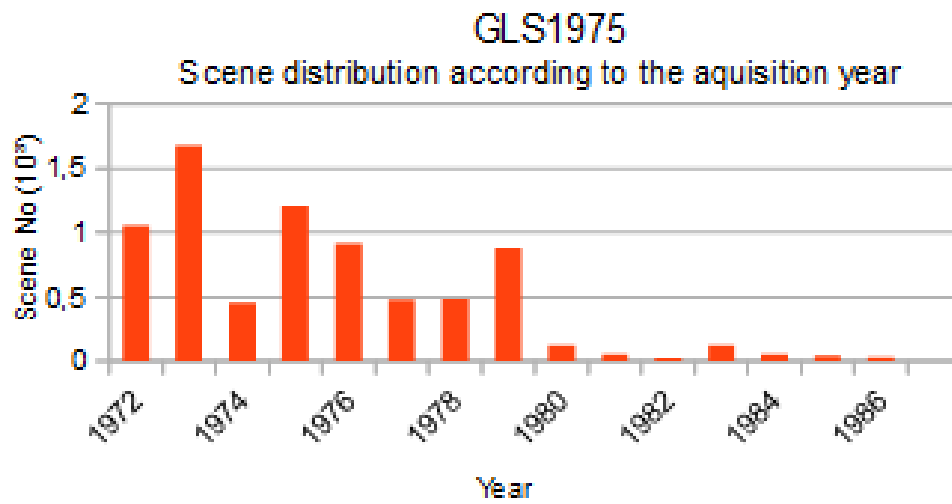
## HOW SHALL I UNDERSTAND THE EPOCH OF THE BUILT-UP LAYER?

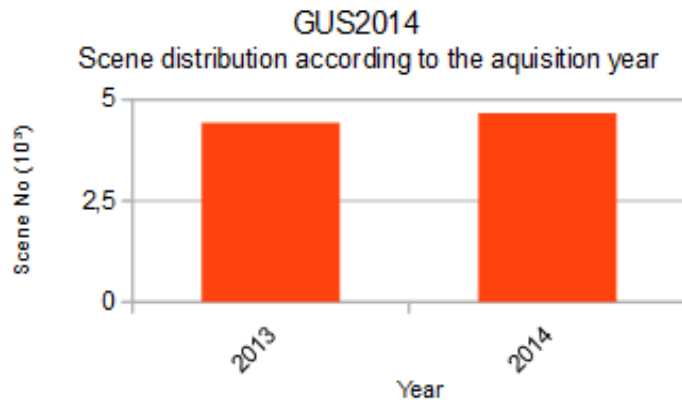
The epochs that characterise the built-up GHSL data approximate the temporal dimension of the input imagery, i.e., the Landsat multitemporal collections. The collections processed are mainly the [Global Land Survey](#) datasets (GLS1975, GLS1990, GLS2000), and a Landsat-8 image collection (an ad-hoc collection named GUS2014).

The Table below shows the analysis of the year of acquisition of scenes per each collection.

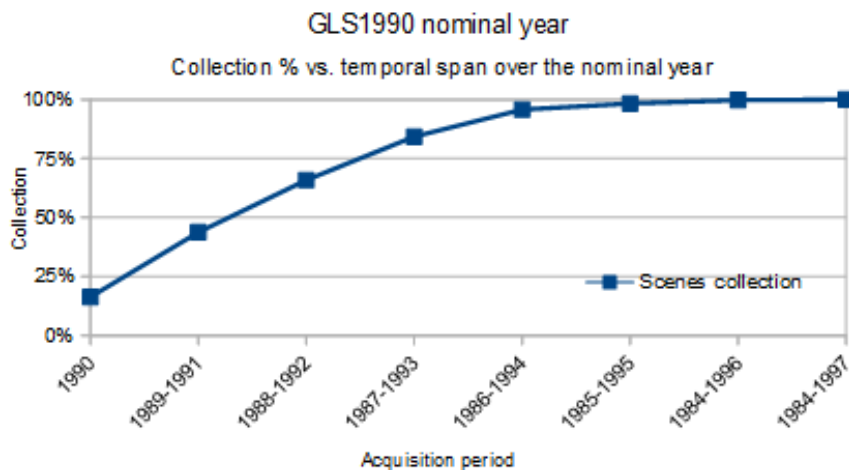
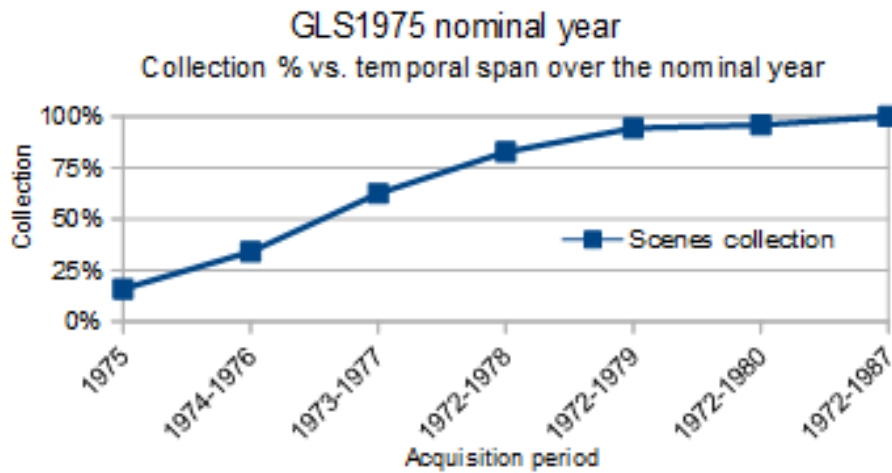
	GUS2014	GLS2000	GLS1990	GLS1975
<b>Number of Scenes</b>	9.089	8.756	7.375	7.588
<b>min year</b>	2013	1999	1984	1972
<b>max year</b>	2014	2003	1997	1987
<b>average of year</b>	2013.51	2000.34	1989.29	1975.41
<b>mode of year</b>	2014	2000	1989	1973
<b>variance of year</b>	0.25	0.77	5.44	8.19

