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ENVIRONMENTAL SUSTAINABILITY INDICATORS IN URBAN AREAS: AN ITALIAN EXPERIENCE

Paper submitted by the National Statistical Institute of Italy¹

Abstract: This report describes Istat experience in developing urban environmental indicators for major cities of Italy and looks at some underlying issues in the development of urban sustainability indicators.

From 1996, Istat collects data related to 22 major Italian cities through *Environmental Survey on Major Cities*. The environmental issues investigated refer to 7 main themes: air, energy, green areas, noise, transport, waste and water. The chosen analytic framework is the well known Driving-Pressures-State-Impact-Responses model, which is widely used for environmental indicators. In some cases, due to the lack of statistical data, indicators have been selected on the basis of availability and comparability criteria.

Istat environmental survey on major cities improves quality of basic environment statistics and fill many data gaps related to urban statistics, providing information to decision makers and the general public concerning key factors determining the state of urban environment.

This paper outlines criteria and models used in Istat to develop urban environmental indicators and the reasons why the selected indicators represent a first important step to achieve a comprehensive system of indicators of environmental sustainability at urban level in Italy.

This report presents a provisional list of urban environmental sustainability indicators, which are of particular interest for cities of Italy. Some tables with indicators related to the action programmes and sectoral policies implemented by municipalities for modifying urban consumption patterns, intensity of resources use and the determinants of mobility towards a more sustainable urban development are also presented.

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Background²

The National Statistical Institute of Italy (ISTAT) is deeply involved on environmental issues through the Environment Methodology and Statistics Project, inside the Department of Social Statistics.

From 1996 Istat is carrying out *Environmental Survey on Major Cities*. The aim was to build up indicators data sets for the improvement of basic environment statistics and the development of information systems able to capture all the most important environment issues at local level.

The yearly survey collects data related to 22 major Italian cities. The environmental issues investigated refer to 7 main themes: air, energy, green areas, noise, transport, waste and water. The chosen analytic framework is the well known Driving-Pressures-State-Impact-Responses (DPSIR) model, which is widely used for environmental indicators. In some cases, due to the lack of statistical data, indicators have been selected on the basis of availability and comparability criteria. Istat environmental indicator sets are a very rich source of statistical information adapted to the specific urban situation, useful for decision-making process at national and local level and as tools for disseminating environmental information to the general public. Istat selected indicators represent basic statistics which can be used in defining frameworks and indicators related to environmental sustainability at urban level.

This paper outlines criteria and models used in Istat to develop environmental indicators for major cities of Italy and the reasons why the selected indicators represent an important step in developing indicators of local environmental sustainability.

Introduction

Urban areas show increasing signs of environmental problems. Major concerns for cities are the quality of air, traffic congestion, acoustic quality and limited land resources, while green areas and open spaces are under continuous threat due to more competitive land uses. Urban activities deeply affect environment and the overall quality of life of the urban population.

The increasing concern for the state of the environment has enforced the policy objective of the integration of environmental protection into sectoral policies both at national and local level and it has become a necessity to identify and select appropriate indicator sets as tools for monitoring the process of integration.

The lack of basic environment statistics and especially of urban environment indicators has been the main reason in setting up Istat *Environmental Survey on Major Cities*.

Istat environmental survey has enforced information systems at local level and has refined methods and presentation of urban statistics which contribute to a better understanding of diversity and complexity of urban dimension and development. Environmental survey on major cities provides information to decision makers and the public concerning key factors determining the state of urban environment and helps to identify major areas for policy intervention.

This report describes Istat experience in setting up urban environmental indicators for major cities of Italy and looks at some underlying issues in the development of indicators of urban sustainability. There are also some remarks about urban sustainability and if is possible to deal with the complexity of urban sustainable development with the same conceptual framework of the national level, since at local level the information systems are not so implemented and environmental accounts are not feasible. The measurement of sustainable development is of critical importance and certainly sustainable development require integration of economic, social and environmental concerns in order to ensure economic development while respecting social equity

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and protecting the environment. To measure the progress towards sustainability in urban areas is essential to develop indicator sets useful for decision-makers and for policy monitoring and evaluation.

