## TISSUE CORE 2 indicators

| Sustainable Urban Transport          | Freight transport demand  
|                                      | Modal split (share of kms)  
|                                      | Quality of public transport |
| Sustainable Urban Design            | Consumption of land  
|                                      | Accessibility to basic services  
|                                      | Population and jobs density  
|                                      | Jobs / housing ratio  |
| Sustainable Urban Construction      | Poor quality housing  
|                                      | Soil sealing  |
| Sustainable Urban Management        | Citizens' engagement with environmental and sustainability oriented activities  
|                                      | Adoption of integrated urban plans (environment, transport, land use)  
|                                      | Legal framework for active public participation  |
| Sustainable Urban Environment       | Air quality; Population weighted exposure to PM10 and O3  
|                                      | Renewable energy consumption  
|                                      | Intensity of energy use in transport  
|                                      | Urban biodiversity  |
**CORE 2 - Freight transport demand**

**Definition and measurement**

Ton kilometres moved per year divided by the regional GDP (ratio).

Ton kilometres are chosen because the definition is relative simple and therefore the data is relatively good comparable. The number of truck movements is an alternative but data is less easily available and comparable. The amount of ton kilometres moved within an area is a clear measure of how much the burden of freight transport is on the environment. This is due to the direct (negative) impact on sustainability issues as traffic safety, carbon dioxide emissions, energy consumption, noise and pollution of kilometres made for transportation of freight by heavy vehicles such as trucks. A relatively high ratio of ton kilometres moved divided by the regional GDP is an indication for a relatively high pressure on the urban environment. This ratio is amongst others affected by the structure of the local economy (industry, services) and the extent to which a city experiences transit traffic.

**Policy relevance**

Transport demand is twofold: passengers and freight. While most transport demand indicators are directed at persons, it is also needed to monitor the demand for freight transport. Freight movements and in particular road haulage, are an important source of congestion and other traffic problems, particular within the urban environment. The noise and nuisance generated by heavy lorries, the problems created by on-street loading and unloading of goods, and the usual complaint about lorries taking up a good deal of the capacity of roads are only some of the problems associated with this type of traffic. This indicator directly measures the desired reduction of traffic volumes and congestion as stated in the Thematic Strategy on the Urban Environment. It also directly relates to commitment 6.5, reducing the impact of transport on the environment and public health, of the “Aalborg+10 commitments”.

**Consensus and feasibility**

No indicator sets which monitor freight traffic demand on the urban level have been found. But there are two indicator sets (Indicators for Sustainable Development in Scotland and IFEN) which monitor freight demand and relate it to the growth of the GDP. Monitoring freight demand on the national level is actually very common in Europe. Also Eurostat has the demand of freight transport related to GDP incorporated in its structural indicators. Unfortunately it is not possible to scale down freight demand data on the national level to the level of cities. However, local authorities are expected to increasingly monitor freight demand in the near future.
**CORE 2 - Modal split (share of kms)**

**Definition and measurement**

Distribution of trip kilometres made among the transport modes.

This indicator is in essence the same as the modal split indicator, but it describes the share of each transport mode based on trip kilometres (%). Data could be obtained from household surveys. It must be noted that precise information on distances per trip are sometimes lacking and are often imprecise because respondents have to estimate distances. However, since the same error is made for car as for public transport, household surveys are a suitable source to determine the kilometre modal split.

**Policy relevance**

This indicator measures more directly the competition between car and public transport with regard to middle and long distance trips. Trip kilometres are the source of most negative transport side effects, not trips. Hence, to achieve a reduction of the number of car kilometres as stated in the Thematic Strategy on the Urban Environment, it is needed to monitor the trip kilometres. The trip modal split is not sufficient because when all long trips are made with the car and only short trips with non-motorised modes the desired impact of a modal shift is limited.

**Consensus and feasibility**

Although modal split based on trips is measured in many cities across Europe this is not yet the case for modal split based on trip kilometres. However, many indicator sets such as the EEA-Dobris assessment and Urban Audit 1 and also the Adriatic Common Indicators already have this indicator incorporated. Therefore availability of this indicator is expected to be sufficient in the near future.
**CORE 2 - Quality of public transport**

**Definition and measurement**

Ratio of the journey speeds (km/hour) for private car and public transport within an urban area. By dividing both journey speeds and thus calculating the ratio between the average journey speeds the indicator is well comparable between different cities. Data can be obtained from household surveys. In these surveys trip distances and times and therefore speeds are usually estimated by the respondent and this may introduce an error. A second way of measuring is to record actual journey times manually or automatically with GPS for a representative sized sample of public transport vehicles in a selected number of corridors within cities. This second approach is difficult and does not always deliver good comparable data. The first approach does give better results but asks for a relatively large survey sample.

