Where are Europe's Assets?

An introduction to the Basic European Assets Map (BEAM)

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SEVENTH FRAMEWORK PROGRAMME

GMES EMERGENCY RESPONSE SERVICE

Safer Services and Applications For Emergency Response

geomer GEOINTELLIGENCE AND BEYOND

infoterra an EADS Astrium company

Section 1: Introduction

Service Offer

BEAM (Basic European Assets Map) has been developed to estimate, evaluate and compare real and potential damages caused by natural disasters all across Europe, focussing both on European and national studies, which results in a significant advantage in cross border areas. Furthermore, the service concept is designed in a way that it can easily be refined to more detailed land use and statistical data.

BEAM displays assets in monetary values per area unit (€/m²). The complete asset information is composed of different layers, as within a damage assessment calculation each type of asset needs to be calculated applying a different damage function.

The information provided is completed by an additional layer showing the population density.

Benefits

BEAM is designed to perform cross border studies and to compare potential damages throughout Europe using a reliable and uniform data base. An additional advantage is the fact that the underlying methodology is scalable and can be adapted to more detailed land use and statistical data if required. Furthermore, as BEAM is coupled to the CORINE data set, it can be used for multi temporal analysis.

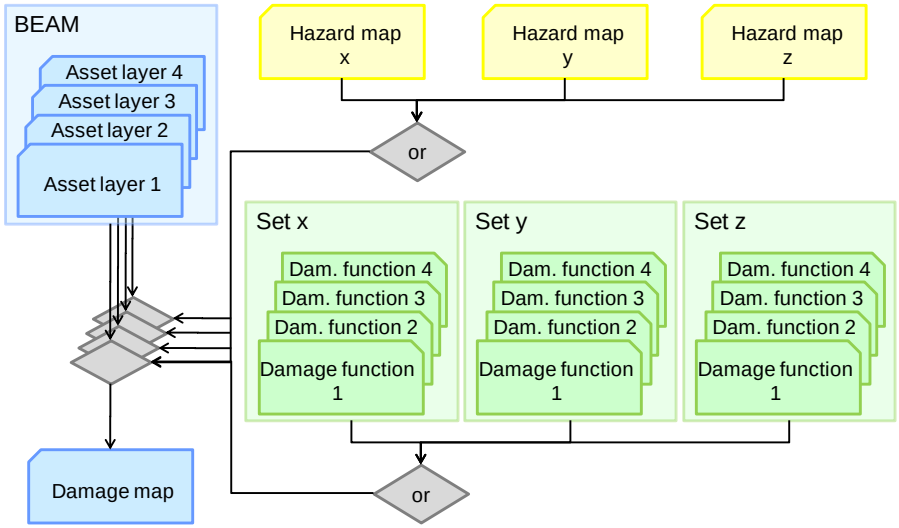
As the concept strictly separates assets from damages, it can easily be applied to all types of risk and is thus an ideal basis for multi-risk-analysis.

How to apply BEAM

Damage assessment can be conducted in two different ways: either by applying damage functions that provide a direct output of losses in monetary value, or by following a two step approach which first calculates the assets and then applies damage functions that calculate the losses in a percentage.

BEAM resorts to the second approach. Thus, the underlying asset layers can be used for various types of hazards (e.g. in a multi risk analysis) and the damage functions can be applied in different regions. For example, the damage function for an average car can be the same in different countries or regions, although the age and value of an average car will probably differ.

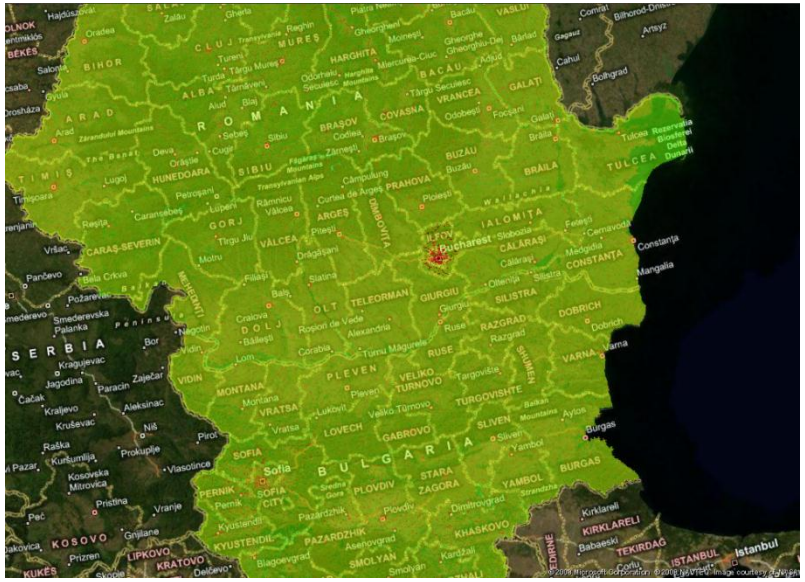
The damage functions applied are not part of BEAM itself, but can be supplied by the user or upon demand created for various types of hazard (e.g. floods, earthquakes).



