Geo Cities Manual

Guidelines for Integrated Environmental Assessment of Urban Areas

UNEP

EECCA Region
UNITED NATIONS ENVIRONMENT PROGRAMME

Totally revised and updated edition customized for the Eastern European, Central Asian and Caucasus region based on the following sources:
"GEO Cities Application Manual", version 3 (UNEP, 2008)
"GEO Cities Adaptation for the Arab region" (UNEP, 2009)
"GEO resource book / Integrated Environmental Assessment Training manual" (UNEP, 2006)

Prepared by Zoï Environment Network on behalf of UNEP-DEWA/GRID-Europe

Editor: Claudia Heberlein, Zoï Environment Network
Analysis and organisational support: Oksana Yakovenko, Nikita Efimov, Alexandra Serebriakova
Layout and Design : Carolyne Daniel

Reviewers:

Nickolai Denisov, Zurab Jincharadze, Zoï Environment Network, Geneva (Switzerland)
Ron Witt, UNEP-DEWA/GRID-Europe, Geneva (Switzerland)
Nora Mzanavadze, Central European University, Budapest (Hungary)
Cristina Garzillo, ICLEI, Bonn (Germany)

Experts in countries and cities:

Dmitry Averin, Donetsk (Ukraine)
Karine Danielian, Yerevan (Armenia)
Ella Ivanova, Moscow (Russia)
Fikret Jafarov, Baku (Azerbaijan)
Pavel Makagonov, Huajuapan de León (Mexico)
Anatol Shmurak, Kyiv (Ukraine)
Lusine Taslakian, Yerevan (Armenia)

Disclaimer:

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the United Nations Environment Programme concerning the legal status of any country, territory, city or area or of its authorities, or concerning delimitation of its frontiers or boundaries. Mention of a commercial company or product does not imply endorsement by the cooperating partners. The views expressed do not necessarily represent the decision or the stated policy of the United Nations Environment Programme, nor does citing of trade names or commercial processes constitute endorsement.

Table of Contents

List of boxes

List of tables

List of figures

Preface

The future will be predominantly urban, and the immediate environmental concerns of most people will be urban ones.

World Commission on Environment and Development (WCED) 1987

Currently, about 75% of the European citizens live in urban areas, with a slightly increasing trend. Local governments are important actors in implementing sustainability strategies and in protecting the environment. Many local governments have started their own initiatives in developing innovative approaches towards public participation in environmental protection, as well as integrating social, economic and environmental perspective into their future development strategies.

As the EECCA region continues to face serious environmental problems to which urban areas contribute significantly, the role of local governments in improving sustainable management of environmental problems is becoming increasingly important.

Air pollution has increased by more than 10% since 2000, more waste is generated every year, while there still remains a legacy of old waste sites across the region, often hazardous and hardly managed. Water quality and supply have been deteriorating in many places, and water loss can be up to 90% from capture until its arrival at the end user.

The fundamental objective of the GEO Cities project is to promote a better understanding of the interaction between urban development and the environment, providing the region's local governments, scientists, policy-makers and the public with reliable and up-to-date information to help them improve urban environmental planning and management. The GEO Cities assessments provide information on the state of the environment, the main factors for change, and the policies affecting the environment and emerging themes.

Introduction

1   Introduction

Planning and management for sustainable development require an understanding of the linkages between environmental conditions and human activities and encourage participation by all sectors of society in decision-making. The GEO cities manual is a useful tool that will help strengthen institutional capacity to prepare environmental assessments and comprehensive reports on cities in Central and Eastern Europe, the Caucasus and Central Asia.

The GEO cities process will support efforts to reach a consensus about the most critical environmental problems in a given city, by establishing a permanent dialogue between the different stakeholders, including specialists on environmental topics and the local government / administration and society.

The present manual explains how to analyse the determining factors of urban development and their relationship with ecosystems and natural resources. This will eventually lead to establishing an environmental database allowing continuous follow-up of progress made in reducing the city's environmental impacts, based on appropriate indicators.

At the end of the process, the municipalities will be able to assess the state of environment of their city, and formulate strategies and programmes to help city administrations to deal with environmental risks, improve the environmental conditions and manage their city in a more sustainable way. In the long term, the assessment will lead to better-informed decision making and enhanced environmental planning and management thus helping to improve the quality of life for the dwellers of cities and their surrounding regions.

The GEO Cities manual is divided into two distinct parts:

1. **How to run the process of an Integrated Environmental Assessment (IEA)**, that is what different steps to take in a IEA, whom to involve, whom to consult, how to promote the results, and how to generate the most impact.

2. **Contents** of the Integrated Environmental Assessment on the local level: describing common issues and indicators for each stage of the assessment.

The GEO Cities Manual for Integrated Environmental Assessment of Urban Areas for the EECCA region is part of the Global Environment Outlook process of the United Nations Environment Programme (UNEP). It aims to build capacities in the EECCA region for integrated environmental assessment and reporting at local level. At the global level, the GEO process[1], which incorporates different activities including capacity building and production of a report series and other materials, aims to:

- Track yearly environmental issues and developments[1], and thus highlight for policy makers and other stakeholders in the GEO Year Book report series developments as well emerging issues and technology advances.

- Undertake, once every five years, a comprehensive and policy relevant assessment of the state of the global environment, analyzing environmental trends, their driving forces, current policies and emerging issues as well as the impacts of the changing environment on people and ecosystems.

---

1   GEO is a consultative and participatory capacity building process for global environmental assessment and reporting on the state of the environment, trends and outlooks. GEO is both a *process* involving stakeholders from across the globe, as well as a *product* for environmental decision-making. The GEO process aims to facilitate the interaction between science and policy-making.

2 GEO Cities Methodology

2.1 Integrated Environmental Assessments

An integrated environmental assessment goes beyond simply describing the state of the different elements that constitute the environment, including also the circumstances that lead to this state and the resulting consequences and effects this has into the analysis.

More concretely: In order to slow, stop and ultimately reverse environmental degradation, we need to understand not only what is directly causing that degradation, but also how human society is contributing through its policies and decisions. In order to go to the root of a problem, one must look not only at potential physical causes (e.g. groundwater depletion caused by water withdrawal for irrigation), but also understand public policy decisions and the web of related interests that lay in the background (e.g. economic incentives for water pumping, strategic food self-sufficiency policies).

The essence of his approach can be summarized in the following five questions:

Question 1:
What is happening to the environment and why?

Compile and analyze **status and trends** of the environment, including pressures and driving forces.

Question 2:
What are the consequences for the environment and humanity?

Analyze impacts of urban development and environmental change on ecosystem services, human well-being and the quality of life in cities.

Question 3:
What is being done and how effective is it?

Identify **policies that impact the environment and policy gaps.**

Question 4:
Where are we heading?

What does the city face **in the future** depending on the chosen path(s) and the influence of the outside world.

Question 5:
What actions could be taken for a more sustainable future?

Describe opportunities for policy innovation and concrete responses.

Box 1: Types of environmental assessments:

State of Environment (SoE) Reporting
Traditional SoE reporting provides information on the environment and trends. It is mainly focused on the biophysical environment rather than on the pressures humanity exerts on it.

Environmental Impact Assessments (EIA)
In contrast with SoE reporting, an EIA is a process for evaluating possible risks or effects on the environment of a proposed activity or development.

Strategic Environmental Assessments (SEA)
SEA can be defined as the systematic and comprehensive process of evaluating, at the earliest possible stage, the environmental effects of a policy, plan or programme and its alternatives. SEAs do not explicitly involve the regular reporting requirement and may focus solely on a single policy or programme.

Sustainability assessments
Sustainability assessments are intended to ensure that the principles of sustainable development are factored into projects and political decisions. Sustainability assessments are dynamic processes that are aimed at incorporating environmental, social and economic aspects into laws, action plans and public projects at both national and local levels.

Greenhouse gas emissions assessments
Climate footprints are assessments of greenhouse gas emissions. They are a specific sort of environmental assessment that focus on emissions created by a city or other and not so much on the effects these emissions have, although the ultimate objective is a reduction of the emissions and thus of the impact (global warming). Climate footprints are technical measuring exercises that will lead to the formulation of reduction targets and an emissions reduction strategy.

2.2 Analytical framework: DPSIR matrix

The Driving forces - Pressures - State - Impact - Response framework (DPSIR) attempts to reflect the key components of the complex and multidimensional, spatial and temporal chain of cause-and-effect that characterizes the interactions between society and the environment. The GEO framework is generic and flexible, and recognizes that a specific thematic and geographic focus may require a specific and customized framework. The DPSIR matrix seeks to establish a logical link between its components to direct the assessment of the state and trend of the environment, from the factors that exert pressure on natural resources (and which may be understood as the "causes" of its present state), to each locality's responses as to how to deal with its own environmental problems.

*Figure 1: GEO conceptual framework:

DRIVERS (D)

Material, Human and Social Capital

Human development:
• Demographics
• Economic processes
  (consumption, production, markets and trade)
• Scientific and technological innovation
• Distribution pattern processes
  (inter- and intra- generational)
• Cultural, social, political and institutional processes
  (including production and service sectors)

PRESSURES (P)

Human Interventions in the environment:
• Land use
• Ressource extraction
• External inputs (fertilizers, chemicals, irrigation)
• Emissions (polluants and waste)
• Modification and movement of organisms

Natural processes:
• Solar radiation
• Volcanoes
• Earthquakes

Human Society

RESPONSES (R)
to environmental challenges:

Formal and informal adaptation to, and mitigation of, environmental change (including restoration) by altering human activity and development patterns within and between the D, P and I boxes through inter alia: science and technology, policy, low and institutions.

Environment

STATE-AND-TRENDS (S)

Natural capital:
atmosphere, land, water, and biodiversity

Environmental Impacts and change:
• Climate change and depletion of the stratospheric ozone layer
• Biodiversity change
• Pollution, degradation and / or depletion of air, water, minerals and land (including desertification

IMPACTS (I)

Change in human well-being:
broadly defined as human freedoms of choice and actions, to archieve, inter alia:

• Security
• Basic material needs
• Good health
• Good social relations

which may result in human development or poverty, inequity and human vulnerability.

Demographic, social (institutional) and material factors determining human well-being

Environmental factors determining human well-being:
• Ecological services such as provisioning services (consumptive use), cultural services (non-consumptive use), regulating services and supporting services (indirect use)
• Non-ecosystem natural ressources in hydrocarbons, minerals and renewable energy
• Stress, inter alia diseases, pests, radiation and hazards

Source: UNEP, The fourth Global Environment Outlook: environment for development (GEO-4), 2008 http://www.unep.org/geo/geo4/media/

The components of the DPSIR matrix that correspond to the questions in paragraph 2.1 are:

1. **Driving forces** are human activities, processes and patterns that impact on sustainable development. In human settlements, there are three main driving forces: **population dynamics, economic activities and territorial basis.**

2. **Pressure** refers to underlying economic and social forces such as population growth, consumption or poverty. From the policy point of view, pressure is the starting point from which to confront environmental problems. Information on pressure tends to be rather easily available because it comes from socio-economic databases. By taking into account pressure factors we seek to respond to the question: **Why is something happening to the environment?** (e.g. discharges of waste water)

3. **State** refers to the condition of the environment, resulting from pressure; for example, the level of atmospheric pollution, soil erosion or deforestation. The information on the state of the environment responds to the question: **What is happening to the environment?** (e.g. bad water quality in rivers and lakes).

4. **Impact** refers to the effect produced by the state of the environment on aspects such as quality of life and human health, on the environment itself, on the built-up environment and on the local economy. For example, an increase in soil erosion will have one or several impacts: reduced food production, increased food imports, increased use of fertilizers and malnutrition.

5. **Response** relates to collective or individual actions that lessen or prevent negative environmental impacts, correct damage caused to the environment, conserve natural resources or contribute to improving the quality of life of the local population.

Responses may include activities on regulation, environmental or research costs, public opinion and consumer preferences, changes in administrative strategies and in providing information about the environment. The instruments included in this category of the matrix attempt to answer the question: **What are we doing?**

Responses to the question: **What will happen if we do not act now?** aim to direct the analysis of future outlooks to the local environment by assessing its present state. The underlying logic of the DPSIR matrix allows links to be established to project/forecast future manifestations/implications of present environmental conditions, encouraging analyses to be made of the possible consequences of present actions.

This supports the development of strategic action to change a city's environmental problems.

It is not always easy to make a clear-cut distinction between the different components, but sorting the issues in this way helps to analyze and prioritize them.

Box 2: Other frameworks for analysis

The DPSIR framework is only one way of getting a grip on the complexity of environmental issues. Other possible approaches are the following:

- Thematic: (Water, air, soil etc.) -the challenge is to account for the different sectors that influence the same theme

- Ecosystem well-being

- Capital-based (establishing a budget of how much of a resource can be used (method "eco-budget" developed by ICLEI)

- Sectoral (transportation, agriculture, energy etc.) -the challenge is to account for the fact that one environmental aspect can be impacted by several sectors

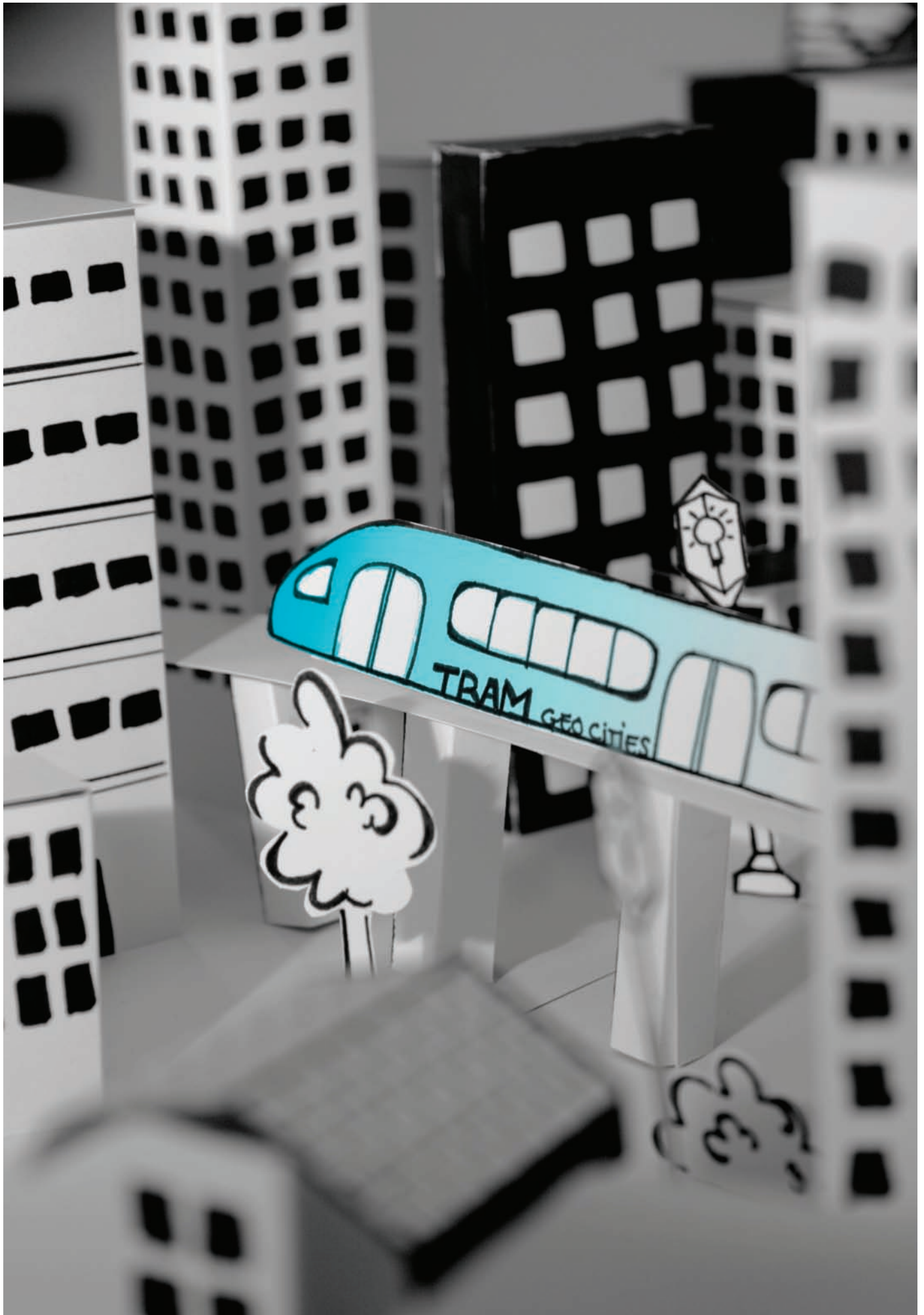- Issue-based (Air quality, quality of life, climate change, consumption and production patterns etc.)