**Policy relevance**

This indicator is of importance for the thematic strategy's objective of reducing the negative impacts of transport by amongst others changing the modal split in favour of more efficient transport modes such as public transport. Because for increasing the modal share of public transport compared to the share of the private car, the relative quality of public transport should be comparable as much as possible. This indicator thereby also directly relates to commitments 6.1 and 6.2 of the Aalborg 10+ commitments. These commitments respectively aim at reducing the necessity for private motorised transport and promoting attractive alternatives accessible to all, and increasing the share of journeys made by public transport, on foot and by bicycle.

**Consensus and feasibility**

This indicator may incidentally be measured in some cities, but there is no consensus yet on a larger European scale on the need for monitoring this indicator. Therefore this indicator is proposed for use in the future.
**CORE 2 - Consumption of land**

**Definition and measurement**

The ratio (%) of the surface of urbanised areas to the total municipal area.

This indicator measures the state of urbanisation. By comparing its value for a frequency fixed at 10 years, it allows to measure the way urbanisation has developed during this period of time. According to ECI\(^1\) methodological sheet of the indicator n°9 (“Sustainable Land Use”) the municipal area is the area under the administration of the Municipality (including rural areas; Metropolitan areas should include the whole territory under administration) and urbanised areas are lands occupied by buildings, in a continuous or discontinuous manner, corresponding to the Corine Land Cover \(^2\) “artificial surfaces” categories land use which include the continuous and discontinuous urban fabric, the industrial and commercial zones, the road and the rail networks and the areas related to them, the harbour areas, the airports areas, the mine, dump and construction sites, the urban green areas, the equipments for sport and leisure.

The Corine Land Cover is a subprogram of the CORINE program monitoring land use. The database contains 44 land use categories divided into groups: artificial surfaces, agricultural areas, forests and semi-natural areas, wetlands and water bodies. The indicator can be computed by using the CORINE EU sources. Thus the frequency of measurement of the indicator has been chosen corresponding to that of the Corine Land Use update (10 years).

In order to gather more complete and specific information it would be interesting to measure the urbanised surface consumed by category. The indicator to be used could be: Land uses [surface/total municipal area]. The different land uses that should be taken into account are\(^3\): unused (contaminated or derelict land area), urban area subject to special physical planning conservation measures, land area in housing/residential use, land area in shop/retail use, proportion of urban area subject to special physical/planning conservation measures, proportion of urban area in housing/residential use, proportion of urban area in shop/retail use, proportion of urban area in commercial/industrial use, proportion of urban area in road/rail networks use, proportion of urban area in ports/airports use, proportion of urban area in mineral extraction, dump and construction sites use, proportion of urban area in sports and leisure use, proportion of urban area that are green spaces.

**Policy relevance**

This indicator is a measure of the degree of land consumption and urbanisation. Urban expansion and the increase of urbanised areas reduce virgin land and green areas. Thus, this indicator supplies information on the protection of ecologically sensitive sites (Habitats Directive 92/43/EEC). It measures the urban sprawl reduction as stated in the Thematic Strategy on the Urban Environment and it is directly related to the TISSUE trends Consumption of land and space, Urban sprawl and urbanisation and Car dependency. The indicator also directly relates to commitment 5.2 of the Aalborg commitments: “avoid urban sprawl by achieving appropriate urban densities and prioritising Brownfield site over Greenfield site development”.

**Consensus and feasibility**

The indicator has been adopted (even if under different names, but with methods and metrics that could be easily harmonised) by relevant existing sets at EU and national level: Urban Audit, Monet, Local quality of life counts, Zukunftsfähige Kommune, Xarxa, Cercle, Baden-Württemberg Indikatoren NRW, Catania - State of the Environment Report. The feasibility is good, but there is a need to harmonise the definition of ‘artificial’, ‘used’, ‘developed’, ‘anthropised’, ‘sealed’ or ‘settled’ area. The progress on updating the Corine Land Cover and data about land use and land use change represent expected reports\(^4\) to the EEA.

---

1. [http://sustainable-cities.org/indicators](http://sustainable-cities.org/indicators)
2. [http://dataservice.eea.eu.int/dataservice/metadetails.asp?id=188](http://dataservice.eea.eu.int/dataservice/metadetails.asp?id=188)
3. Land use categories used by URBAN AUDIT set (www.urbanaudit.org).
4. See [http://rod.eionet.eu.int/index.html](http://rod.eionet.eu.int/index.html) for the list of the countries and detailed information.
CORE 2 - Accessibility to basic services

Definition and measurement

The ratio (%) of inhabitants within 300 m from basic services to all inhabitants.