Area Covered

BEAM has been designed to be used all over Europe. As it is based mainly on CORINE (land cover) and EUROSTAT (statistics) data it can be applied wherever these or similar data sets are accessible. Outside these areas the applicability can be checked upon request.

Fully processed products - ready for delivery - are available for 12 European countries; further production is done on demand.



Update Frequency

A complete update of the maps is scheduled together with each upcoming CORINE release and will carry the same release number as the CLC-version.

On demand, additional updates can be performed on a yearly basis, with regard to the statistical data and/or the update of the complementary land use data sources.

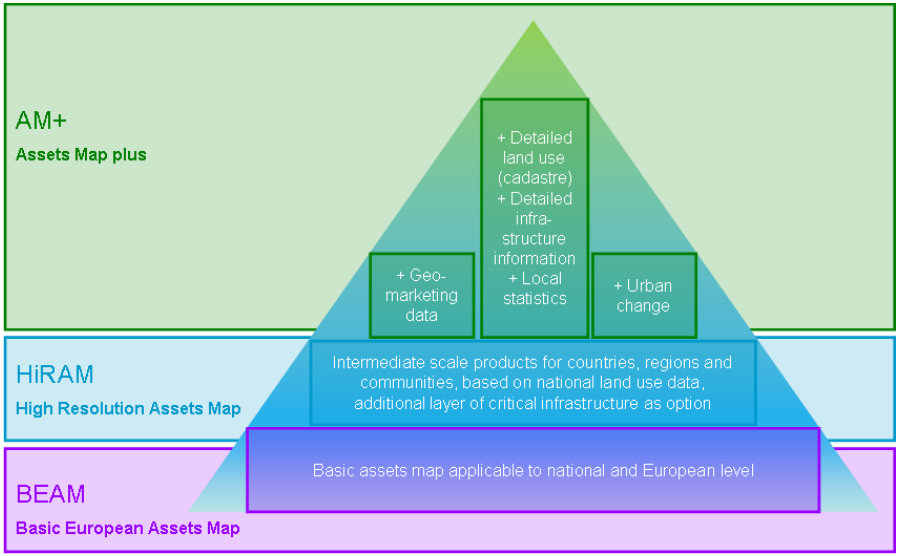
History of BEAM

Like many products BEAM did not start from zero. Some European studies on flood risk assessment as well as very detailed local studies have been used to develop background knowledge for the BEAM product.

In particular, experiences from creating risk maps for the rivers Rhine, Elbe and Odra are referred to. Further developments (e.g. Weser) have been performed within the projects PREVIEW (FP6), RISK-EOS (GSE) and finally SAFER (FP7), all funded by the European Union and ESA, respectively.

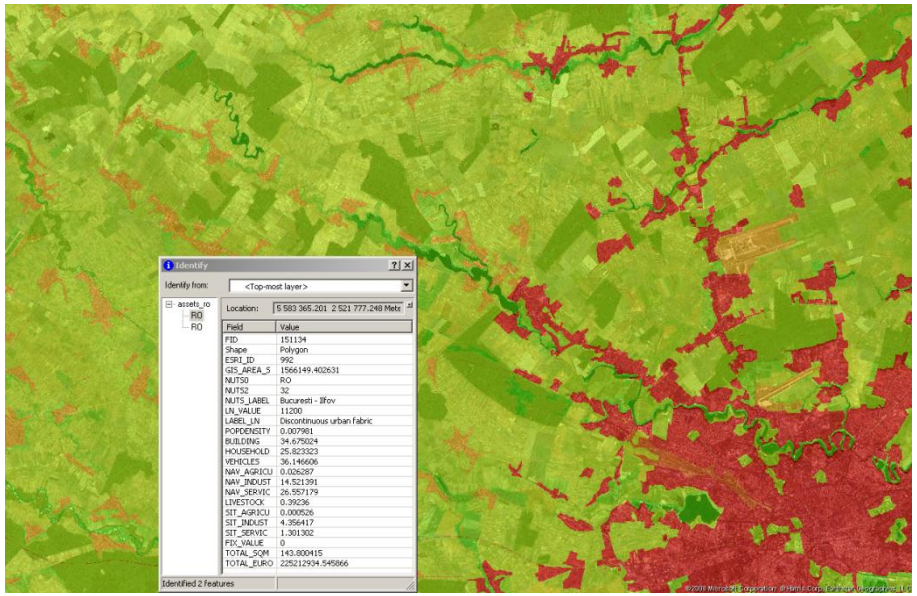
Further Assets Map Products (AM+ / HiRAM)

BEAM is one component of a complete product line which is currently under development. Depending on the user requirements, the level of detail can be enhanced (HiRAM) or additional data sets can be used to optimize the final product (AM+). Further, a layer displaying critical infrastructure may be added.



