5. Land use database applications

The Murbandy/Moland project is a continuously evolving activity. To date, the territorial data sets have been completed and validated for 25 European areas and for six mega-cities outside Europe, and the assessment of the derived data is progressing rapidly. Moreover, several new areas - six European and one non-European - are currently being studied. The analysis of the data sets is therefore quite advanced, and allows several investigations to be performed. The work presented in this chapter is mainly aimed at showing both the potential of the database, and its capability to implement user-driven tasks.

The main target of the project itself consists of proposing a common methodology within the European Union (EU) for monitoring urban dynamics and supporting a sustainable planning process. In order to carry out sustainable land use planning and management it is necessary to identify problem typologies according to which indicators can be developed. The trends and features associated with urban growth that should be measured include:

- New urban areas built up on productive agricultural and environmentally sensitive areas;
- discontinuous urban growth;
- relation between residential needs and urban growth areas;
- availabilityof public facilities and green urban areas per capita;
- accessibility to collective transport networks and other services;
- exposureto natural hazards;
- social segregation associated with urban growth processes.

Addressing many of the above topics can be facilitated through the adoption of the Murbandy/Moland territorial database. Several statistics can be directly derived without further elaboration. Some examples are shown in Table 5.1. (a more complete table with the numeric values of land use classes for most of the cities has been added as Annex 2). More complex assessments can be carried out according to the needs of the specific users.

5.1. Preliminary results

The Murbandy/Moland database structure allows an easy and immediate extraction of basic land use data and indicators related to the classes of land cover and land use. Its GIS-based and ready-to-use configuration enables even a user with a minimal knowledge of GIS tools to handle it. A differentiated analysis of the urban uses, as for instance the proportion of residential areas services, industries and green urban areas is directly available. More advanced analyses can be carried out by combining several layers and ancillary data according to the detail of information needed. The analytical possibilities are thus endless and can be tailored according to user requirements.

5.1.1. Urban sprawl and land consumption

The population in Europe is almost steady. Nevertheless European cities are experiencing continuous growth. Murbandy/Moland allows harmonised analysis of cities' spraw1 to be carried out. With simple 'clicks' of the mouse it is possible to navigate in the GIS-based environment to individuate, within the study domain, the artificial areas and their evolution during different time periods. The phenomenon of sprawl is common to all cities independently of their geographical, economic or administrative characteristics. The analysis can be carried out at different levels. However it is possible to quantify the changes that have occurred in every single land use class since the beginning af the study.

The phenomenon of sprawl seems to be even more dramatic when, reversing the analytical approach, its immediate effects are assessed. In many cases the consumption of natural and agricultural area took place once urbanisation was already advanced (e.g. in the Ruhrgebiet, Germany), and the effect has been tremendous in all the areas under study, as shown by Milan, Dublin and Setúbal. Among the functions of natural and agricultural areas, the importance of biodiversity, hydrological and microclimatic regulation, and recreational and aesthetic values should be emphasised.

Statistics directly extracted from the Murbandy/Moland database. The sea area, when present, has not been taken into account during the computation.

Table 5.1

City	Total area: km²	Total urbanised area (class 1): km²		Total green urban area (class 1.4.1): km²		Urban sprawl: increase in artificial area (%) during the 40/50 years study period	Loss of natural and agricultural land due to sprawl vs. total area (%) during the 40/50 years study period
		1950s	1990s	1950s	1990s		
Algarve	781.5	32.2	119.1	0.2	0.7	270.4	11.4
Bilbao	169.6	27.4	61.4	0.7	1.9	124.2	20.6
Bratislava	462.7	40.8	123.3	1.1	2.1	202.6	18.1
Brussels	1 308.8	318.6	560.3	15.7	17.9	75.9	19.3
Copenhagen	665.0	242.7	386.1	9.3	16.0	59.1	19.4
Dublin	676.8	163.1	319.3	21.2	52.1	95.8	22.7
Dresden	1 256.7	231.1	314.1	52.1	44.0	36.0	7.3
Grenoble	193.4	31.1	91.4	4.1	5.1	193.5	31.2
Helsinki	1 041.5	135.0	326.0	13.3	29.3	191.0	25.6
Iraklion	29.8	9.0	21.7	0.1	0.1	139.7	41.3
Lyon	311.6	122.8	222.6	17.6	14.5	81.2	32.7
Marseille	328.3	93.5	150.2	9.5	4.6	60.7	17.6
Milan	325.2	114.5	233.4	4.3	16.6	103.8	37.0
Munich	797.8	246.7	357.0	20.8	30.9	44.7	14.3
Nicosia	75.9	24.8	52.0	0.7	1.2	109.6	36.6
Porto	197.5	51.3	121.5	2.3	5.2	136.8	35.7
Padua-Venice	515.5	69.7	188.9	4.4	9.7	171.0	23.1
Palermo	223.1	27.8	86.5	3.5	5.6	211.0	26.0
Prague	797.6	186.9	288.4	11.0	13.5	54.4	13.2
Ruhrgebiet	352.6	219.8	273.9	4.6	12.2	24.6	18.8
Setúbal	22.6	3.3	11.2	0.2	0.3	243.3	33.1
Sunderland	199.7	84.6	106.7	11.0	16.1	26.1	12.9
Tallinn	1 070.1	88.3	182.1	7.1	15.5	106.1	10.0
Vienna	841.8	249.7	341.1	14.8	19.5	36.6	11.5