Applying the DPSIR matrix is only useful when accompanied by urban - environmental indicators suited to reflect the behaviour of relevant factors and to show trends over time. The use of indicators in the DPSIR framework can bring scientific findings from the field and lab to the public and decision-makers. Ideally, a set of indicators is a means devised to reduce a large quantity of data to a simpler form, while retaining essential meaning for the questions that are being asked. Please refer to chapter 3.3.4 for a detailed description on how to choose the appropriate indicators.

The following table shows an example of a problem analysis using the DPSIR framework. It shows how population, as a driving force, is putting pressure on the environment through releasing untreated wastewater, leading to a degraded quality of fresh water resources; the outcome is an increased number of infected individuals. An appropriate response would be to allocate investments for wastewater management (collection and treatment). Each element of the situation should be described with appropriate indicators.

Table 1: Example of integration of indicators in to the DPSIR framework

Ressource	DPSIR Dimension Indicators				
	Driving force	**Pressure**	**State**	**Impact**	**Response**
Water	Population	Volume of untreated domestic sewage	Water Quality Index (WQI): BOD, COD, DO, count of E–Coli cells, etc.	Incidence of water–borne diseases	Drainage system, collection, treatment and water distribution systems

3 The GEO Cities process

Establishing a GEO Cities process requires careful advance planning. One prerequisite for an effective IEA is adequate management, technical and scientific capacity to lead the process and carry out the assessment. Organizations in charge of the IEA should be able to mobilize a wider group of participants, including senior researchers and decision-makers.

Because the GEO Cities process involves a range of complex activities and promotes active engagement of the local government, the academic community, scientists, NGOs and the private sector, a series of basic conditions need to be in place in order to make sure the process can be properly managed. One key element is **political will and commitment** of the local government to support the process. The two other key principles are:

Cooperation: Integrated environmental assessments require bringing together information and insight that usually lay scattered across a variety of disciplines and organizations. This implies bringing together organizations and people that may not have a history of collaboration. The potential for tension along professional, bureaucratic, religious or political lines is considerable. Trust, confidence and cooperation both between organizations and key individuals are keys to success.

Buy-in and participation: the report is meant to increase knowledge about the interaction between society and the environment so as to bring about needed changes. The best way to ensure that its observations and recommendations influence decision-making is to involve the people who need to make the decisions and those who are affected by the results at all levels of the process.

Stages of the GEO cities process

We can identify seven stages of a generic IEA process, as well as a set of activities and outcomes related to them.

Stages	Activities	Timeframe	Outputs
Stage 1 Start-up	• Secure (legal) mandate for environmental assessment and reporting. • Identify a local technical team within the lead agency. • Develop a basic outline for conceptual framework and process, capacity, time and resources required. • Hold start-up meetings to discuss the process and institutional arrangements. • Secure commitment for resources and in-kind contributions.	1-2 months	Conceptual framework
Stage 2 Institutional set-up	• Define roles and responsibilities of the political and technical partners. • Establish mechanisms of coordination among collaborating institutions. • Define an institutional framework. • Discuss the elements for the impact strategy. • Prepare a stakeholder map.		Stakeholder map
Stage 3 Scoping and design	• Establish the geographic boundaries and detailed timeline for producing the report. • Identify key environmental issues. • Identify indicators, data requirements and sources of information. • Draft an outline of the report. • Identify the target audience. • Develop the impact strategy. • Discuss the elements for a communication and outreach strategy.	3-6 months	Designed document (annotated structure or outline) Impact strategy
Stage 4 Planning	• Define activities, assign responsibilities and identify expected outputs. • Allocate financial and human resources for data collection, analysis and report writing. • Review and adjust the impact strategy and define indicators of impact. • Develop a communication and outreach strategy. • Establish a monitoring and evaluation system.	1-2 months	Implementation plan Communication and outreach strategy
Stage 5 Implementation	• Validate priority environment/development issues and their connection according to the IEA framework. • Collect, process and analyze data and information. • Present and discuss preliminary results with relevant partner organizations. • Write draft report, organize peer review and finalize report based on feedback. • Translation and publication (hard-copy, CD, website, etc.)	3-6 months	Report and complementary products, in different media
Stage 6 Communication of results	• Promote different IEA products and messages. • Organize interviews with the media. • Organize presentations for stakeholders.	1-3 months	Report and complementary products, in different media
Stage 7 Monitoring, evaluation and learning	• Evaluate the process. Identify lessons learned. • Evaluate the impact of the process in terms of contribution to policy planning, capacity building and public awareness.	1-3 months	IEA impacts and recommendations for the future

Table 2: Stages of the GEO cities process

Source: GEO Resource Book, 2006

3.1   Stage 1: Start up

Assessment and reporting are complex tasks that will not produce the expected results unless they are carried out with the needed time and energy devoted to it. This requires that the mandates and capacities to carry out this task are considered as part of the core infrastructure of social organizations, a responsibility often of government. The mandate should be clearly backed by laws and regulations.

Civil society and other stakeholder groups must be given a leading role along with to the local administration. This will create synergies and provide the public with different points of view. The starting points are diverse: while some cities have experience with scientific research, systematic gathering of data and planning and information on the environment may be well developed and organized, in other cities information may be scattered and more difficult to organize.

Local coordination team

The role of the coordination team is to manage and coordinate the entire process. This includes engaging the wider expert community; gathering, analyzing and interpreting data; and organizing peer review. The selection of effective technical partners is crucial for the process. Criteria for selection may include the following:

*   experience in integrated environmental assessment;

*   high public profile and recognized leadership capacity;

*   good relationship with the local authority;

*   capacity to dialogue with different stakeholders from both the public and private sector;

*   ability to build consensus on key environmental issues;

*   experience in organizing and facilitating workshops.

Collaborating institutions and other stakeholders

Another important step in the process is to identify the stakeholders to be part of the process. They can be institutions and/or individuals:

*   whose interests are affected by environmental problems or
*   whose decisions have environmental effects;

*   who possess information, resources or expertise required for policy formulation and strategy implementation; and

*   who control key mechanisms (e.g., funding) for policy and strategy formulation and implementation.

It is important that all participants understand the need for a long-term commitment. The assessment and integrated report are tools to facilitate communication between science and politics. The GEO Cities assessment may lead the way to a continual dialogue between the interested stakeholders and society in general. In order to keep an active relationship with collaborating institutions, it is important to keep in mind the following:

*   identify a contact person for the duration of the process;

*   establish a clear definition of their role and responsibilities; and

*   keep the contact person regularly informed about progress and seek out his/her views on key decisions.

The number of participants should be relatively limited in order to allow for a smooth handling of the process.

3.2 Stage 2: Institutional set-up

3.2.1 Definition of the basic agenda

At this stage it is recommended to establish terms of reference to define roles, responsibilities and commitments. These terms of reference include:

- Joint activities,

- The partners' roles, including specific activities to be carried out as well as a programme of contributions,

- Rules for sharing information used in the process (including confidentiality agreements).

- Decision methods (including problem solving),

- Resources to be provided by each partner,

- Agreements on how to integrate the results of the process into the city's planning activities,

The terms of reference should be periodically reviewed.

3.2.2 Training the local team

There are two aims of the training on the methodology:

1. Technical training and public policy workshops

Participants of a GEO Cities process are to cover a wide range of knowledge and experience on environmental problems and this demands a minimum of common understanding on the concepts applied. Training workshops help to create a basic level of understanding of the factors involved in the interaction between urban development and the environment and the features and range of the GEO Cities Report. Training may include three aspects:

- Managing the GEO Cities methodology, including the use of the DPSIR matrix and the use of indicators.

- Managing the techniques of collecting and analysing data, including information sharing among stakeholders,

- Discussion on the process of formulating, managing and following up public policies, in particular on subjects relating to urban areas and the environment.

2. Production and dissemination of information materials derived from the report (Please refer to chapter 3.3.6 Impact strategy)

3.3   Stage 3:
Scoping and design

3.3.1   Territorial dimension of the assessment

It is the city or municipal authority that determines the territorial area to be covered by the GEO Cities report; the report will cover the area necessary to help the municipal authority to intervene in urban management, planning and development processes. This is of particular importance for urban centres in metropolitan zones where the limits of the urban functional area are difficult to define. In contemporary societies, the functional influences of cities reach far beyond their immediate boundaries, and there are multidimensional links between urban and rural areas.

3.3.2   Defining a time-table for the activities and defining the outputs (products and processes)

The timetable helps to plan the work and to monitor progress. It includes all the stages and indicates the type and content of the activities with their respective tasks and the time needed to carry them out.

The outputs, together with the timetable, are the team's guide. They specify expected goals and how to achieve them. Defining them with precision will help to obtain the final result and ensure consistency. An example of an intermediate goal is holding technical discussion and methodology workshops for team members. The final goal is an" improved environmental awareness of the citizens", while the outputs would be the GEO Cities Report, the material to be published and an event where the results will be presented to the public. (see also chapter 3.3.6 Impact strategy)

3.3.3   Identifying priority environmental issues of concern (see GEO Resource Book, module 5)

A GEO Cities assessment brings organizations and individuals representing a range of sectors and disciplines into a joint process, and generates a richness of viewpoints and interests while building a common ownership of the results. Such a multi-stakeholder process presents challenges in reaching consensus because assessing environmental conditions can raise a large number of intertwined issues, themes and interests, and stakeholders often have divergent views on those. Institutionally, different issues are addressed by different organizations, and it may be challenging to understand who is in charge of exactly what.

In order to carry out a GEO Cities assessment, it is essential to identify a list of major environmental issues, and then categorize them into a manageable number of themes.

The issues important for any given state-and-trend environment analysis can be identified using a combination of methods: A good list often can be identified from a brainstorming session among GEO Cities assessment participants (possibly in multi-stakeholder breakout groups, with the results discussed together in a plenary). The more diverse the group of participants, the more comprehensive the list of issues will be. Some of the methods for developing a list of important environmental issues include:

- Multiple expert and stakeholder consultations (smaller groups than above).

- Surveys of individual experts and stakeholders by e-mail, telephone or regular mail.

- Review of relevant literature.
  (These approaches can be ran in parallel.)

Further selection is necessary even after a comprehensive set of environment themes and specific issues has been identified. The list that emerges from this process is often longer than can be reasonably accommodated in a GEO Cities reporting process, given the constraints of time, and human and financial resources. You might find it useful to narrow down the issues, using criteria such as the following:

- Urgency and immediate impact

- Irreversibility

- Effects on human health

- Effects on economic productivity

- Number of people affected

- Loss of aesthetic values

- Impacts on cultural and historical heritages

There are many challenges associated with prioriti-zation, including:

- Criteria for an issue to be considered a priority (e.g., high cost, significant risk, public awareness, political attention, place in issue cycle);

- Relationship to the priorities listed in official policy statements / identified by high-ranking officials, or real priorities which for some reason did not find their way into official policies or are not supported by adequate financing;

- Stakeholders who select priorities and legitimacy of representation;

- Number of issues that can be included in a GEO Cities report;

- Process used to agree upon priority issues.

It is important to identify key criteria to distinguish higher priority issues from lower priority ones and to have a sense of the number of specific issues that reasonably can be accommodated in the reporting process.
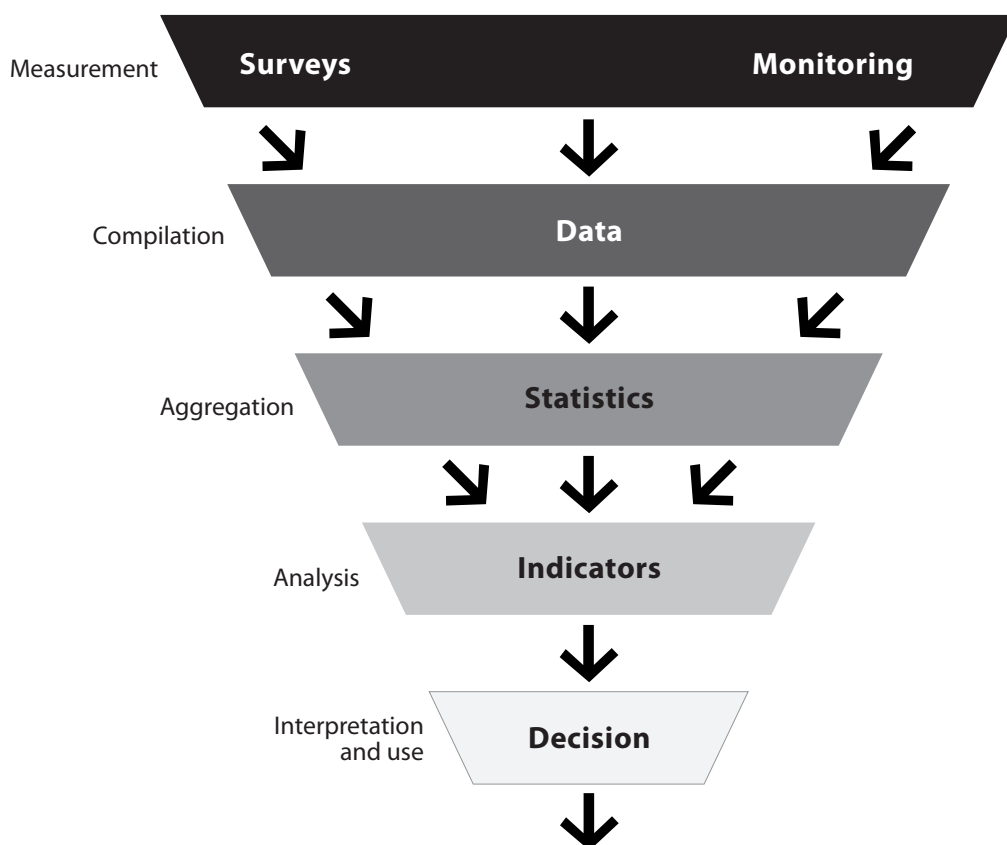
The priority list identified during a GEO Cities as-sessment can be refined after analysing its content in more detail.

3.3.4 Appropriate indicators to describe the priority issues

This section is meant to guide readers in how to choose the most appropriate indicators. Examples of indicators can be found across chapter 4, and com-monly used indicator sets in annex I.

Indicators are "packets of information" that help us understand the complex interactions between different phenomena. They are indispensable for well-informed decision-making and in planning urban development and environmental management. Indi-cators can be seen as tools that allow a description of the characteristics of a phenomenon or the evaluation of its performance in time and space. They provide statistical, scientific and technical information about public policy objectives and goals, the features and trends of urban, environmental, economic and social matters, and show how effectively public bodies perform. Desirable indicators are variables that sum-marize or otherwise simplify relevant information, and quantify, measure and communicate it.

*Figure 2: shows how indicators contribute to taking policy decisions.

Source: Source: von Schirnding, Yasmin (Dr.) 2002.

There are different types of indicators that are used to measure very different things. An attempt to classify the different categories can be found in the table below:

*Table 3: different indicator types and concrete examples.

Table 3: Different indicator types and concrete examples			
Type of indicator	**Pressure indicator**	**State indicator**	**Performance indicator**
Phenomenon it describes	The consumption of resources or destruction of resources	The "stocks" of the natural resources	The relationship of the use of the resource to the community's well–being
Example	Fresh water use per capita	Area and volume of freshwater bodies	number of water–saving taps installed in public buildings

Source: Adapted from EcoBudget® (method for measuring use of and impact on environmental resources developed by ICLEI).