Section 2: Technical Specifications

Projection and coordinate system: Lambert Azimuthal Equal Area, ETRS 1989 LAEA, others and on request.



BEAM consists of the following set of asset layers:

- Population density
- Private housing: buildings and equipment (urban immobile)
- Household goods (urban mobile)
- Vehicles
- Industry: buildings and equipment (net asset value, immobile)
- Industry: stock in trade (mobile)
- Service and trade: buildings and equipment (net asset value, immobile)
- Service and trade: stock in trade (mobile)
- Agriculture: buildings and equipment (net asset value, immobile)
- Agriculture: stock in trade without livestock, mobile)
- Agriculture: livestock

gis_area_sqm	nuts0	nuts2	nuts_label	ln_value	label_ln	popdensity	building	household	vehicles	nav_agr	nav_ind	nav_service	livestoc
1066543.75569372	BG	41	Yugozapaden	31'200	Coniferous forest								
310109.480558578	BG	41	Yugozapaden	32'400	Transitional woodland-shrub								
2025289.43037431	BG	41	Yugozapaden	31'300	Mixed forest								
1192051.95108309	BG	41	Yugozapaden	32'100	Natural grasslands					0.0140625			0.0296
2278997.21625602	BG	41	Yugozapaden	23'100	Pastures					0.0140625			0.0296
791255.194266286	BG	41	Yugozapaden	32'400	Transitional woodland-shrub								
727525.040225216	BG	41	Yugozapaden	32'400	Transitional woodland-shrub								
663472.599333148	BG	41	Yugozapaden	11'200	Discontinuous urban fabric	0.00211882537	16.4847998	9.3867376441	8.06902778	0.1056644	1.1270295	2.5662537193	0.0617
581861.634484682	BG	41	Yugozapaden	31'300	Mixed forest								
915221.294142795	BG	41	Yugozapaden	21'100	Non-irrigated arable land					0.0140625			
44739785.4884643	BG	41	Yugozapaden	32'100	Natural grasslands					0.0140625			0.0296
0.181784910677922	BG	41	Yugozapaden	12'210	NAVTEQ_Streets_RT>4								
8319.206506123	BG	41	Yugozapaden	12'210	NAVTEQ_Streets_RT>4								
518646.013733125	BG	41	Yugozapaden	11'200	Discontinuous urban fabric	0.00211882537	16.4847998	9.3867376441	8.06902778	0.1056644	1.1270295	2.5662537193	0.0617
235893.178412255	BG	41	Yugozapaden	11'200	Discontinuous urban fabric	0.00211882537	16.4847998	9.3867376441	8.06902778	0.1056644	1.1270295	2.5662537193	0.0617
2.93828853215801	BG	42	Yuzhen tsentralen	12'210	NAVTEQ_Streets_RT>4								
453642.740306711	BG	34	Yugoiztochen	31'300	Mixed forest								
678544.706988854	BG	34	Yugoiztochen	22'100	Vineyards					0.0116398			
488993.491799541	BG	41	Yugozapaden	11'210	NAVTEQ_AdminBndy5	0.00211882537	16.4847998	9.3867376441	8.06902778	0.1056644	1.1270295	2.5662537193	0.0617
115853.877844032	BG	41	Yugozapaden	11'210	NAVTEQ_AdminBndy5	0.00211882537	16.4847998	9.3867376441	8.06902778	0.1056644	1.1270295	2.5662537193	0.0617
308.853049931827	BG	42	Yuzhen tsentralen	12'210	NAVTEQ_Streets_RT>4								
0.286702313378424	BG	41	Yugozapaden	12'210	NAVTEQ_Streets_RT>4								
1651844.5553875	BG	41	Yugozapaden	31'200	Coniferous forest								
19669.7698439662	BG	41	Yugozapaden	12'220	NAVTEQ_Streets_RT3_RT								
938704.843625247	BG	42	Yuzhen tsentralen	21'100	Non-irrigated arable land					0.0215011			
985.206695234826	BG	41	Yugozapaden	12'220	NAVTEQ_Streets_RT3_RT								
337.923369415741	BG	41	Yugozapaden	12'220	NAVTEQ_Streets_RT3_RT								
21732.4714661932	BG	41	Yugozapaden	12'220	NAVTEQ_Streets_RT3_RT								
1422731.46193595	BG	41	Yugozapaden	24'200	Complex cultivation patterns					0.0140625			

Additionally, BEAM contains one combined layer that covers asset values for:

- Arable land
- Grassland
- Forest
- Road network
- Green urban areas and sport areas

This aggregated layer can easily be related to single land use classes as this information is contained in another column of the data file.