This indicator measures the state of presence and vicinity of basic services. By comparing its value for a frequency fixed at 5 years, it allows to measure the way the creation of basic services and their accessibility have taken into account in the urban design.

This indicator measures the number of inhabitants divided by the total number of inhabitants of the municipal area who live within 300m (as the crow flies) from basic services [%].

The basic services are defined as:

- Primary public health services (general practitioner, hospitals, first-aid posts, family advice bureaux or other public centres supplying medical services, such as diagnosis or specialist examinations) (Basic services 1),
- Public schools (compulsory and kindergarten) (Basic services 2),
- Food shops (bakeries and greengroceries) (Basic services 3),
- Spaces and structures for cultural and leisure activities (theatres, movie theatres, civic centres, libraries, sport complex (Basic services 4).

The indicator should be calculated for each of the 4 services separately, and computed through the following steps:

1. Identification of services, e.g. measure of the availability in terms of total amount and their geographical distribution.
2. For each service and them for each service category, measurement of population living in the vicinity, e.g. measure of their accessibility.
3. Measurement of population living in the vicinity of each basic service category:

   Data concerning the geographical distribution of basic services require the use (and the setting –up) of special database that may be available from the local authority, from public bodies (Chamber of Commerce), etc. This indicator can also be measured thanks to specific surveys or interviews even if this method is expensive. The suggested measurement frequency for this indicator could be 5 years.

Policy relevance

This indicator helps discover how accessible services are to local people and whether their needs are likely to be met in the vicinity. This indicator is related to the TISSUE trends Accessibility of basic services and facilities, Densification and clustering of settlements, mixed land use, Short distance and public transport oriented development, Urban sprawl and sub-urbanisation and Car dependency.

It measures the improving of mixed land use and the reduction of mobility needs as stated in the Thematic Strategy on the Urban Environment. It also directly relates to commitment 5.3, 6.1, 6.2 and 9.2 of the Aalborg+10 commitments.

Consensus and feasibility

This indicator has been adopted – even if under different names, but with methods and metrics that could be easily harmonised, - by relevant existing sets at EU and national/regional level: ECI, ISDIS, Zukunftsfähige Kommune, MONET, Quality of life indicators-UK, XARXA. Many systems, in addition or instead of this indicator use “Availability (tot. amount or amount/pro capita) of basic services” (see first step of the measurement of the indicator).

The existing systems consider generally different categories within basic services, thus this indicator require specific harmonisation. Normally the systems consider within the basic services the public transports. As we suggest a specific indicator on the accessibility of public transport, this indicator doesn't take into account this kind of service.
**CORE 2 - Population and jobs density**

**Definition and measurement**

Inhabitants + jobs / surface of the urbanised area (present people / urbanised km²)

This is a more sophisticated indicator of density. It measures the total density of “day” (employees) and “night” (residents) population in the urban area, i.e. the intensity of land use for living and for working. The notion of human activity density, obtained by adding up population and employment provides a more faithful description of the use of urban space than the simple population density in which only the number of residents is considered. This indicator can be measured thanks to statistical data about population and about employment. The suggested frequency of measurement is 10 years.

**Policy relevance**

This indicator is related to the TISSUE trends Consumption of land and space, Urban sprawl and urbanisation, and Car dependency.

It also directly relates to commitment 5.2 (“avoid urban sprawl by achieving appropriate urban densities and prioritising Brownfield site over Greenfield site development”) and 5.3 (“ensure the mixed land use of buildings and developments with a good balance of jobs, housings and services”), of the Aalborg commitments.

**Consensus and feasibility**

According to TISSUE assessment there are no systems containing this indicator.
**CORE 2 - Jobs / housing ration (Attractiveness)**

**Definition and measurement**

The indicator is the total number of workplaces (industry and tertiary jobs or “day time” population) divided by the total number of population living in houses within the boundary of the city/neighbourhood (resident or “night time” population). The indicator makes sense when applied to analyse the distribution of the workplaces and the resident population between the core city and the suburbs, including satellite towns. When the distribution is balanced the indicator is near 1 meaning that mixed-uses are evenly distributed on the entire metropolitan area. On the contrary, when the distribution of workplaces is polarised, we have dormitory towns/neighbourhoods including a majority of housing and few services – which show therefore values of the indicator below 1 – and office or industry poles with a higher density of workplaces compared to housing, and values of the indicator well above 1.