Proxy indicators

Sometimes data are not available for a certain indicator. In this case, proxy indicators can be developed to give an approximate idea of the features and trends of the issues for which information is required.

For instance, surveys at main roads or their representative stretches can be a proxy for all-covering regular measurement of traffic density in a city. Similarly, monitoring of air quality throughout the entire city, hardly possible even in well-off countries, can be substituted with modelling which uses punctual monitoring data for air quality or information about emissions from major pollutants.

New indicators

Since different cities are faced with different physical and built-up contexts and problems, the environmental effects of urban development can vary greatly, potentially leading to a situation where no adequate

indicator is readily available. In that case a new indicator needs to be developed to describe the specific local situation. In this case, it will be necessary to specify the source of the data, the methodology used and the degree of reliability of the indicators.

Should the coordination team propose new indicators that may or may not be the result of a combination of already-existing indicators, it is important they are described in a way that they are reproducible. (The description should include the information source, the methodology, and the reliability of an indicator.)

Transversal indicators

The GEO Cities methodology separates the environment into its constituent elements of water, air, soil and biodiversity so that it is easier to assess each of them, but we must remember that they are all interlinked.

For that reason, some indicators will be transversal in that they may be used to analyze more than one environmental resource in any of the dimensions of the DPSIR matrix.

Public consultation on indicators

Indicators gain strength when they are accepted by a broad public consensus, so involving diverse social groups in choosing them may add credibility to the process. To validate the indicators and facilitate final acceptance of the document it is recommended to apply a participatory methodology that combines the use of focus groups (joining urban-environmental stakeholders with specialists) with holding open public meetings. A participatory approach may help you narrow down the list of indicators by ensuring that the ones selected are relevant, reliable and understandable. A participatory approach also engages people in the process, which can lead to shared responsibility for the state of our environment and society, leading to greater possibility for change.
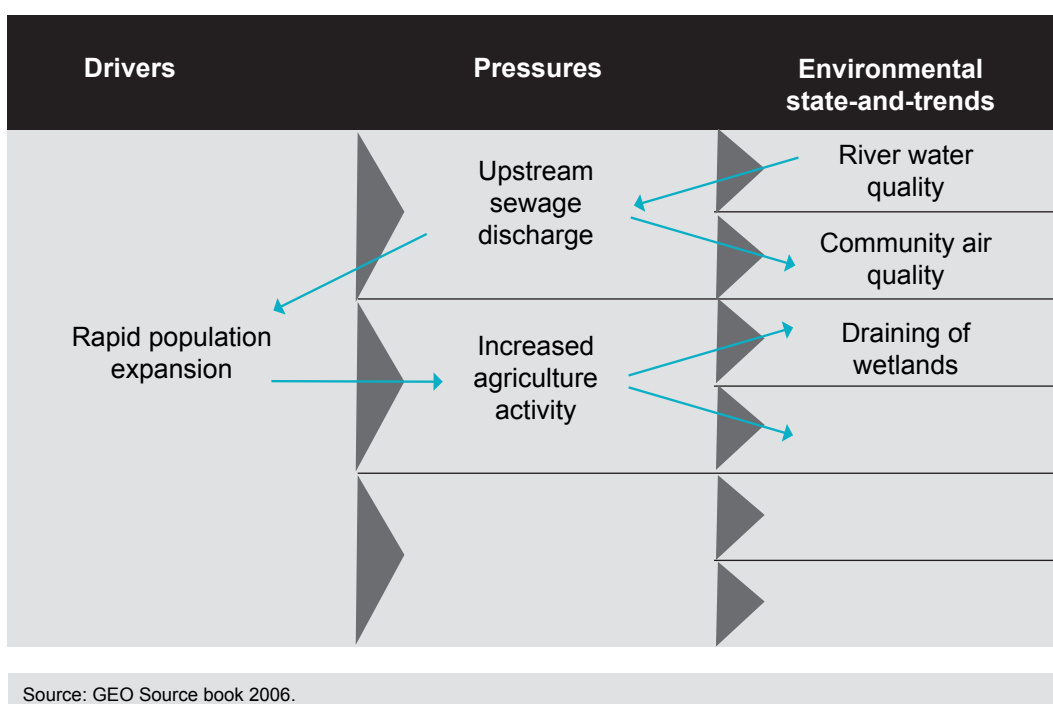
Criteria for the selection of indicators

The selection of indicators will depend on the issues and targets defined by the GEO-cities partners. The selection process will be coordinated by the coordination team, as every city needs to find its own combination of indicators most appropriate for its particular situation. There is no need to reinvent the wheel. Numerous indicator systems have been developed, and some initiatives are looking at identifying the most suitable ones to allow a comparison across European cities. Indicators produced by organizations such as OECD, UNCSD and EEA provided a good basis to start putting together one's indicator set (see Annex I).

The number of indicators should not be too high, otherwise data collection will be too time-consuming and the report will become complicated and less user-friendly.

It is thus important to define the indicators along the lines of the DPSIR framework. Once the priority environmental issues identified, they can be analysed in the context of the DPSIR framework, which then leads to the definition of the indicators.

*Figure 3 Analysing drivers, pressures and states and trends

Drivers	Pressures	Environmental state-and-trends
	Upstream sewage discharge	River water quality
		Community air quality
Rapid population expansion	Increased agriculture activity	Draining of wetlands

Source: GEO Source book 2006.

Each indicator will have a baseline value; and later in the process a target value will be defined (where do we want this value to be at a defined point in the future: for example, the Kyoto Protocol Parties defined their individual targets for CO_2 emissions to be reached by 2012).

Table 4: Criteria for selecting urban environmental indicators

CRITERION	A GOOD INDICATOR IS...
Policy relevance	• relevant to the selected issue; • sensitive to changes in the environment and related human activities; • applicable to local environmental issues, or to national and/or nationally issues important from the local viewpoint; • correctly reflecting public policy priorities.
Analytical consistency / reliability	• founded on scientific and technical foundations. • based or founded on international models and on an international consensus about their validity;
Measurement	• available or will become so on a reasonable cost/benefit basis; • appropriately documented and of recognized quality; • periodically updated following appropriate procedures;
User friendliness	• clear, understandable and easy to communicate, thus adequate in terms complexity to the target groups;
Comparability	• able to assess a condition and trend; • capable of being expressed above or below a target; • comparable across space and time.

Source: Cookbook for SoE reporting, GRID-Arendal 1998

As important as the indicators themselves is the explanation and documentation to go with it: they clarify why a specific indicator was chosen and not another; what it describes; how it was measured; etc. It is recommended to document this for each indicator with an indicator fact sheet.

Table 5: Contents of an indicator fact sheet

Definition of indicator	Proportion of population with access to a sanitary facility in the dwelling or immediate vicinity.
Type of indicator	State / Response
Underlying definitions and concepts	Sanitary Facility: A sanitary facility is a unit for disposal of human excretes which includes faeces from contact with people, animals, crops and water sources. Suitable facilities rage from simple but protected put latrines to full toilets with sewage, All facilities, to be effective, must be correctly constructed and properly maintatained.
	Population: This includes the urban and rural population served by connections to public facilities (pits, pour-flush latrines, septic fields).
Unit of measurement	%
Measurement methods	May be calculated as: number of people with improved disposal facilities available (x100)/total population.
Data needed to compile indicator	The number of people with access to improved sanitary facilities and total population.
Data sources	Routinely collected at national and sub-national levels in moist countries using census and surveys. In order to arrive at more robust estimates of sanitation coverage, two main state source types are required. First, administrative or infrastructure data which report on new and existing facilities. Second, population-based data derived from national household surveys.
References	WHO, 2000. Development of Indicators for Monitoring Progress towards Health for All by the Year 2000. Geneva, WHO, 1981, p. 81

3.3.5 Identifying sources of information and data needs

Now that your indicators are defined you will need to make an overview over data needed to describe the issues and indicators. As it is very likely that the information needed is dispersed among different institutions, you could start by identifying the different potential sources.

Table 6: Potential providers of data for the assessment	
Institution	**Type of Data**
Government bodies	Responsible for state statistics, national population census, environmental monitorinResponsible for information to formulate lcal level public policies. Responsible for formulating and administering public policies (for example, health and education agencies).
Foundations	Public or private institutions that finance research and may establish a critical comparison with official data.
Research and urban planning institutes	Public or private, that produce socio-environmental information to complement or classify official data. Also sources of information on public opinion and the local perception of the city's urban-environmental problems.
Universities	Academic institutions continue to be dedicated to producing information, to scientific research and their technical staff show a more scientific slant. They are a prime source, but information from academic research tends to circulate among a restricted university public.
Non-Government Organizations	NGOs are the most important social intervention stakeholders. They all produce information and other material that may contain relevant facts.
Business associations	They hold specific information on local economic activities that allow an analysis to be made of the economic dynamics and of pressure factors.
Trades unions	They possess or are able to produce specific information about the city's economic and social situation. Their data tends to complement and/or qualify information provided by other bodies representative of business (employment, wages, income, …).
Local and national media	Newspapers, magazines, television, radio and the Internet may serve as a counter-part to information collected from other local sources.
International organizations and /or bilateral and multilateral agencies	They provide financial resources, prepare projects and take action on the basis of international resolutions, supervise compliance with such resolutions and use data about the situation in each country. Although they usually do not produce these data, they often finance research and provide training on producing information and, therefore, are an important source for consultation.

Note: the fact that data are available at a particular source does not mean that these data can be easily accessed. See for example national implementation reports and the materials of the Compliance Committee under the UNECE Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters http://www.unece.org/env/pp/.

3.3.6 Impact Strategy

This section focuses on methods to position an Integrated Environmental Assessment (IEA) in order to have a real impact on environmental policy and practice. IEA is proactive in nature, and adaptive in a public policy environment where priorities of governments and citizens can shift and change. It helps the participants of the process to determine how to engage the right people to listen to you and respond to the report and its messages. This impact process takes time; and involves real emphasis on being clear and strategic in identifying the changes that you want to see as a result of the assessment. The process focuses on building relationships with key people and institutions, finding out what they already know and what key people need to know. With that understanding, you can then seek out optimal opportunities to get the messages across and capitalize on, to generate dialogue, and gain the attention and support of those who may have in the past appeared non-responsive to your work. An impact strategy should be prepared once the team has initiated the process for an integrated environmental assessment. It is considered as part of the "institutional set-up" stage.

The need for an impact strategy

Elaborating a GEO Cities report lends itself to thinking of the potential uses for the assessment: What impact it might have on policy and planning, and what steps should be taken to ensure that the right people are willing to pay attention to the findings of the assessment.

A well-marketed GEO Cities report can shift the mood of the public, and lead to political pressure. It may educate a wide range of audiences on key issues, and as a result, it may trigger detailed studies linked directly to specific issues and decisions.

It is often an underlying assumption of reporting that good information will lead to good decisions. However, while good information is necessary, it does not follow that decision-makers will act on it. Decision-makers are often quite well informed, but their priorities and intentions may be different from that of the team elaborating the GEO Cities report. The challenge is to take proactive steps to ensure that their assessment does not sit on a bookshelf once it is done, but that it provides good input to decision making. Process participants thus have to consider from the outset how the findings from their assessment might be used, and how the priorities they identify can become the priorities of their government and their country.

For team members it is important to have a good understanding of several factors.

- What is the political and administrative context in which the assessment is taking place?

- If assessments have been prepared in the past in your city, what happened to them? What priorities for action were recommended? Were they acted upon? Why (or why not)? Barriers to use of previous assessments may continue to be barriers; but by identifying them ahead of time, ways to overcome them may be identified.

- What is taking place within the current local political context that might:

  →prevent key decision-makers from responding to the findings, or

  →enable them to apply the findings in support of a particular agenda.

- What is taking place within the city more generally that might provide a window of opportunity to gain public attention for the findings? For example, if there is a debate going on now about health impacts of air pollution, think about how the findings can contribute to that debate. You might personally be interested in an issue such as water pollution, but by looking for the connection to the issue on the top of today's public and political agenda, you could promote your assessment in the context of the issue "cycle" which may be the air pollution agenda.

Be aware that if your assessment process serves only to produce a report simply to comply with a legal or policy instruction, then the impact—the ability to have the findings used to effect change—will be severely limited.

Please refer also to part 3.5.3 "Data analysis"

Attributes of impact strategies and traditional communications activities

An impact strategy incorporates communications activities combined with a good understanding of government relations as practised by advocacy groups, PR agencies and professional lobbyists. With any communications strategy it is necessary to identify key recipients of the assessment, prepare key messages and products that will help them grasp the essentials of the research, and identify appropriate

channels to deliver those messages and products, including the media, participation in events (e.g., conferences, workshops), and electronic delivery via e-mail and web.

An impact strategy builds on communications activities in several key respects examined below.

1. Purpose

An impact strategy begins with articulating the changes expected as a result of the assessment. This provides purpose beyond simply following through on the mandated requirement for the assessment. For those conducting an GEO Cities assessment for the first time, seeking better linkages between the findings of the report and formal decision-making processes in government (e.g., city strategic plans, policy, priorities, budgets, etc.) may be the main objective. Those who are conducting an assessment for the second time or more might be able to think more specifically about issues and necessary changes in city policies identified from the first process.

2. Audience

The audience for the GEO Cities assessment and the target group for its impact strategy may be small group of key actors who are in a position to have significant influence on environmental outcomes if they adopt the assessment's findings and recommendations. Directly reaching these influential actors, however, may be difficult. Instead, the impact strategy may target those who are able to influence them or try to reach them through other channels indirectly, for example through the mainstream media. Lately Internet blogs, life journals, and posting on YouTube have become powerful channels of influence and communication. Your ultimate objective should be to reach those people whom you definitely want to act on the

GEO Cities assessment's results. In parallel, communications activities will always include broader audiences: those who can benefit from the information contained in the report and become actors in their own way.

Those who are already supportive are prime candidates to become champions of the findings. They should be briefed on the process from the beginning, informed and even engaged in the process, and be priority recipients of presentations and policy briefs on the findings. Those who have concerns about the whole concept and practice of assessments may become detractors - either critical of the report, or focusing attention away from the report and onto other government matters. As member of the team, consider how you might best build bridges with them. Having a legislative mandate makes it less likely other influences will prevent you from initiating and completing your report (although limited budgets may be a constraint). Government auditors and civil society should help ensure that the legislation is followed. However, once the report is done, there is often no obligation to address its findings, so it is equally important to learn who supports the practice of assessments, and where there might be opposition to the process.

3. Timing

In order to get largest possible political buy-in on the recommendations and actions proposed, early involvement of political decision makers in defining the options is essential. An impact strategy should be developed from the very beginning of the assessment process, and monitored and adjusted throughout the process. The communications activities are an important component of the impact strategy, and are usually implemented towards the end of an assessment, once the findings and recommendations become clear.
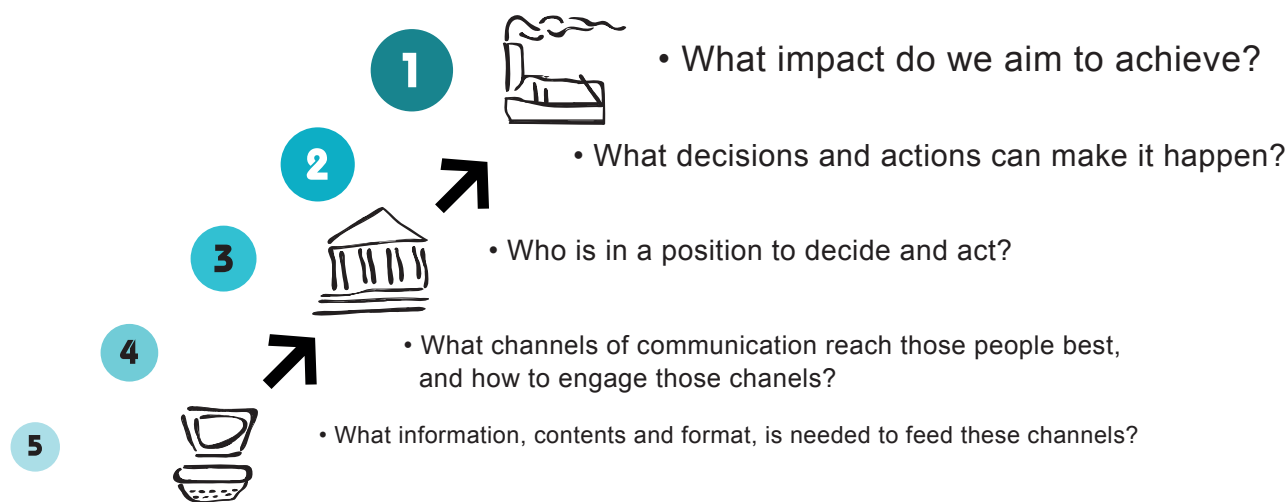
BOX 3: Steps in building an impact strategy

There are five main steps to creating an impact strategy:
1. Creating the change statement. What should the impact of the assessment be?
2. Relationship management. Identify the key actors that you are seeking to influence, and build connections to them.
3. Knowledge management. Gather and analyse the knowledge for the assessment.
4. Opportunity management. Move the knowledge into the hands of those that need to be influenced.
5. Monitoring and improvement. Determine whether the impact strategy is working, and adjust it as necessary.