Pricing

The prices for the production of a country-wide BEAM data set are available on request and depend on area size and data availability. Countries outside EUROSTAT/OECD data coverage can be processed at additional costs for data procurement.

Delivery

Data can be delivered either as Shape-File, Geodatabase or ESRI-Grid. The data may be provided via internet or DVD. A web-based download system is envisaged for the future.

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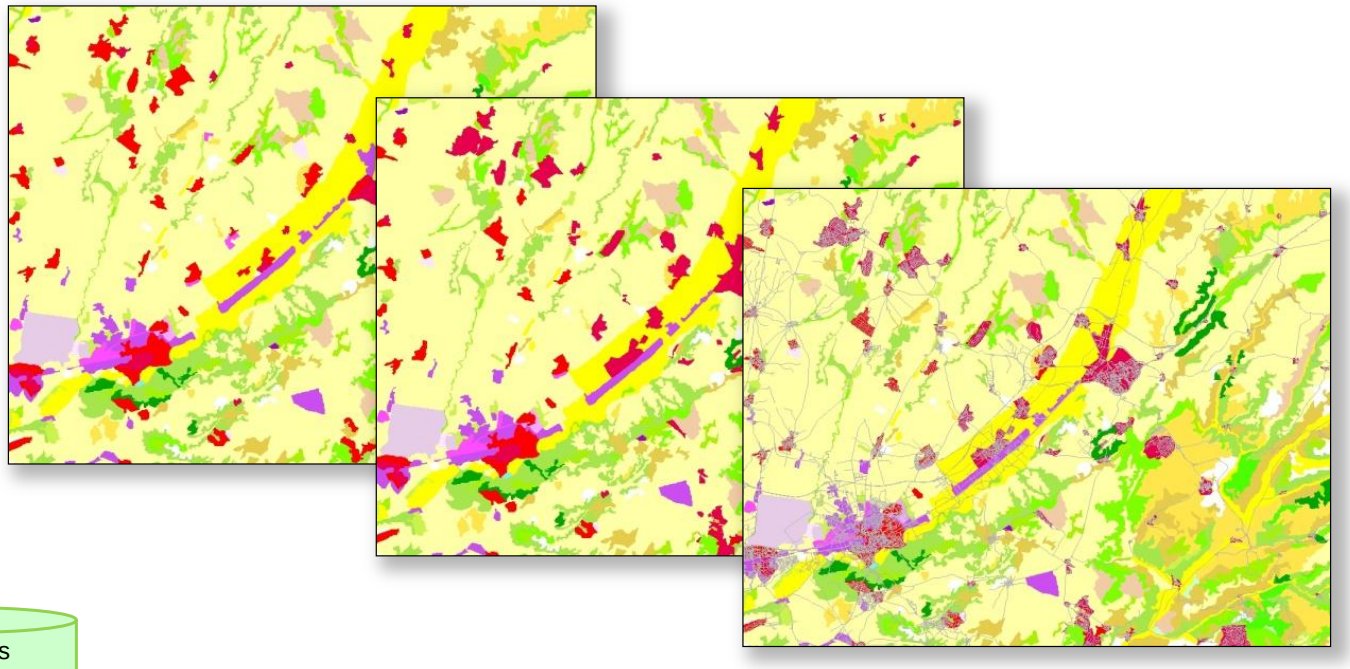
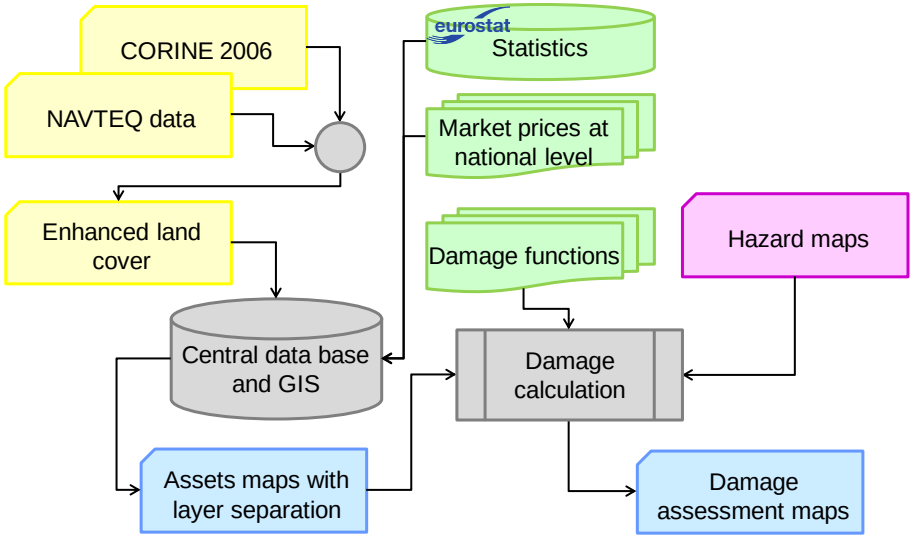
Section 3: Concept of BEAM

General Remarks

BEAM is composed of two major components: The asset volume taken from the statistics and the land use data needed to disaggregate these values. In some cases addition statistical data are needed to perform intermediate steps. Details of this process are described below for each layer.





