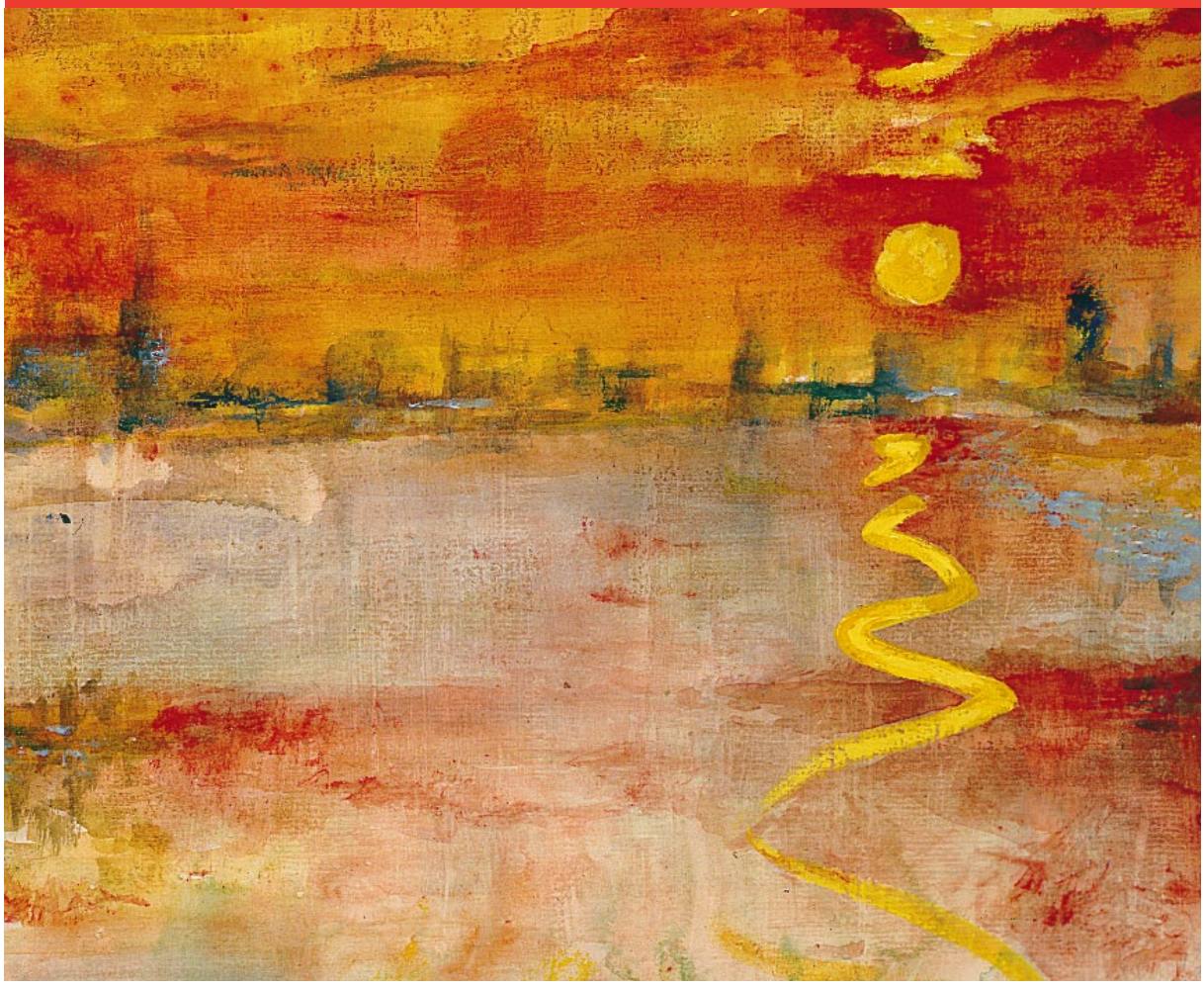
Urban Sustainability Indicators



EUROPEAN FOUNDATION
for the Improvement of Living and Working Conditions

Urban Sustainability Indicators

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Urban Sustainability Indicators

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FOREWORD

The Foundation's work on urban sustainability indicators started in 1994 when Voula Mega proposed a first set of indicators based upon The Charter of European Sustainable Cities and Towns, issued in Aalborg in May 1994. These proposals were discussed at a workshop on urban innovations and medium-sized cities, held in Oviedo in September 1994. The framework was subsequently tested by the cities participating in the research network of medium-sized cities. The full results can be found in the Foundation's publications "What Future for Urban Environments in Europe?", prepared for HABITAT II, and "Medium-Sized Cities in Europe".

This publication presents the urban sustainability indicators framework in the context of the Foundation's programme on socio-economic aspects of sustainable development.

Clive Purkiss
Director

Eric Verborgh
Deputy Director

A. EUROPEAN CHALLENGES FOR CITIES AT THE DAWN OF THE 21ST CENTURY: THE URBAN SUSTAINABILITY QUESTION

Europe is first and foremost urban. It consists of an archipelago with some of the most splendid cities humanity ever created. Braudel called these cities "greenhouses of civilisation", and Levi-Strauss "objects of nature and subjects of culture". Twenty-five centuries ago, Aristotle defined the city as "Built Politics". In the 1990s, cities emerge as the most complex and dynamic ecosystems, the only human ones, open, dependent and vulnerable. From the traditional city, with its physical, institutional and sociological entity, and the mid-20th century metropolis, dominated by a centre-periphery morphology, we moved to a new World city, a network of networks in a universal network. They are all "built politics", but politics confront even dynamic, shifting challenges (EF 1997a, b; EC 1996a).

At the dawn of the 21st century, cities appear stronger on the European scene and seem decided to remain the main centres of economic activity, innovation and culture. They establish brown, green and grey agendas to meet the three-fold challenge of globalisation, sustainability and cohesion. However, environmental problems and social shock waves cannot be absorbed in many cities, which become increasingly fragmented, far removed from the European urban archetype or the great urban utopias. Unemployment scars their face. The "Balkanisation" of the urban fabric – cities torn to pieces – and the cumulative spiral leading to exclusion become obstacles to the creation and (class and intergenerational) distribution of urban wealth. This unequal sharing has draining effects on the vitality of urban activities and is a source both of unsustainable lifestyles and obstacles to cultural change. New forms of poverty ("fuel poverty" etc.) become an overriding concern. Expressions like the "Martyr City", symbol of distressed urbanity, or even "Urban Genocide" are significant (EF 1997b; EC 1997b).

Cities crystallise hopes for a better tomorrow, which will be much less like yesterday. The global economy gives the opportunity to many more cities to become world players, but the global conglomeration might have strong central quarters and weak, peripheral ones (Sassen 1994). Globalisation may trigger processes of change which cannot be influenced by local communities, but which can reshape them against their will. Shifts may be swift, but lethal. D. Harvey, in a paper entitled "From Place to Space and Back Again", suggests the strengthening of the social place as the best way of meeting the new challenges emerging with globalisation (1991). Cities are the political institutions most able to create new democratic spaces between the world economic macro-regulations and the micro-regulations of the local community (EF 1997b).

The challenge of sustainable development raised awareness of the need for a new equilibrium between the Scylla of rising poverty and the Charybdis of overconsumption (EC 1997b).

Sustainability is equity and harmony extended into the future, a careful journey without an end-point, a continuous striving for the harmonious co-evolution of environmental, economic and socio-cultural goals. A sustainable city is one which succeeds in balancing economic, environmental and socio-cultural progress through processes of active citizen participation. All cities are now confronted with the challenge of considering economic, social and environmental issues simultaneously and constantly readjusting the balance. An unusual definition for sustainability is that sustainability is a striving for eternal youth. It is a continuous invention of new opportunities, resembling youth itself, a capacity for innovation which is a non-depletable resource, a permanent thirst for the unknown, the search for something better. All these issues were at the very heart of HABITAT II, the UN Summit on Cities (June 1996).

HABITAT II was an extraordinary event, representing the culmination of decades of effort (HABITAT 1996). The HABITAT agenda was based on principles of equality, eradication of poverty, sustainable development, liveability and diversity, family, civic engagement and government responsibility, partnerships, solidarity and international co-operation and co-ordination. It set out recommendations and concepts, it laid down a basis for substantive input from local authorities, the public and private sectors, NGOs and professional bodies; it emphasised the important role of private individuals and market forces. Several key points of consensus emerged: the economic, social, political and environmental futures of the Earth will depend on how urban issues are addressed; the roles of government decentralisation and of non-public actors are of increasing importance; local and national institutional and financial capacities have to be strengthened to address urban issues; most financial and technical resources have to originate from countries, cities and communities themselves. Finally, best practices and indicators were highlighted as the most innovative instruments towards urban sustainability.