Source: GEO Resource Book Training Module 3: Developing an impact strategy for your IEA, UNEP and IISD

*Figure 4: The impact chain

1 • What impact do we aim to achieve?

2 • What decisions and actions can make it happen?

3 • Who is in a position to decide and act?

4 • What channels of communication reach those people best, and how to engage those chanels?

5 • What information, contents and format, is needed to feed these channels?

Source: The Impact of information on environmental decision making processes and the enviornment, GRID-Arendal 2001.

3.4   Stage 4: Planning

A big part of the preparatory work is now achieved. The issues are known, indicators defined, data sources identified. With the impact strategy, the team has a clear idea what to reach with the results of the assessment. It is now time to plan how to document this; how, when and where to collect and analyse data and based on this identify actions and responses to be given.

Monitoring

The planning stage is also the time where the team should think about how to monitor progress, and keep track of changes in the state of the environ-ment and its impacts. Monitoring should provide you with tangible information on a regular basis over an extended period of time. In addition to environmental information, monitoring systems also collect social and economic information that is relevant for under-standing environmental issues.

(see GEO module 4 for more in-depth discussion of monitoring systems and data collection).

BOX 4: Environmental monitoring versus process monitoring

Environmental monitoring systems play a great role in environmental observation and protection in the EECCA region. Governments have put considerable efforts into the collection of data, less into their dissemination and sharing with a wide audience.

In addition to environmental observation connotation, monitoring is also understood as the observation of changes in the process and actions involved in implementing a project (project monitoring). In the case of the GEO Cities process, both types of monitoring are needed:

Existing environmental monitoring systems can be used as a source for data collection, to show evidence about trends and impacts identified.

Monitoring of progress is also necessary to ensure a successful implementation of the GEO Cities project. In the latter case, one wants to put together a set of performance indicators that allow measuring whether the project advances as expected, and whether the goals and outputs defined at the beginning will be reached et the end.

3.5 Stage 5: Implementation

3.5.1 Data collection

Data to formulate, manage and assess policies has become an important instrument to enable local governments and society to intervene in policy-making. Data provide you with useful information that can be processed into a more readily accessible form for use by policy-makers and the public. Similar to the process of identifying and selecting key issues, obtaining and analysing data, developing indicators and indices involves making decisions about what to measure and include. Due to constraints in resources, not everything that we want to measure or analyse can be included in the assessment process. It is also inefficient to have so much information that the resulting analysis is too complex for anyone to use effectively.

You can approach initial decisions about what data to collect and how to collect it in a couple of different ways. You may begin by conducting a survey of available data prior to scoping thematic issues for the assessment. Availability of data then becomes a criterion for selecting data and developing indicators around priority issues. Alternatively, and this is the approach suggested in this guide, you may use a more targeted approach, where priority issues and indicators are identified first, followed by data collection. In this case, if data are not already available, you have four options: (1) exclude the indicator from your list; (2) define a proxy indicator (see 3.3.3) for which data is available; (3) include the indicator as a theoretical measurement tool, but point out that data is not available; or if you have time and resources collect primary data, keeping in mind that in this case time series data will not be available.

Types of data

Environmental data collection typically involves "hard" science. Quantitative indicators and data serve as the main foundation of environmental assessment and subsequent decision making by policy-makers, civil society and the public at large. Quantitative data is often complemented by qualitative data to capture attributes that cannot be easily measured. Not everything can, or needs to be, quantitatively measured, so quantitative data alone could miss critical elements. Qualitative ecological and socio-economic attributes help provide a more holistic picture.

Generically, data are categorized as bibliographical materials (including official texts and reports), statistical tables and charts, maps and remotely sensed data (satellite and aerial images) and come in many forms, both electronic and analogue. They can also be extracted from photos, videos and drawings or computer-animated design.

For more detailed explanations on data types including spatial and non-spatial data see GEO Resource Book module 4.

What data and information to look for?

The challenge for GEO-Cities assessments is that data are needed for a wide range of environmental and socio-economic issues; that data is often needed for different spatial units; and that the assessment requires time series. Except in special cases, the coordination team should not produce primary data. Due to limitations of time and resources, as well as the technical difficulties in gathering primary data, the material to be analysed should consist of secondary data - that already prepared by institutions in each locality and/or country.

Quality of data and precision of measurement are important considerations during data collection. "Perfect" data are not always necessary or possible, but data quality must be sufficient to satisfy the objectives of the assessment.

At this stage you will find out to what extent data is available for the indicators you chose earlier. If it turns out that for many of your indicators data is not available, you might want to go back and take another look at the indicators and choose some new ones.

3.5.2 Systematization of information (creation of a local environmental database)

A database for environmental analysis is an organized collection of data that is used to bring together all information about the state and trends in the environment, and may also include information about environmental policy, references to other data sources and to current research. It is important to ensure the database has continuity, and is kept up to date by linking it to monitoring systems, so that data generated through monitoring are fed into the database. The environmental database can also be used to regularly publish printed documents, such as environmental data compendia and indicator reports, to directly

inform policy makers and the public, and to provide a snapshot overview of the state of the environment. A database typically includes metadata, which are the background information about a data set itself. They include facts, such as the source of the data, the scale at which they were collected, the year they were collected, data processing methods, and any other information that you need to know before you can interpret the meaning of the data and use them in your analysis or report.

3.5.3   Data analysis

The analysis of the information compiled in the previous stage serves the following purposes:

1. Review /refine environmental priorities;

2. Assess the state of the environment and the responses of government and society;

3. Identify emerging themes;

4. Build future scenarios;

5. Formulate recommendations for future policy/ strategy and action plan.

One of the major objectives of a GEO Cities assessment is to provide a basis for the city leaders to set priorities for environmental problem solving. With this in mind and the DPSIR matrix as a reference to sort your data you should now be able to carry out an analysis of the issues in order to provide the necessary background for the city authorities to orient their policies accordingly.

Data analysis is usually divided into spatial and non-spatial analysis. Performance evaluation, trend analysis, correlation analysis and other statistical techniques are examples of how data can be analysed. Presentation of the results of data analysis might be facilitated by graphical representation of data, showing trends and developments more obviously than in a table.

Identifying emerging themes and building scenarios: city development pathways

Environmental changes caused by human activity, with little or no short-term significance, may have cumulative effects over time. The changes on the global level affecting local environmental conditions are difficult to recognize on a government mandate time scale and, therefore, are surrounded by uncertainty and controversy. But the lack of scientific certainty does not justify the lack of action to protect the environment.

Sustainable development in cities presupposes long-term processes that reflect society's responses to urban environmental problems. Discussing the themes that may be central to the definition of future urban environmental policies is important for medium and long term planning. By exploring an array of possible future scenarios, city managers can get a clearer picture of what tomorrow might bring and what the impact of their decisions is likely to be. GEO scenarios are not a prediction, but rather a description of how the future might unfold and an exploration of the different outcomes of policies and environmental change.

Scenarios can illustrate the role of human activities in shaping the future, and the links among issues, such as consumption patterns, environmental change and human impacts. To prepare scenarios is to set in motion and discuss possible visions of the future from options now available.

Steps to build scenarios:

- Define the environmental problem and its basis (policies and actions);

- Diagnose the causes and consequences that result in a specific state of the environment;

- Define the objectives and goals (policies) to achieve a given result;

- Identify public policy options for strategic development;

- Define alternative paths that may lead to the desired objectives;

- Identify possible results, problems and probable obstacles in reaching sustainable development objectives;

- Define alternative obstacle management strategies;

The result will be a mixture of indicators, trends and potential goals with explanatory text. For effective decision-making, information on costs and benefits is also relevant because it will permit to determine how feasible the economic and financial needs of each scenario are. The scenarios can be built based, for example, on three commonly used types of assumptions for how the future might unfold:

- The inertia trend, considered as the possibility that there will be no response to the environmental problems detected, that any responses there are will not be adequate or will not meet the objectives. In this case, the future scenario will project a broadening or worsening of the problems.

- The best case trend, is a situation in which the responses by the local government and society would be perfectly adequate and in which there are no obstacles that prevent action being taken on the responses. In this case, either the scenario will project an improvement in the state of the local environment in all sectors, or in those where social stakeholders have intervened.

- The worst case trend, is a situation where there is no response to the problems, where conditions for acting on the responses are not appropriate or even become obstructions, or where decisions made by social stakeholders increase or worsen pressure on the environment.

These scenarios should help decision-makers to assess the impact of how they act, or fail to act, when faced with the city's environmental problems.

Concrete approaches to building scenarios are described in module 6 of the GEO Source book (UNEP, 2006).

3.5.4   Presenting data and writing draft report

In the data analysis part, you will already have started to formulate the GEO Cities report. At this stage, write up the results of the analyses into a coherent document including many visual elements such as graphics and maps to facilitate understanding of the complex issues.

Taking particular care of the visual presentation of data and indicators adds great value to your report. Maps, schemes and graphs are usually the first thing readers turn their attention to.

For more detailed information on how to present data visually, see: Cookbook for SoE reporting, pp. 13 to 18, Grid-Arendal, Arendal, 1998.

Text writing deserves attention too. Quite often the writers of environmental reports know a lot about the subject but have little experience of non-technical writing. Such reports are understood by experts but are incomprehensible to a broader audience – which incidentally includes city planners and managers not confronted with environmental matters on a daily basis. The end effect of analysis and the report will then be much weaker than it could have been (see 3.3.5 – Impact strategy).

It can often be useful already at an early stage to strengthen the coordination team with an expert in popularizing technical information (such as a science journalist, a writer or an NGO representative who knows the subject well). Such a person would work on the text in close interaction with other experts and the city. Facts would then not be distorted, but explained in a language which is clear and attractive for various parts of the target audience.

An alternative solution is to prepare a concise and well illustrated summary of the report in addition to its main text. Such a summary will deliver key facts and conclusions to the decision makers, a broad range of specialists and the city public. This is exactly what some international organizations do, such as UNEP commissioning popular summaries of global climate research (see "Climate in Peril, 2008") or the European Environment Agency when analyzing the state of the Pan-European environment (see "European Environment – Sate and outlook 2010").

3.5.5   Peer review and circulation of the draft

As you are aiming for a broad acceptance of the GEO Cities report, make sure the draft report is widely circulated, and take into account the comments of the different reviewers for your finalized version.

3.6   Stage 6:
Communication and dissemination
of outputs and results

Ideally, the GEO Cities report becomes a catalyst for social mobilization on the question of the environment and sustainable development. For this to be the case, particular attention must be paid to how to communicate its results, stimulating its broadest possible social use by citizens and public bodies not directly involved in its preparation.

This is the moment to go back to the impact strategy developed at stage 3 and implement the plans developed at the time for dissemination and publication of the results of the report. There are many techniques and products to communicate the results of a GEO Cities report. Before you start producing your main report and other products, you need to come back to a series of important decisions made at stage 3.3.6. As was discussed before, among the different target audiences there may be a number of specific groups, such as politicians, academics, women, businesspersons, journalists, youth, the general public and others. Look for specific points of reference or interests to be addressed for each target group. Review what has been done so far with respect to communicating with these target groups, and what, if any, have been the reactions? It can be useful to define the level of involvement each group has with the most important issues, and ask if that involvement is on a personal or official basis. It also is helpful to know their perception of the issues and what their current behaviour is with regard to them. Think about public presentations to target specific audiences separately. Particular care should be taken to presentations to government representatives, as these are the people who have the power to implement the actions your report proposes.

In remembering your target audience(s), you will be more able to shape your message and select the right content, and later the right presentation format (see 3.5.4). By considering your budget, you will be in abetter position to take realistic decisions about the kind of product will be most suitable. You will have to decide what kinds of information products best suit your message. There are printed materials (e.g., popular reports, flyers, posters, brochures), electronic (e.g., websites, CD-ROMs) and visual (e.g., photos, graphics, maps, posters), each with its advantages and disadvantages.

A major part of the production and dissemination process is related to practical and organizational steps. You need to evaluate internal and external resources to best meet your needs. Often it is best to use external services for needs such as cartography, web design, editing and printing.

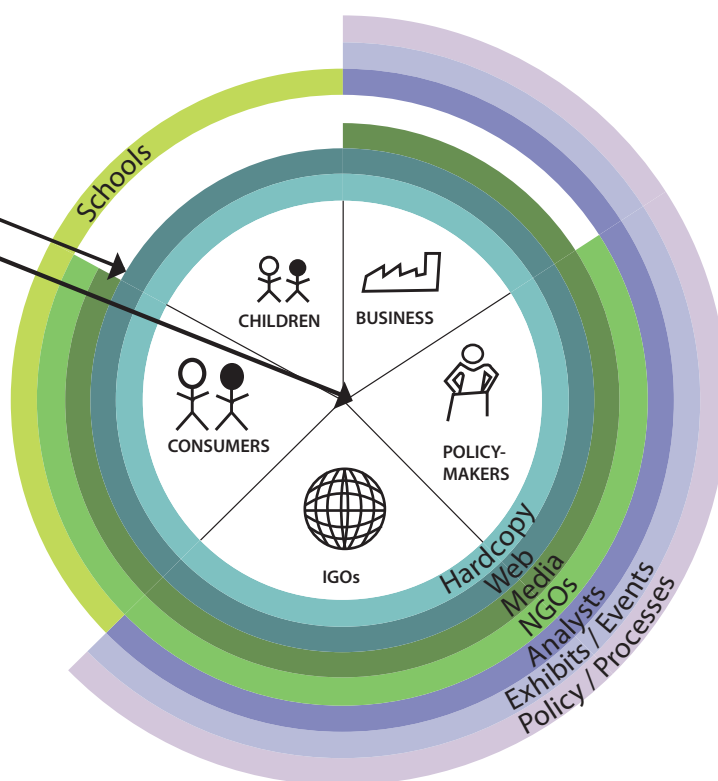*Figure 5: Example of a strategy for information dissemination