Data used for BEAM

The basis for the background land use information is the CORINE land cover information. This is subsequently enhanced by additional data sources (NAVTEQ). These enhancements relate mainly to the introduction of small settlement areas as well as the traffic infrastructure (roads, railways, etc.).

In order to cover social-economic data needs, data from the EUROSTAT data base are processed and analysed. Additional values are being gathered from the national statistical institutes as well as from other sources.

Production Background

Data processing and analysis are carried out based on a geo-enabled relational database system, compatible to OGC standards. The data is also ready-to-use for INSPIRE-related activities and projects.

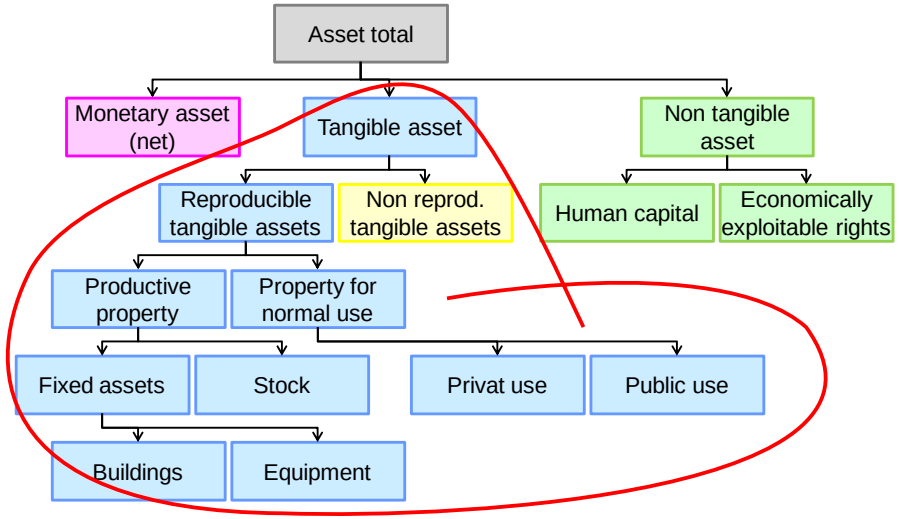
The set of baseline data follows the same standards for each country covered in the BEAM database system. Data for additional countries can

easily be created by processing the spatial land use data model and by entering the basic statistical figures.

Assumptions and Definitions

Due to the complexity of the topic and the area covered, it is not feasible to integrate all types of assets. As the product is related to risk assessment in the context of natural hazards, the following assumptions were made:

- Only direct assets (tangible) are taken into account (see diagram below).
- The product is based on the so-called net concept, which reflects the current market value of an asset (not restoration costs or insured assets).
- No costs for the building ground are included as it is assumed that the value assigned to it will not change in the case of an event.
- No external planning costs are included (i.e. building permits) as they will not apply for a simple restoration after an event.
- No costs due to production downtimes are taken into account.

