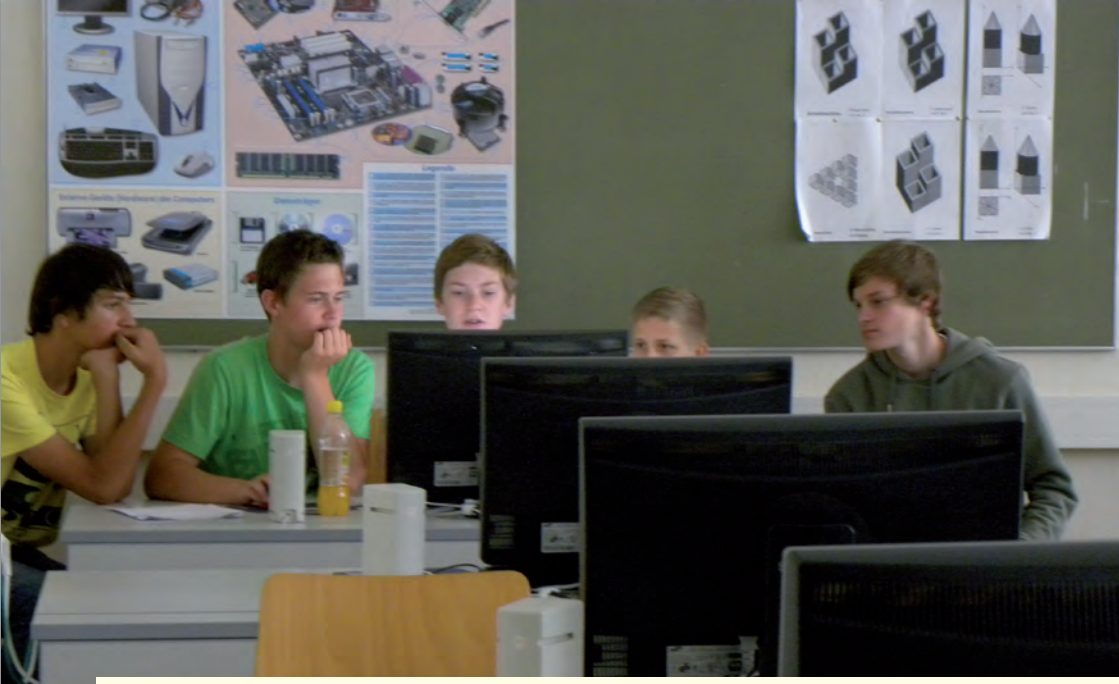

CircUse

Land Use and Environmental Effects

Training Course for Secondary Schools

This project is implemented through the CENTRAL EUROPE programme co-financed by the ERDF

Impressum

The CIRCUSE training course for secondary schools "Land Use & Environmental Effects" has been developed in the context of the project CIRCUSE (Circular Flow Land Use Management).

CIRCUSE is implemented through the CENTRAL EUROPE Programme co-financed by the ERDF. The following institutions and persons contributed actively in the development of the teaching material:

umweltbundesamt	Teaching material development (Barbara Birli and Gundula Prokop)
ifu	Scientific Support (Thomas Preuss and Maic Verbüchelen).
telepark	Liaison with local school (Michaela Geidl and Bern Osprian)
BG BRG Köflach	Local school, providing all infrastructure (Regina Götz, Alois Ruprecht, 5B and 6C of 2010/2011)
SCHABL CONSULTING e.U. GEO INFORMATIONSWESEN	Schabl Cosulting e.U. providing local data.

The CIRCUSE training course for secondary schools "Land Use & Environmental Effects" is available in English and German language: http://www.circuse.eu

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The project CIRCUSE

Despite all efforts to reduce land take and to promote sustainable land use, the built environment expands by more than 1,000 km² every year in the European Union. This corresponds to the size of Berlin[1]. On the other hand, former production sites and old settlement areas remain unused due to negative effects resulting from their former use.