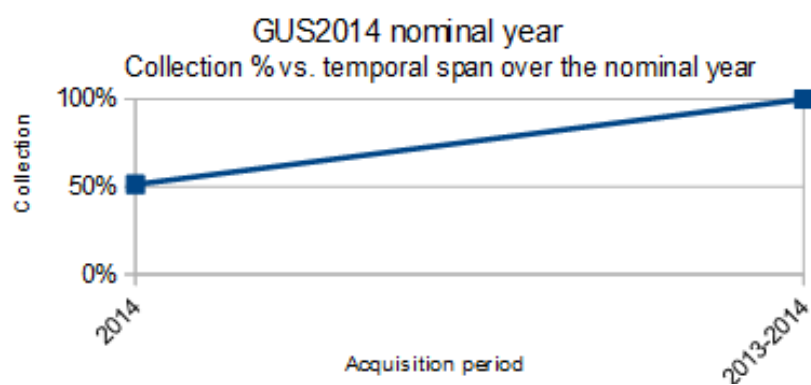
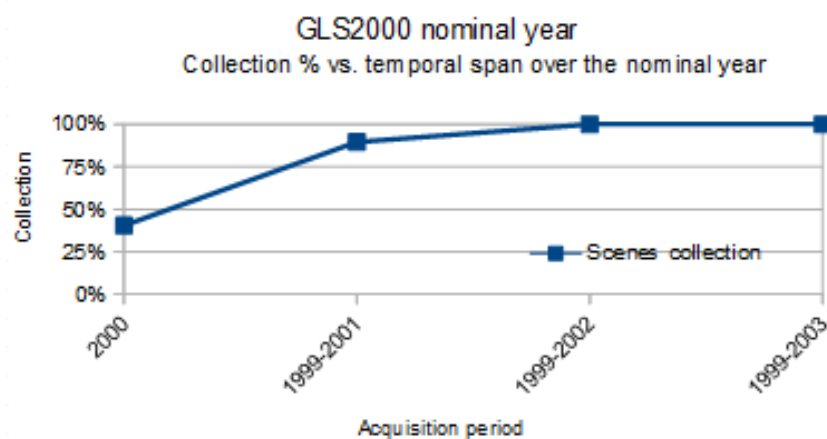
The Figures below show the acquisition year frequency of scenes per each collection.





The Figures below show the percentage of collection per different temporal spans that warp the nominal year. For example, we can observe that more than 80% of scenes of GLS1990 and GLS2000 are from periods between 1987-1993 and 1999-2001, respectively.







## GHS BUILT-UP GRID

This data grid is a multitemporal information layer on built-up presence, which has been derived from Landsat image collections (GLS1975, GLS1990, GLS2000, and ad-hoc Landsat 8 collection 2013/2014).

The data have been produced by means of Global Human Settlement Layer methodology in 2015.