Regardless of how balanced a community is with values of the jobs-to-housing ratio near to 1, the same community can be more or less self-sufficient in terms of employment catchments areas. Their business may use local labour force or we may have a balanced community whose business import every day the majority of workers from elsewhere. A measure used by urban geographers to gauge the degree of self-containment is the independence index that is the number of internal trips (within the community) divided by the number of external trips. The index depends on the dimension of the geographical area, the larger being the community area the higher the self-containment. The “independence index” is meaningful when comparing communities of similar dimension. A low degree of self-containment of work trips in otherwise jobs-to-housing-balanced communities encompasses balanced two-way traffic flows between the satellite towns, i.e. with peak traffic in both directions in the morning and in the evening. This may facilitate public transport, especially if the satellite towns/neighbourhood are interconnected by efficient rail services. Tidal patterns of rail commuting – full trains in one direction and half-empty ones in the other – have been an Achilles heel in many parts of the world. Unidirectional flows are typical on radial networks where the only significant concentration of jobs is downtown. On the contrary, cities as Stockholm where regional planning has channelled the population and employment growth into compact, mixed-use communities sited along rail-served suburban corridors, have been successful in achieving and maintaining a high share of public transport. The indicator is strongly related with the “modal split” indicator.

The indicator can be easily computed for the generality of municipalities at Census years, using census data on employment and resident population. Data from Census surveys on mobility and commuting flows may also be used to compute the independence index. The indicators built upon Census data are useful to analyse structural changes in the territorial distribution of workplaces and housing over an entire census period. The frequency of measurement corresponds to the frequency of census (generally 10 years). However, it is also possible to collect data from the administrative records of population and business registers available at city level, in order to update the indicator at years between two censuses.

**Policy relevance**

The indicator is relevant in relation to polycentric development and the reduction of travel needs and private car traffic this may enable, thanks to a potentially higher number of short journeys within the mixed-use communities (due to the availability of workplaces or services in walking or cycling distances) or a higher number of public transport trips facilitated by the bi-directional commuter flows between the communities. The indicator is related to the TISSUE trends Densification and clustering of settlements, mixed land use, Attractiveness of cities centres and amenity of streets and neighbourhoods, Urban sprawl and suburbanisation, Consumption of land and space, and Car dependency. It measures the ensuring of the mixed land use as stated in the TSUE. It also directly relates to commitment 5.3.

**Consensus and feasibility**

The indicator is included in the list of Urban Audit indicators, and it is used in 59% of the cities of the Urban Audit sample (157 European cities).
CORE 2 - Poor quality housing

Definition and measurement

The suggested content of the indicator is as follows: Percentage of total population/households living in substandard/unfit housing.

Substandard conditions should be defined with reference to three elements:
− the floor area per person,
− the level of building services and
− the building performance of houses in terms of indoor climate and safety.

This indicator should not be for the monitoring and comparing of European cities but for the monitoring the development of the quality of building stock within a city. The use of this indicator requires that the city would formulate the suggested three sub-indicators in such a way that it would be possible to collect information. The suggested three sub-indicators are as follows:
− The limit of cramped living conditions is defined as more than one person per room including kitchen.
− The required services include the connection with sewerage treatment system and the availability of safe drinking water (connection with water supply network). Other specific city services should also be included, as for example central heating.
− The assessment of building performance should be a rough estimation of the share of houses the structural safety and building physical conditions of which are so low that the building would need immediate renovation.

Policy relevance

Housing is one of basic needs of people in order to get shelter from surrounding outdoor environment and in order to ensure possibilities for rest and recover. The Communication "Towards a TSUE" (11.2.2004) states that with regard to sustainable urban construction key issues of the visions include the ability to produce good-quality built environment (attractive, durable, functional, accessible, comfortable and healthy). The indicator is consistent with the Aalborg commitment "secure good housing and living conditions".

The quality of housing conditions depends on the availability and affordability of housing. Availability and affordability of housing can be indicated on the basis of the share of homeless people, availability of different kinds of houses and flats with regard to ownership, the prices and rents compared to income level etc. However, these indicators are not dealt with as construction related indicators. With reference to urban construction, the quality of housing is dealt with on the basis of technical quality of buildings and available technical services.

The quality of housing depends on a number of factors including the following:
− adequate floor area per person,
− the standard of equipment and the level of services: connection with sewerage treatment system, availability of safe drinking water, connection to water supply network, warm water, central heating, adequate heating, adequate ventilation to provide adequate indoor air quality, waste collection and waste sorting systems
− adequate building physical state (with regard to moisture damages) of buildings in order to provide adequate indoor quality

For example the city of Helsinki defines that the living conditions are cramped in the case of more than one person per room. The needed level of building services varies for example according to the climate conditions.