Environmental information

delivered directly

• Vital graphics
• Vital stories
• Environmental news
• Topical web sites
• Topical CDs
• Games
• School study guides
• 'Cabinet briefs'
• Policy papers
• Action plans
• SoEs
• Posters
• Leaflets
• Materials for exhibitions and events
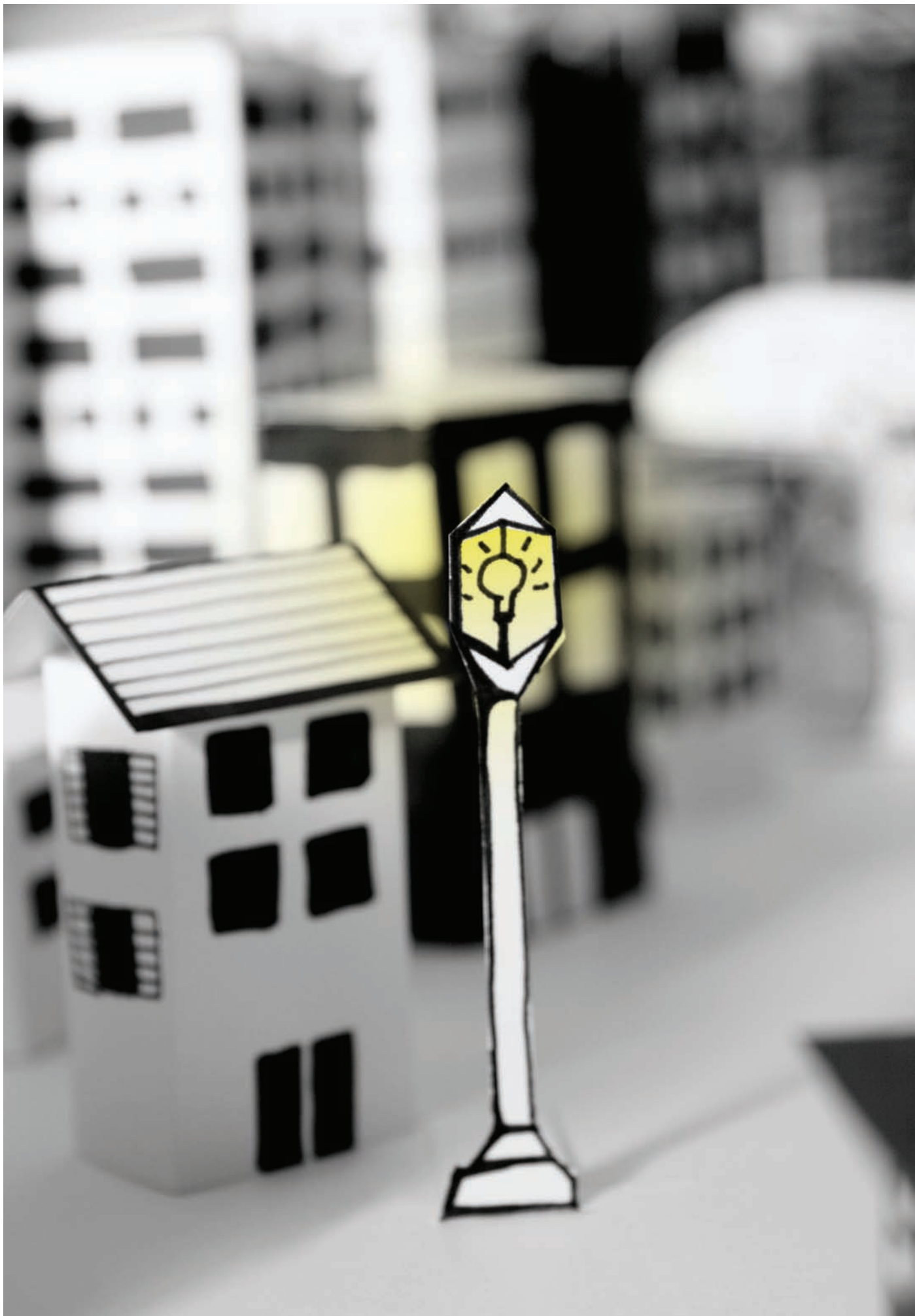• Media tours
• Product launches

through channels

to end users

3.7   Stage 7:
Evaluating and continuing the
GEO Cities process

With the preparation of the report, the GEO Cities project hopes to set the methodological basis for a permanent assessment process on the state and trends of the environment. The aim is to periodically repeat the assessment in order to regularly evaluate the progress in sustainable environmental management and adjust policy response. Continuity will allow to monitor the evolution of the relation between pressure factors and the state of the local environment.

4 Contents of a GEO Cities Assessment

While the previous part of this guide explained the methodological aspects of each step of a GEO Cities assessment, this part focuses on specific elements frequently identified as essential issues in a local Integrated Environmental Assessment. The present part is meant to serve as a resource for the local team in order to orient their work on commonly used practice of describing environmental issues and provides some basic information specific to the region for each topic. It is however up to each local team to structure the report according to local specificities and priorities.

BOX 5: Checklist contents[2]

Driving forces and pressures
Social, political and economic context
Historic evolution of local urban development
Local political and institutional structures
Socio-economic factors
Dynamics of demographics
Social inequity
Dynamics of economics
Characteristics of different activity sectors
The use of natural resources

Typical sectors putting pressure on the environment
Industry
Transport
Construction
Agriculture
Commerce and services
Land occupancy
Energy production and consumption
Water consumption
Solid waste generation
Sewage

State of the environment
Local (urban and suburban) ecosystems and biodiversity
Natural resources
Atmosphere
Water
Biodiversity
Built-up environment
Climate change

---

2   The different elements will be described in more detail later in the text.

Impacts
... on the quality of life and human health
... on urban economy
... on the built-up environment
... on the politico-institutional level
... on vulnerability of citizens and the city as a whole

Emerging themes and plausible futures

Responses: Policy interventions and instruments

Key stakeholders (institutions and individuals)
Urban environmental management structures and functioning
Implementation of environmental policies
Policy instruments
Technological instruments
Physical intervention instruments
Socio-cultural and public communication instruments
Policy performance and gaps

Conclusions and recommendations

Driving forces	D
Pressure	P
State	S
Impact	I
Response	R

Historic evolution of local urban development | D | P | S | I | R |

The analysis of the evolution of a number of factors of urban development over time will help to understand the driving forces, trends and problems involved, for example:

• Occupation of the territory and land use over time;
• Distribution of people and activities within the urban area;
• Distribution of economic activities in the urban area and their impact on the city's structure;
• Growth of population and its distribution in different areas of the city;
• Structure of supply systems for water, sanitation, transport, telecommunications and energy;
• Infrastructure and social services (health, education, culture and entertainment) and their geographic distribution and among the different social classes of the population.

Political and administrative structure | D | P | S | I | R |

The development of cities and their influence on local ecosystems is to a large extent influenced by the characteristics, range, and authority of local governance and their relationship with other social stakeholders (civil society and the economic players).

Box 6: Topics to describe the local political and institutional structure

a. The local government and the structure related to the administration, with particular attention on the environment and urban planning;

b. Urban Master Plans, regulative instruments for local urban development;

c. Environmental Management and Local Environmental Legislation Plans, as well as protected areas;

d. Funds available in municipal budgets for environmental preservation/protection and sustainable development;

e. The definition of the population that benefits from services;

f. The characteristics of civil society, its role and interaction with city authorities.

Dynamics of demographics   **D** P S I R

Population growth and migration are the two factors influencing the growth of society. Some natural and social processes are particularly relevant. The relationship between the number of live births (birth rate) and the number of deaths per year (death rate), are influenced by an number of quantifiable elements (family income, structure of the health system and of infrastructure services; how women are integrated into the labour market; conditions of scientific medical knowledge). There are also qualitative elements (educational level of families, religion, culture and local customs, the acceptance of birth control measures, the activities of social movements that defend reproductive rights).

Natural population growth, together with growth caused by migration will determine how demographics interact with the environment. Migratory movements generally associate with the concentration of economic activities in a given area. Population dynamics are very varied across the EECCA region. While seven countries experienced a significant population decrease from 2000 to 2005, all Central Asian countries with the exception of Kazakhstan are faced with a population growth of around one per cent per year. The proportion of urban to rural population remained relatively stable in the region during the last two decades; only in neighbouring Latvia ca. 4% of the population moved from cities to the countryside.

Social inequity   **D** P S I R

Social inequality[3] goes beyond the income differences between social classes, although they are central to its classification. The degree of access of inhabitants to urban services essential for a good quality of life (such as supply of drinking water, drainage system and collection of domestic waste) are indicators of social equity. Another one is the availability and good urban land for housing.

The lack of services provided to marginalized city dwellers puts pressure on the local environment, contributes to water and soil pollution and harms flora and fauna. Degradation of the environment often inflicts damage on marginalized population. Marginalized population, on the other hand, might be forced to inflict damage on the environment, as can be seen with the decimation of urban parks and forests in Yerevan during the energy import ban inflicted upon Armenia in 1990s.

---

3   There is a conceptual difference between equality and equity. The former means the state or quality of being equal; correspondence in quantity, degree, value, rank, or ability; while the latter means fair and just.

Box 7: Deforestation in Yerevan

In the years after the break-up of the Soviet Union, when Armenia gained independence, it also became entangled in a long war with its neighbour Azerbaijan. This led to a shortage in energy supply. The electric power crisis of the beginning of the 1990s resulted in chaotic tree cuttings. Urban citizens saw themselves forced to cut down trees in the forests surrounding the capital Yerevan and even in parks within the city in order to cook their meals on wooden stoves in their apartments and to heat the buildings. In this case the deforestation is a clear indicator of poverty, lack of control by local (and state) authorities and a show-case for the inter-linkages between the social situation of the population and environmental degradation. In 1995-96 the energy crisis was overcome, but the illegal logging continued for construction purposes. In this case, the pressure was continued by wealthy social groups and their greed for raw materials and space for building more lucrative commercial property.

The wealthier social groups contribute to the pressures on the environment by building, for example, condominiums on environmentally protected land. Civil construction industries and companies discharge polluting substances and advance on spaces that are natural breeding grounds for local fauna. Enforcement of laws is essential to limit illegal urbanisation.

Analyze the following:

• Local income distribution, specifying the way it affects where people live in the city,

• Social and territorial distribution of essential urban services,

• The main features of the local housing market.

• The local population's access to education, specifying average years of study, the distribution of students in formal education, the number and frequency of school drop-outs.

Dynamics of economics and its environmental impact   `D` `P` `S` `I` `R`

All the goods a society consumes originate in nature, which makes pressure of economic activity on the environment inevitable. For a long time, agriculture, industry, business and services made few efforts to minimize their impact on the environment, with resulting destructive effects, such as pollution and extinction of flora and fauna. Consumption becomes increasingly unsustainable, due in part to the increased rate a product is disposed of and the depletion of natural resources this causes. The prevailing economic model tends to over-exploit resources, to degrade the environment or to put ecosystems at risk. The global ecological crisis is the result of this. Identifying and assessing the type and scale of different activities that exploit natural resources and have an impact on the environment is a first step in reversing this tendency.

In most cases, the economy is the determining factor of urban development in a country, and places heavy pressure on the environment. Economic activities that affect the environment are:

- Exploitation of raw materials (mining) and natural resources

- Use of land for production (agriculture, infrastructure, construction, commercial, residential, recreational, highways and streets, storage, and others).

- Industrial activities with resulting emissions and production of wastes.

An activity sector is a group of organizations and people engaged in the same general economic activity; in other words, a category of development activity. Each activity sector will include groups and organizations with broadly similar interests and needs, and a similar relationship with urban development and the urban environment.

There is not a fixed rule for identifying and categorizing activity sectors. The situation will be different in each city, and the list of activity sectors will reflect local circumstances. The local team has to pay attention to the activity sectors (typically mining, manufacturing, housing, transport, agriculture) which present the biggest challenges for urban environmental management.

The description of the nature and characteristics of the activity sectors could include, where appropriate, the following information:

- The general types of activities in the sector, an approximation of how many people work in the sector, recent trends – growth or decline in activity, in employment, etc. and important linkages, if any, to other activity sectors.

- Groups, institutions, firms, individuals, ministries, sector representative bodies, etc. that are important for organizing how the sector operates.

- Special arrangements made to link the sector with environmental management activities in the city.

To describe in general the use of environmental resources by a specific activity sector; in terms of both quantity, quality, and its impact on the resources, one may address the following questions:

- What specific resources are used (water, air, land, minerals, trees, etc.) and how much of them?

- What are the recent and likely future trends in the consumption of resources by the sector?

- What are the main sources of supply of these resources? Have these sources changed in recent years?

- How readily available are the resources being used by the sector? What are the special measures that the society has taken to expand available supplies or to protect existing supplies?

- Are there specific shortages of certain resources – or are there problems in obtaining the quantity - or the quality – of resources needed?

- Does this sector compete directly with other activity sectors for supplies?

- Are there any particular initiatives under way in response to shortages?

- What are the main pollution effects of the activity sector, and how do these affect various environmental resources?

- Have any projects or programmes been undertaken specifically to alleviate the impact of this sector on various resources?

- Typical sectors and activities putting pressure on the environment are further reviewed separately.

Industry   D P S I R

Liquid, gaseous and solid waste also cause pressure. Uncontrolled release of industrial by-products such atmospheric emissions (gases and particles), liquid wastes/effluents (containing toxic or polluting chemical products, heavy metals) and solid wastes are a heavy burden on the environment.

Consider in particular the emissions of greenhouse gases, sulphuric acid, ozone depleting substances (types, sources, volume); discharge of industrial waste/effluents into water bodies (types, sources, volume, kind and degree of treatment); solid wastes (types, volume, final destination), industrial wastes (toxic, non-toxic and inert).

A specific regional problem is the environmental impact of large industrial enterprises built during the Soviet time. Many such factories have outdated equipment, some of them no longer work. Yet these facilities have extensive polluted areas (often with toxic waste) and have significant influence on urban environment. Especially important factor is a policy of removing old equipment and reclassifying the polluted territories. This is often done without any environmental assessment, cleaning and remediation. This can create significant problems in the future.

Transport   D P S I R

Transport with its high energy consumption is responsible for a lot of harmful air emissions. Pressure is also caused by traffic-related noise, and the infrastructure needed to provide an efficient transport system occupies big areas (including parking in public space).

The nuisances caused by urban transport depend to a large extent on the local policies for individual and public transport infrastructure and the modal split (type of transport means used, i.e. percentage of public versus individual transport).

Construction   D P S I R

In urban centres, the civil construction activities demand urban space to expand to, occupy and build in important ecosystem areas, threatening local biodiversity and generating wastes. Demolition and (re-) construction activities are responsible for the biggest waste source in Germany for example.

Agriculture   D P S I R

In urban centres agriculture has less importance than other activities, but can be an important pressure on the environment. If significant its main features should be shown – number of people employed, products, destination of the products, area occupied, production techniques, depletion of water resources through irrigation, soil and water pollution caused by the use of pesticides and herbicides, methane emissions, among others.

Commerce and services

D P S I R

Commerce and services affect the environment as they demand the construction of buildings, shops and shopping centres, and produce solid and liquid wastes that pollute the soil, water and harm biodiversity. Commerce generates movements of both goods and people on land and in the air, with their respective emissions. Some of these pose particular threats to the environment. They include pollution from the pathogenic agents in hospital waste, which release biological and chemical vectors that can easily spread diseases and pollute both soil and water, threatening the environment and human health. Tourism involves the hotel and other related sectors. It puts pressure on space for building hotels (perhaps intruding on to yet preserved natural areas), produces solid and liquid waste, and consumes energy.

Land occupancy

D P S I R

The progressive integration of the territory into the urban area threatens the integrity of ecosystems. Urban development necessarily implies occupying territory, the physical basis for such urban activities as:

*   Construction of housing;
*   Communication (streets, rails)
*   Industrial sites;
*   Deposits;
*   Hotels and shops;
*   Cultural and sports infrastructure;
*   Health care and education;
*   Drainage, water and energy supply infrastructure.

In making the analysis, it may be helpful to highlight the following features:

*   Population distribution and activities within the territory;
*   Occupation/production in vulnerable areas;
*   Land use;
*   Building and using infrastructure;
*   Transport infrastructure and usage patterns;

Energy production and consumption

D P S I R

Energy consumption exerts more or less pressure on the environment, depending on its source and the emissions created by the particular energy source and the way the energy is produced. The pressure on the local environment depends on the location of the production.

Energy is involved in almost all aspects of human society, and has significant impacts on the environment that need to be accounted for in the specific local circumstances.

Two aspects of energy consumption and production are problematic in the EECCA region: the use of non-renewable and polluting energy sources and the inefficiency of energy use, causing a much greater consumption than necessary.