**Product name:**

GHS\_BUILT\_LDSMT\_GLOBE\_R2015B

**Projection:**

Spherical Mercator (EPSG:3857), World Mollweide (EPSG:54009)

**Resolutions available:**

approx. 38m, 250m, 1Km

<b>Description:</b>	multi-temporal classification <i>38m of resolution - Spherical Mercator (EPSG:3857)</i>
<b>Dataset name (size):</b>	<i>GHS_BUILT_LDSMT_GLOBE_R2015B_3857_38 (13GB)</i>
<b>Legend:</b>	0 = no data 1 = water surface 2 = land no built-up in any epoch 3 = built-up from 2000 to 2014 epochs 4 = built-up from 1990 to 2000 epochs 5 = built-up from 1975 to 1990 epochs 6 = built-up up to 1975 epoch

<b>Description:</b>	built-up presence by each epoch <i>38m of resolution - Spherical Mercator (EPSG:3857)</i>
<b>Dataset names (size):</b>	<i>GHS_BUILT_LDS1975_GLOBE_R2016A_3857_38 (768MB)</i> <i>GHS_BUILT_LDS1990_GLOBE_R2016A_3857_38 (854MB)</i> <i>GHS_BUILT_LDS2000_GLOBE_R2016A_3857_38 (892MB)</i> <i>GHS_BUILT_LDS2014_GLOBE_R2016A_3857_38 (900MB)</i>
<b>Legend:</b>	values are expressed in byte from 1 to 101 [0 = no data]

<b>Description:</b>	built-up presence by each epoch <i>250m of resolution - World Mollweide (EPSG:54009)</i>
<b>Dataset names (size):</b>	<i>GHS_BUILT_LDS1975_GLOBE_R2016A_54009_250 (215MB)</i> <i>GHS_BUILT_LDS1990_GLOBE_R2016A_54009_250 (296MB)</i> <i>GHS_BUILT_LDS2000_GLOBE_R2016A_54009_250 (338MB)</i> <i>GHS_BUILT_LDS2014_GLOBE_R2016A_54009_250 (398MB)</i>
<b>Legend:</b>	Values are expressed as decimals (Float) from 0 to 1

<b>Description:</b>	built-up presence by each epoch <i>1Km of resolution - World Mollweide (EPSG:54009)</i>
<b>Dataset names (size):</b>	<i>GHS_BUILT_LDS1975_GLOBE_R2016A_54009_1k (43MB)</i> <i>GHS_BUILT_LDS1990_GLOBE_R2016A_54009_1k (64MB)</i> <i>GHS_BUILT_LDS2000_GLOBE_R2016A_54009_1k (74MB)</i> <i>GHS_BUILT_LDS2014_GLOBE_R2016A_54009_1k (87MB)</i>
<b>Legend:</b>	Values are expressed as decimals (Float) from 0 to 1

## GHS BUILT-UP CONFIDENCE GRID



This data grid is a complementary information layer to the multitemporal GHS built-up grid (1975, 1990, 2000, 2014). It is a quality layer, which has been produced together with the built-up data by means of Global Human Settlement Layer methodology in 2015.

This dataset is an aggregated confidence map about built-up area presence. Each pixel value represents the confidence of the model on the built-up presence.

**Product name**  
**Projection**  
**Resolutions available**

GHS\_BUILT\_LDSMTCNFD\_GLOBE\_R2015B  
Spherical Mercator (EPSG:3857)  
approx. 38m

### Description

gaps-filled confidence grid on the built-up class, and aggregated for 2014

### Dataset name (size)

*38m of resolution - Spherical Mercator (EPSG:3857)*

### Legend

*GHS\_BUILT\_LDSMTCNFD\_GLOBE\_R2015B\_3857\_38 (9.3GB)*

Continuous values in the range [0 to 255]

0 127 255



0 = 100% confidence of no built-up

127 = 50% decision cut off

255 = 100% confidence of yes built-up

## GHS BUILT-UP DATAMASK GRID



**Product name**  
**Projection**  
**Resolutions available**

This data grid is a complementary information layer to the multitemporal GHS built-up grid (1975, 1990, 2000, 2014). It is a quality layer, which has been produced together with the built-up data by means of Global Human Settlement Layer methodology in 2015.

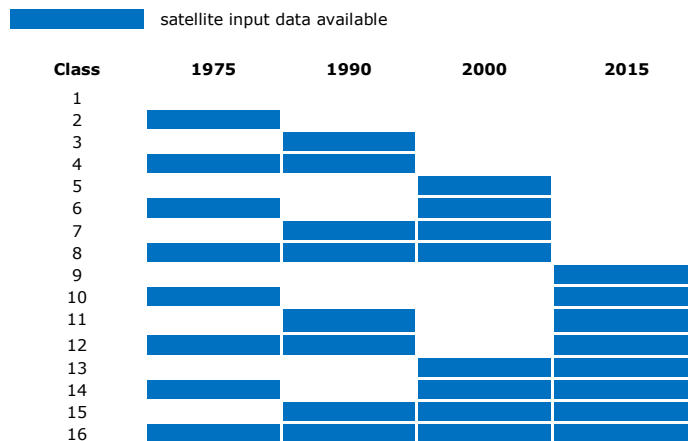
This dataset contains a data mask as produced from the input image availability in each Landsat collection.