Istat environmental indicator sets are a good starting point for building up an integrated environmental information systems, which is an essential base for the development of urban environmental sustainability indicators.

Istat urban environmental indicators: the framework

Through *Environmental Survey on Major Cities*, Istat collects data related to 22 major cities in which 10 million people live that represent approximately 18% of total population of Italy. The territorial units of analysis for data collection are the communes of Italy (Eurostat NUTS 5) and the environmental issues investigated are related to air, energy, green areas, noise, transport, waste and water. Data are collected from different sources, mainly from statistical offices of municipalities and from some administrative sources as public utilities (e.g. electricity and gas companies).

The primary aim of *Environmental Survey on Major Cities* is to improve quality of basic environment statistics and fill many data gaps related to urban statistics. The indicators selected by Istat cover the main environmental issues at cities level and represent the trends in respect to the pressures, the driving forces underlying these trends and the policy responses. In this way, Istat indicator sets are policy relevant and help to achieve a wider picture of the complexity of urban sustainable development.

The characteristics of Istat urban environmental indicators can be summarised as:

- based on common conceptual framework the DPSIR model;
- selected on basis of availability and analytically soundness criteria;
- easy to understand, policy relevant and measurable;
- cover information over time;
- provide a base for comparative analysis at local level;
- are appropriate information tools able to raise public awareness of particularly policy actions at local level.

Istat urban environmental indicators are measured annually from 1996 to 1999. Even though the selected indicators can not give a complete picture of all environmental issues involved, they are essential for identifying key sectoral trends and represent a first step in building up indicator sets able to measure progress towards environmental sustainability at local level.

Some remarks about urban sustainability

Istat indicator sets describe the basic context of urban environment, focus deeply on environmental issues particularly relevant at local level and can be used in defining and measuring the progress towards urban environmental sustainability.

Sustainable development strategies and policy actions can be different at national and local level and the local context is much more sensible to the policy intervention, so the information systems for urban areas have to provide an overview of policy-relevant facts and trends on detailed and regular basis.

The definition of sustainable development refers to an economic and social growth while protecting the environment. At national level a sustainable development is defined as a process of integration of economic, social and environmental concerns, which means assessing trade-offs between different dimensions of sustainable development and dealing with choices. Lists of sustainable development indicators have been compiled by international organisations, but the progress in

measuring sustainability is based also on the developing of environmental accounts. These instruments are not available at local level so become very important to define how is measurable the sustainability at urban level.

In urban areas local authorities are the level of governance closest to the citizens and efficient information systems are an essential policy tool since the policy strategies are coping directly with people. Cities are very important for testing the success or the failure of the policy actions and for the development of action programmes for improving the state of the urban environment. Local governments have to implement extensive citizens participation process in order to modify urban consumption patterns, intensity of resources use and the determinants of mobility towards more sustainable paths. The dissemination of information to the citizens become an important part of the consultative process and the monitoring of local policies becomes essential to measure the progress towards an environmentally sound management system of the cities.

Istat urban environmental indicators, improving availability of information and raising public awareness of particularly policy actions in order to achieve more sustainable development objectives, represent a set of indicators able to measure urban sustainability.

The selected indicators represent a primary tool to provide guidance for policy maker and have a potential for assisting in decision-making and monitoring local strategies.

Compared to UN/CSD indicator framework and CSD indicators list, considering all the four dimensions of sustainable development, Istat urban environmental sustainability indicators focus on the environmental dimension of sustainable development and cover some indicators from economic dimension (e.g waste generation and management), due to the inter dimensional aspects of urban sustainable development.

Istat urban indicator sets give information in particular on the setting up of environmental action programmes and sectoral policies for all the environmental issues investigated and in this way are a powerful information tools both for local government and the general public. Furthermore Istat environmental survey collects data related to environmental measures implemented by municipalities which give a wide picture of the state of urban environment.

Istat urban environmental sustainability indicators are listed in Table 1. The following list is by no means exhaustive and presents Istat indicators which are of particularly interest for urban areas of Italy. The selected indicators are adapted to specific country context and the interpretation of the indicators in context is essential.