In the EECCA region, coal is still a major source of energy, nearly half of Central Asia›s air pollutants are emitted by Kazakhstan›s coal consumption. Total energy consumption is on the rise again after a sharp decline in the 1990ies. In SEE, total energy consumption increased by 15 per cent over the period 1992-2004. Thanks to the closure of inefficient energy-intensive industries, consumption energy-intensity was improved, but final energy intensity (energy consumption per GDP or population) in EECCA countries is still 3 times higher than in Western Europe.

Atmospheric emissions

D **P** S I R

Most of the polluting gases in the atmosphere emanate from urban centres. Different sources of air pollution found in the city exert pressure. One usually distinguished between mobile and fixed sources of air pollution, Car, bus and truck exhausts are a major source of greenhouse gases as well as various gas emissions presenting a health threat.

Emissions from fixed sources include those from industry and heating of private and collective housing. Besides greenhouse gases – CO_2, NOx, methane – industrial activities (such as mining activities in urban centres) emit substances that deplete the ozone layer, in particular chlorofluorocarbons (CFCs), as well as diverse particles (PM) and particulate precursors. The industrial sector is responsible for about three quarters of all ghg emissions in the region.

Energy efficiency of heating systems for buildings is very low in the region, and therefore heating is another important source of emissions of air pollutants.

Urban populations in Armenia, Azerbaijan, Georgia, Kazakhstan, Ukraine and Uzbekistan are exposed to average concentrations of air pollutants that regularly exceed maximum allowed concentrations.

Water consumption

D **P** S I R

As a natural resource, water is essential to nearly all human activities and an indispensable part of all terrestrial ecosystems. It occupies a central place in any analysis assessing the state of the environment worldwide. Freshwater is an indispensable part of all terrestrial ecosystems.

Much of the world lives with a serious problem of water shortages, pollution of water resources, uneven distribution of water among the different social groups and conflicts over its multiple uses – domestic and sanitary, agricultural, industrial, urban development, energy generation, fishing, transport, entertainment – which makes water, together with climate change, one of the key issues on the global public environmental agenda. A constant supply of clean water and sanitation plays a central part in efforts to protect the environment, improve the health of the population and fight poverty in urban centres.

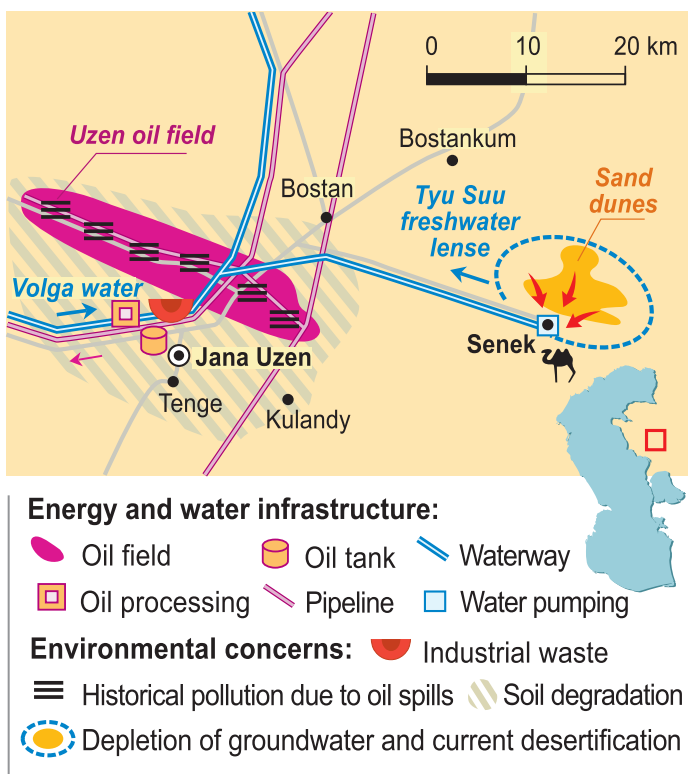## Box 8: Water issues in Jana Uzen, Kazakhstan

The town of Jana Uzen (70 000 people) and the oil-extracting enterprise Uzen use a lot of water. The bulk of water is supplied by a water pipeline from the Volga river and from the Caspian Sea. However, a smaller part of the water is pumped from nearby natural groundwater reserves. Since 1971 intense exploitation of the Tyu Suu fresh groundwater lenses has lowered the water table, affecting vegetation and creating large sand dunes. These moved towards the village of Senek, Mangystau Province's largest farm, partly burying the north-western edge of the village. Scientists have warned that similar expansion of deserts near the Ushtagan and Tishukuduk villages will occur unless adequate action is taken.

The Uzen oil field is the largest in the eastern Caspian region. Development began in 1964. Increasing oil production gave rise to severe environmental problems. An estimated 10 000 ha of land in Uzen are polluted by oil spills. Spillage around the wellheads or pipeline failures had contaminated about 3 million tonnes of soil. Almost no attention has been paid to protecting the environment from oil exploitation over the last 30 years. According to the local authorities and EBRD, the cost of improving environmental protection, mitigating damage and rehabilitating land at Uzen is estimated at US$100 million.

Source: ENVSEC 2008. Environment and Security. Transforming risks into cooperation.
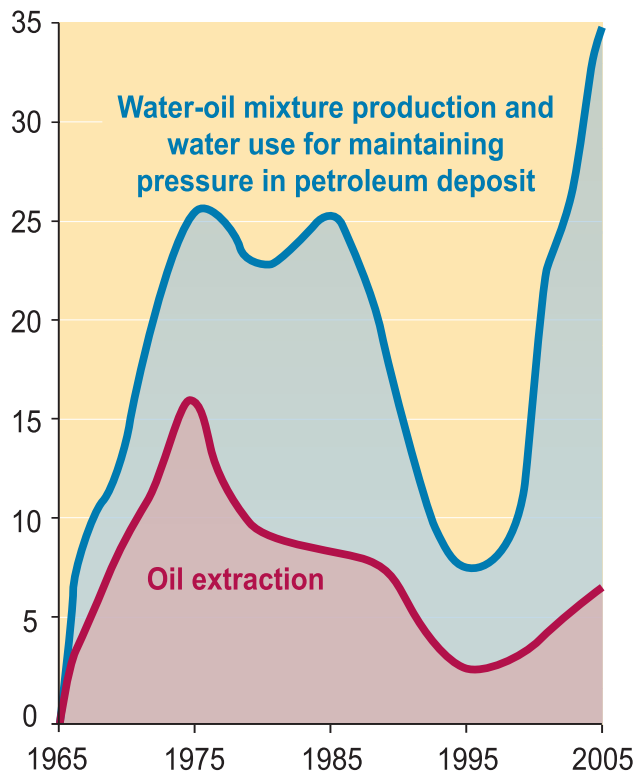
The case of the Eastern Caspian region.

*Figure 6: Uzen oil field

**Uzen oil field and water supply
Mangystau province, Kazakhstan**

Source: ENVSEC East Caspian assessment (field mission to Aktau, April 2006)
Map produced by UNEP/GRID-Arendal, August 2008

**Uzen oil field development
and water use**

Source: Uzenmunaygaz

Solid waste generation

D **P** S I R

The exponential increase in many type of consumption since the end of the Soviet period, the lack of financial and technical resources to collect and finally dispose of waste, as well as depositing it in inappropriate places, are among the factors that make waste a matter of great concern. Solid waste, both industrial and domestic (accounting for the largest volume sent to rubbish dumps and landfills) deposited without proper handling is perhaps the greatest source of environmental land pollution and causes serious environmental damage.

In EECCA cities, both the quantities of municipal waste have increased and its composition has changed in recent decades, along with the growing consumption of industrial products. Garbage has gone from being organic and compact to non-degradable, with large amounts of plastic, glass, aluminium and other metals, as well as other hazardous materials. As production of waste increases, more garbage collection is needed, but the most serious problems are how to dispose of it. The lack of capacity results in improper waste disposal, in soil, water and air pollution, as well as severe impacts on the quality of life and health,

above all in low-income groups.

The infrastructure for waste treatment in many cities in the region is not adequate to handle the volume and types of urban waste. There are often problems in collecting and disposing of very large objects – vehicles, furniture, electric domestic appliances. These are often dumped, in particular into areas of land outside the city limits, adding to soil and ground water pollution and an environmentally degraded landscape.

Waste deposit sites need to be built in a sustainable manner, to avoid methane (a greenhouse gas 21 times more powerful than CO_2) to escape into the atmosphere. Methane can be captured and used as a fuel for distant heating systems or even to run cars. Also, leaking of toxic substances into soils and groundwater must be avoided.

In Central Asia, large amounts of waste have accumulated from resource mining and processing activities. There are also stockpiles of obsolete pesticides in many EECCA countries, containing persistent organic pollutants (POPs) dating back to the Soviet era, which pose a risk to health and environment.

Sewage

D **P** S I R

The difficulties associated with domestic and industrial effluents are similar to those related to solid waste. Discharging untreated urban effluent into water bodies causes serious health and environmental damage to people and ecosystems, in particular among the urban poor.

The most common untreated effluents dumped into water bodies are:

• Domestic or sewage water that discharges organic matter into water bodies, affecting drinking water quality;

• Industrial effluent chemicals resulting from production processes (mainly oil-combustibles) and dumped as untreated waste into bodies of water;

• Hospital wastes, with a high potential for polluting and transmitting diseases to the population, or partly radioactive.

Problems related to effluents include:

• Limited coverage of the urban drainage system,

• Lack of treatment stations for the volume of effluent produced,

• Poor territorial and social distribution of the collection system in cities,

• Financial limitations to expand the service.

Local ecosystems and biodiversity — D P **S** I R

Municipal boundaries do not always coincide with natural boundaries marked, for example, by watercourses or the region's specific geomorphological characteristics. Other natural systems outside the context analysed must be considered if they are associated with or linked to local ecosystems.

Even if the conservation of biodiversity might have high priority in national strategies, urban development necessarily poses a threat to biological biodiversity through deforestation, eutrophication of water bodies and acidification, introduction of invasive species, polluted air, soil and water, and occupying risk areas thus increasing the vulnerability of endangered species. Noise can negatively affect not only people, but also local wildlife. Urbanization leads to fragmentation of ecosystems. The fragmentation of natural habitats along with changes in ecosystem dynamics greatly contribute to the loss of biodiversity.

Removing vegetation with soil sealing influences the microclimate and increases the risk of flooding, landslides on slopes and the loss of biodiversity. The effects of urban development on the environment also include the deterioration of the micro-climate. The absence of vegetation and the sealing of soils are responsible for significantly higher temperatures in city centres compared to their immediate surroundings. The lack of permeable surfaces increases the incidence of flooding in case of heavy rain fall, as the drainage system cannot absorb the run-off surface water that else would be absorbed by the soil. That also creates a risk of mixing clean rain water with sewage run-off.

In some EECCA regions, poverty might lead to over-exploitation of forests near urban areas. Deforestation increases erosion and disturbs the hydrological cycle. Forests capture and store CO_2. When destroying them, CO_2 is released aggravating its warming effect on the atmosphere. Green areas in cities directly regulate air quality, temperature and noise. The size of green areas per inhabitant is one measure of the quality of life and human health (the World Health Organization recommends 12m^2 of green areas per inhabitant in cities).

The description of local ecosystems should take into account their contribution to:

- Restoring the environment's natural resources: water, air, biodiversity, etc.;

- Environmental services provided (water, regulation of air temperature, the local population's quality of life, recreation);

- Economic activities sustaining the local urban life.

Box 9: Elements to characterize local ecosystems and biodiversity:

- Quantitative and qualitative description of the main features of the municipality's predominant ecosystems taking into account their physical environments and resources, including existing biological diversity and the habitats they occupy.

- Water resources and the distribution of water bodies.

- Climate: rain, relative air humidity, etc.

- Urban fauna: native and exotic.

- Urban flora: forests, green areas, type and quantity.

- Land: type, use and area.

- Vulnerability to disasters, both natural and human-induced.

- Type of occupation in risk areas.

Natural resources

| D | P | **S** | I | R |

Information related to the state of natural resources shows the result of human interaction with nature and gives an indication of the quality of life of the people who depend on these resources.

Table 7: Elements to characterize local ecosystems and biodiversity

Natural resource	Environmental issue	Indicator for the use of the resource (state and/or pressure)	Performance indicator
Climate stability	Greenhouse effect	Carbon dioxide emissions	T/year
Air (quality)	Summer smog	Days with a harmful level of ozone concentration	Events/year
(Unsealed) land/soil	Surface sealing	Newly sealed area (according to realised construction plans)	Ha/year
Freshwater (supply)	Drinking water use	Specific drinking water usage per private household	Litre/inhab./day
Silence	Traffic noise	Streets in general residential areas with a noise level that is harmful to health	Length of streets (km)

Source: ?

Note: ICLEI proposes the following scheme to help identify indicators for the different resources (including also immaterial things such as "clean air" as a resource).

Air

| D | P | **S** | I | R |

No natural resource is less restricted to a locality than the atmosphere; however, measuring local air quality is basic to assessing urban environmental quality and quality of life, as the territorial origin of the emissions (tailpipe or smokestack, the geographic localization of chimneys) is very local when it isn't mobile (trucks, cars, etc.). Poor air quality has environmental, social and economic implications; its consequences are long term and may be irreversible, as in the case of loss of biodiversity, or the impact on the health of children and the elderly (respiratory diseases that may even cause death).

Atmospheric pollution is one of the harshest demonstrations of poor environmental quality and is of major concern in many major cities in the EECCA region. Economic recovery and the growth in transport since 2000 have led to increases in the emissions of most air pollutants. The only decrease in SO2 was reported in Belarus and Ukraine. The major problem for the urban environment has been the rapid increase in private transport. In capitals such as Ashgabat, Dushanbe, Moscow, Tashkent and Tbilisi, transport is the dominant source of air pollutants - more than 80% of the total. Mobile sources are also important in other large cities including capitals such as Baku, Bishkek, Chisinau, Kyiv, Minsk and Yerevan.[4]

Air quality measurements usually include CO, CO_2, SOx, PM10 and ground-level ozone (O3). Other indices may be added according to local conditions. For example, emissions of ozone-depleting gases, measured by the production and consumption of the fluorocarbon family of gases (CFCs).
(see also pressure -atmospheric emissions)

---

4   Source: EEA (2007) Europe's Environment: the fourth assessment

Table 8: Example of a DPSIR analysis for air

Driving force	Pressure	State	Impact	Response
increasing individual mobility	emissions from traffic	high levels of air pollution	respiratory diseases	road pricing maximum values
heavy industry	emissions from industries	high levels of air pollution	high levels of air pollution	Emission controls and restrictions, maximum values taxes according to "polluter pays" principle

Source: EEA (2007) Europe's Environment: the fourth assessment.

Water

D P **S** I R

Water is essential to the life of species, ecosystems and people. As a resource, its main uses are domestic and industrial, energy generation, transport and even for recreation. For the environment, it is a vital resource for natural cycles of ecosystem renovation.

Urban use of water is mostly industrial and domestic. To assess the state of water, consideration must be given to quality of supply, availability and access, as well as the replenishment capacity of water bodies. The analysis considers the source (surface and ground water), the type (freshwater, brackish and salty), quality, and the ecosystem (coastal zones, lakes, rivers, and others) as well as the distribution system.

Freshwater lakes and reservoirs and groundwater are the main sources of water supply in EECCA cities. The supply of water in the EECCA region is often intermittent and of poor quality with a deterioration of water and sanitation services quality over the past two decades. While water supply coverage is high in urban areas of Eastern Europe and the Caucasus, only 60% of the urban population in Central Asia are connected to piped water. Water loss through leakage is very high and can reach 50-60 % (Kyrgyzstan) if not, as some sources suggest up to 80% in the case of Armenia) while in Georgia, Moldova and Ukraine it rose from 30% to 45% over the past two decades. Outside of EECCA, in South Eastern Europe, chemical pollution is the more immediate problem, while in Central Asia microbiological pollution is more important.