GHS\_BUILT\_LDSMTDM\_GLOBE\_R2015B  
Spherical Mercator (EPSG:3857)  
approx. 38m

### Description

**Dataset names (size)**  
**Legend**

mosaic of data availability in the different epochs  
*38m of resolution - Spherical Mercator (EPSG:3857)*  
*GHS\_BUILT\_LDSMTDM\_GLOBE\_R2015B\_3857\_38 (1.9GB)*





## GHS POPULATION GRID



This spatial raster dataset depicts the distribution and density of population, expressed as the number of people per cell. Residential population estimates for target years 1975, 1990, 2000 and 2015 provided by CIESIN GPWv4 were disaggregated from census or administrative units to grid cells, informed by the distribution and density of built-up as mapped in the Global Human Settlement Layer (GHSL) global layer per corresponding epoch.

<b>Product name</b>	GHS_POP_GPW4_GLOBE_R2015A
<b>Projection</b>	World Mollweide (EPSG:54009)
<b>Resolutions available</b>	250m, 1Km

<b>Description</b>	distribution and density of population, expressed as the number of people per cell
<b>Dataset names (size)</b>	<i>Resolution of 250m - World Mollweide (EPSG:54009)</i> GHS_POP_GPW41975_GLOBE_R2015A_54009_250 (280MB) GHS_POP_GPW41990_GLOBE_R2015A_54009_250 (787MB) GHS_POP_GPW42000_GLOBE_R2015A_54009_250 (824MB) GHS_POP_GPW42015_GLOBE_R2015A_54009_250 (1.1GB)  <i>Resolution of 1Km - World Mollweide (EPSG:54009)</i> GHS_POP_GPW41975_GLOBE_R2015A_54009_1k (141MB) GHS_POP_GPW41990_GLOBE_R2015A_54009_1k (144MB) GHS_POP_GPW42000_GLOBE_R2015A_54009_1k (148MB) GHS_POP_GPW42015_GLOBE_R2015A_54009_1k (155MB)
<b>Legend</b>	Values are expressed as decimals (Float) and represent the absolute number of inhabitants of the cell.



## GHS SETTLEMENT MODEL GRID

This data package contains an assessment of the REGIO-OECD "degree of urbanization" model using as input the population GRID cells in four epochs (2015, 2000, 1990, and 1975).

Each grid has been generated by integration of built-up areas produced from Landsat image, and population data derived from the CIESIN GPW v4.

In this assessment, the REGIO-OECD model<sup>1</sup> concerning the selection of the "high density clusters" (HDC), "low density cluster" (LDC), and rural areas have been used (please see below). HDC definition has been modified as follows "contiguous cells (4-connectivity, gap filling) with a density of at least 1 500 inhabitant/km<sup>2</sup> or a density of built-up greater than 50%, and a minimum of 50 000 inhabitants" per cluster.

**Product name** GHS\_SMOD\_POP\_GLOBE\_R2016A  
**Projection** World Mollweide (EPSG54009)  
**Resolutions available** 1Km

<b>Description</b>	model that classify the human settlements on the base of the built-up and population density <i>Resolution of 1Km - World Mollweide (EPSG:54009)</i>
<b>Dataset names (size)</b>	GHS_SMOD_REGIO1975_GLOBE_R2016A_54009_1k (12MB) GHS_SMOD_REGIO1990_GLOBE_R2016A_54009_1k (13MB) GHS_SMOD_REGIO2000_GLOBE_R2016A_54009_1k (14MB) GHS_SMOD_REGIO2015_GLOBE_R2016A_54009_1k (14MB)
<b>Legend</b>	1 = "rural cells" or base (BAS) 2 = "urban clusters" or low density clusters (LDC) 3 = "urban centres" or high density clusters (HDC)

<b>Description</b>	layers that identify the settlement with an unique ID <i>Resolution of 1Km - World Mollweide (EPSG:54009)</i>
<b>Dataset names (size)</b>	GHS_SMOD_REGHDC2015_GLOBE_R2016A_54009_1k (12MB) GHS_SMOD_REGLDC2015_GLOBE_R2016A_54009_1k (16MB)
<b>Legend</b>	The raster value are the unique ID of the Urban centers and Urban clusters, respectively, in the epoch 2015.

CODE	DESCRIPTION	S-MOD	
1	BASE	RURAL	grid cell outside high-density clusters and urban clusters
2	LDC	URBAN CLUSTERS	(towns and suburbs or small urban area) contiguous grid cells with a density of at least 300 inhabitants per km <sup>2</sup> and a minimum population of 5.000 inhabitants
3	HDC	URBAN CENTERS	(cities or large urban areas) contiguous cells with a density of at least 1.500 inhabitants per km <sup>2</sup> or a density of built-up greater than 50% and a minimum of 50.000 inhabitants

<sup>1</sup> Dijkstra, Lewis, and H. Poelmann. "A harmonised definition of cities and rural areas: the new degree of urbanization." European Commission Urban and Regional Policy. Working paper 1 (2014): 2014.