Consensus and feasibility

There is a wide consensus about the significance of quality of housing on the sustainable development and welfare of citizens. It is clear that the building sector and the construction technologies have a significant effect on the quality of housing. However, there is no relevant information and methods available in order to monitor and compare the quality of housing in different European cities. This kind of indicators should be taken into account as cities collect information about the sustainable development and welfare of citizens, but the results should not be compared on the European level. The comparisons would be possible only after the development of a common methodology.
**CORE 2 - Soil sealing**

**Definition and measurement**

The suggested content of the indicator is as follows: Soil sealing (m² per citizen) and the changes in five years periods. Soil sealing happens because of covering earth with non-permeable or low-permeable layers because of constructive assets (roads, buildings etc). Soil sealing expresses impacts of construction on biodiversity, quality of soil and water table.

**Measurement**

The area of soil sealing within the whole area of the city should be mapped considering buildings and yards, roads, vehicle parks and other covered areas. The changes taken place during five years periods should be taken into account on the basis of statistics considering all construction projects.

**Policy relevance**

The value of earth and soil is based on its ability to offer a living environment, natural resources and protect cultural heritage. The protection of soil means maintaining its ecological, cultural and economic capacity. The ecological functions of soil include the production of biomass, percolation, buffering and conversion of materials and energy, offering of a living environment, genetic reserves and spreading routes. Construction causes irreversible changes and consequently the bio-diversity will be reduced. The damage of soil can be classified as physical damage, biological damage, radio activity, chemical damage, irreversible changes of land use and damages with regard to cultural heritage and natural historic values. The use of land means consumption of resources both in terms of changing the end use and consumption of soil materials. Land areas can be classified according to their value. Different European countries have classified and mapped valuable areas from the view point of nature protection. The value in terms of nature protection can be taken into account when assessing the environmental impacts of land use. The reduction of different kinds of living environment results from the purpose of use of land especially because of agriculture and forestry and urban construction.

Covering of earth by buildings and other constructive assets including roads and ways can be expressed with the term sealing. Sealing earth with non- or low-permeable layers may express impacts of a building or other constructive assets on bio-diversity, quality of soil and water table. The widening of urban areas affects significantly the ecological capacity of earth. For example changes in the quality of groundwater and the lowering of water table may indicate the changes in water-economy. Soil sealing together with fragmentation effect are among the most important land use related environmental effects of building. Fragmentation isolates areas from others, increases the border effect and has influence on bio-diversity. There is a certain relation between the size of a population and the land area. The fragmentation may affect in such a way that the size of the population decreases more than in the case of continuous areas.

The European Environmental Agency (EEA) lists the following issues as the biggest land use related problems:

- Sealing, erosion, hillside stability, pollution, acidification and impairing quality of soil in Eastern Europe.
- The significance of sealing may still increase considering the threats with regard to climate change and increasing risks of strong weather changes (including floods and dry periods).

**Consensus and feasibility**

There is a wide consensus about the significance of building with regard to land use and soil sealing. The effect of construction on land use and biodiversity is typically included in the sustainable constructions methods. However, the availability of relevant information with reference to city level management of data may be difficult. On the other hand, after once mapping the degree of soil sealing, it should be possible to monitor the development of the situation, if this information was required within supervision of building.

---

CORE 2 - Citizens' engagement with environmental and sustainability oriented activities

Definition and measurement
Number and proportion of citizens (i) engaged in environmental and sustainability oriented activities and/or (ii) average time in hours spent per year and inhabitant in such activities. Data and information required for both indicators can be collected in a special representative TSUE survey among citizens of EU cities and urban areas.

Policy relevance
Clear policy relevance.

Consensus and feasibility
The number and proportion of engaged citizens can be measured in activity surveys like European Social Survey (ESS), the average time per year and inhabitant in time use surveys (TUS). The big problem and unsolved question of this approach is the choice of which civic engagement activities should be counted as a contribution to sustainability and sustainable management of local environment.
**CORE 2 - Adoption of integrated urban plans (environment, transport, land use)**

**Definition and measurement**

This indicator will be used only in case of voluntary implementation of EMP and EMS and for cities which do not apply these instruments. Integrated land-use, transport and environment plans are similar as EMP in their content, form and objectives. Some of them fulfil or would fulfil all EMP criteria - or even go beyond - and will be used instead or as them. The indicator will measure the number and proportion of cities and urban areas which have integrated - as opposed to sectoral - land use, transport and environment plans.

**Policy relevance**

Cities with good integrated land-use, transport and environment plans fulfil the most objectives of SUM, regardless whether they let their plans being registered and formally approved as EMP. The difference between EMP and local integrated plan (LIP) lies in the fact of decentralised (national, regional or sometimes even local) registration, validation and/or approval of the latter. If a city has a LIP and not an EMP, it does not necessarily mean that it does less for the sustainable development of urban environment; the cities could have other reasons for their LIPs not being registered and approved as EMPs.