Lack of sanitation is another frequent urban environmental problem. The most serious problems are pollution from domestic drains, dumping sewage and industrial effluents into bodies of water, and infiltration of sewage into drinking water. Data on freshwater quality and availability are, consequently, highly relevant for urban environmental management.

Table 9: Example of a DPSIR analysis for water

Driving force	Pressure	State	Impact	Responses
Population, lifestyle	high per capita water consumption	lowering ground water level	drinking water shortage in dry season	increase efficiency of water distribution system (avoid leakages) raise drinking water price (reduces consumption)

Source: EEA (2007) Europe's Environment: the fourth assessment.

Soil | D | P | **S** | I | R |

The ecological and socio-economic functions provided by soil are essential to well being. As a natural resource, soil provides raw material and support for other biosphere systems and environmental services, such as drainage. However, little attention is paid to soil conservation within the environmental protection activities. Urban soil problems are essentially chemical contamination that may date back very far - making it difficult to track the polluters - solid waste

pollution and eroded areas. This type of pollution may originate in chemical effluents from industry, grease contained in waste matter or landfills or clandestine toxic waste deposits. Another effect of urbanisation on soil is the increased degree of impermeability (soil sealing). This may lead to, e.g., an increase in vulnerability to natural disaster risks such as flooding. Similarly, changes in composition and the loss of vegetation and erosion may cause landslides.

Built-up environment | D | P | **S** | I | R |

Cities that invest in maintaining the quality of the built-up environment are aware of the important role a well-kept built-up environment together with well-functioning services has in attracting citizens and companies. Administrations take direct contact with the inhabitants, allow them to participate in the debate about the quality of urban life and arouse their interest in environmental matters relating to local urban development. This will lead to an appropriation of the public space by the inhabitants - they will feel it is their city - and eventually to more respect for public space, leading to less depreciation. Neglecting this leads to cities with no character where the inhabitants are out of touch with the environment.

On the built-up environment the relevant themes are likely to be the following:

- The quality of the built-up environment, the state of conservation of the urban landscape and its buildings;

- Cultural, architectural and historical heritage of buildings and neighbourhoods and their maintenance;

- Urban infrastructure and services.

Climate change | **D** | **P** | **S** | **I** | R |

Climate change can be felt in some sub-regions of the EECCA region by more severe droughts, decreasing fresh water availability, heavier storms, among others. Other regions will be getting more precipitation, with a increased risk for floods. Impacts of climate change pose very serious risks for cities and sectors

including agriculture, forestry, health, local economic activities and biodiversity. In conjunction with other pressures, they could also exacerbate other serious local and regional challenges, such as poverty, poor healthcare, diminishing ecological resilience and energy insecurity.

Impacts of environmental problems | D | P | S | **I** | R |

Impacts in the context of the DPSIR framework are impacts caused by the state of the environment on the quality of life of the inhabitants, on the built-up environment (buildings, urban infrastructure, etc.) and the economic activities that stimulate the city's development. This helps to answer itself the question **"What are the impacts of the state of the environment?"**

The impact information helps to estimate economic and social costs, that is the damages or benefits to the local economy and the quality of life.

The team should take the following wide selection of impacts into consideration:

- Impact on quality of life and human health

- Urban attraction

- Juvenile crime rate

- Incidence of water- and air-borne diseases; and public health costs of water- and air-borne diseases

- Incidence of diseases caused by poisoning and pollution (skin, eyes, and others)

- Respiratory disease incidence, etc.

- Impact on urban economy

- Costs related to environmental management, percentage of local budget allocated,

- Cost of work on preventing and containing environmental risks;

- Property value depreciation; etc.

- Impact on the built-up environment (urban vulnerability)

- Incidence of floods and landslides;

- Population in vulnerable urban areas;

- Deterioration of historic centres and cost of repairing monuments and/or restoring historic centres; etc.

- Impact at the policy-institutional level

- Loss of tax income, etc.

Impact on quality of life and human health | D | P | S | **I** | R |

The effect of degraded environmental conditions on the population can be expressed in the incidence of environment-related diseases. The negative effect on labour (worsening workers' physical capacity, making it more difficult to engage in recreation and sports linked to environmental resources) and the spread of urban inequality and poverty are central to assessing the impact of the state of the environment.

Foremost among diseases that harm the quality of life are those related to poor sanitation and lacking quality of drinking water (leading to water-borne diseases), and the diseases caused by air pollution and noise (respiratory diseases like asthma and lung cancer, and headaches, sleeplessness, stress etc.).

Water-borne diseases appear, above all, among people with few resources living in degraded areas or with no proper urban infrastructure. In Central Asian countries, recurrent environmental diseases such as diarrhoea, intestinal infections and tuberculosis are directly associated with poverty and closely linked to environmental degradation. Dumping untreated domestic drainage effluents into water bodies is a serious source of biological pollution that can affect human health. The costs resulting have to be covered by public health services and cause a loss of productivity, low school attendance and high rates of infant morbidity.

Infant mortality is a measure of the population's general health and quality of life, varying in accordance with income levels, educational standards and access to such essential urban services as water supply and drainage, as well as a public health system. It reflects, therefore, poverty and social inequity, environmental pollution, the lack of investment in public health, and the lack of sanitation services.

Chemical soil contamination also causes damage to human health. Contamination from chemical products dumped directly or from decomposing organic material in waste without proper final disposal constitutes an indirect threat to human heath, by for example drinking water flowing through the contaminated area or the food chain.

Manufacturing establishments are responsible for pollution from heavy metals. Some deposit waste and effluents without any control, thus harming the health of the low-income groups living closest to industries where they look for work, because of the low cost of land in illegal plots.[5] People may also suffer from consuming products polluted with heavy metals, as is the case of fish from polluted rivers. In the case where mining industry is located near the city, toxic mining deposits might be another source of bad health.

But the illnesses and diseases cited are only the most extreme examples of a general effect on urban quality of life.

Examples that are less dramatic, but equally worth mentioning are: an absence of green areas are partly responsible for obesity in children; noise exceeding tolerable levels can cause stress-related diseases; intolerable traffic levels can impede social interaction where street life used to be lively, to name just a few.

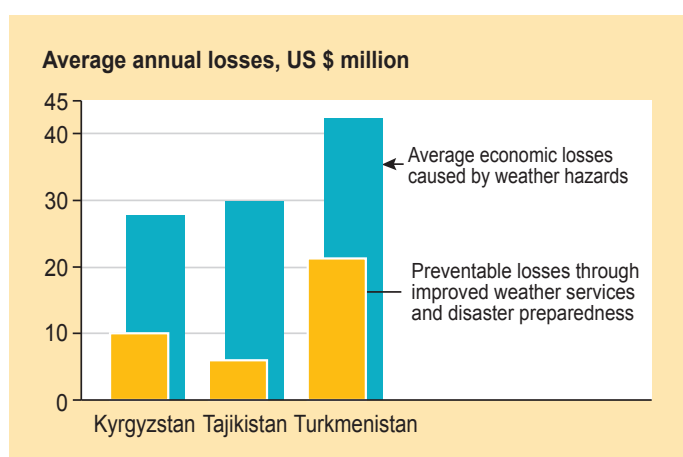## Impact on urban economy

D **P** **S** **I** **R**

The state of the environment causes impacts on the urban economy and productivity in general. This is shown, for example, by how urban functions and living conditions in the most vulnerable zones produce environmental degradation (floods, erosion or soil pollution in water basins, pollution of air basins, warm spots) or by the worsening of risks to housing.

Atmospheric and water pollution or environmental disasters cause health problems that reduce labour productivity because of absenteeism due to illness and increase public health costs.

The attraction of a city and successful competition with other cities depends on natural resources not only in touristic places. A loss in attractiveness could affect the number of jobs available in the sector and a reduction in trade.

Increased expenditures due to increased costs caused by environmental degradation and related public health costs imply higher taxes for enterprises and thus a comparative disadvantage.

*Figure 7: Economic losses from weather hazards in selected Central Asian states

Average annual losses, US $ million

Average economic losses caused by weather hazards

Preventable losses through improved weather services and disaster preparedness

Kyrgyzstan Tajikistan Turkmenistan

Source: World Bank, 2009

---

5   The latter is however not always true: in Ukraine's Donetsk the most expensive land and property are located in the city centre next to 'Donetskstal' steelworks.

Impact on the built-up environment   D P S **I** R

The built-up part of a city has physical and structural functions and is a basic reference for its inhabitants and their activities. This environment consists of buildings, architectural combinations and monuments, the infrastructure itself and urban installations in general.

Direct impacts on buildings are mainly caused by acid rain and air pollution. An indirect impact would be the loss of urban attraction, related to the difficulty of attracting private investments or the influx of business or tourism that stimulates local economic growth.

The impact on the urban infrastructure can be expressed in costs such as the maintenance and repair of historic monuments or in data on the real estate market.

Impact on the political-institutional level   D P S **I** R

Environmental problems increase public spending in different sectors: in the health sector to combat diseases caused by poor water and air quality and by the lack of sanitation, and in public works to contain unstable inhabited hillsides and risk areas, for example. They also cause the loss of tax income should there be a downturn in economic activities such as tourism and services, industry and trade, affecting the local government's capacity to take action on sustainable urban management.

Impact on vulnerability of urban environment and the populations   D P S **I** R

Urban vulnerability may be accentuated due to:

- Economic and social concentration or discrimination of specific population groups;

- Locating settlements in unstable or critical areas;

- Accelerated urban environmental degradation;

- Inadequate and precarious buildings and infrastructure;

- Lack of political and institutional will to solve the problems;

- Lack of effective regulatory and control instruments and mechanisms on land use and occupation and on activities harmful to the environment.

Poverty increases vulnerability to natural disasters. The groups most affected by disasters are usually the poorest living in marginal housing. This population is often pushed towards areas not suitable for occupation, economically marginalized, vulnerable and polluted, without proper infrastructure, and the most affected by flooding and landslides on hillsides caused by rain.

Vulnerability to climate change is recently getting increasing attention, and adapting to climate change impacts has been subject to a manual published by UNEP in the IEA training modules series.

Box 10: Emerging themes

These topics have recently turned into important issues or will form part of the public agenda of cities in our region in a not very distant future, taking into account the accumulation of still solved environmental problems ("environmental liabilities"), and that generally accompany urban development and the growth of cities. These are some of the subjects to be dealt with:

- The effects of climate change on the local environment, and their consequences for the population and economy;

- Impact of local activities on climate change due to the emissions of greenhouse gases into the atmosphere by local industries, household-related energy use and transport.

- Contaminated industrial locations or brown fields, and their impact on health and ecosystems;

- Environmental conflicts related to economic losses and interethnic divergences, damage to health and quality of life caused by environmental pollution and climate change;

- Environmental compensations resulting from pollution caused by industrial activities in the locality;

- Densification of urban areas and non-respect of existing land-use planning regulation;

- Advantages and limits for competition and local development resulting from each locality's environmental liabilities;

- Growing waste generation, growing toxicity of household waste, managing the increasing size of landfills;

- Increased mobility and the traffic problems this generates;

- Deteriorating quality of foodstuffs;

- Urban vulnerability and environmental disasters.

Mechanisms of developing and taking decisions | D | P | S | I | **R** |

People and organisations have important roles in relation to environmental resources. The purpose is to understand the ways in which they currently – or potentially – affect the processes of urban development and of environmental management. Key actors include the public sector but also private businesses, NGOs, interest groups and others.

When describing the various key actors it is useful to discuss their activities and roles in relation to the following three aspects of urban development and environmental management:

a. Information, knowledge, technical expertise

What is the information, specialized knowledge, and technical expertise that different key actors may possess or have access to? Relevant and useful knowledge is much more than simply the technical skills possessed by trained professionals; informal knowledge –and practical experience – is often more valuable than formal or academic knowledge.

b. Decision making, policy formulation and policy coordination

What is the extent to which various key actors are involved in designing policies and in various stages of the decision making process? Private and community sector key actors can have significant influence and roles to play in the formulation of policies and decision making, even if public sector organisations are the main actors in this respect.

c. Policy implementation

What is the involvement of different key actors in implementing the city's development and the environmental policies, strategies and programmes? This involvement can be formal as for public sector actors with legal implementation responsibilities or informal, with less explicit, but equally important roles of communities, NGOs, and private sector groups.

Urban environmental management structures and functioning | D | P | S | I | **R** |

This concerns general administrative structure of the city-wide management and the different responsibilities of the departments as well as cooperation and coordination. Awareness of the local political and institutional structure will help to identify available or missing political instruments and the leeway the local government has to induce change.

The focus of the attention is on the following key factors:

a. Overall organization and structure

The basic structure and organisation of the city's management system - the institutions and groups that are responsible for various aspects of urban environmental management.

b. Information, knowledge and technical expertise

Organisations and groups responsible for collection, distribution, analysis, management, and use of information and specialized knowledge. Accessibility of information and main areas of technical expertise available to city management.

c. Decision making, policy formulation and policy coordination

Who is involved in the formulation of policies, what are the main organisations and groups with decision-making responsibility? How is policy coordination handled?

d. Policy implementation.

Which organizations are responsible for implementation of public policies in the different sectors and the subject areas of concern? There are usually three different levels of decision-making and policy formulation and implementation:

•   Political

•   Managerial/Administrative

•   Operational/Technical

The implementation of environmental policies	D	P	S	I	R

What are current activities to increase local abilities to plan, coordinate and manage sustainable urban development? **How effective are they?** Highlight policy instruments that may contribute to solving some of the difficulties identified earlier. These re-sponse instruments take different forms, are directed at different social stakeholders and have different consequences for urban surroundings and the different actors, and are more or less effective.

Political-administrative instruments	D	P	S	I	R

Policy comes in the form of rules, principles, norms, and incentives and negotiated decision-making procedures. Environmental policies are developed in a socio-economic and political context, usually in response to a problem. Policy-administrative instruments are mechanisms, usually mandatory, that drive the actions of local public and private stakeholders.

Societal responses may mitigate an environmental problem leading to improving the state of the environment, or could be in themselves drivers for worsening the same problem or creating new ones. For example, subsidizing energy prices could increase energy accessibility for the poor. However, low energy prices could send market signals that result in a growing energy demand, resulting in an increase in harmful air emissions.

Policy instruments include a broad range of initiatives, such as:

Table 10: Categorization of politico-administrative instruments	
Instrument	**Description**
Economic instruments (financial incentives)	Are measures that directly influence the price that a producer or consumer pays for a product, behaviour or activity.
e.g. Subsidies or Taxes	Instruments such as cash subsidies, tax breaks and grants induce behavioural change by making the more desired behavioural option cheaper, thereby increasing its attractiveness to the producer or consumer (Barg and others 2000).
Direct Expenditure	Governments influence producer and consumer behaviour by channelling expenditures directly at the behaviour they want to encourage. Direct expenditures differ from subsidies in that they are typically broad programmes of expenditures targeted at a macro level to foster activities such as technological innovation, whereas subsidies reward incremental changes in individuals' behaviour.
e.g. Green procurement Research and Development	Governments can allocate budget expenditures to R&D directed at specific economic, social and environmental goals.
Regulatory/legal	Creating change via legal avenues (standards, regulations, urban-environmental laws at local, regional, national or global level that have a local effect)(e.g. by demanding energy-efficiency standards in the building sector or ISO environmental certification for enterprises)
Institutional	Affect the workings of the government itself in an effort to promote change, (internal education, Internal policies and procedures).
Plans and programmes	Set a vision or goals for future development (urban master plans, agenda 21 programme, etc.)

Source: IISD and TERI 2003.