Urban sprawl in Bratislava (Slovakia) from 1949 (left) to 1997. Only artificial surfaces (class 1 of the Murbandy/Moland legend) are depicted.

Figure 5.1

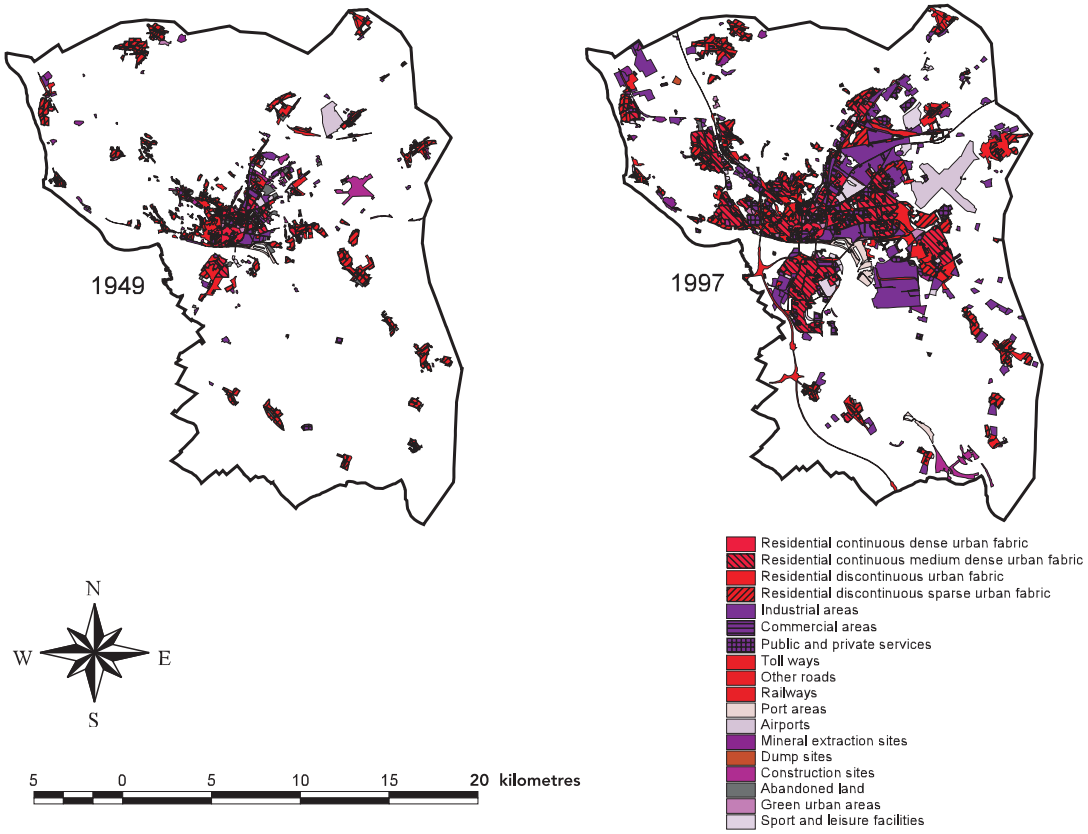


Figure 5.2 **Urban sprawl in Brussels (Belgium) from 1955 (left) to 1997. Only artificial surfaces (class 1 of the Murbandy/Moland legend) are depicted.**