Table 1. Illustrative list of possible urban environmental sustainability indicators

Issues	Urban patterns of environmental significance	Indicators	Measurement Unit
AIR	<i>Urban environmental quality</i>	Air pollutants in urban areas	
	<i>Air environmental management</i>	Density of fixed monitoring sites	sites per 100.000 inhabitants sites per 100 km ²
		Number of monitored air pollutants	
		Number of days of traffic restriction (affecting non catalysed passenger cars)	
ENERGY	<i>Energy use</i>	Electricity consumption per capita	MWh per capita
		Electricity consumption by sector (residential, industrial, agricultural, commercial/services)	MWh
		Gas methane consumption per capita	m ³ per capita
		Gas methane consumption by sector (residential, heating, others)	m ³
	<i>Urban action programme</i>	Implementation of Environment Energy Plan	

GREEN AREAS	<i>Urban environmental quality</i>	Density of public green areas	m ² per capita m ² per 100 km ²
		Density of public green by typology (urban parks, historic green areas, neighbourhood green, green belts, special green areas - school gardens, botanical gardens, green playgrounds, etc)	m ² per capita
	<i>Green areas environmental management</i>	Building up of new green areas in the year	
		Census of green urban areas in the year	
	<i>Urban action programmes</i>	Implementation of Green Urban Plan	
NOISE	<i>Noise environmental management</i>	Number of fixed noise monitoring sites	
		Implemented noise barriers	Km
		Number of implemented noise monitoring campaigns	
		Number of requests of interventions for noise disturbance by typology of noise sources (industrial activities, traffic, recreation activities)	
		Number of municipality's authorisations for temporary acoustic polluting activities by typology (musical events, sport events, noisy equipment, others)	
		Number of fines for traffic noise due to passenger cars	
	<i>Urban action programmes</i>	Implementation of Acoustic Zoning Plan	
		Implementation of Noise Abatement Plan	

TRANSPORT	<i>Supply of infrastructure</i>	Rail infrastructure length	Km
		Density of railway	Km railway lines per 100 km ²
		Density of lines by typology - railway, tram, metro, trolleybus	Km lines per 100 km ²
	<i>Density of road vehicle</i>	Passenger car density	Cars per 1000 inhabitants
		Road vehicle density	Road vehicle per 1000 inhabitants
		Density of taxis	Taxi per 1000 inhabitants
		Number of road vehicles by categories (e.g. passenger cars, buses, motorbikes, lorries), by fuel type (gasoline, unleaded gasoline, diesel, others) and by average age	
	<i>Transport environmental management</i>	Density of pedestrian areas	m ² pedestrian areas per 100 inhabitants m ² pedestrian areas per 100 km ²
		Cycling paths length	Km
		Density of restricted traffic zones	Km ² restricted traffic zones per 100 km ²
		Number of paying car parks on roads	
		Number of free car parks in proximity to public transport	
	<i>Public transport passenger</i>	Number of public transport passenger by bus, tram, metro, trolleybus	
	<i>Urban action programmes</i>	Implementation of Urban Traffic Plan	
		Innovative traffic control programmes	

WASTE	<i>Waste generation and management</i>	Collection of municipal waste	Kg per capita
	<i>Waste environmental management</i>	Separate collection of municipal waste by typology (paper, glass, plastic, aluminium, iron material, wood material, organic waste, etc)	Kg per capita
		Number of waste treatment and waste disposal facilities	
		Availability and use of recycling facilities inside the commune or in other commune	
		Density of waste dustbin	Dustbin per 10.000 inhabitants and per km ²
		Number of dustcart	Dustcart per 10.000 inhabitants
		Number of campaign to improve separate collection of waste from households	
		Number of fines for illegal waste disposal	Fines per 10.000 inhabitants
WATER	<i>Water resources</i>	Water consumption per capita	m ³ per capita
		Water consumption by residential use per capita	m ³ per capita
		Water consumption by sector (residential, industrial, agricultural, commercial/services, others)	m ³
	<i>Water environmental management</i>	Number of waste water treatment plants by typology	
		Percent of population connected to waste water treatment plants	
TERRITORIAL AND DEMOGRAPHIC DATA	<i>General indicators</i>	Territorial surface of the city	Km ²
		Population density	
		Number of Households	

Source: Istat *Environmental Survey on Major Cities*

Istat Indicators of urban environmental sustainability

The quality of urban environment is influenced by population density and by consumption patterns and individual behaviours which are also important determinants of personal mobility and transport needs.