“Innovation is a creative destruction” (Schumpeter 1976). It includes the invention of new concepts, products or ideas, the coalitions for their implementation and the transformation that they bring. An old world of obsolete ideas, principles and practices dies while a new one emerges. According to A. Einstein, “the world we have created today as a result of our thinking thus far has problems which cannot be solved by thinking the way we thought when we created them”. Indicators appear to be a rediscovered issue, linked to the urgency of adopting a new measure of progress. They have high potential for those cities wishing not simply to adapt to but to initiate the desired transformation. For cities are the only places where people concentrate at a level beyond which they produce not simply additional but synergetic effects. Innovation is a product of the “disorderly order of human interaction” (Jacobs 1969). The structure of coalitions to achieve political support is critical in order to reap the rewards of the transformation, because vested interests will always be resistant to change (EF 1993a, 1996c). Indicators offer a powerful instrument in addressing change.

Two-thirds of the actions proposed by the Rio Conference and Agenda 21 require the active involvement of local authorities, while Chapter 28 specifically addresses local government and calls for a consensus of local authorities on a Local Agenda 21. The EC's review of the Fifth

Environmental Action Programme includes a special mention of the decisive role of local and regional initiatives for the promotion and implementation of Local Agenda 21 (EEA 1995b). Cities and towns should base standards of living on a natural carrying capacity, while seeking to achieve social justice, financial and environmental sustainability (CEMR 1996). The process has proceeded unevenly. In some Member States of the European Union, the preparation of Local Agendas 21 took the dimensions of a decisive movement. In Sweden, all 288 local authorities have been engaged in Local Agendas 21 (EF 1996b). Around the globe, only 1,800 cities and towns have developed a Local Agenda 21. Even in these pioneer agglomerations, sceptics question whether these documents represent more than sanctimonious promises, whether their implementation will correspond to any degree with the desired goals.

On the road from Rio to HABITAT II, the first conference on European Sustainable Cities and Towns (Aalborg, May 1994) marked an important step in the move towards urban sustainability. At this conference, the EU Urban Environment Expert Group presented the First Policy Report for the application of the concept of sustainability in urban areas (EC 1994a), together with a Good Practice Guide. The main objective of the conference was the discussion and final issue of the "Charter of European Cities and Towns: Towards Sustainability". Eighty municipal signatories and 200 individual signatories were counted at the end of the conference. The end of the conference was the starting point for the European Campaign of Sustainable Cities and Towns (ESCTC 1994), which, at the end of 1997, has more than 300 cities participating. It constitutes the most massive movement of cities in Europe and is an important pillar in the panthéon of networks and movements. The Healthy City network, the United Towns Federation, EUROCITIES, the Council of European Municipalities and Regions and ICLEI are all partners in the campaign.

The Charter embraces an ecosystem approach to urban management and states the responsibility of European cities and towns for many of the environmental problems facing mankind. Patterns of division of labour and functions, land use, transport, industry, consumption, leisure, and, hence, values and lifestyles, are responsible for the reduction of sustainability. Sustainable development cannot be achieved without local communities, governments and citizens rising to meet the major challenge of sustainability. Sustainability is described as a creative, local, balance-seeking process extending into all areas of local decision-making. Each city has to find its own individual path towards sustainability. Integrating the principles of the Charter in their policies reinforces their strength and forms a common basis for progress.

The Charter, often seen as the European version of Local Agenda 21, recognises that natural capital has become a limiting factor for economic development in cities, and urban economies should give priority to investments in conserving the remaining capital and encouraging its growth by reducing the levels of current exploitation, relieving pressure on natural capital stocks and increasing the end-efficiency of the consumption goals. Social equity is considered to be a precondition to the achievement of sustainability, as the inequitable distribution of wealth both causes unsustainable behaviour and makes it harder to change. The Charter advocates the development of urban system sustainability indicators on which to base policy-making systems.

Urban sustainability is synonymous with a stream of at least non-declining output and seems inextricably linked to a non-declining urban capital (natural, physical and human). Urban metabolism can be perceived as the economic or production process which leads from flows of input (materials, products, energy, labour) to flows of output (products, services). A steady flow of output requires steady flows of input and maintenance of the urban metabolism. The output constitutes primarily the consumption basket for citizens, while a part is used for the maintenance of the production process (Hartwick 1994). We will need a reduction in consumption by moving from quantity to quality. According to the Charter, declining levels of per capita consumption might be quixotic, but it is of the highest importance at least to stabilise the consumption levels (currently increasing continuously in the northern hemisphere, even though technology often increases efficiency in the use of resources) through changes in lifestyles and consumption patterns.

City and town signatories of the Charter recognise that they cannot export problems into the larger environment or the future and seek equitable regional interdependencies. Priority is also given to ecologically sound means of transport and the decrease of enforced mobility. Emphasis is placed on the stabilisation and reduction of greenhouse gases into the atmosphere and the prevention of ecosystem toxification. The local authority signatories of the Charter are prepared to reorganise cities and towns for sustainability and ask for sufficient powers and a solid financial base. When developing Local Agenda 21 plans, cities commit themselves to working together with citizens.

B. TOWARDS THE DEVELOPMENT OF A SET OF SIGNIFICANT URBAN INDICATORS

The Commission's European Sustainable Cities Report (EC 1996a) recognises the need for sustainability indicators as tools for quantifying sustainability performance. If sustainability is a coherent policy goal, it must be possible to measure whether we are moving towards it. The World Bank defines indicators as performance measures that aggregate information into a usable form, highlighting, however, the unresolved issues of fluctuation, intertemporal variations and uncertainty. All organisations involved in indicator construction seem to agree that indicators provide a useful tool for policy making (prospective) and for assessing policy implementation (retrospective indictors), but they stress their limitations (World Resources Institute 1994).

The magnitude and significance of sustainability indicators has received much attention in recent years, but their real use in measuring urban sustainability performance is at an initial stage. Descriptive indicators, illustrating the status of the environment and based on real, concrete physical measures, are more easy to establish and interpret by judging them against specified benchwork and thresholds. Performance indicators are based on policy principles and goals. Indicators are meaningless without specified objectives and they cannot contribute to the improvement of the urban quality of life if there is not a policy framework, based on a diagnosis of the current situation, recognising that some facts should change and giving directions for change and objectives (and, if possible, ultimate targets) to be attained.

All organisations involved in the development of indicators seem to agree that the significance of indicators extends beyond that which is directly obtained from observations and that they should be clear, simple, scientifically sound, verifiable and reproducible. Urban indicators cannot include solely environmental indicators, as environmental performance is not the only factor in achieving a city's sustainability. Socio-economic issues play a critical role and socio-economic indicators are necessary. This was the very first conclusion of the Dublin National Forum on Indicators (UCD 1996) and the Rennes Conference, where more than 40 representatives from city networks and international organisations came together with 200 researchers and decision-makers to discuss the use of indicators in urban policies (OECD 1997).

The pressure-state-response model is a widely accepted framework for the compilation of sustainability performance indicators and has been adopted by the OECD and referred to by the World Bank. The model links the causes of environmental changes (pressure) to their effects (state) and finally to the projects, actions and policies (response) designed and undertaken to tackle these changes (Fig. 1). Indicators should tell us in what fields the city is doing better than in others and according to its specific goals. A single sustainability index should tell us whether or not the city is becoming more sustainable. The passage from thematic indicators to an index of

sustainability policy performance for cities is a complex task as indicators have to be weighted by contribution to sustainability levels and all the previous levels of aggregation have to be taken into account. A special effort must be made to avoid multiple counting of individual sustainability pressures which are taken into account in the composition of the thematic indicators (Fig. 2).

The required properties of indicators are that they should be significant, should aid in comparison, evaluation and prediction, and should help to construct and harmonise data banks, and decision-making at various levels to promote local information, empowerment and democracy. They should also contribute to making the city more visible and transparent and have, if possible, a symbolic role. They should embrace all sectors and neighbourhoods contributing to the co-evolutionary process of sustainable development. As with all innovations, the development of indicators is strengthened by the existence of a permanent innovative milieu. Seattle, in the USA, is often quoted as a classic example of a dynamic city with a coherent set of indicators.