This discrepancy is exceptionally high in typical "shrinking regions"; i.e. regions with a poor economy and significant migration to other economically more promising regions. The negative effects of this process are widely known and include, above all, an increase in traffic (long distance commuters), higher costs for infrastructure (streets, sewage systems etc.) and loss of social integrity. This trend is highly unsustainable in view of reducing green house gases and saving energy.

The project CIRCUSE (Circular Flow Land Use Management) aims at tackling these discrepancies. CIRCUSE includes twelve project partners and three associated organisations from the countries of Austria, Czech Republic, Germany, Italy, Poland and Slovakia. A climate friendly land use concept is being tested in six European pilot regions where the key ambitions are to promote inner urban development by reusing brownfields, introduce new land uses on abandoned or derelict land and to protect soils and landscapes.

http: www.circuse.eu

[1] European Commission (2011): Overview of best practices to Overview of best practices for limiting soil sealing or mitigating its effects in EU-27, authors: Prokop G., Jobstmann G et al.

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Teaching Material "Land Take"

Aim of the Training Course

The CIRCUSE training course is concerned with land take, mobility and soil sealing. The overall objective is to make students aware of the value of soil and unused land as these resources can hardly be recovered once they are used. This will be done by encouraging them to reflect on their own land use.

The course material is targeted at students at secondary schools aged 14 years and older.

The provided material should be used on two separate days with a considerable break in between to allow students to investigate data and to make interviews back home with their families. The agenda of the two project days might be as follows.

Day 1 (3 hours working time)		
Lecture: Introduction, land use and spatial planning	40 min	Plenary
Poster preparation: "How do I want to live"	40 min	Working groups
Calculation: "Is our country big enough to fulfil our housing dreams?"	40 min	Plenary
Discussion and Presentation: Land take and building activities	45 min	Working groups & Plenary
Day 2: (full day working time)		
Excursion	60 min	Plenary
Project Groups, Compilation of presentations	240 min	Working groups
Presentations	120 min	Plenary
Feedback, Closure	45 min	Plenary

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This brochure now describes the contents of the course for students. It is broken up into an introduction to the topic and four tasks to be completed by the students.

Introduction: Why is efficient land use important?

Can you build as you like? Discuss with your teacher:

- Can you build wherever you like and whatever you like? For example a house with 8 floors in the shape of a butterfly? Or a factory in the middle of a residential area?
- Which organisation in your region issues building permits?
- With the help of your teacher try to get a copy of the land use plan for your municipality and explore it.

Definition

Land take is defined as the increase of settlement area over time and is also known as "urbanisation".

Settlement areas include areas for housing, shops, shopping centres, factories, commercial buildings, schools, hospitals, streets, railway tracks but also recreational areas like sports grounds.

Settlements usually grow at the expanse of rural areas at the outskirts. The table and figure below provide information re-

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garding the urbanisation process in the case of Brussels. The red colour refers to urban buildings. Between 1955 and 1997 the urbanised area and population changed.

Exercise

- To which extent did the population in Brussels grow between 1955 and 1997?
  ➔ calculate the percentage
- To which extent did the urbanised area increase in the same time?
  ➔ calculate the percentage
- What was the average ratio of urbanised area per inhabitant in 1955 and 1997?
  ➔ define the result in m² / inhabitant
- Discuss your observations
- Try to find out more about the land take in your region. With the help of your teacher try to find similar information (as provided in the table below) for the largest city in your region.

➔ **Example – land take in Brussels between 1955 – and 1997**

	1955	1997
Population	991,000 capita	1,122,000 capita
Total urbanised area	319 km²	560 km²
Total area	1,308 km²	1,308 km²