Istat indicators sets do not measure cities environmental performance and by no means are useful for ranking cities, nevertheless Istat urban statistics provide a very useful base for comparative analysis on environmental trends at urban level.

From an analytic point of view, Istat environmental indicator sets can be divided in three type of sets which can help to measure environmental sustainability: *urban action programmes* indicators which are the policy strategies implemented by the municipalities for improving urban environment, they represent the institutional capacity at local level and the local action plans for dealing with environmental concerns; *urban environmental management* indicators represent the level of implementation of local strategies and the environmental measures taken by municipalities; finally a third set of environmental quality indicators, territorial and demographic data and pressure indicators which describe the environment condition of urban areas.

The selected indicators recorded in Tables 2 represent the actions programmes implemented by municipalities in order to integrate the environmental concerns into sectoral policies at local level. Indicators are measured annually from 1996 to 1999. The increasing number of action programmes implemented by municipalities from 1996 to 1999 should indicate an increasing efforts in dealing with environmental concerns in urban areas. The action programmes express the policy strategy at local level for protecting the environment and are the base of urban environmental management and measures taken by municipalities (Table 3).

All the indicators collected by Istat and listed in Table 1 and in the tables below describe the basic environment context of major cities of Italy and can help to monitor progress towards a more sustainable urban environment. The selected indicators focus on relevant issues at local level such as transport, noise, waste or green areas due to the relevance of the environmental issues for urban sustainable development and to the availability of data.

Table 2. Selected urban action programmes in major cities of Italy. Year 1996 and 1999 (a)

COMMUNES	Implementation of Environment Energy Plan		Implementation of Acoustic Zoning Plan		Implementation of Noise Abatement Plan		Implementation of Urban Traffic Plan		Innovative Traffic Control Programmes		Implementation of Green Urban Plan	
	1996	1999	1996	1999	1996	1999	1996	1999	1996	1999	1996	1999
Torino	X	X	-	-	-	-	X	X	X	X	-	X
Aosta	-	-	-	X	-	-	X	X	-	-	X	X
Milano	-	-	-	-	-	-	X	X	X	X	-	-
Bolzano	-	-	-	-	-	-	-	X	-	-	-	-
Trento	-	-	X	X	X	X	-	X	-	X	X	X
Venezia	-	-	-	-	-	-	-	-	-	-	X	X
Trieste	-	-	-	-	-	-	-	X	-	-	-	-
Genova	-	-	-	-	-	-	X	X	X	X	-	-
Bologna	X	X	-	X	-	X	X	X	-	X	-	X
Firenze	-	-	-	-	-	-	-	X	X	X	-	-
Perugia	-	-	-	-	-	-	-	X	-	-	-	-
Ancona	-	-	-	-	-	-	-	X	-	X	-	-
Roma	X	X	-	-	-	-	-	X	X	X	-	-
L'Aquila	-	-	-	-	-	-	-	-	-	-	-	-
Campobasso	-	-	-	-	-	-	-	-	-	-	-	-
Napoli	-	-	-	-	-	-	-	X	X	X	-	-
Bari	-	-	-	-	-	-	X	X	X	X	-	-
Potenza	-	-	-	-	-	-	-	X	-	-	-	-
Catanzaro	-	-	-	-	-	-	-	-	-	-	-	-
Palermo	-	-	-	-	-	-	-	X	-	-	-	X
Catania	-	-	-	-	-	-	-	-	-	-	-	-
Cagliari	-	-	X	X	X	X	-	-	-	-	-	-

Source: Istat Environmental Survey on Major Cities
(a) Provisional data for year 1999