The development of indicators for urban policies can be an important instrument fostering citizen participation. From information to active involvement, dynamic citizen participation is a precondition for the construction of the political identity of the European Union. There is a unanimously recognised trend: city dwellers are increasingly invited to act as partners rather than protesters. Scenario workshops try to bring together, on “neutral grounds” and on “equal terms”, various traditionally opposed local groups in order to formulate a consensus on a vision of a sustainable city. Enlightened consensus-building requires art and science from thinkers and doers; it needs decision-makers striving to become change-makers. It also needs instruments to establish equitable communication.

Indicators can more precisely measure pressure, state or policy, but in a dynamic situation what really matters is the “ultimate state”. A policy, no matter how good or sustainability-oriented, will not be efficient if the result is far from the goal (owing, that is, to the initial state or an unrealistic target). Indicators can measure the success of one course of action and even stimulate action, but they do not indicate what kind of action. Decision-makers, citizens and inhabitants have at their disposal a large choice of instruments for urban intervention and good practice guides can inspire them. Targets for thematic indicators may be defined at the city level, according to the priorities of each city. The performance of a city at a national or supranational level should therefore be judged according to both its targets and the progress achieved in this respect.

The “Charter of European Cities and Towns: Towards Sustainability” can serve as a valuable common policy framework for the development of performance indicators based on the policy principles and orientations of the Charter. The European Foundation made a first attempt to develop a set of sustainability indicators in the framework of its project on medium-sized cities (Mega 1994b). Efforts and achievements were extensively discussed at workshops organised by the Foundation, and indicators were subsequently developed for Alicante, Toledo, Evora, Coïmbra, Perugia, Siena, Freiburg, Dessau, Nîmes, Bastia, Parma, Kavala and Rhodes.

Figure 1. *A Conceptual Framework for Urban Sustainability Performance Indicators*

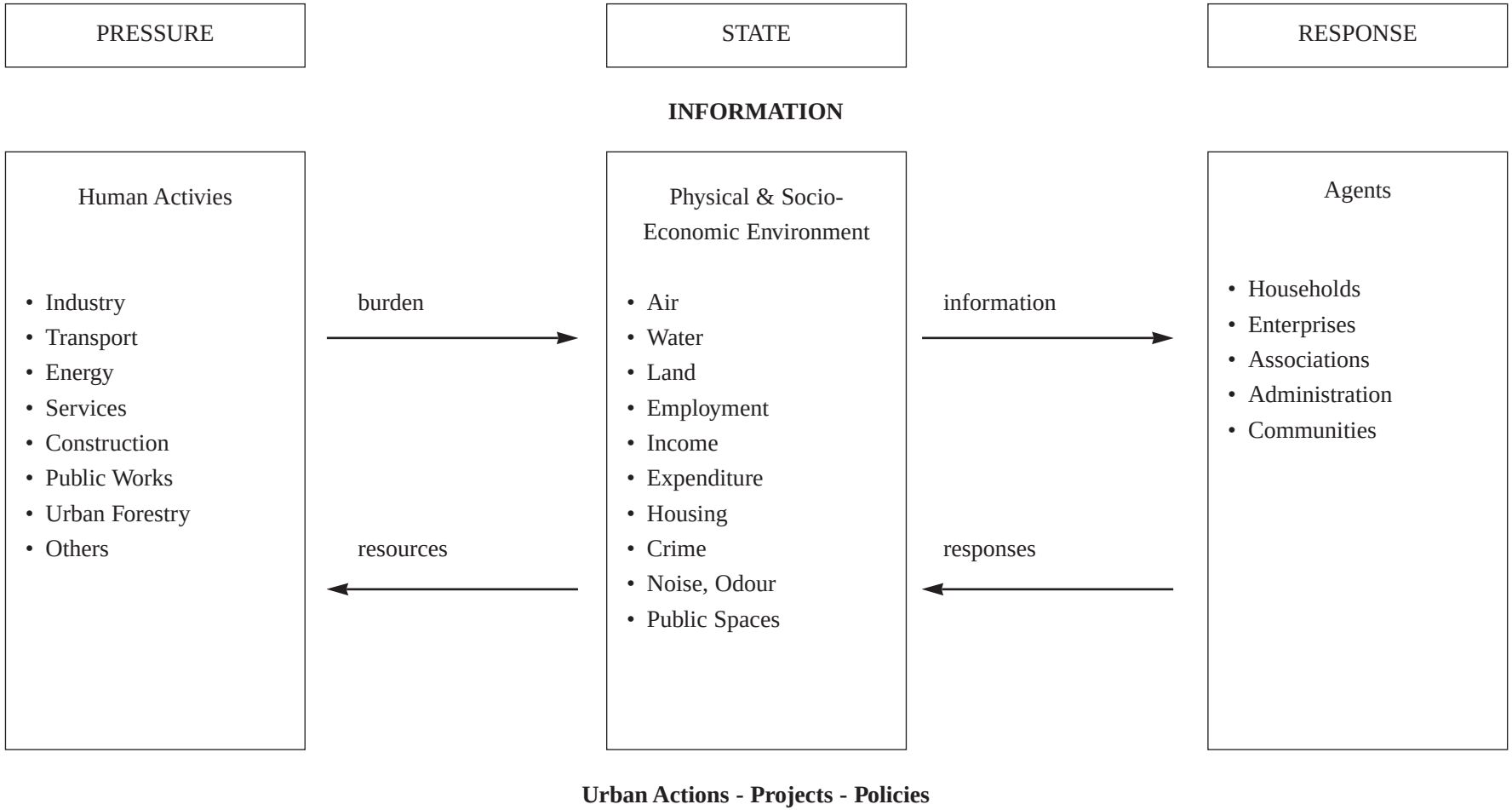
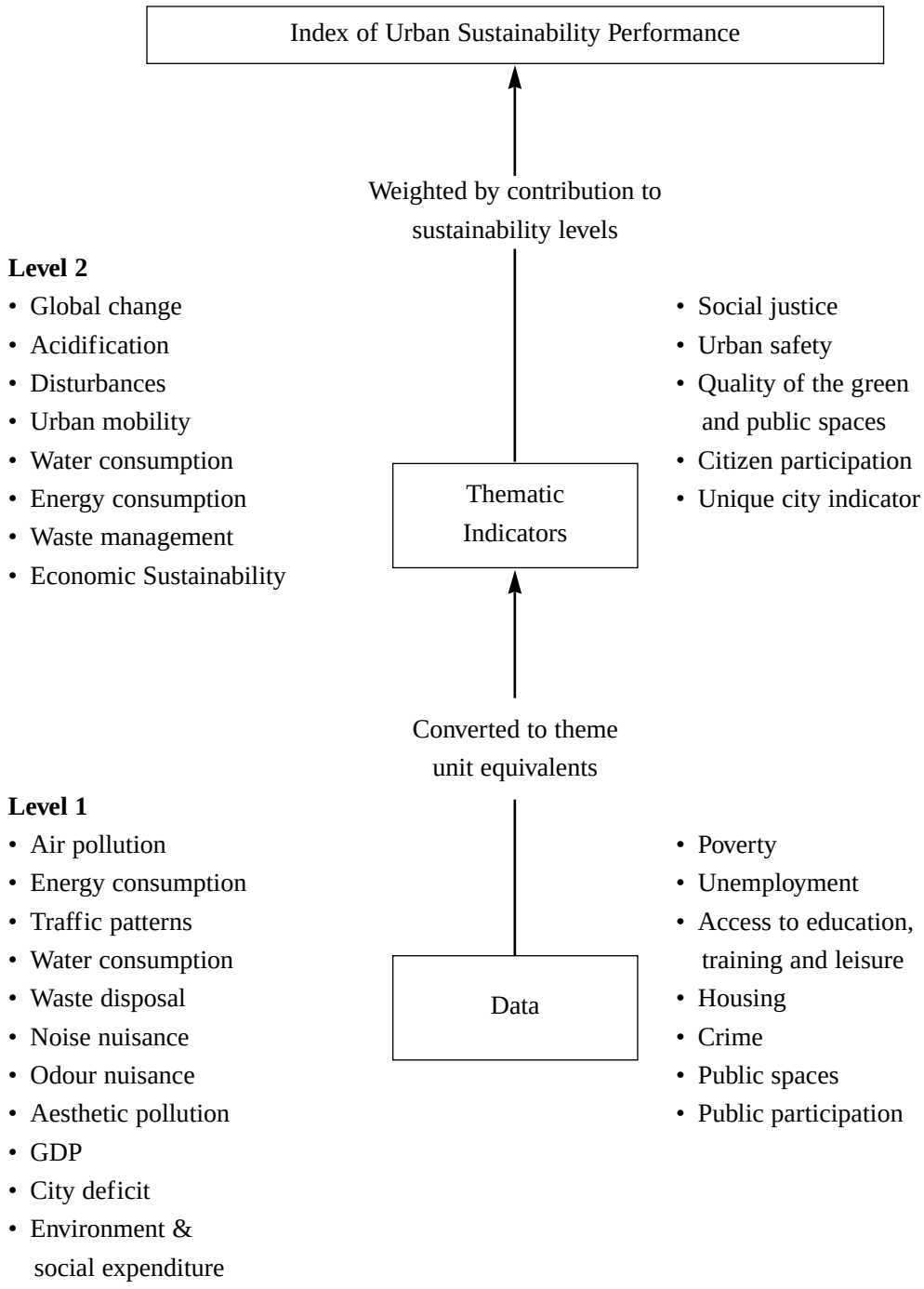