**Consensus and feasibility**

It is very important that only officially approved ("statutory") LIPs are counted for the calculation of the pertinent indicator value; regardless of the fact, by whom they have been approved and whether they contribute and do more or less for the urban environments than EMPs. For the purposes of the calculation of this indicator all cities and urban areas in EU-member states must be divided into two groups:

- cities and urban areas with integrated land-use, transport and environment plan
- cities and urban areas with sectoral land-use, transport and environment plans

The existence of a third group of cities and urban areas without any land-use, transport and environment plans is very unlikely. The exact way, criteria and "thresholds" for the above mentioned division cannot be described here, but could be subject of a future study or research project. Some hints for this classification can also be derived from the Commission's Guidance on the Implementation of the 2001/42 Directive on the Assessment of the Effects of Certain Plans and Programmes on the Environment and from Commission's publications and communications on Strategic Environmental Assessment (SEA). Another methodological approach could be a survey: all cities without EMP and EMS could be asked to deliver a report on their local land-use, transport and environment plans, containing information and data necessary for the calculation of this indicator's values.
CORE 2 - Legal framework for active public participation

Definition and measurement
Existence of legal framework: Number and proportion of cities in which public participation local environmental planning and public consultation of relevant local plans is required and regulated by national, regional or local legislation.

Implementation of specific measures and strategies: Number and proportion of cities which have specific strategies and implement specific measures aiming to enhance public participation in environmental planning.

Policy relevance
This indicator refers to the first legalistic as well as the second investment and prerequisite-oriented approach to public participation elaborated in the section 5.3. Most European cities acknowledge the participation of the public in the local environment planning as an important objective, even though the understanding of this concept, it's appropriate forms, and promotional activities, etc. vary widely among European countries and cities. The relevance of public participation and this indicator is therefore high, in spite of the above mentioned differences and of the complex and unclear impact of public participation on urban environments.

Consensus and feasibility
The existing experience with public participation indicators (see the concluding table in section 5.7) is not a very positive one. Self-reporting and self-evaluation on pertinent participation possibilities and measures lead often to glossy favourably biased pictures. The reality is much more complex and public participation can be also an obstacle to sustainable solutions and cause of problems in local environment. Nevertheless and as already suggested in other TISSUE WP2 and WP3 reports, we consider it as important to establish an overview, what larger European cities undertake in order to inform the public and to enhance the citizen participation in local environmental planning. Since we doubt on the explanatory power and significance of the self-reporting and self-evaluation in this respect, and since all top-down controlling approaches are not feasible as well, an analysis of legal situation, and a classification system of relevant public participation forms and measures/strategies combined with the collection of pertinent data could be established in a pertinent 6th or 7th FWP research project.
**CORE 2 - Air quality; Population weighted exposure to PM10 and O3**

**Definition and measurement**

Unit of measurement: – substitute, if confirmed as new Eurostat's Structural indicators

Urban population exposure to PM10 and Ozone (annual average)

**Compare CORE 1 Air quality indicators**

Fore the CORE 2 Indicator the method under definition by the Eurostat's Structural indicators should be considered (and for this reason here considered as a possible perspective as CORE 2, but not as a standard reference). The indicator is expressed as *Urban Population exposure to PM10 and Ozone (annual average)*

**Policy relevance**

The main reasons for these indicators selection are:
- the present legislative framework represented by the Council Directive 96/62/EC of 27 September 1996 (on ambient air quality assessment and management) and the following daughter directives
- the on going Thematic Strategy for Air Quality Pollution (Clean Air for European programme - CAFE), launched in March 2001 and expected to be ready on 2005

**Consensus and feasibility**

The Eurostat's Structural indicators, presently submitted on revised process (and for this reason here considered as a possible perspective for CORE 2, but not as a standard reference), include two indicators for air quality related to Urban Population exposure to PM10 and Ozone (annual average). The data source indicated, in the revised methodology proposed on Sept 2004, will be the AirBase air quality data system. In this case warning data (reported at national scale) should be expressed at city level.