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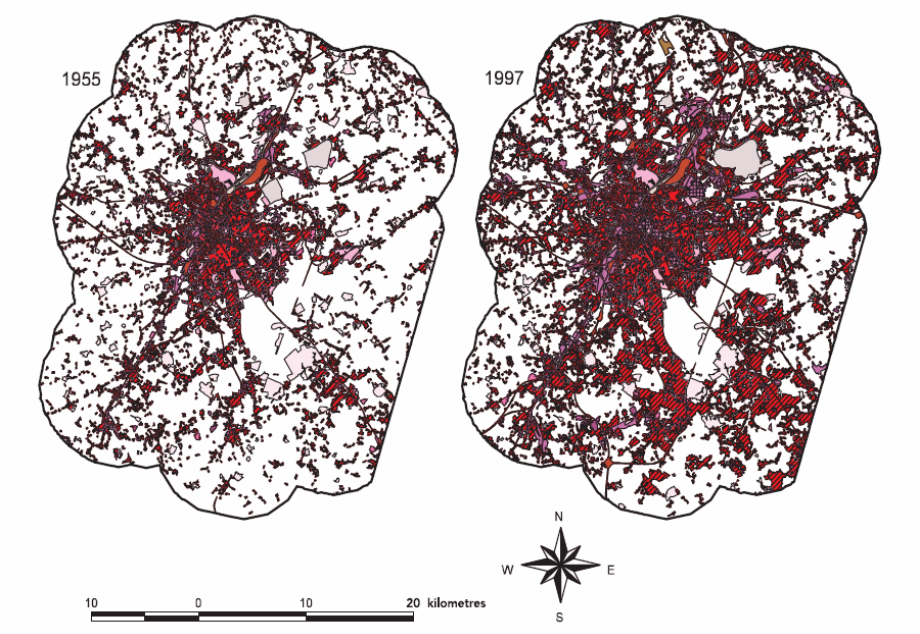
➔ **Land take in Brussels between 1955 and 1997**
Source: European Environment Agency, 2006



How is land take regulated in your country? With the help of your teacher do an internet search and try to find answers to the following questions.

At the national level.

- Is there a key national organisation which co-ordinates spatial planning in your country?
- Is there a key national policy document for spatial planning?

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- Does this document refer to a policy target with regard to land take?

At the regional level (in particular in your region)

- Which organisation is responsible for spatial planning?
- Is there a specific policy document for spatial planning in your region?

At the local level (municipality level)

- Local planning authorities and the land use plan (zoning plan).

Why is efficient land use so important? Inefficient land leads to a variety of negative effects above all the loss of valuable soil and unnecessary costs.

Citizens living in the outskirts have to cope with longer distances to their workplaces and to the city centres compared to citizens living in downtown areas. Commuters have to spend more time in their cars and communities have to maintain a growing infrastructure leaving everyone involved with less money for other activities.

Communities have to provide and maintain municipal infrastructure and services, such as streets, water supply, sewage water systems, waste collection, schools, nursery homes for elderly, hospitals, etc. Dispersed settlements require higher maintenance costs compared to compact settlements.

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Land take is influenced significantly by the type of dwelling. Detached family houses need a lot of surface area. About 10 such houses will fill one hectare. Terraced houses take less land, about 20 fit on one hectare. On the same plot 10 apartment house with shared gardens, each with 6 apartments fit easily, this means in total 60 family apartments.

But why is land take of such importance? Soil has many important functions, of which the most important are to filtrate underground water, to hold and provide nutritious substances and water necessary for plant growth, to be a living source for different organisms and decomposing substances, to absorb, store and reflect the sun's energy, and to provide the surface on which man and other animals exist.

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Task 1 – My favourite house

Collect pictures. Before the start of the 1st teaching day collect pictures of houses you like. Alternatively your teacher may provide catalogues and housing magazines and you choose pictures from there or you may draw a picture of "your favourite house".

➔ **Different types of houses**

detached house

apartment house

terraced houses

Make a poster showing your favourite houses. Work in small groups (about 5 students in one group) and compile posters describing the forms of living/houses you liked, focusing also on "where" you would like to live (city, small city, village etc.)

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Discussions of the topic should take place in small groups, ask your teachers to assist if necessary.

Present the posters and their contents and discuss in a plenary session why in particular you chose these houses.

➔ **Example poster "My favourite house"**

Calculation of land take. In a second step calculate the land take in square meters of your class. Assume that everybody is building their favourite house. Take into account that there is no land take for already existing houses!!