Figure 2. *Construction of an Indicative Index of Urban Sustainability Performance*



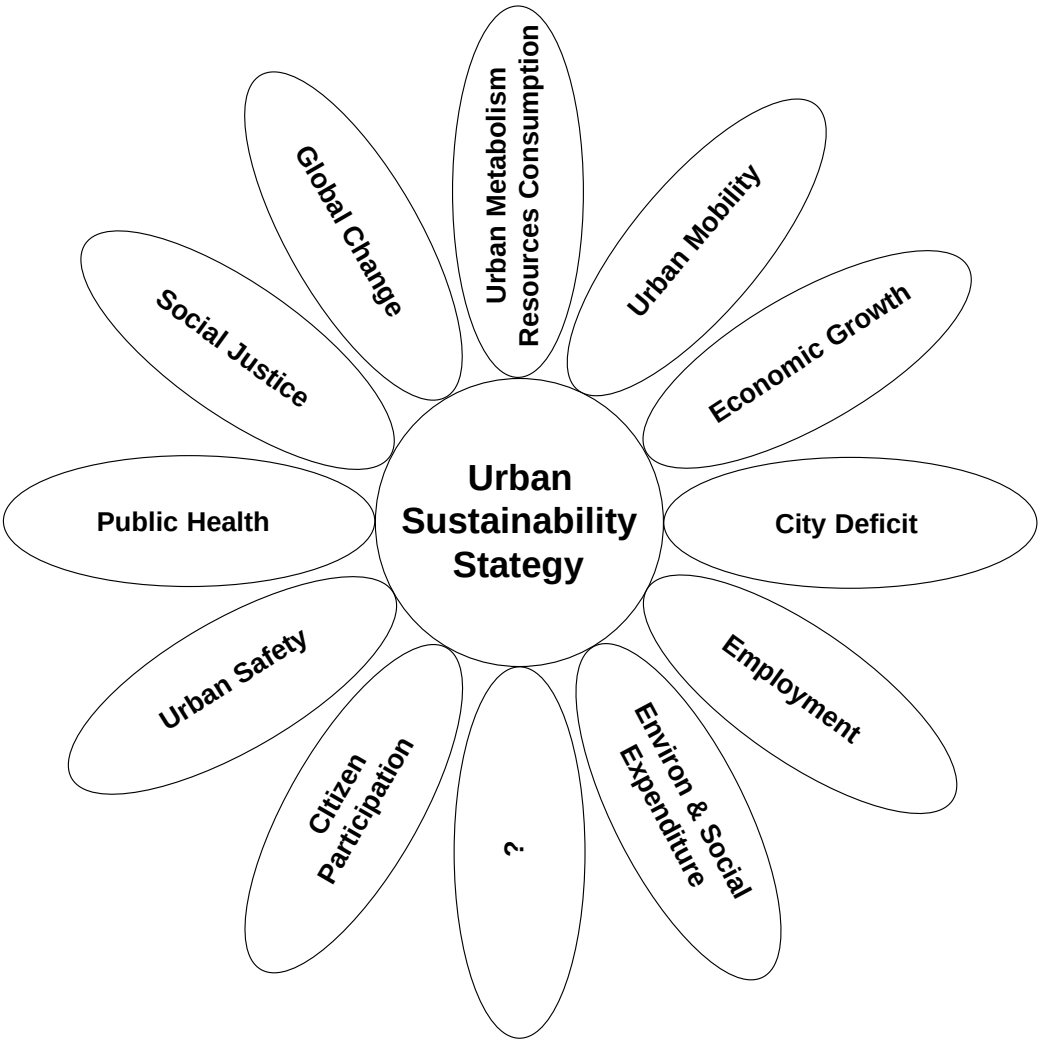
The policy fields emerging from the European Charter of Sustainable Cities and Towns constitute our basic framework for the development of indicators (Fig. 3). An indicator can be *a priori* assigned for each policy theme. The variety in nature and scale of the policy themes dictates the variety of the indicators to be suggested. The composed indicators should assert whether a city follows the directions for change declared in the Charter.

The suggested set of indicators includes nine environmental indicators. The indicators for the themes Responsibility for Global Climate, Acidification of the Environment, Toxification of Ecosystems and Local Disturbances follow the directions of the Dutch set, with its limitations and its potential (Adriaanse 1993). They express, together with the energy and water consumption indicators, with the exception of the local disturbances indicator, the responsibility of a city for the global environment. The local disturbances indicator, together with the air quality indicator, the urban mobility and the waste management indicators, expresses important aspects of the local quality of life linked to global considerations (Mega 1994b).

The indicators of social justice, housing, urban safety and citizen participation have been chosen to express some of the key social elements of sustainability. Next to these, the quality of green, heritage and public space indicator serves as a measure of the quality of spaces promoting public health, social life and cultural identity (Council of Europe 1992). Finally, for each city we thought it useful to assign a unique sustainability indicator representing the contribution of unique assets, characteristics or events to the sustainability of the city.

The scale for the development of each indicator is very much dependent on its nature: global climate, acidification, ecosystems, toxification or economic sustainability indicators are relevant at the city level. The remaining indicators are most relevant at neighbourhood level, if they are to reflect the various paces of development within the same city. The degree of diversity and heterogeneity within a city defines the territorial frameworks for the development of local significant indicators.

Figure 3. *Composing Urban Policies and Performance Indicators*



C. The Framework of Indicators-Revelators proposed by the European Foundation

(A) GLOBAL CLIMATE INDICATOR (GCI)

Definition: The contribution of cities to the change in the global climate.

Measure: Global Climate equivalent (GCeq) = total greenhouse gases (CO_2, CH_4, N_2O and CFCs).

Policy Direction: Decrease in the discharge of greenhouse gases.

Subindicators / Components Data: Emitted total CO_2, CH_4, N_2O and CFCs and halons.

Composition of the Indicator: The warming potential of the greenhouse gases in the troposphere is taken to weigh the constituent components. The degree (N) to which each greenhouse gas contributes to the global warming process depends on its concentration in the troposphere and on its ability to absorb the heat radiated by the earth.

$Gceq = N_{CO2} \times GC_{CO2}eq + N_{CH4} \times GC_{CH4}eq + N_{N20} \times G_{N20}eq + N_{CFC-11} \times G_{CFC-11}eq$ (if $N_{CO2} = 1$, $N_{CH4} = 1/12$, $N_{N20} = 1/290$, $N_{CFC-11} = 1/3500$)

Note: The target has to be fixed as a composition of the targets for the emissions of each one of the constituent greenhouse gases. The Protocol of Montreal, stipulating world-wide termination of the production and use of CFCs and halons by the year 2000, dictates that the target for these substances should be zero. These substances disintegrate ozone when entering the stratosphere and deplete the ozone layer.

(B) AIR QUALITY INDICATOR (AQI)

Definition: The number of days per year on which attention levels defined by law are exceeded in the most negative measurement.

Policy Direction: Improvement of air quality for all.

Subindicator: Number of days per year on which alarm levels are exceeded and traffic circulation is stopped.