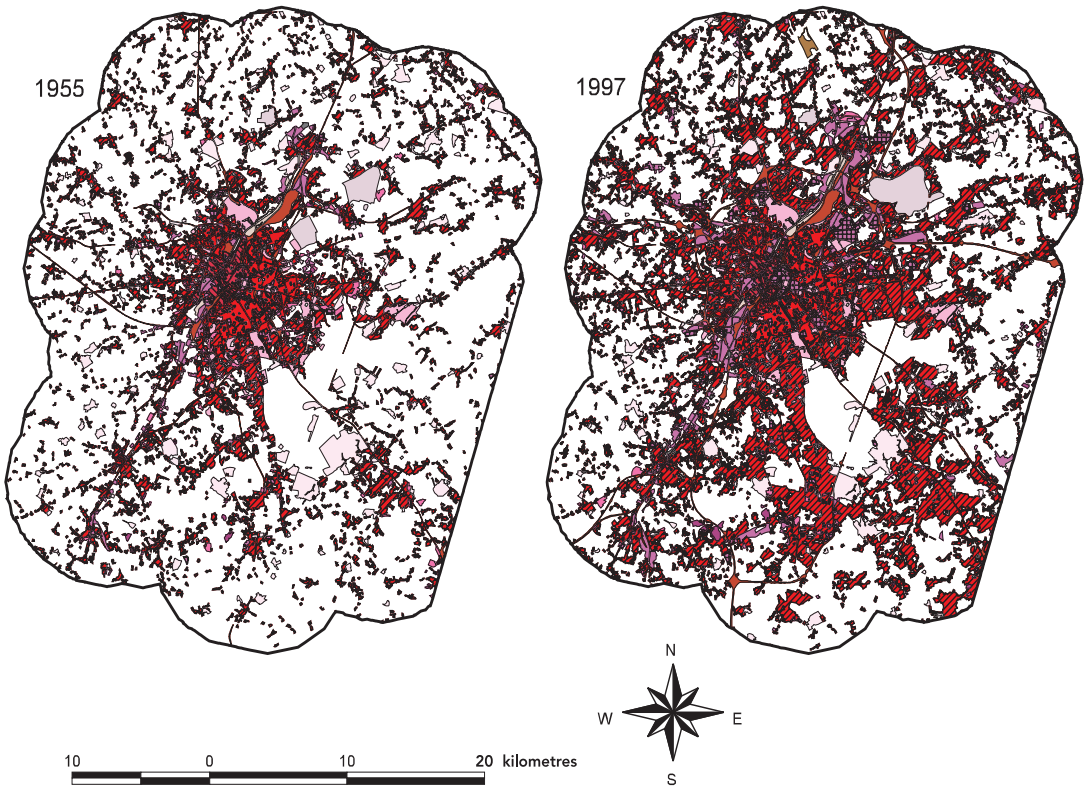
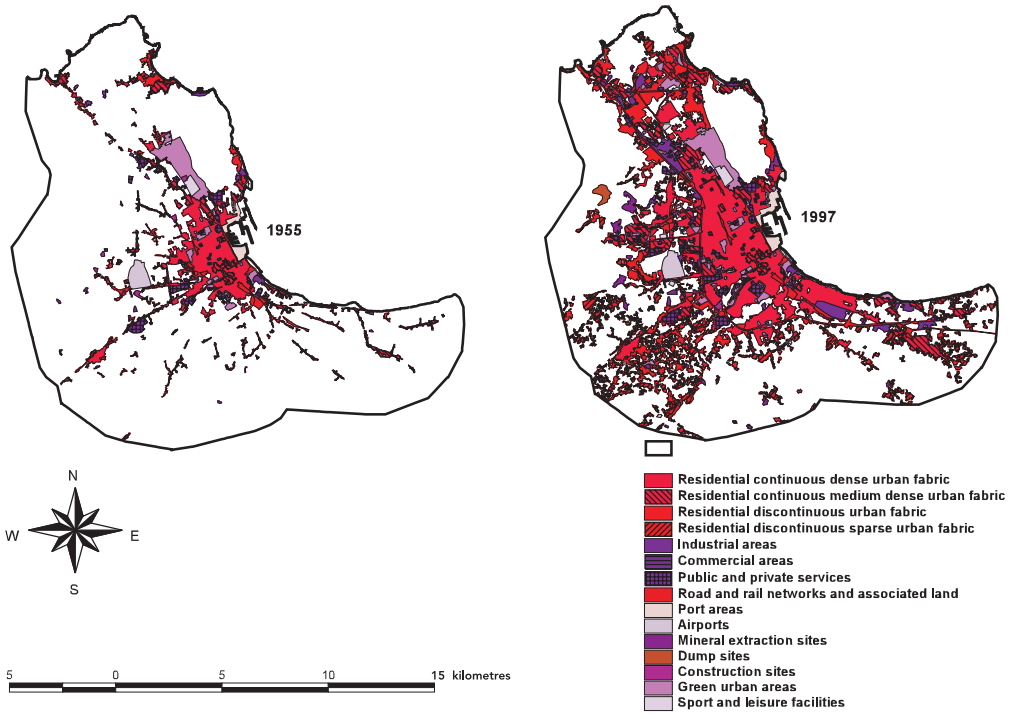