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➔ **Average land take per dwelling (examples)**

Type	Land take [m²]
Apartment house	150 m²
Terraced house	300 m²
Small family house (semi-detached)	450 m²
Large family house (detached)	800 m²
Mansion	>1,500 m²

➔ **Land take of your class**

Name	Type of dwelling	Estimated land take
Name 1	Detached house	1000 m²
Name 2	Villa	1500 m²
Name 3	Hut at a lake	400 m²
Name 4	Old mansion	0 m²
Total		**????? m²**

Discuss the result.

- The land take of yourself and your classmates equals to how many soccer fields?
  (➔ one soccer field = 7,000 m²).

Is there enough space for all of us to live in single family houses? The detached single family house is still the most preferred dwelling form. But is it actually possible that all inhabitants of a country live in a detached family house? Here, we calculate whether this is possible. Try to find the answers by consulting geography books or the internet.

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→ A dream house for each citizen! → Calculate the resulting land take

Total Inhabitants	Enter the total number of inhabitants in your country
Land take of average house or dwelling	Estimate the average plot size of your dream houses in m² **→ Try to find an average value for your class**
Average household size	Estimate the average number of inhabitants per house. Compare actual household sizes of your classmates **→ Try to find an average value for your class**
Total number of houses needed	Divide the number of inhabitants by the average household size **→ How many houses do you need**
Land take of these houses	Multiply the number of needed houses with the average plot size and convert this figure in km² **→ What is the land take of these houses**
Total settlement area in your country?	What is the size of the settlement area in your country? If you cannot find this information you can use the size of "artificial surface" instead (see next table). But note that this information is not very accurate **→ What is the actual settlement are in your country?**

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Compare the land take of the dream houses to the actual settlement area.

→ The dream houses increase the actual settlement area by ……..%.

Discuss the result. What does it mean if the actual settlement area increases by …%. ?

- Take into account that these new buildings have to be realised on the account of agricultural land, forest, natural land etc.
- Take into account that on top of the above you need land for streets, commercial buildings, industry, but also for the public (like hospitals and schools).
- Have you ever thought about how much space is actually needed for your daily routines?
- Can you redesign your dream house?

→ European data for your calculation referring to the year 2006
Sources:
Population data from EUROSTAT
Artificial Surface from CORINE Land Cover Layer of the European Environment Agency
***estimated data**

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Country	Total Surface [km²]	Artificial Surface [km²]	Population
Austria	83.925	4.092	8.254.298
Belgium	30.664	6.303	10.511.382
Bulgaria	110.964	5.575	7.718.750
Cyprus	9.260	791	766.414
Czech R.	78.869	5.019	10.251.079
Denmark	42.891	3.247	5.427.459
Estonia	43.462	942	1.344.684
Finland	337.029	4.834	5.255.580
France	548.813	28.266	63.229.443
Germany	357.086	30.123	82.437.995
Greece	131.629	2.833*	11.125.179
Hungary	93.001	5.616	10.076.581
Ireland	69.879	1.626	4.209.019
Italy	301.505	14.983	58.751.711
Latvia	64.614	862	2.294.590
Lithuania	64.978	2.156	3.403.284
Luxemb.	2.597	242	469.086
Malta	316	82	405.006
Netherl.	37.358	5.110	16.334.210
Poland	311.950	12.547	38.157.055
Portugal	91.964	3.155	10.569.592
Romania	238.451	15.117	21.610.213
Slovakia	49.014	2.687	5.389.180
Slovenia	20.277	562	2.003.358
Spain	506.730	10.308	43.758.250
Sweden	449.114	6.289	9.047.752
UK	244.467	18.364*	60.425.786
EU27	**4.320.805**	**191.732**	**493.226.936**

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Task 2 - Dwellings now and then

Homework. Look for pictures showing the house in which your family lives today and how your grandparents used to live. You can also choose the house of a neighbour or a friend and their living situation in the past.

Derive some facts with regard to these houses for toady and the past; in particular

- technical standards (bathrooms)
- number of rooms and inhabitants
- estimate the available space per inhabitant

Compile a presentation. Describe the pictures and their surroundings.