Figure 4

NUMBER OF DAYS IN A YEAR ON WHICH ATTENTION AND ALARM LIMITS HAVE BEEN ATTAINED IN PERUGIA, 1991–1992

	Historic centre		Pesa Gate		Rome street		Fontivegge	
	Attention	Alarm	Attention	Alarm	Attention	Alarm	Attention	Alarm
SO2	0	0	0	0	0	0	0	0
NO2	0	0	30	0	110	5	154	14
CO	0	0	0	0	82	0	93	13
Particles			0	0	0	0	0	0

Source: Semboloni 1994

(C) ACIDIFICATION INDICATOR (AI)

Definition: The deposition of acidic components.

Measure: Acidification equivalents (Aeq) = total acidification caused by acidic compounds and deposited per hectare.

Policy Direction: Drastic reduction of deposition.

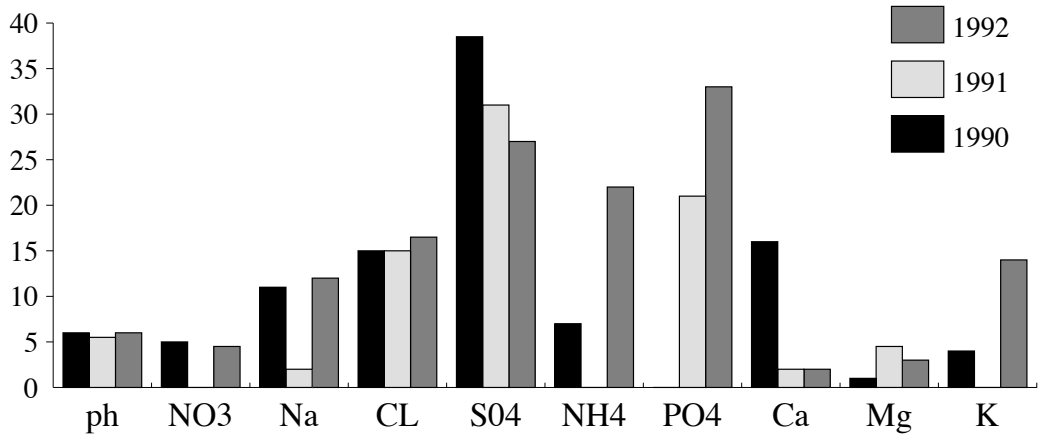
Subindicators / Components Data: Deposition of SO2/hectare.
Deposition of NO2/hectare.
Deposition of NH3/hectare.

Composition of the Indicator: According to the Dutch National Institute for Public Health and Environment, the Acidification equivalent used as the unit is the measure of the acidic potential of the various substances and corresponds to 32 g SO2, 46 g NO2 and 17 g NH3. Therefore, Aeq = 1/32 ASO2eq + 1/46 ANO2eq + 1/17 ANH3eq.

Note: The total deposition concerns the deposition of acidic substances on a city, regardless of whether they derive from local or remote sources.

Figure 5

AVERAGE PH AND MICROGRAMS OF ELEMENTS PER LITRE OF RAIN IN PERUGIA



Source: Semboloni 1994

(D) ECOSYSTEM TOXIFICATION INDICATOR (ETI)

Definition: The emissions of toxic substances.

Measure: Toxic Substances equivalent (TSeq) = total emission of priority substances and radioactive substances.

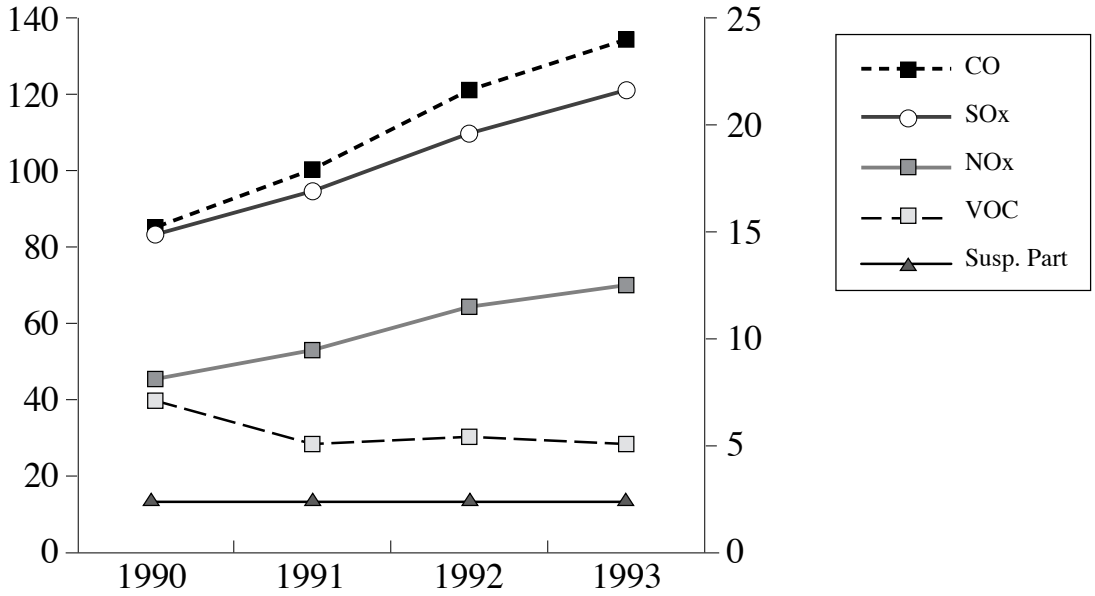
Policy Direction: Reduction of the quantity of each one of the hazardous substances released by the city to a level where the risk posed by each substance is negligible.

Subindicators / Components Data: Emitted quantities of cadmium, polyaromatic hydrocarbons, mercury, dioxin, epoxyethane, fluorides and copper. Emitted radioactive substances.

Composition of the Indicator: The indicator is the sum of the quantities of priority and radioactive substances emitted in the urban environment, weighted according to their toxicity and their residence time in the environment.

Figure 6

TOXIC EMISSIONS (kg/inhab.) IN PERUGIA



Source: Semboloni 1994

(E) URBAN MOBILITY INDICATOR (UMI) OR CLEAN TRANSPORTATION INDICATOR

Definition: The use of environment-friendly means of transport, especially for enforced mobility, defined as mobility for commuting and basic needs.

Measure: Urban Mobility equivalent (Umeq) = total number of passenger kilometres by non-environment-friendly means (private car) per inhabitant and per year. (If passenger kilometres cannot be estimated, trips can be used). Enforced Umeq (EUMeq) = total number of passenger kilometres – passenger kilometres by foot and bicycle – passenger kilometres by public transport, per inhabitant and for basic needs each year.

Policy Direction: Reduction of unnecessary use of motor vehicles, reduction of enforced mobility and improvement of accessibility. The EC's study on Car-Free Cities (EC 1992) indicates that there is a maximum number of private cars that cities can afford.

Subindicators: Enforced Urban Mobility Indicator (EUMeq, mainly for commuting). Relevant subindicators may be developed according to trip purposes (tourism, work and study, leisure, business, freight) and according to transport means.

Components Data: Total number of trips (and their length) by private car and number of trips (and their length) for commuting and basic needs/inhabitant/year.

Remarks: The increase/decrease in the length of pedestrian areas and cycle paths over time is also a useful indication of the city's policy to promote less unsustainable mobility.

