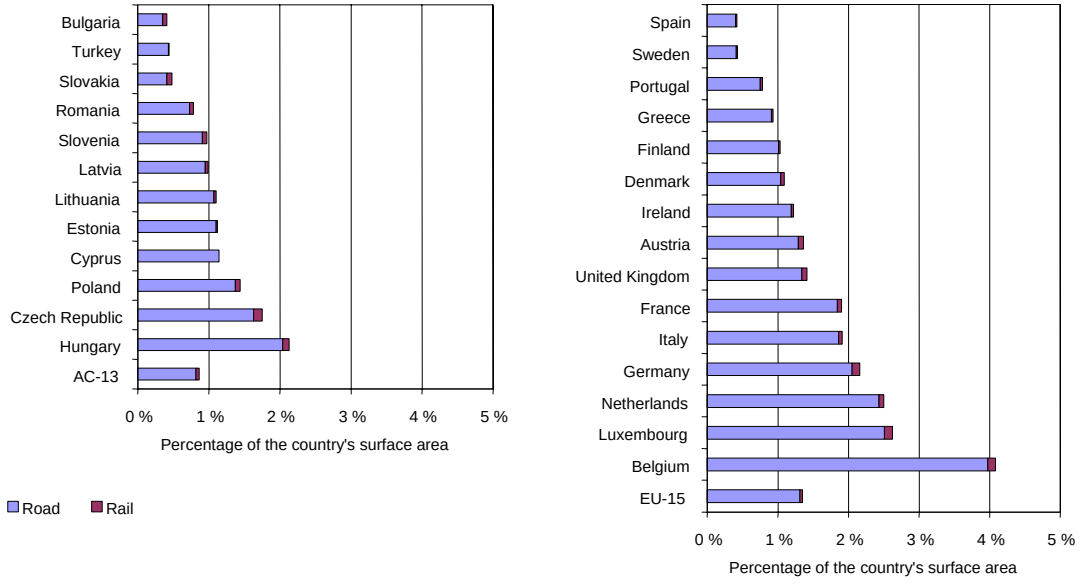
Indicator fact sheet

TERM 2002 08 EU+AC — Land take by transport infrastructure

☹ **Land is under continuous pressure from new transport infrastructure. Road is the biggest land consumer, followed by rail. Lack of GIS-based data seriously hinders assessing land 'consumption' by transport over time, but it can be estimated that between 1990 and 1999 almost 10 ha each day were consumed by new motorway construction in the EU and about 2 ha each day in the ACs.**

Figure 1: Road and rail land take in 1998



Source: EEA–ETC/TE, 2002.

Results and assessment

Policy relevance

The common transport policy (CTP) advocates an optimal use of existing infrastructures before creating new ones, partly to minimise land taken for transport infrastructure (European Commission, 2001).

Policy context

Land resources in much of Europe are relatively scarce, and achieving a sustainable balance between competing land uses is a key issue for all development policies. New initiatives, such as the European spatial development perspective and the sixth environmental action programme, are specifically addressing the spatial impact of policies (including transport) on the European territory. The ESDP proposes the integration of transport policy and land use planning to specify appropriate location of activities requiring journeys with focus on the development of Euro-corridors. The common transport policy underlines an optimal use of existing infrastructure and some Member States have developed land use policies restricting additional transport developments in certain areas.

There are few quantitative targets, as for the one found in the CTP, for this indicator. Some Member States have developed land-use policies and plans that restrict additional transport developments in certain areas.

Environmental context

Potential environmental impact of transport infrastructure depends strongly on the type of land affected (including its immediate surroundings). Important factors are the infrastructure characteristics, which determine, for example, the visual impact on the landscape and the extent to which the infrastructure constitutes a barrier hampering the movement of animals or people.

Land taken by transport is withdrawn from other uses. Land take in natural areas may lead to a decrease of biodiversity, as may fragmentation by linear infrastructures such as roads, railways or canals. Land taken from agriculture or forestry may have harmful environmental effects (e.g. visual impact on landscapes) as well as socioeconomic impacts.

Disused railway land is a valuable resource. Environmentally, the best alternative is to return this land back to nature. Other possibilities are to use it for 'clean' means of transport like walking paths or cycling paths (as in Belgium and Spain).

Assessment

Road transport is by far the largest consumer of land for transport. The road network (motorways, State, provincial and municipal roads) occupies 93 % of the total area of land used for transport in the EU and 85 % in the ACs. Rail adds to this only 4 % of land taken by transport in the EU and 10 % in the ACs.