6 The Indicators, calculated on national scale, are:

Population weighted exposure of urban population to Particulate matter (PM10) (considering the annual average PM10 concentration);
Population weighted exposure of urban population to Ozone (considering the average of 8 hourly maximum concentration (less a cut-off concentration that still needs to be evaluated) for each station for all days in a year for which data is available);

As indicated in the revised methodology proposed on September 2004, "both indicators are calculated as population weighted concentrations, measured in the stable set of urban and suburban background stations and subject to QA/QC (quality assurance / quality control) procedures, aggregated for a particular country. Population attributed to each measurement/station is defined by the area of representativity around the station. At present this area is defined by a circle with a radius of 3 km, uniform for all measurement stations. Where areas of representativeness intersect, a procedure is applied to attribute population to the closer station, preventing it to be counted twice."
**CORE 2 - Renewable energy consumption**

**Definition and measurement**

The indicator shows the percentages of total energy consumption supplied from renewable energy sources over total energy consumption of the FUR calculated for a year (in %). Renewable energy sources refer to energy collected from current ambient energy flows or from substances derived from them. This definition includes energy derived from geothermal, hydro, solar, tide, wind and wave power, and bio-fuels, such as fuel-wood, bagasse, charcoal, animal and vegetal wastes, and other (industrial and municipal) wastes.

A wider concept may include also the energy produced from heat recovery, and in this case we would adopt the indicator “share of consumption of renewable energy sources and heat recovery”. Difference in definitions sometimes can give rise to comparability problems.

At urban level gathering information on renewable energy consumption is often harder to do than collecting data on the other forms of energy consumption. Therefore, a complementary indicator to be analysed may be the ratio between total fossil fuel consumption on total final energy consumption; where final energy consumption corresponds to energy supplied available to the final consumer to be converted into useful energy, in other words is the consumption of primary and derived energy by the end-use sectors. Fossil fuel are taken from natural resources (coal, crude oil, natural gas, oil shale) which were formed from biomass in the geological past; by extension, the term fossil is also applied to any secondary fuel manufactured from a fossil fuel (petroleum products, manufactured solid fuels and gases).

**Policy relevance**

The importance of renewable energy sources is due to the absence of GHGs emissions during their generation (except for biomass which is neutral over its life cycle in GHG terms). In the White Paper on the Security of Energy Supply the European Commission sets the goal of increasing the share of renewable energy sources to 12% of total amount of energy consumption by 2010 and in 1999 it launched the Campaign for Take-Off\(^7\). The aim of this campaign is the promotion over the period 1999-2003 of the three key renewable energy sectors identified: solar energy, wind and biomass. Finally, Chapter 4 of Agenda 21 calls for an improvement of efficiency in the use of energy sources and for a transition towards the environmentally friendly use of renewable resources.

The indicator is related to the TISSUE trends: “Local production of renewable and non-renewable energy sources and dependency on external sources”, “Making use of renewable energy sources”, “Energy intensity related to relevant units”, “Energy consumption by sector”, “GHGs and CO\(_2\) emissions by sector”.

**Consensus and feasibility**

National data and estimates on renewable and non-renewable resources are available from national statistical offices and country publications in many countries. A combination of a “top-down approach” - exploiting the availability of national data on renewable resource availability and standard energy conversion factors – with a “bottom-up” approach exploiting local data to compute the share of urban energy consumption on the total energy consumption of the country and/or the presence of local sources of renewable energy, seems the best strategy to obtain reliable indicators at the city level. Looking at the TISSUE assessment, there are several indicators sets which include similar or look-alike indicators: EcoBudget, Urban Audit, Respect, Ianus, and other local sets.

---

\(^7\) The objective has been confirmed by the adoption of the Directive of the European Parliament and of the Council on the promotion of electricity from renewable energy sources in the internal electricity market (2001/77/EC).
CORE 2 - Intensity of energy use in transport

Definition and measurement

Two different indicators are recommended, respectively for energy intensity of passenger and freight travel:

- energy consumption for transport per tonne-km (freight transport) – (MJ/tonne-km)
- energy consumption for transport per passenger-km (passenger transport) – (MJ/pkm)

These indicators express the measure of the energy effectiveness of the provision service better than the per capita indicator. The indicators consider final energy consumption since it is very difficult to estimate the allocation of primary energy consumption used in the various final sectors. Electricity consumption for subway, trams rails and electric vehicles should be indeed converted into primary energy consumption, but in the various city contexts different conversion factors are often applied, which makes any attempt to compare primary energy computations very difficult and unreliable.

These indicators are primarily a measure of the energy efficiency, they represents a performance index suitable for comparison between different transport modes. Separating freight and passenger travel is needed and generally not difficult, but separating the related energy consumption is often complicated. Energy use per passenger-km or tonne-km within the Functional Urban Area should be disaggregated by vehicle type, i.e. two-wheeler, car/van, bus, local rail, metro, tram for passengers; and light and heavy lorries for freight. Aggregate energy intensity for passenger travel or freight transport is a meaningful summary indicator, the value of which depends on both the mix of vehicles and the energy intensities of particular types of vehicles. The energy intensity for a vehicle type depends on both capacity and capacity utilisation. A large vehicle that is fully loaded generally has a lower energy intensity per tonne-km than a fully-loaded smaller vehicle, but a small vehicle fully loaded will have a lower energy intensity than a large vehicle with the same load. Typical load factors for private cars are 1,5 people per car. Typical load factors for rail and bus vary from well below 10 percent to over 100 percent of nominal capacity at peak times. Typical load factors for trucking might be 60 to 80 percent of weight capacity when loaded, but trucks commonly run 20 to 45 percent of their kilometres empty, yielding a relatively low overall load factor. Fuel consumption per vehicle-km also depends on traffic conditions as well as vehicle characteristics.