Figure 7

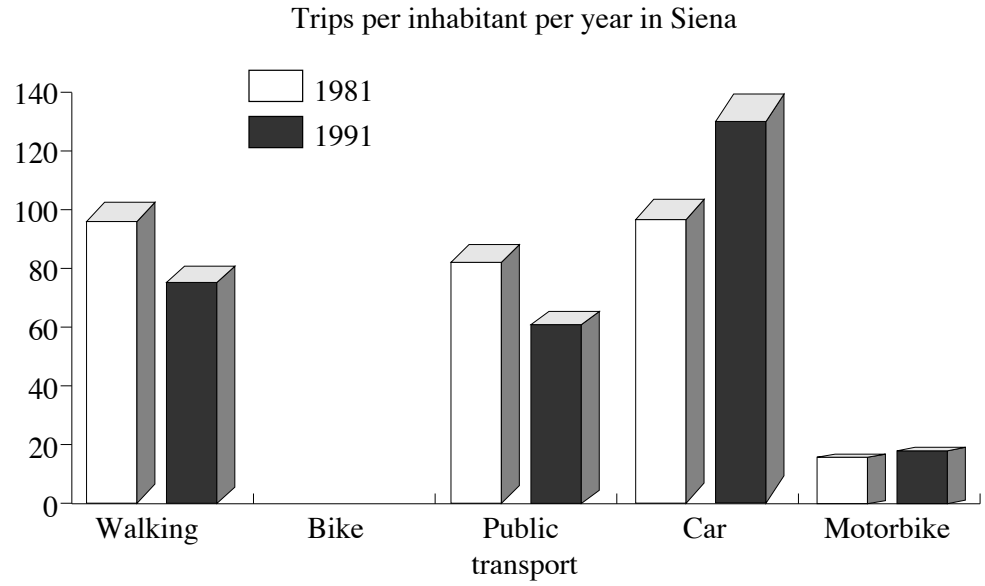
MODAL SPLIT IN SIENA

Trips per inhabitant and per year in Siena, 1991						
	Walking	Bike	Public Transport	Car	Motorbike	Total
Workers	58	1	35	116	14	223
Students	19	0	27	16	4	66
Total	77	1	62	132	18	289

Source: Population census, 1991

Trips per inhabitant per year in Siena.						
Year	Walking	Bike	Public Transport	Car	Motorbike	Total
1981	58	1	35	116	14	223
1991	77	1	62	132	18	289

Source: Population census, 1981-1991



Source: Semboloni 1995

(F) WASTE MANAGEMENT INDICATOR (WMI)

Definition: The total volume of waste disposed of.

Measure: Disposal equivalent (Deq) expressed in tonnes per inhabitant and per year.

Policy Direction: Primary goal: waste minimisation, i.e. prevention and avoidance, followed by reuse and recycling;
drastic reduction of waste for disposal.

Subindicators: Waste disposed of by incineration or in controlled landfills and in uncontrolled landfills; waste reused or recycled.

Components Data: Building and demolition waste.
Industrial waste.
Domestic waste.
Retail and service waste.

Composition of the Indicator: Following the principles of the Dutch system of indicators, the Disposal Indicator is the sum of all waste streams as they all end up at the same landfill sites (with toxic waste transported to special landfills) and, as with the actual practice of landfill, there is no adequate separation of the various types of waste.

Remarks: The indicator considers only solid waste. Liquid waste can be distinguished by degree of treatment. Possible overlapping with ecosystem toxification has to be considered.

(G) ENERGY CONSUMPTION INDICATOR (ECI)

Definition: The total amount of consumed energy.

Measure: Energy equivalent (Eeq) expressed in TOE (tonnes of oil equivalent) per inhabitant per year.

Policy Direction: Conservation and reduction.

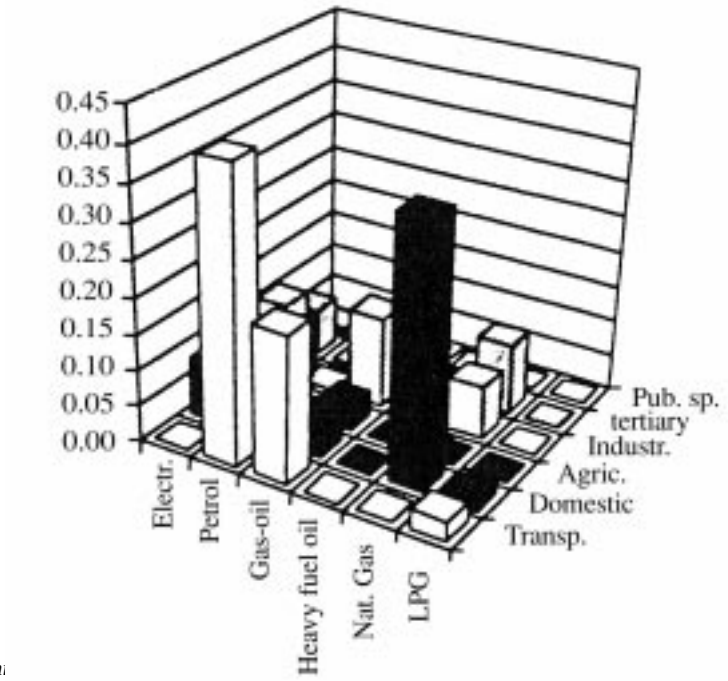
Subindicators: Consumed energy according to the source of production (renewable energy, electricity, petrol, gas-oil, heavy fuel oil, natural gas, carbon and wood).

Components Data: Energy for: domestic use;
industrial use;
tertiary sector;
public spaces.

Composition of the Indicator: The Energy Consumption Indicator is the sum of consumed energy per inhabitant per year.

Figure 8

ENERGY CONSUMPTION (TOE/inhab.) IN PERUGIA



Source: Sembolon

(H) WATER CONSUMPTION INDICATOR (WCI)

Definition: The total amount of water withdrawal.

Measure: Water equivalent (Weq) expressed in m3 per inhabitant per year.

Policy Direction: Reduction of water consumption by conservation patterns and techniques; recycling, reuse.

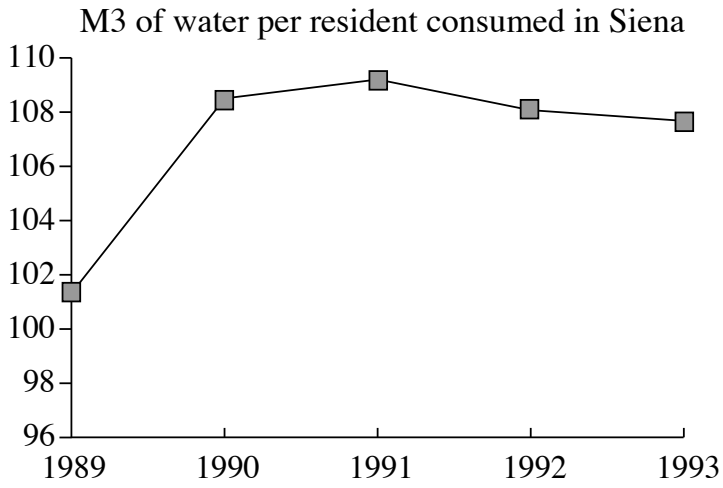
Components Data: Water for:
- domestic use;
- industrial use;
- building sector;
- retail services;
- maintenance of public spaces.

Composition of the Indicator: The Water Consumption Indicator is the total amount of water extracted. Water from recycling and used mainly for maintenance of public and green spaces is to be subtracted.

Remarks: Quantity of water lost in mains should be estimated (5-40% of the total amount).

Figure 9

WATER CONSUMPTION (m3/inhab.) IN SIENA



Source: Semboloni 1995

(I) NUISANCE INDICATOR (DI)

Definition: Nuisances created by noise, odour or visual pollution.

Measure: Nuisance equivalent (Neq) = percentage of the population affected by noise, odour or visual pollution.

Policy Direction: Improvement of local environments by reduction of odour, noise or visual pollution (Dutch target for odour or noise: 41 Neq by 2000).

Subindicator: It is essential to have a subindicator for the percentage of the population seriously affected by one of the above factors.

Components Data: Percentage of the population adversely affected by:
- noise;
- odour;
- visual pollution (i.e. graffiti).

Composition of the Indicator: Noise nuisance results from air, road and rail traffic and industry.
Odour nuisance is mainly caused by traffic, industry and services.
Visual pollution is mainly caused by derelict land and social degradation.
The total number of people affected is the sum of the people affected by any one of these sources after correction is made to avoid overlaps within the area of nuisances, as simultaneous exposure to different sources or different types of nuisance may occur.

Remarks: The complaints registered by source of nuisances are an indication of the seriousness of the problem. Regarding noise in particular, the number of days per year where measurements exceed norms is also a good indication and may serve as an alternative indicator.

(J) SOCIAL JUSTICE INDICATOR (SJI)

Definition: The degree of social sustainability of a city.

Measure: Social Justice equivalent (Sjeq) expressed by the percentage of people affected by poverty, unemployment, lack of access to education, information, training and leisure.

Policy Direction: Reduction (ideally elimination) of the percentage of the excluded and marginalised population.