Table 3. Selected indicators of environmental management by Municipalities. Year 1996 and 1999 (a)

COMMUNES	Monitoring sites for air pollutants per 100.000 inhabitant		Number of monitored air pollutants		Number of fixed noise monitoring sites		Implemented noise barriers - km		m ² Pedestrian areas per 100 km ²		km ² Restricted traffic zones per 100 km ²		Cycling paths length - km		Number of waste treatment and waste disposal facilities		Percent of population connected to waste water treatment plants	
	1996	1999	1996	1999	1996	1999	1996	1999	1996	1999	1996	1999	1996	1999	1996	1999	1996	1999
Torino	1,0	1,1	4,0	8,0	1,0	-	0,2	3,0	70.539	76.823	0,85	0,85	33,0	33,0	1	4	95,0	95,0
Aosta	17,1	17,3	5,0	10,0	-	-	-	-	1.640	1.661	1,87	2,34	-	-	1	1	100,0	100,0
Milano	1,5	0,8	5,0	9,0	-	-	-	6,5	52.620	53.168	-	0,07	30,0	37,0	3	4	-	-
Bolzano	3,1	4,1	5,0	7,0	1,0	-	-	5,7	10.508	10.510	0,51	0,57	20,0	14,0	3	5	94,8	95,0
Trento	2,9	3,8	11,0	12,0	-	-	-	-	-	-	0,22	0,22	23,5	28,2	2	5	100,0	100,0
Venezia	2,7	2,9	5,0	9,0	-	-	-	-	6.997	7.757	0,04	0,04	8,0	8,0	7	5	54,0	54,0
Trieste	1,8	3,7	4,0	6,0	-	-	46,0	44,3	-	-	-	-	5,9	5,9	1	2	90,0	85,0
Genova	4,0	4,1	10,0	16,0	5,0	4,0	-	1,9	450.328	540.604	1,40	2,67	-	-	1	2	-	-
Bologna	1,8	1,6	5,0	9,0	2,0	2,0	-	3,4	31.976	38.451	2,49	2,63	18,0	24,0	6	4	96,0	100,0
Firenze	2,1	2,1	5,0	8,0	-	-	0,7	5,1	269.505	286.105	3,62	3,61	11,0	17,0	7	11	15,9	15,9
Perugia	2,6	2,6	5,0	11,0	-	-	2,0	-	4.474	5.941	12,71	12,71	-	-	4	4	72,0	83,0
Ancona	4,0	4,1	6,0	8,0	-	-	-	0,3	6.887	6.887	13,85	13,82	-	-	4	2	85,0	77,0
Roma	0,5	0,5	7,0	10,0	-	-	0,2	-	11.048	18.514	0,35	0,57	16,0	22,0	3	2	85,0	85,0
L'Aquila	-	-	-	-	-	-	-	-	1.071	2.570	0,04	0,13	-	-	1	1	99,7	99,1
Campobasso	-	-	-	-	-	-	-	-	8.985	8.985	0,09	0,20	0,5	0,5	1	1	81,0	81,0
Napoli	0,9	0,9	5,0	5,0	-	7,0	-	-	214.832	248.524	46,05	36,67	-	-	1	2	70,0	-
Bari	-	1,8	-	-	-	-	-	13.941	21.859	0,15	2,81	-	2,3	1	2	90,0	92,0
Potenza	-	5,7	-	7,0	-	-	-	-	2.041	2.041	-	-	-	-	1	1	90,0	80,0
Catanzaro	-	-	-	-	-	-	-	-	-	1.168	-	-	-	-	2	2	75,0	75,0
Palermo	1,0	1,0	9,0	10,0	-	7,0	-	-	-	-	-	-	-	-	2	2	10,0	25,0
Catania	5,3	5,0	10,0	10,0	-	-	-	-	9.398	9.951	0,06	0,06	-	-	2	1	-	-
Cagliari	-	-	-	-	-	-	-	-	3.511	3.511	1,00	0,99	-	-	2	2	100,0	100,0

Source: Istat Environmental Survey on Major Cities
(a) Provisional data for year 1999

Urban Transport indicators

Road transport is a major source of air and acoustic pollution in urban areas. The integration of environmental concerns into transport policy is one of the main strategic objectives of current policies both at national and local level in Italy.