Final energy consumption for transport deals with all energy used for passenger and freight transport. For the various modes of transport it can be based on information from the supplying companies, for example oil companies can provide data on related sales for different purpose of use. As far as possible local final energy consumption for transport should be directly recorded.

Policy relevance

Transport is a major consumer of energy, mostly in the form of fossil fuels, and the share of transport in energy consumption is generally increasing. Urban transport is a major and growing share of total transport activity, too. The indicator is clearly related to Sustainable Urban Transport (SUT) trends. In order to reduce total amount of transportation energy consumption and to decrease the related level of GHGs emissions, improvements should be get not only in terms of technologies implemented but also through a better organisation of traffic plans.

Consensus and feasibility

The indicator is in use in many countries, and it is included in the European Environment Agency (EEA) TERM reporting mechanism. Problems of data availability may limit the dis-aggregation of the indicator to the desired level, and considerable work is often required even at the national level to disaggregate energy balances into various modes of transportation. Ecosistema Urbano investigated in 103 Italian cities the indicator “Fuel consumption (gasoline and diesel) per capita in a reference year”; data were collected at provincial level (NUTS 3), and included only urban fuel sales (sales made in both highways and extra-urban network are excluded).
**CORE 2 - Urban biodiversity**

**Definition and measurement**

Types and numbers of threatened/protected species. Types and numbers of bird species and/or other relevant species.

The proposed indicators have high relevance across all areas of Europe. With regard to the indicator concerning biodiversity of threatened/protected species these types of species are readily defined at a national, EU and international level. Although the indicator concerning general urban biodiversity is mainly concerned with bird species, specific towns and cities may also wish to monitor trends in other species according to their local urban circumstances. Rather than use such indicators to compare absolute levels of urban biodiversity it is only feasible to use them to compare the relative status of urban biodiversity between towns/cities in terms of its maintenance, improvement or degradation. The actual species monitored will vary according to a range of factors, and particularly the geography of the city/town.

**Policy relevance**

An integrated approach to the sustainable urban management of nature and biodiversity, as well as its protection through more sustainable urban design are key elements of TSUE. They provide an important contribution to the quality of urban areas and the provision of a healthy living environment. In addition, TSUE highlights the fact that green space, parks, gardens and woodland should be enhanced since they offer great potential to maintain and develop urban biodiversity.

The first biodiversity indicator relates to specific species defined as being acutely at risk at the European level or beyond. It concerns the existing presence of rare/protected species and whether trends indicate increasing or decreasing populations. In addition this type of indicator could identify rare/protected species previously not present suggesting improvements in at least some aspects of urban biodiversity.

The second biodiversity indicator relates to a need for a more general indication of the level of urban biodiversity. This requirement is often fulfilled by indicators, which are a proxy indicator for the general level of biodiversity such as the numbers of different types of bird species or tree species present. However, this type of indicator may not in itself be a sufficiently useful indicator to identify undesirable pressures on specific urban species until that species is no longer present to any great extent. It would therefore be of more use to also monitor the trend in population of identified species.

**Consensus and feasibility**

These indicators are not a reporting obligation in themselves at a city level. There are however national reporting requirements concerning the Habitats Directive and Birds Directive. In addition there are responsibilities relating to the adopted Communication on a European Biodiversity Strategy, together with the associated requirements for Biodiversity Action Plans operating within the wider framework of the UN Convention on Biological Diversity. All of the aforementioned may have implications at the local level of towns and cities. The extensive geographical coverage of the relevant TISSUE indicators suggests good feasibility.

The relevance is based on the following. TSUE: Habitat and species presence, Aalborg Commitment 3.3: Promote/increase biodiversity, TSUE: Green/Open space quality, Aalborg Commitment 3.3: Care for Nature Areas, Aalborg Commitment 3.4: Soil quality improvement and preserve ecologically productive, TSUE Themes: Sustainable urban management, construction and design, Habitat Directive⁸ and Birds Directive⁹. The consensus is based on the following: RESPECT: Biodiversity - number of rare/protected species, EEA Dobris: Number of bird species.

---

⁸ Directive 92/43/EEC  
⁹ Directive 79/409/EEC