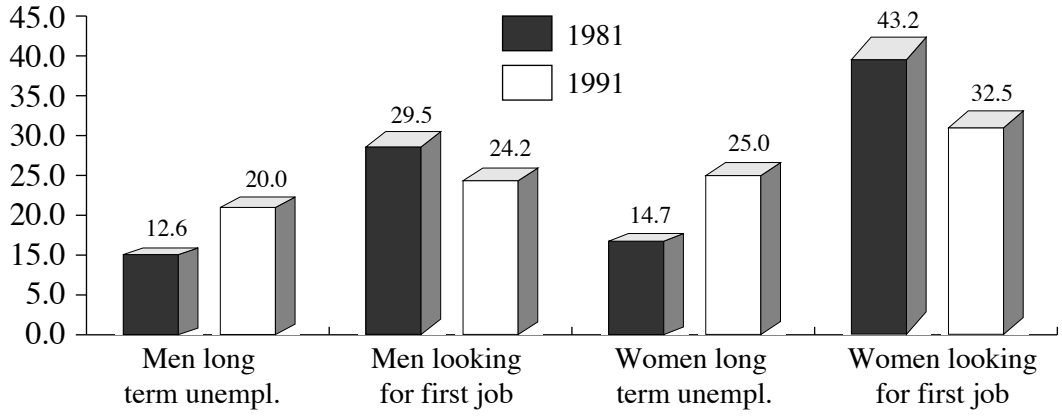
Subindicators: It is essential to have a subindicator for the percentage of the population seriously affected by one of the above components. It is also essential to have subindicators for vulnerable groups of population (youth, women, the handicapped and long-term unemployed).

Components Data: Percentage of the population affected by poverty, unemployment, lack of access to education, information, training and leisure.

Composition of the Indicator: The total percentage of people affected by lack of social justice is the sum of the percentages affected by any one of the above factors. A corrective factor has to adjust the percentage of the population affected by more than one factor.

Figure 10

COMPOSITION OF UNEMPLOYED IN PERUGIA



Source: Semboloni 1994

(K) HOUSING QUALITY INDICATOR (HQI)

Definition: The degree to which inhabitants suffer from poor housing conditions.

Measure: Housing Quality equivalent (HQeq) = percentage of people affected by lack of housing or poor housing environments.

Policy Direction: Offering all inhabitants good housing conditions.

Subindicator: The number of homeless in percentage of the inhabitants and of those who might become homeless.

Components Data: Percentage of the homeless population; percentage of the population threatened by loss of housing; percentage of the population in poor housing conditions.

Composition of the Indicator: The percentage of inhabitants without good housing.

Remarks: The number of registered demands for good housing is a good indication of the actual needs and may serve as an alternative indicator.

(L) URBAN SAFETY INDICATOR (USI)

Definition: The degree to which people suffer from lack of urban safety.

Measure: Urban Safety equivalent (USeq) = total percentage of the population affected seriously by crime or traffic accidents.

Policy Direction: Fostering of urban safety. Decrease in, ideally elimination of, attacks and incidents.

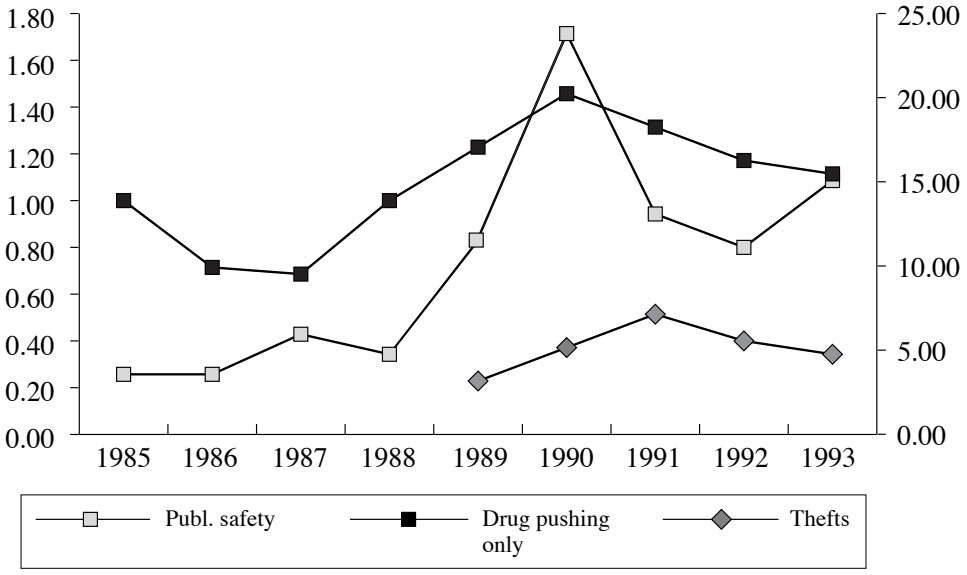
Subindicator: It is essential to have a subindicator for the total percentage of irreversible long-term injuries.

Components Data: Percentage of people attacked. Percentage of people affected by road accidents.

Composition of the Indicator: The total percentage of the population affected by the previous two factors.

Figure 11

CRIME INCIDENTS (per 1,000) IN SIENA



Source: Semboloni 1995

(M) ECONOMIC URBAN SUSTAINABILITY INDICATOR (ESI)

Definition: The viability of the urban economy.

Measure: Economic Sustainability equivalent (ESeq) = city income - city fiscal deficit - environmental expenditure - pollution damage per inhabitant per year.

Policy Direction: Increase of economic sustainability with increase of city income and city budget and reduction of pollution damage.

Components Data: City income (total individual incomes).
City fiscal deficit (–) (city budget – taxes).
Environmental expenditure (for waste collection, sewage, transport, water management).
Pollution damage (air, water, land).

Composition of the Indicator: ESeq = [CI – CFD – EE – PD]/population.

Remarks: The city environmental expenditure per inhabitant per year is a good indicator of the city's environmental behaviour, and the city expenditure per inhabitant per year is an expression of the city's financial capacity. They can both serve as valid subindicators.

(N) GREEN, PUBLIC SPACE AND HERITAGE INDICATOR (GPI)

Definition: The improvements needed for green, public spaces and heritage.

Measure: Green, Public Space and Heritage equivalent (GPSeq) = percentage of the green or public spaces and local heritage in need of improvement.

Policy Direction: Improvement of green and public spaces, restoring sites, forging the identity of cities.

Subindicators: It is important for urban quality of life to have the surface of green spaces per inhabitant, the surface of heritage spaces per inhabitant and the surface of public spaces per inhabitant. They are suggested as alternative indicators.

Components Data: Percentage of green spaces needing improvement/total surface of green space. Percentage of heritage spaces in need of improvement/total surface of heritage space. Percentage of public spaces (including heritage sites) in need of improvement/total surface of public space.

Composition of the Indicator: The percentage of green, heritage and public (including historic) spaces to be improved is the sum of the three percentages.

(O) CITIZEN PARTICIPATION INDICATOR (CPI)

Definition: The degree to which the local population participates in the decision-making and improvement of the local quality of life.

Measure: Citizen Participation equivalent (CPeq) = total percentage of the population participating in local elections or as active members in associations for urban improvement and quality of life.

Policy Direction: Co-management of cities with citizens, urban governance with all actors.

Components Data: Percentage of people participating in local elections.
Percentage of people being active members of environmental, public health and cultural associations.

Composition of the Indicator: The total percentage of the population active in local elections and participating in associative life.

Remark: It is important when assessing the participation in local elections to know if participation in the elections is obligatory or not.

(P) UNIQUE SUSTAINABILITY INDICATOR (USI)

Definition: Indicator to be defined by each city according to its uniqueness (i.e. unique climatic and local conditions) or the planning of a unique once-in-a-lifetime event such as the organisation of the Olympic Games or a universal exhibition. This indicator should represent the degree to which unique factors or events lead to urban sustainability with its environmental, social and economic dimensions.

It is worth highlighting in this respect the Tourism Sustainability Indicators developed in Venice by the Eni Enrico Mattei Foundation, as a model of its kind.

D. TOWARDS THE DEVELOPMENT OF AN INDEX OF URBAN SUSTAINABILITY PERFORMANCE

Indicators are not simply relevant data or statistics. The definition of indicators is a complex procedure which will have to be checked and updated whenever required. The degree of complexity increases with the creation of a unique sustainability index, as indicators have to be weighted by their contribution to urban sustainability levels. The method we suggest for defining a unique urban sustainability index is based on a survey measuring the theoretical degree of interest shown by the citizens of a given city. The theoretical degree of interest is the individual's true value, true probability of accepting an offer and true ranking of alternatives.