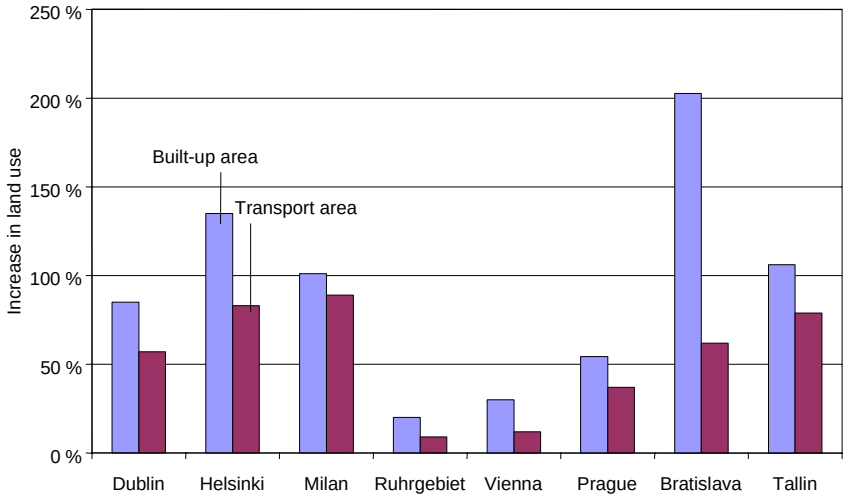
The average daily land take for motorway construction can be calculated as a proxy for land 'consumption' by transport. Using increases in motorway length and a factor for land used per kilometre of motorway (2.5), it can be estimated that between 1990 and 1998, a total of over 30 000 ha of land, about 10 ha every day, was taken for motorway construction in the EU. It should be noted that such calculation does not take into account the possibility that a new motorway is the result of upgrading smaller roads, which consumes less land. Ideally, a 'consumption' calculation should therefore be based on historical and recent GIS data.

Efficiency of land use (ratio between land used and the traffic carrying capacity of the infrastructure) varies strikingly from one infrastructure type to another. For example, railways require far less land take per transport unit (i.e. passenger-kilometre and tonne-kilometre) than road transport: land take per passenger-kilometre by rail is about 3.5 times lower than for cars (EEA, 1998).

Box 1: Land take by transport infrastructure in urban areas

In urban areas, space is scarce, and urban transport (parking space, roads, petrol stations, etc.) takes up increasing proportions of land. Building new roads in urbanised areas will in many cases not reduce congestion, because the extra road space is quickly filled up by new traffic. The results of the Murbandy study (monitoring urban dynamics) covering selected urban agglomerations show that during the period 1950–90 the surface used for residential areas increased more than the surface area used for transport (see Figure 2), marking trends to more dispersed cities. Due to longer distances between targets the amount of transport is also increasing. It is difficult for public transport to compete with private cars in such a structure.

Figure 2: Increase in urban built-up and transportation areas in the period 1950–90



Source: EEA–JRC, 2002.

Data

Table 1: Direct and indirect land take by type of transport infrastructure

Unit: hectares per km^2

Infrastructure type	Direct	Direct + indirect
Motorways	2.5	7.5
Highways, main or national roads	2.0	6.0
Secondary or regional roads	1.5	4.5
Other roads	0.7	2.0
Railway lines	1.0	3.0
Inland waterways	5.0	10.0

Source: EEA–ETC/LC, 2000 (modified for available road categories by EEA–ETC/TE).

Spread sheet file containing graph data: TERM 2002 08 EU+AC — Land take.xls

References

European Commission, 1998, 'European Community biodiversity strategy', COM(1998) 42, Commission of the European Communities, Office for Official Publications of the European Communities, Luxembourg, http://biodiversity-chm.eea.eu.int/convention/ECBS/fulltext.html

European Commission, 2001, 'European transport policy for 2010: time to decide' COM(2001) 370, White Paper of the Commission of the European Communities, Brussels, Belgium, 12 September 2001, http://europa.eu.int/comm/energy_transport/library/lb_texte_complet_en.pdf

EEA, 1998, *Spatial and ecological assessment of the TEN — Demonstration of indicators and GIS methods*, European Environment Agency, Copenhagen, Denmark.

EEA–ETC/LC, 2000, Raster version of CLC 90 database prepared by the European Topic Centre for Land Cover.

EEA–ETC/TE, 2002, Statistical data compilation and graphical presentation by the European Topic Centre on Terrestrial Environment, http://terrestrial.eionet.eu.int

EEA–JRC, 2002, *Towards an urban atlas — Assessment of spatial data on 25 European cities and urban areas*, European Environment Agency (EEA) and Joint Research Centre (JRC). Copenhagen, Denmark, http://reports.eea.eu.int/environmental_issue_report_2002_30/en/tab_abstract_RLR

Metadata

Technical information

1. Data sources:

   Corine land cover data: Corine land cover database version 6/2000 — 250 m grid resolution by ETC/LC. Corine land cover data for 25 EU/AC agglomerations by IES/JRC.

   Infrastructure data: Eurostat and national infrastructure statistics for ACs 1990–98.

2. Description of data: Corine land cover data: Corine land cover database raster version 6/2000 — 250 m grid resolution produced by ETC/LC. Corine land cover data for 25 EU/AC agglomerations provided by IES/JRC (Murbandy/Moland CEO projects —Monitoring urban dynamics and monitoring land use and land cover change dynamics, 1998–2000)

   Infrastructure data: Eurostat and national transport infrastructure statistics for ACs 1990–98.