The government strategy for transport aims at improving the integration of the environmental concerns into national transport policy and at implementing environmental sustainable transport in urban areas. Specific policy actions have been implemented for promoting effective and environmentally sound transportation system, such as improvement in public transport and infrastructure, in vehicle emission limits and fuels quality.

Local municipalities are particularly involved in promoting the public transportation in order to achieve a more environmentally sustainable transport system. Municipalities try to deal with local mobility by managing the transport demand and optimising the modal balance. But the demand for mobility also depends by individual behaviours and lifestyle patterns for work and leisure purpose and a number of social aspects act as driving forces behind transport trends (household consumption, time for leisure, income levels, etc). As general pattern, differences in vehicle usage are due to wealth and availability of good public transport alternatives.

Istat selected urban transport indicators cover supply of city infrastructure, which is indicative of the accessibility of transport services and typology of land use, and city distribution of road vehicle. The number of road vehicle per capita is of primary importance in determining the environmental pressures from transport. Detailed characterisation of road vehicle stocks are very informative such as the number of vehicle by categories (e.g. passenger cars, buses, motorcycles, lorries), while data on average age and fuel type (unleaded gasoline, diesel, others) are very important for evaluating the efficiency of use of road vehicle and the related pressure on urban environment.

One of the main determinant of transport demand is the volume of passenger transport expressed in passenger-km which provides an indication of the modal split of the transport system. This information is not easy to achieve and represents one of the relevant data gap at local level. Through environmental survey on major cities Istat collects data related to the number of public transport passenger by bus, tram and metro.

The implementation of Urban Traffic Plan (Table 2) is one of the main action programmes taken by municipalities for improving environmental performance of local transport. Other environmentally effective actions have been taken at local level concerning urban traffic management (Table 3) such as traffic restriction in central areas through entry permits (e.g. Rome, Florence, Bologna, Ancona), traffic restrictions affecting cars not meeting the exhaust emission standards (e.g. Milan, Bologna, Rome, Naples), traffic free areas (e.g. Florence), increasing provision of cycling paths and walkways and the use of car-sharing (e.g. Florence, Rome, Naples) and computer assisted traffic control system (e.g. Turin, Milan, Florence, Rome).

The selected urban transport indicators can be associated with indicators related to air issue, since road transport is a major sources of air pollutants.

The indicators of density of fixed monitoring sites per 100 km² and the number of days of traffic restriction due to exceedances of alarm level in the city can give a picture of the air environmental management by municipalities. The data availability and quality depend on the number of monitoring stations. The number of monitoring sites is recorded in the Table 3 for each of the five main local air pollutants (NO₂, SO₂, O₃, PMs, CO). The number of monitoring sites varies between cities and it is quite stable over years, while the number of monitored pollutants in urban areas is increasing over year.

The indicator of air pollutants in urban area measures the number of days per year per station that the concentration of a number of air pollutants exceeded the health exposure limits in urban areas. In Italy, in accordance to the national legislation, there are two type of indicators which measures different type of exceedances of based exposure limits in urban areas. The Italian law provides

exceedances of "alarm level" which is a condition of risk for environment and health and exceedances of "attention level" which is a condition of air pollution that if continues it will determine risk of alarm level. For available stations, the number of days of exceedance of alarm level are very few if compared to the number of exceedance of attention level.

Noise Indicators

Noise is one of most pressing environmental problem in urban areas and the main source is road traffic followed by neighbourhood and aircraft noise. Istat indicators are related mainly to a variety of actions taken by municipalities to promote noise reduction measures (e.g. Acoustic Zoning Plan) aiming at abatement at source and at behavioural changes and to inform the public on noise pollution problem.

Measures on zoning, insulation programmes and noise barriers are local action plans to improve the situation and urban development planning in the cities is also a basic element in the fight against acoustic pollution by changing given urban areas into pedestrian ones, increasing the existence of open spaces, promoting the public transportation and improving the quality of buildings.