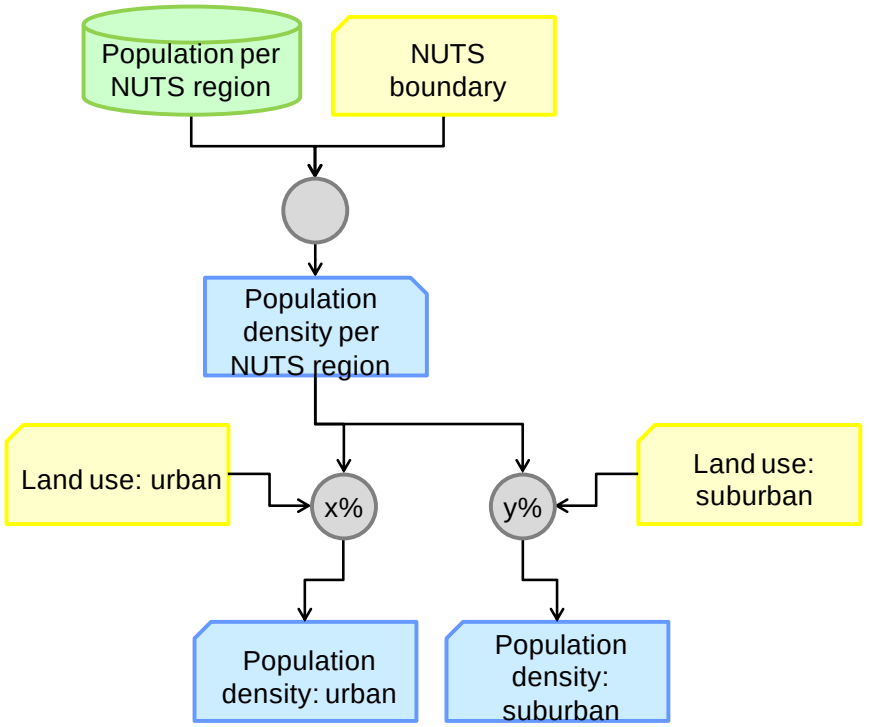


Source: M. Frenkel & K.D. John, 1999 (modified)

Additional assumptions concerning model-specific values are made to feed the different calculation models.

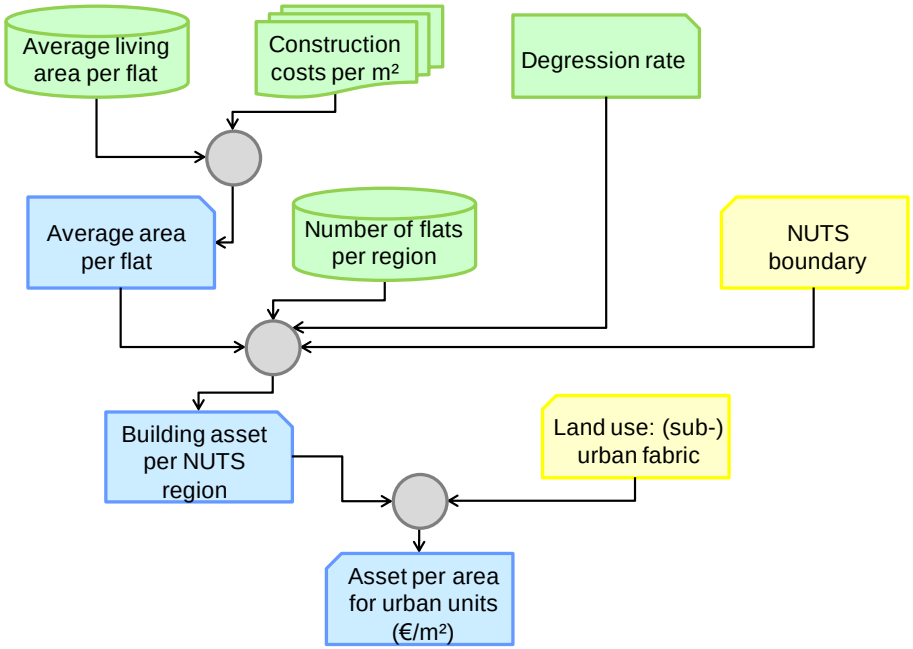
Population Density

In case of a hazardous event, the estimation of figures for the potentially affected population is of highest priority. Thanks to good data availability, the statistical base figures need to be allocated according to land use only, under consideration of different density classes.



Private Housing

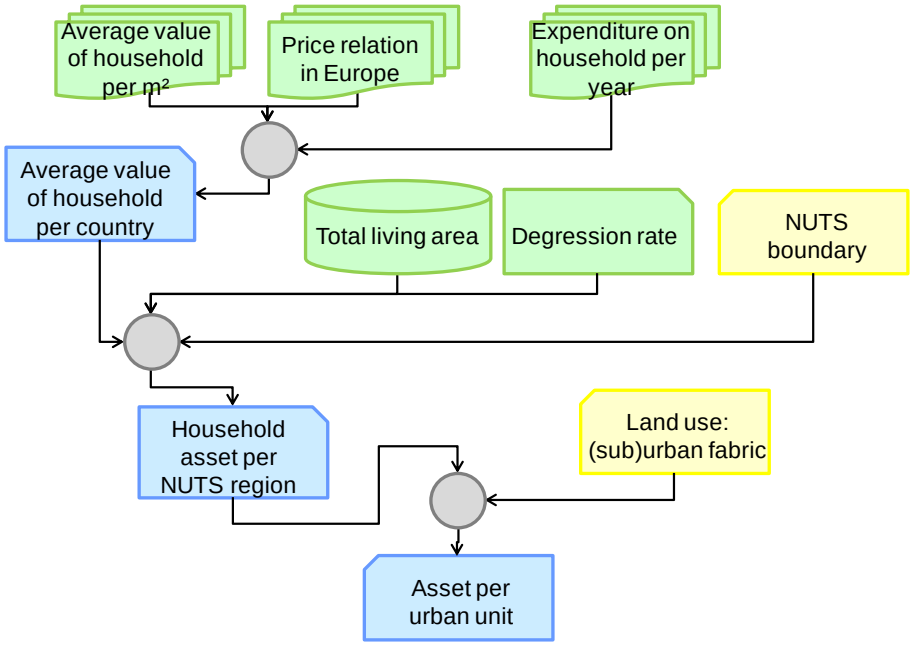
Private housing accounts for the largest portion of the total asset. The processing details are schematically displayed in the diagram below. The parameters are chosen mainly due to their general availability across Europe. Tests performed comparing the output to results from the more detailed input data (i.e. living area per NUTS region) showed only neglectable deviations.