   Files: TERM 2002 08 EU+AC — Landtake.xls

3. Geographical coverage: EU-15 + AC-13.

4. Temporal coverage: Reference time 1998 — current Corine land cover database for ACs reflects time period 1989–96. Murbandy data set covers the period from the 1950s to the 1990s. National transport infrastructure statistics collection available for 1990–98.

5. Methodology and frequency of data collection: Corine land cover data are prepared according to standard Corine land cover (CLC) methodology (see more below). Update is planned to be done every 10 years. Currently, the first update is ongoing within the I & CLC 2000 project.

6. Corine land cover data for agglomeration have been prepared according to adapted Corine land cover methodology within the Murbandy project (visual interpretation with 90 % area accuracy, image data in 1 m to 30 m resolution, topographic maps and city maps at different scales (mainly scale 1:25 000), minimal mapped area of 1 ha). See more information at http://murbandy.sai.jrc.it/. Land cover mapping for monitoring urban dynamics was done for 25 European agglomerations. Temporal coverage includes data for the 1950s, 1970s, 1980s and 1990s. For the data extracted from existing maps from the 1950s to the 1990s, uncertainty on comparability between countries on applied classification of roads and built-up areas. National transport infrastructure statistics are based on compilation of various official statistical data sources. Information is collected annually (statistical yearbooks and sectoral statistics).

7. Methodology of data manipulation: Direct and indirect land take by transport infrastructure is based on average land take estimates using infrastructure statistical data (see Table 1). Estimates for motorways and high-speed train lines (based on assumptions about the number of lanes or tracks and their average width) may be of variable quality, for example they may not take account of associated facilities such as garages, filling stations and parking areas.

   Land take by transport infrastructure in urban areas is based on figures for the 1950s and the 1990s produced in the Murbandy project: land cover mapping for monitoring urban dynamics was done for 25 European agglomerations. More about methodology used in Murbandy can be found on http://natlan.eea.eu.int/datasets/landcover/reports/methodology/ and http://murbandy.sai.jrc.it

Quality information

8. Strength and weakness (at data level): Exhaustive land use/land cover inventory based on

standardised Corine land cover methodology using satellite data as input, therefore comparison of a spatial indicator between countries is feasible. Unfortunately, the original satellite data for CLC are not time-consistent, they originate from the 1980s to the late 1990s (to be eliminated by CLC 2000 update). No Corine land cover data are available for Malta, Cyprus and Turkey. Comparison between agglomerations (Murbandy) is uncertain, as data were extracted from existing maps of non-consistent classification of roads and built-up areas. Few agglomerations are available for ACs (three) in the Murbandy project.

For the estimate of average daily land take, assumptions on direct and indirect land take are based on annual road length statistics and average area of land take per kilometre of motorway (2.5).

National transport infrastructure statistics are incomplete for certain countries.

9. Reliability, accuracy, robustness, uncertainty (at data level): Corine land cover data (version 6/2000): prepared according to standard Corine land cover methodology (based on visual interpretation using Landsat TM imagery and ancillary data, working scale 1:100 000, 44 classes nomenclature, minimal mapped area 25 ha, minimal width 100 m). See more information at http://natlan.eea.eu.int/datasets/landcover/reports/methodology/. Current Corine land cover database for ACs reflects time period 1989–96.

   Areal objects, resolution 250 m grid.

   Corine land cover data for agglomerations: prepared according to adapted Corine land cover methodology within the Murbandy project (visual interpretation with 90 % area accuracy, image data in 1 m to 30 m resolution, topographic maps and city maps at different scales (mainly scale 1:25 000), minimal mapped area of 1 ha). See more information at http://murbandy.sai.jrc.it/. Land cover mapping for monitoring urban dynamics was done for 25 European agglomerations (including Bilbao, Bratislava, Brussels, Dresden, Dublin, Grenoble, Helsinki, Iraklion, Copenhagen, Lyon, Milan, Munich, Nicosia, Oporto, Palermo, Prague, Ruhrgebiet, Setubal, Tallin, Padua-Venice, Vienna). Temporal coverage includes data for the 1950s, 1970s, 1980s and 1990s. For the data extracted from existing maps from the 1950s to the 1990s, there is uncertainty on comparability between countries on applied classification of roads and built-up areas.

   National transport infrastructure is on official national statistics bureaux or Eurostat publications.

10. Overall scoring (give 1 to 3 points: 1 = no major problems, 3 = major reservations): 3

    Relevancy: 3 (Only land cover available, not land take. Proxy (daily land consumption by motorways) is rather inaccurate.)
    Accuracy: 3 (No GIS-based data available.)
    Comparability over time: 3 (No time series available, except for the proxy indicator ‘daily land take by motorways’.)
    Comparability over space: 3 (No harmonised methodology available for land consumption computation.)

Further work required

National transport infrastructure statistics completion for certain countries.

Update of GISCO-based transport infrastructure data set for land take calculations. Update of Corine land cover with IMAGE 2000 (European satellite image coverage for year 2000). Data extension to other ACs.

Storage of historical data is needed to allow calculations over time, instead of momentary status descriptions only.