Data related to measurement of noise level in major cities are not available.

Energy indicators

Due to the scarcity of availability data at urban level, Istat indicators for energy use are related to electricity and gas methane consumption per capita and by sector in major cities.

The production and the consumption of energy have important impact on the environment, particularly atmospheric pollution. The challenge for local governments is to reduce energy consumption and increase energy efficiency also with a major use of renewable sources of energy in order to achieve development while protecting the atmosphere and the environment. From this point of view, is very important the setting up of Environment Energy Plan by municipalities to promote sustainable energy consumption patterns at local level through energy planning and management, but only few communes, between surveyed cities, at the end of 1999 have implemented local energy action plan.

Water indicators

The amount of water used per capita in urban areas reflects consumption patterns and also depends by the availability of adequate infrastructure that reduces the waste of water. The latter is particular important in the south of Italy where there are old infrastructures and water availability become scarce in summer season.

Municipalities try to ensure water demand and water supply by promoting efficient allocation of water resources for urban use. The availability of waste water treatment plants in urban areas give a measure of environmental management of water resources, since an adequate treatment of urban waste water prevents pollution of water.

Waste indicators

The amount of municipal waste generated has strong impact on environment, particularly on water, air and land resources. The generation of municipal waste reflects mainly household's consumption while separate collection of waste reflects individual habit and personal attitudes towards environmental sustainability patterns. One of the major national policy target is promoting recycling and reducing waste volume; urban waste management strategy try to minimise the amount of waste generated, maximise reuse and recycling and improve waste treatment facilities. The indicator of generation of municipal waste presents the amount of waste collected by or on behalf of municipal authorities. It represent the amount of waste disposed mainly by households and commercials (trade). In many cities, information for improving separate collection of waste from households through campaign have been played an important role in raising public awareness in sustainable

waste strategy. The indicator of waste treatment and waste disposal facilities presents the number of landfill sites, incineration plants and treatment sites e.g. composting sites.

Green areas indicators

Istat selected indicators quantify the extension and the quality of public green areas available in major cities of Italy and give a measure of local administration policy in improving "urban green system" in the cities, through Green Plan and efficient green areas management.

Green areas are an important land use in urban areas which perform important environment functions as improving urban climate, reducing atmospheric pollution, providing amenities, esthetical benefits and a good environment for urban population. Green areas planning and management are very important to achieve a qualitative urban environment.

Availability of public green and accessibility varies considerably in size and distribution within major cities of Italy with relevant difference for living condition of urban population. The selected indicators quantify the amount of green areas by typology as urban parks, historic green areas, neighbourhood green, school gardens, botanical gardens, green playgrounds which give a measure of quality and amenities of available green areas for urban population. Indicators related to public green areas management by municipalities as maintenance typology, staff number, cleaning service typology are also collected.

Conclusion

At local level is quite difficult to collect data and implement indicator sets necessary for building information systems able to measure progress towards sustainable development objectives. In urban areas policy strategies are copying directly with citizens and the availability of indicator sets for monitoring and evaluation are an essential policy tool; then the measurement of sustainable development has a crucial importance in selecting indicators.

Istat indicators collected from 1996 through *Environmental Surveys on Major Cities* represent a first important step to achieve a comprehensive system of environmental sustainability indicators at urban level in Italy. Considering all the four dimensions of sustainable development of UN/CSD indicator framework, Istat urban environmental sustainability indicators focus on the environmental dimension of sustainable development and cover also some indicators from the economic dimension. Istat indicator sets can be divided in three type of sets useful to measure urban sustainability: *urban action programmes* indicators which represent the institutional capacity at local level to deal with environmental concerns; *environmental management* indicators which are the level of implementation of local action plans and the environmental measures taken by municipalities and finally a third set of environmental quality indicators, territorial and demographic data and pressure indicators which describe the basic context of urban environment and focus on relevant issues.

Istat experience in developing urban indicators is not concluded and one of the following steps for improving the availability of urban indicators is the possible extension of the *Environmental Survey* to all 103 Provinces of Italy which will give a wider and deep picture of environmental sustainability at local level.

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