The approach considers only construction costs, additional values based on special locations (e.g. city centre) are not taken into account, as these will endure natural disasters. Further, the added value of a building, which could be considered an asset of building ground, has been excluded in this approach.

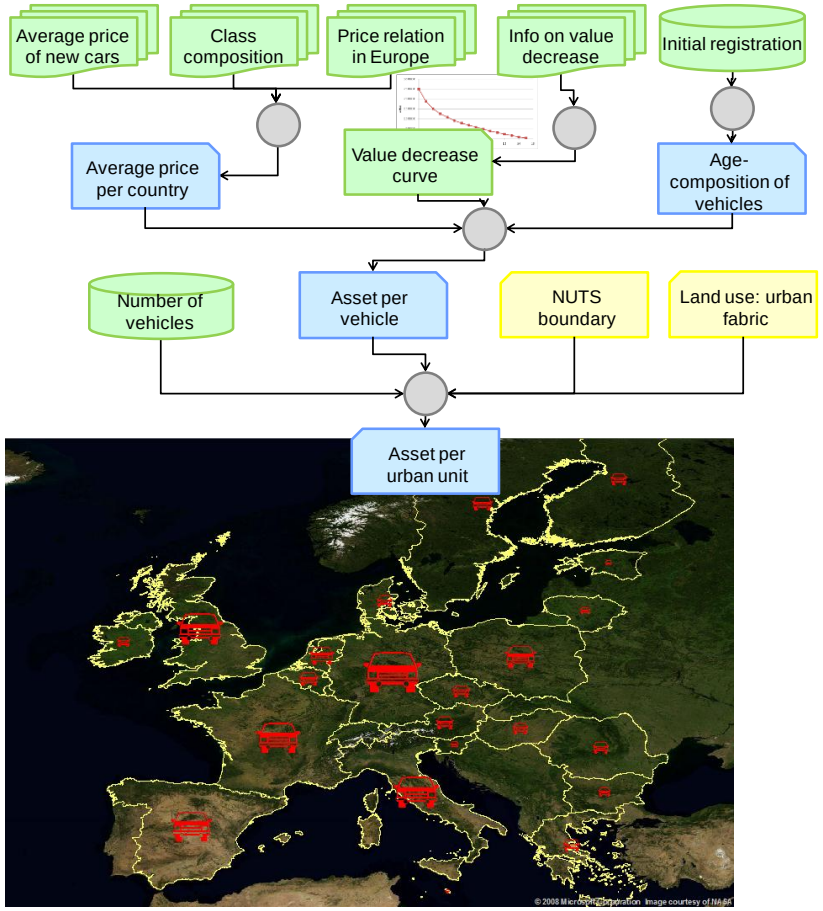
Household

Household assets are very difficult to capture as there is only little information available. The values that can be found for some countries, e.g. from the insurance sector, need to be transferred to other countries where such information is not available. Price index relation and the average expenditure on household goods are used for that purpose. The allocation is done by using the available information on the total living area under the assumption that the size of dwellings relates directly to the value of household assets - an assumption also made by the insurance industry.



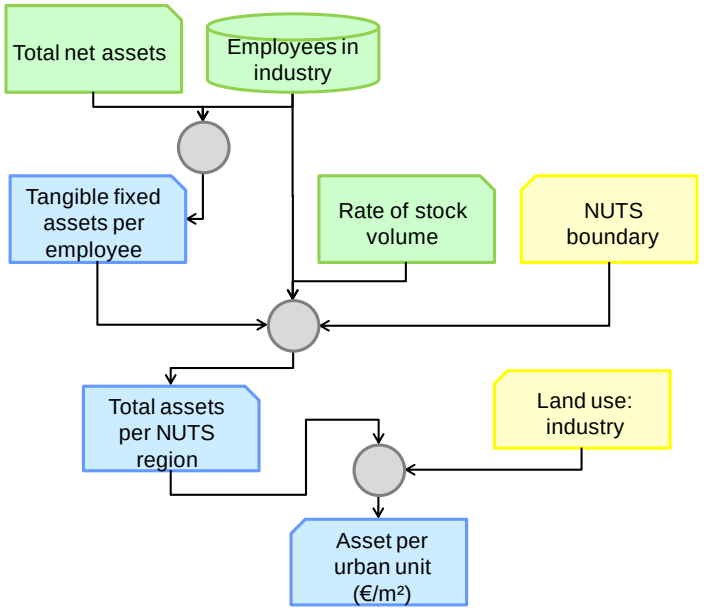
Vehicles

The vehicle assets layer covers cars and motorbikes. Other vehicles are mostly covered within the net asset value of the applicable economic sector. In this field of analysis, the availability of data in the official statistics data is very poor. Therefore, the data (especially prices and information for the value decrease curve) were compiled from various other sources. Further details can be taken from the diagram.