Typical policy instruments of local governments are used to manage tasks as the following:

- Defining rules on using urban space - for example by establishing construction standards or setting conservation objectives for the urban green areas;

- Allocating public funding - setting priorities for positive interventions (through investments into new and maintenance and rehabilitation of existing housing, public buildings, public space (squares, streets, parks etc.) as well as providing the local population with services);

- Describing a vision of the ideal city, environment, type of development (economic, social and environmental) - setting objectives, goals, defining indicators, mechanisms, instruments, and estimating the budget needed;

- Public participation: Inviting sectors interested in or affected by a policy to participate to a greater or lesser extent;

- Sectoral policies (environmental protection, urban development, transport and mobility, control of environmental pollution, health care, local agenda 21);

- Institutional measures (establishing ministries or other environmental agencies, programmes, projects and institutional action, e.g. local agenda 21 coordination office or creating entities covering the entire functional urban area beyond the administrative boundaries of the city center);

- Follow-up and control (control mechanisms to enforce standards, laws and public policies; environmental monitoring instruments);

- Territorial planning (urban master plans, environmental management plans, land use, distribution of functional zones[6], environmental protection areas).

Technological instruments of environmental policy	D	P	S	I	**R**

Technological advances introduced by the public or private sector may be able to change environmental conditions through either new processes (new production technologies, solid and liquid waste treatment, pollution from industrial gas emissions, recovery of degraded areas, recycled material) or products (industrial filters, automobile catalysers, sprays without CFCs, unleaded gasoline, hybrid cars).

If possible, relate the assessment to incentives created by the local authorities: Are these innovations the result of incentives created by the local government? In order to evaluate their effectiveness, show how the new technologies affect the state of the environment: for example, were emissions of greenhouse gases reduced with the introduction of industrial filters, catalytic converters or CFC- free aerosol sprays?

Physical intervention instruments of environmental policy	D	P	S	I	**R**

Among the principal mechanisms to improve the local environment are physical measures to reduce pressure of urban activities on the environment. These are generally sanitary engineering works (building a drainage network or a network to collect, treat and distribute water) or others designed to correct socio-environmental problems caused by uncontrolled land occupation (for example, areas at risk of landslides or subject to flooding).

The following are typical engineering operations and works:

- Increasing access to public health services (building, expanding, improving infrastructure, connecting to drainage networks, collecting and treating solid waste, decontaminating rivers and other water courses);

- Creating and reclaiming green areas, parks, gardens, environmentally protected areas, even when finance alone is not a good indicator that the response is effective;

- Water supply system (financing, source, socio-spatial distribution, supply/demand relation);

---

6   In Azerbaijan it was decided to establish the Apsheron industrial area 30 km away from the capital Baku. All major industrial enterprises, the sea port, and oil terminals are to be relocated there. Such a concentration of industries in one territory will abruptly increase the impact on the environment, thus already at the initial stage a strategic environmental assessment of the plan is clearly needed.

- Drainage systems (financing, source, socio-spatial distribution, supply/demand relation);

- Final disposal of solid waste (financing, source, type of treatment, localization of garbage deposits,

- Channelling rivers, clearing watercourses, protecting springs, conserving riverbanks; and

- In areas subject to flooding: types of operations, amount of resources, areas and population benefiting.

Socio-cultural, educational and public communication instruments of environmental policy   D P S I **R**

Instruments that try to promote changes in the behaviour of individuals, companies and government bodies are increasingly employed to deal with environmental problems. There is a growing understanding that if social stakeholders do not change their own behaviour with regard to the use of natural resources, other response instruments will have a limited effect. Environmental education and communication play a central role in halting the irresponsible exploitation of the environment.

Contemporary production and consumption models are supported by the constant use of advertising and marketing. Using this know-how, a wide range of instruments has been developed in recent years to make people aware of the interactions between society and the environment and to change consumption patterns that are incompatible with the sustainable use of environmental resources

These instruments include mechanisms that encourage greater social participation in formulating, managing and following up on local public policies and decision-making on concerns about the quality of life.

In analysing this type of response, the focus should be on:

- Participation by civil society in city life

- Incentives for participating in social organizations, in decision-making and in implementing public policy on the environment state/civil society/private sector projects

- Participation in elections

- Educational programmes and services (environmental education, campaigns on the use of natural resources, selective collection of waste, recycling material).

- Use of mass media and information technology (availability of environmental information on the Internet, in press, radio and television programmes) to promote environmental communication.

Gaps and recommendations   D P S I **R**

After having analysed the existing instruments of environmental policy and their performance, one can carry out a gap analysis to identify the missing policies (that is, what instruments fulfil their purpose, which ones are not applied correctly or don't show any results? What instruments are missing for an effective environmental management?). This will lead to the part of looking into the future, developing scenarios by projecting the collected data into the future, and making recommendations on how to improve the situation.

The analysis of the local problems and their responses will conclude in recommendations and conclusions to guide decision-makers, based on the priorities identified in the beginning of the analysis. The recommen-

dations will set objectives and goals, and describe actions, instruments and institutional and financial resources needed to carry out the strategies and policy actions outlined in the report.

The policies proposed should be directly derived from the analysis, indicating how implementing them will help to change the state of the environment and what impact they have on the quality of life, on ecosystems and on the urban economy.

For these recommendations you would ideally seek the approval of the local parliament/government, as it is up to them to carry the results further and to translate the recommendations into a strategy and a concrete action plan.

Glossary and Definitions

→ Biodiversity is the variation of life forms within a given ecosystem, biome or for the entire Earth. Biodiversity is often used as a measure of the health of biological systems. Biodiversity found on Earth today consists of many millions of distinct biological species, the product of four billion years of evolution.

→ Biotic means relating to, produced by, or caused by living organisms.

→ Chemical Oxygen Demand (COD) test is commonly used to indirectly measure the amount of organic compounds in water. Most applications of COD determine the amount of organic pollutants found in surface water (e.g. lakes and rivers), making COD a useful measure of water quality. It is expressed in milligrams per litre (mg/L), which indicates the mass of oxygen consumed per litre of solution. Older references may express the units as parts per million (ppm).

→ City proper is the single political jurisdiction, which contains the historical city centre.

→ Climate is the average and variations of weather in a region over long periods. Climate zones can be defined using parameters such as temperature and rainfall. Paleoclimatology focuses on ancient climate information derived from sediment found in lake beds, ice cores, as well as various fauna and flora including tree rings and coral. Climate models can be used to determine the amount of climate change anticipated in the future.

→ Deforestation is the change from forested areas to non-forest land for use such as pasture, urban use, logged area, or wasteland. Generally, the removal or destruction of significant areas of forest cover has resulted in a degraded environment with reduced biodiversity. Deforestation results from removal of trees without sufficient reforestation, and results in declines in habitat and biodiversity, wood for fuel and industrial use, and quality of life.

→ Desertification is the degradation of land in arid, semi arid and dry sub-humid areas resulting primarily from human activities and influenced by climatic variations. A major impact of desertification is biodiversity loss and loss of productive capacity.

→ Ecosystem is a natural unit consisting of all plants, animals and micro-organisms (biotic factors) in an area functioning together with all of the non-living physical (abiotic) factors of the environment.

→ Hazardous substance is any solid, liquid, or gas that can harm people, other living organisms, property, or the environment. Hazardous substances may be radioactive, flammable, explosive, toxic, corrosive, bio-hazardous, an oxidizer, an asphyxant, a pathogen, an allergen, or may have other characteristics that render it hazardous in specific circumstances. Mitigating the risks associated with hazardous materials may require the application of safety precautions during their transport, use, storage and disposal. Most countries regulate hazardous materials by law, and they are subject to several international treaties as well.

→ ICLEI - Local governments for sustainability is an international association of local governments and national and regional local government organizations that have made a commitment to sustainable development. More than 1100 cities, towns and their associations worldwide comprise ICLEI's growing membership.

→ LA21 Local Agenda 21 is a programme that provides a framework for implementing sustainable development at the local level. LA21 aims to build upon existing local government strategies and resources.

→ Metropolitan area is the set of formal local government areas, which are normally taken to comprise the urban area as a whole and its primary commuter areas.

→ Organic compound is any member of a large class of chemical compounds whose molecules contain carbon.

→ Pollution is the introduction of contaminants into an environment, of whatever predetermined or agreed upon proportions or frame of reference, which causes instability, disorder, harm or discomfort to the physical systems or living organisms therein. Pollution can be in the form of chemical substances, or energy such as noise, heat, or light. Pollutants can be naturally occurring substances or energies, but are considered contaminants when in excess of natural levels. Pollution is often categorized into point source and nonpoint source pollution. In another sense, pollution is a term for any substance introduced into an ecology that causes instability and breakdown of the life or reproductive forces of said system. A substance as common and

generally healthy as water can become a "pollutant" at high enough concentrations, e.g. if a human were to drink excessive amounts, leading to a burden on physical systems, a breakdown of such systems, and potentially leading to death. In an even broader application of the concept, excessive noise "pollution" and exposure is used in military exercises to induce imbalance in the subject's mental ecology, causing malfunction and psychosis.

→ Resource-based depletion refers to depleting non-renewable resources, such as fossil fuels, and the degradation of renewable resources, such as soil and water

→ UNCSD an inter-governmental body whose members are elected by the Economic and Social Council (ECOSOC) from amongst the Member States of the United Nations and its specialized agencies. The Commission on Sustainable Development (CSD) was established as a functional commission of the Economic and Social Council by Council decision 1993/207. Its functions are set out in General Assembly resolution 47/191 of 22 December 1992.

→ Urban agglomeration is the built-up or densely populated area containing the city proper; suburbs, and continuously settled commuter areas. This may be smaller or larger than the metropolitan area. Other similar UN definition: Comprises a city or town proper and the suburban fringe or thickly settled territory lying outside, but adjacent to, its boundaries. A single large urban agglomeration may comprise several cities or towns and their suburban fringes.

Links and references

→ Cities Alliance, ICLEI, UNEP, "Liveable Cities, The Benefits of Urban Environmental Planning", 2007 http://www.unep.org/urban_environment/PDFs/LiveableCities.pdf

→ European Environment Agency, The European environment – state and outlook 2010, Copenhague 2010.

→ European Environment Agency, "Ensuring quality of life in Europe's cites and towns", 5/2009 www.eea.europa.eu/publications/quality-of-life-in-Europes-cities-and-towns

→ European Environment Agency core set of indicators: http://themes.eea.europa.eu/IMS/CSI

→ European Environment Agency, "Europe's Environment - the fourth assessment", Denmark, 2007 www.eea.europa.eu/publications/state_of_environment_report_2007_1/chapter1.pdf

→ National Strategies for Sustainable Development (NSSD), "Pressure State Response Frameworks," www.nssd.net/references/SDInd/PSR.html

→ UNEP and IISD, GEO Resource Book: A training manual on integrated environmental assessment and reporting, 2007, www.unep.org/dewa/cbps/georesource/

→ UNEP, "GEO Process," www.unep.org/geo/Docs/GEOProcessBrochure.pdf

→ UNEP, GRID Arendal, Cities Environment Reports on the Internet (CEROI) Programme, Urban Environment Gateway, "DPSIR Framework". http://ceroi.net/reports/arendal/dpsir.htm

→ UNEP, IISD, and Ecologistics International, 2000: "Capacity Building for Integrated Environmental Assessment and Reporting". Training Manual, 101.

→ UNEP, The fourth Global Environment Outlook: Environment for development (GEO-4), 2008 www.unep.org/geo/geo4/media/

→ UNEP (ed.) "IEA training manual volume two. Vulnerability and Impact Assessments for Adaptation to Climate Change (VIA module)", 2010.

→ UNEP/ GRID-Arendal: Cookbook for SoE reporting, Arendal, 1998 http://www.grida.no/_res/site/file/publications/cookbook/cookbook.pdf

→ UNEP/GRID-Arendal: Communication strategy for GRID-Arendal, March 2003 www.grida.no/news/seminars/impact.aspx?id=3036

→ UN-HABITAT, "Urban indicators," www.unhabitat.org/programmes/guo/urban_indicators.asp

→ UN-HABITAT, Urban Indicators Guidelines. Monitoring the Habitat Agenda and the Millennium Development Goals, August 2004, www.unhabitat.org/programmes/guo/documents/urban_indicators_guidelines.pdf

→ UN-HABITAT "Planning Sustainable Cities. Global Report on Human Settlements 2009". Nairobi. Earthscan. order here: www.unhabitat.org/pmss/listItemDetails.aspx?publicationID=2831

→ Von Schirnding, Yasmin (Dr.) 2002. Health in Sustainable Development Planning: The role of indicators. Geneva: World Health Organization.

→ UNECE, Environment for Europe process, "Environmental indicators and reporting in Eastern Europe, the Caucasus and Central Asia": www.unece.org/env/europe/monitoring/IandR_en.html

→ Zoï Enviroment Network, Climate Change in Central Asia, Geneva, 2009. www.zoinet.org/fileadmin/publications/CCCA_dec2009.pdf

→ UNEP / GRID-Arendal 1998. Cookbook for State of the Environment Reporting on the Internet www.grida.no/_res/site/file/publications/cookbook/cookbook.pdf (на русском языке: www.grida.no/_res/site/file/publications/cookbook/coockbook-ru.pdf).

→ UNECE 2009. Making Data Meaningful www.unece.org/stats/documents/writing/

→ UNEP IEA community learning platform
http://hqweb.unep.org/ieacp/iea/

→ Urban audit:
www.urbanaudit.org/index.aspx.
The Urban Audit contains data for over 250 indicators across the following domains: Demography, Social and Economic Aspects, Civic Involvement, Training and Education, Environment, Travel and Transport, Information Society, Culture and Recreation. It involved 321 European cities in the 27 European countries plus 36 cities from Norway, Switzerland and Turkey.

→ ICLEI local sustainability internet platform:
www.localsustainability.eu/

→ Local resources toolkit
www.localresources21.org/
The Local Resources 21 Toolkit provides resources and guidance to assist local governments in making effective progress towards local sustainability implementation, and is based around the principles of the Aalborg Commitments.

→ Aalborg commitments website
www.aalborgplus10.dk/

→ Local Environmental Action Plan guidelines in Russian and English from the Regional Environmental Centre REC-Caucasus:
www.rec-caucasus.org/recc/index.php?f=15&su=15010080&t=index

→ UN Department of Economic and Social Affairs, Division of Sustainable Development's set of indicators on sustainable development:
www.un.org/esa/sustdev/natlinfo/indicators/isdms2001/table_4.htm

Annex 1

Indicator sets

In this list you will find different sets of indicators from different levels. Most indicator sets were developed to cover not only the environmental pillar but all three aspects of sustainable development (economic, social, environmental). Please do not take them over blindly, but make a choice that suits your local circumstances. Many of these lists are much too extensive, but they are listed here because they contain some pertinent elements. As most of them are from official sources, they may constitute a reference and are therefore relevant.

- EEA core set of indicators (2005)

- ECE key environmental indicators for Eastern Europe, Caucasus and Central Asia

- List of indicator sets collected in the context of the TISSUE project (Trends and Indicators for Monitoring the EU Thematic Strategy on Sustainable Development of Urban Environment)
  http://ce.vtt.fi/tissuebrowser_public/index.jsp

- The Urban audit. Over 250 indicators from over 300 European cities

- STATUS (Sustainability Themes and Targets for the Urban Thematic Strategy) indicators

- CEROI core set of indicators (Cities Environment Reports on the Internet, project coordinated by GRID-Arendal)

- European Common Indicators towards sustainable cities

- EMAS indicators (European Eco-Management and Audit Scheme)

- FEST (Arbeitsgruppe Nachhaltige Entwicklung der Forschungsstätte der Evangelischen Studiengemeinschaft -Germany) system of 64 Indicators

- Ecobudget list of indicators

- UN Department of Economic and Social Affairs, Division of Sustainable Development's set of indicators on sustainable development:
  www.un.org/esa/sustdev/natlinfo/indicators/isdms2001/table_4.htm

Annex 2

- Examples

- Example of an indicator fact sheet (EEA, Europe's Environment, the fourth assessment, 2007)

- Example of an indicator methodology sheet (UN-HABITAT, Urban Indicators Guidelines. Monitoring the Habitat Agenda and the Millennium Development Goals, August 2004)

- Example of an indicator sheet from Zurich city's sustainability report (in German)

- List of city networks

- Eurocities

- European Green Cities Network (EGCN)

- The European Sustainable Cities & Towns Campaign

- International Healthy Cities Foundation

- Green cities

UNEP