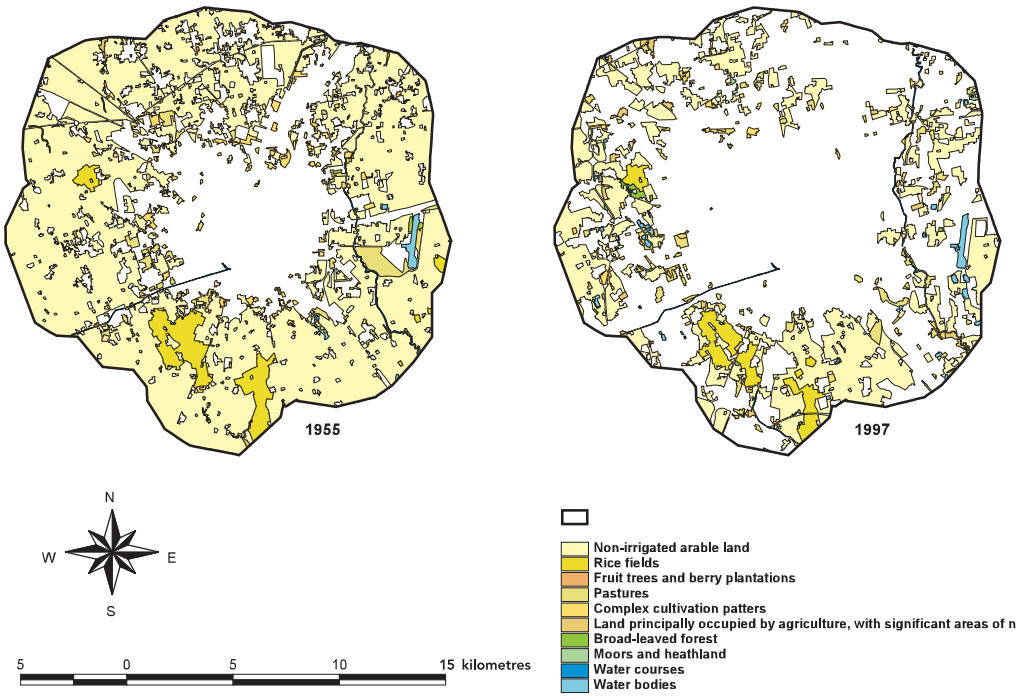