- What has changed? Can you estimate the changes with regard to land take?
- What is the impact of these changes?
- Assume the same trend for the future and try to describe the house of the future generation.

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➔ Example: Living standards now and then

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Task 3 - Mobility

This task should be carried out by each student individually.

The distance of daily routines. Calculate the distance of your daily routine, the transport means and the related CO_2 emissions.

Questions. Ask your parents for help or use a map to derive the distances.

- Which distances do your daily routines involve?
- Which transport means do you use?
- Enter your results in the table below.

➔ **Average CO2 emissions of different transport means per kilometer** [2]

Car	150 g/km	Bus	20 g/km
Motorbike	105.g/km	Walking	0
Train	40 g/km	Bike	0

Present the results of your calculation and try to interpret them. The following questions should be answered.

- Describe your daily distances and calculate your daily CO2 Emission
- Interpret the table. Which of your daily routines has the largest CO2 emissions and how can this be changed?

[2] http://www.co2-emissionen-vergleichen.de/verkehr/CO2-PKW-Bus-Bahn.html

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➔ **Template to enter distances of everyday routines**

In km	Car	Motor-bike	Walking	Bike	Train	Bus	other
To school							
To friends							
Leisure/sports							
Shopping							
Other							
TOTAL							
CO_2 Emission*							

* Multiply with data on CO_2 emission above

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Task 4 - Excursion - Soil Sealing

Definition

Soil sealing is defined as the covering of soils by buildings, construction and layers of completely or partly impermeable artificial material (asphalt, concrete, etc.). It is the most intense form of land take and is essentially an irreversible process. Soil sealing results in the loss of important soil functions, above all soil fertility and water storage capacity.

Impacts. Through sealing and thus interrupting the exchange in between the soil system and other ecological elements, including the biosphere, hydrosphere and atmosphere, all processes in the water cycle, biogeochemical cycles and energy transfers are affected. This leads to a number of negative effects:

- Less availability of fertile soils for future generations.
- Reduction of soil functions such as a sink and diluter for pollutants, a transformer of organic wastes and as a storage for water that leads to ground water renewal.
- Loss of water retention areas and at the same time an increase in surface water runoff, which leads to additional flood risk and in some cases to catastrophic floods.
- Less soil carbon sequestration and carbon storage.

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- Landscape fragmentation and loss of biodiversity through the reduction of habitats and sometimes the remaining systems are too small or too isolated to support species.
- Unsustainable living patterns such as the increase of the spread of buildings which leads to an increase in traffic and air emissions, infrastructure costs for the municipality concerned and urban development on high-quality agricultural land that leads to a loss of productive soils for food and other biomass production.
- Sealed surfaces have higher surface temperatures than green surfaces and alter the micro climate particularly in highly sealed urban areas. Large sealed areas become even more problematic in view of climate change and increasing temperatures.

Questions. What are the impacts of soil sealing on

- Soil
- Groundwater
- Biodiversity

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➔ Template for excursion

Surface Type	Is the surface sealed or not?	Describe the soil (colour, condition, surface..)
 Asphalt		
 Field		
 Grass pavers		
 Forest soil		
 Gravel		
Others		

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Notes

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CircUse Project Partner

Institute for Ecology of Industrial Areas/Poland
LEAD PARTNER

Asti Municipality

City of Trnava

City of Piekary Slaskie

Slovak University of Technology SPECTRA Centre of Excellence

Institute for Sustainable Development of Settlements

The Usti Region

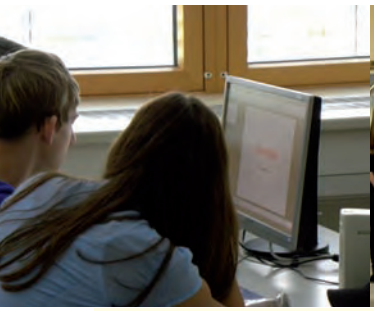
German Institute of Urban Affairs

Telepark Bärnbach

Higher Institute on Territorial Systems for Innovation

Environmental Agency Austria

Saxon State Office for the Environment, Agriculture and Geology



CircUse Teaching Material
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