The design of the survey should include the assessment of the survey instruments (and scenaria, to see if all known sources of bias have been removed or avoided) and the empirical analysis of responses to check their consistency. For urban policies, it is essential to know how citizens value the different fields of action and intervention. Their willingness to pay for achieving sustainability goals is most important when decisions are to be taken for the provision of a public good or an increase in the level of an environmental amenity. For the given set of sustainability goals, the survey should be based on the following principles:

1) All the citizens included in the sample representing the city population should have full information on all sustainability goals and fields. There is, in general, much more information on local environment and quality of life issues than on those concerning the national and global level.

2) The basic question is how the citizens divide the whole budget available for improvement of the environment and quality of life (i.e. total taxes) into the following categories:

    - Reduction of the city's contribution to the global climate
    - Improving air quality
    - Cleaning-up of the acidic deposits
    - Preventing ecosystems toxification
    - Reinforcing clean transportation
    - Reducing waste disposal
    - Reducing energy consumption
    - Reducing water consumption
    - Reducing levels of local nuisances
    - Improving social justice
    - Improving housing conditions
    - Improving urban safety

- Improving local heritage, green and public spaces, or
- Improving a specific local condition or investing in the creation of a unique project (to be specified for each city)

3) Systematic errors or bias into the value measures should be avoided by:
   - Adequate provision of information to make the context of the question fully understood by the respondent, in order to avoid mis-specification;
   - Provision of information in a way not to predispose the respondent;
   - The questions and information should not provide any incentive to the respondent to misrepresent his or her values.

4) In the set of fields of action suggested above, we did not include the economic elements of sustainability and the citizen participation goals. The economic urban sustainability indicator, with the composition suggested here, is, in fact, an index as it includes economic, social and environmental considerations and may be used as a reference to measure the economic and environmental improvements. However, this indicator depends on the budget allocated to the city by the central government and cannot be used as an absolute indicator for the performance of the city. It depends also on the level of local taxes, a fact which might induce respondents to misrepresent their true values. The survey should consider the degree of the respondent's participation in local improvements, mainly because a citizen involved in local policies is better informed and more aware.

5) The analysis of the survey results would conclude with the degree of preference of citizens, expressing the weight citizens give to each sustainability goal and field of urban intervention. This weight is what citizens perceive as contribution of each goal to the achievement of sustainability in their city. The thematic indicators, weighted by their contribution to sustainability levels, compose the index of Urban Sustainability Performance.

6) The survey should be done periodically to identify changes in preferences of the same respondents.

The above methodology leads to an index of sustainability independent of finances provided to the city. The Charter states that for the achievement of the sustainability goals it is essential that local authorities are given a solid financial base. The city may allocate its budget to projects according to citizens intensity of priorities, without achieving significant improvements in each field.

E. HIGHLIGHTS AND PERSPECTIVES

Many more indicators could also enrich the set of suggested indicators. It is, however, essential to have the shortest, most significant set. Income per capita, provision of housing units, socio-economic composition reveal much about a city and its quarters. The natural space urbanised each year is a valuable indicator of sustainability. It has been suggested to have separate sets of indicators for residential population and tourists who, in cities like Rhodes, represent two different social entities. Seasonal fluctuation is also very important for tourist cities. Indicators of social conflicts (hosts-tourists) or indicators of cultural sustainability (i.e. evolution of spoken languages etc.) could also be envisaged. Data are often missing, but the problem mainly concerns their quality and significance rather than their quantity.

In the Foundation's project on medium-sized cities, the exercise only reached the stage of the development of thematic indicators. A discussion on the progress towards the sustainability index remains to be undertaken. As a general rule, the cities studied possess too little information on problems linked to the global environment and much more on the local environment. This can possibly be explained by the fact that global concerns have been the most recent ones to be included in the urban agenda. The only measured gas contributing to the global climate change is CO_2. Concerning air quality, we have been surprised to see that even in medium-sized cities, attention and alarm limits, especially for NO_2, are often exceeded. This indicator can be totally insignificant if the attention or alarm levels are not exceeded (as is the case of Kavala or Rhodes).

One of the most interesting indicators for all cities has been the one concerning urban mobility. The evolution of modal split is very important for changing environmental models and lifestyles. In an attempt to compare cities we distinguish two outstanding exceptions, both from Germany. The first, Freiburg, is the secret capital of ecology, and the other, Dessau, is in a maelstrom of problems, challenges and changes. Freiburg is one of the few cities witnessing an increase in the use of public transport and this only after 1989 (the boom in public transport use was registered in 1991 with the introduction of the “Environment Pass”). In Dessau, the use of public transport has decreased continuously since 1972 (16%) and fell, from 1990 to 1991, from 12% to 6%. On the other hand, the private car, used by 25% of the inhabitants in 1990, still conquered 37% of them in 1991. It is also interesting to see that cities' efforts in restricting the access of private cars to their historic centres, like Perugia, did not succeed in a total decrease in private car use.

The indicator of energy consumption seems quite coherent with the increase in the use of the private car. Water consumption is slightly increasing with a dramatic amount lost in water mains (in some cases up to 40% of the quantity provided). As to local nuisances, noise pollution is becoming a serious problem, even in medium-sized cities. There is very little information on olfactory nuisances and almost nothing on visual and aesthetic pollution. The perceived

cleanliness of local environments may also lead to the formation of a valuable indicator. In Rhodes, a Ministry of the Environment survey insisted on citizens' perception of the quality of beaches and sea water. The indicators on waste management reveal an insignificant rate of reuse and recycling in most cases (zero for the city of Kavala and around zero for a number of other cities), and even in cities that have introduced pioneering recycling schemes, like Parma, the quantity recycled represents only 0.1% of the quantity produced.

The social justice indicator reveals that in all the cities included, 10% of the population, on average, suffers from various degrees of exclusion, even though the homeless population is not registered. However, Freiburg (which, along with Parma belongs to well-developed regions of the European Union) has registered 1% of the population as homeless, 2.8% of the population as threatened by loss of housing and 8.3% of the population as living in low-standard social housing. Concerning unemployment, Alicante has a rate of 16% and Dessau more than 20%. In 1991, Parma was the only city with an unemployment rate lower than the EU average. However, after a rapid increase, it reached this average in 1994. The same city also registers the lowest percentage of bad housing (5% in 1991), but this indicator is mainly formed from the number of square metres per inhabitant. Less than 1% of the urban population appeared to have been victims of social insecurity in the cities studied and this conforms quite well to the peaceful and serene image of medium-sized cities (EF 1997d).

Our case studies did not define extremely vulnerable social groups, but the study on Alicante revealed that, in 1991, 2.65% of the population was illiterate, which is a very high percentage for an urban population in Europe. The development of an economic sustainability indicator led to the study of the varied composition of municipal budgets, but it did not succeed in revealing whether a city has the means to pay for its search for sustainability. The development of the indicator of local heritage, green and public spaces was made difficult by the many different definitions of such spaces, which in some cities even include forests which are within the administrative boundaries. The indicator on citizen participation in local elections cannot have much significance in countries where voting is compulsory. Citizens' participation in cultural associations seems more significant and the indicator reveals that more than 10% of the inhabitants of the cities studied participate in such associations.

At the turn of this century, building Eutopia (Doxiadis 1975a) depends on the art of co-governing cities by and with the help of all actors. Institutional innovations and indicators are needed to provide fertile ground for socio-economic improvements and creativity. All actors have a major role to play in this process. It involves establishing a sense of urgency, developing a vision and strategy, communicating the vision of change and proposing new measures for evaluating progress. They must proceed with empowering people for broad-based action, generating short-term wins, consolidating gains, producing more change and anchoring new changes in culture. Cities need paradigm shifts towards a new economic, political and socio-environmental equilibrium.

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European Foundation for the Improvement of Living and Working Conditions

Urban Sustainability Indicators

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Urban Sustainability Indicators

Urban sustainability indicators are important instruments for assessing the performance of cities. They include environmental, economic and social indicators designed to identify progress in meeting the objectives of socio-economic and environmental sustainability.

Many European cities work with specific sets of indicators which enable them to measure their success in attaining their targets and communicating with their citizens. The Foundation created a common framework of urban sustainability indicators for cities according to the Charter of European Sustainable Cities and Towns, the European version of Local Agenda 21.

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