Figure 5.3 **Urban sprawl in Palermo (Italy) from 1955 (left) to 1997. only artificial surfaces (class 1 of the Murbandy/Moland legend) are depicted.**



Loss of natural and agricultural area in Milan (Italy) from 1956 (left) to 1998, only natural and agricultural areas are depicted.

Figure 5.4



Loss of natural and agricultural area in Dublin (Ireland) from 1956 (left) to 1998, only natural and agricultural areas are depicted.

Figure 5.5

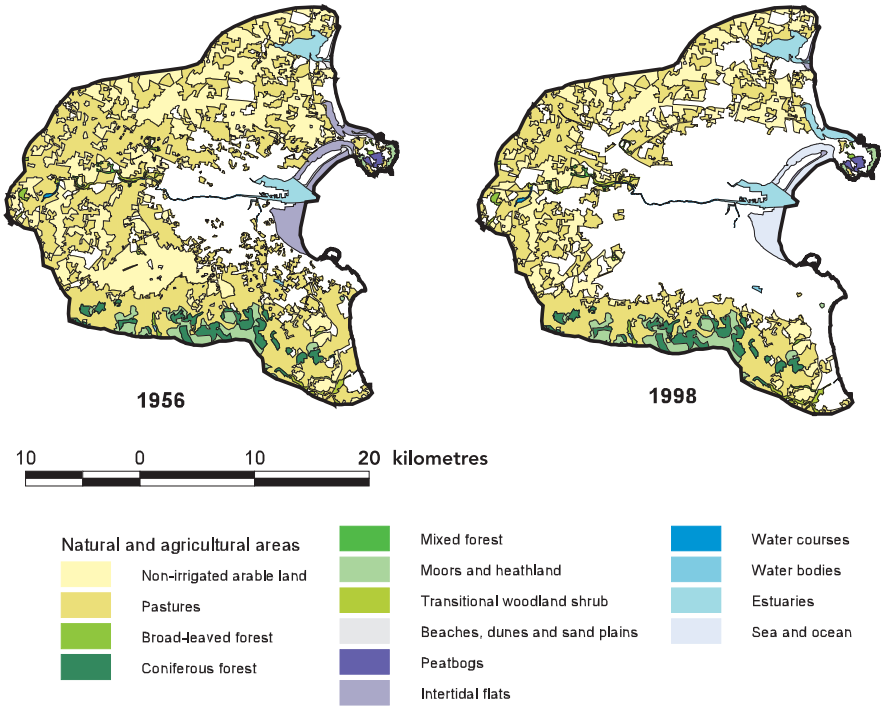
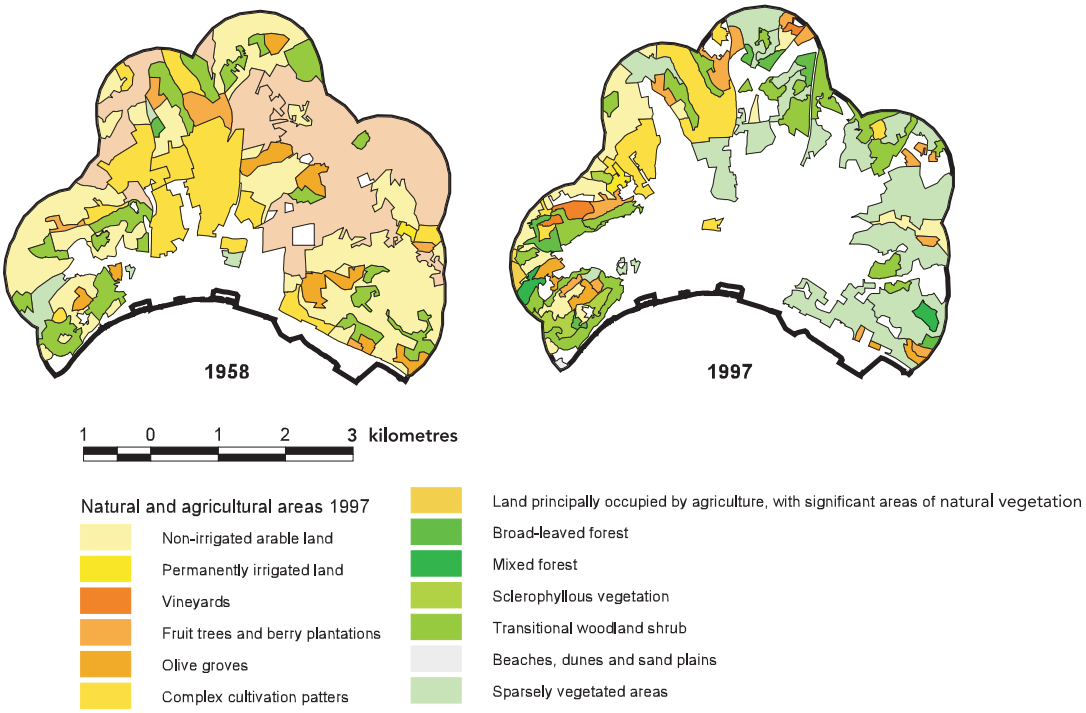


Figure 5.6 **Loss of natural and agricultural area in Setúbal (Portugal) from 1958 to 1997, only natural and agricultural areas are depicted.**



Land consumption by urban expansion affects the surrounding landscape, which is mainly formed by agriculture, forest and natural areas, represented in level 3 and 4 of the Murbandy/Moland legend. In the context of a intense urban development, natural areas have important environmental functions and increase the quality of life of the urban dwellers.

5.1.2. Transport network

Transport corridors are major consumers of space. Since the Murbandy/Moland database also surveyed line features, it is possible to verify the densification of the transport network. It is also the case that length per capita has increased steadily over the last few decades.

The methodology is particularly useful for the carrying out both environmental impact assessment (EIA) and strategic environmental assessment (SEA). For instance, it is possible to work out the rate of surface waterproofing (impervious surface coverage) from linear transport infrastructure.

Figure 5.7 **Natural and agricultural land lost to development from 1952 to 1998 in the Ruhrgebiet area (Germany). The figure shows the different artificial land uses that have taken natural and agricultural areas during a 46 year period.**