Industry:
Buildings and Equipment (net asset value, immobile)

For the buildings and equipment the total net asset value is provided by the national statistics accounts, generally only on national level. This value is distributed to the desired NUTS level by using the number of employees as an indicator and, in a further step, by the land use. Not only the designated industrial areas are considered but, to a minor extent, the settlement area as well, as some of the industry is located there.



Industry: Stock in Trade (mobile)

As the stock in trade is not longer covered directly by the official statistics (as it was the case at least in some countries in the past), it has to be derived and updated from the latest available figures and is now calculated as a percentage of the net asset value.

Service and Trade: Buildings and Equipment (net asset value, immobile)

The methodology is analogue to that applied for the industrial assets, i.e. the totals for each country are collected from the statistics and are then spatially disaggregated based on the land use information.

Service and Trade: Stock in Trade (mobile)

Again, due to the non-availability of direct data, the stock volume has to be estimated based on the net asset value. As the overall service sector has only a very little stock volume but the subsection of the trade-sector a quite large one, the relation of trade to the other services needs to be taken into account for the stock estimation. This relation ranges from about 3 to 10%.

Agriculture: Buildings and Equipment (net asset value, immobile)

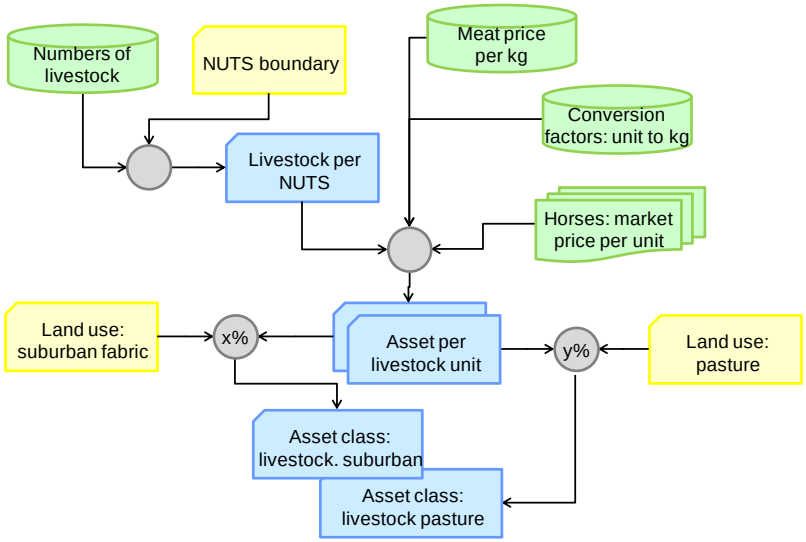
In the agricultural sector, the asset disaggregation is performed using the employees' figures in this sector. The scheme is again identical to the one used for the industry and service sector assets.

Agriculture: Stock in Trade without Livestock (mobile)

The agricultural stock in trade can be divided into livestock and further stock. As the livestock covers the lion's share of the mobile assets and has to be allocated to different land use classes, it needs to be separated from the other stock assets.

Agriculture: Livestock

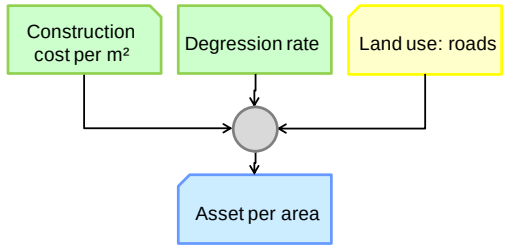
Thanks to very detailed agricultural statistics, the livestock distribution is well documented. Based on national market prices, which differ quite a lot between the countries, the number of livestock can be converted into a monetary asset value. The disaggregation process considers the relation between indoor breeding and grazing by assigning a part of the asset to rural settlement areas and another part to grassland.



Constant Assets

Types of land use where the corresponding assets are not (or only partially) covered by the statistical figures are estimated by average construction or maintenance costs. For each land use class an appropriate value in €/m² has been derived from different publications and previous studies. External costs such as planning costs, ecological compensation costs, construction permit etc. are not included.

All constant values are combined in one column of the value table, if needed they can be reallocated by the underlying land use class.



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