IPIECA: playing an active role in urban air quality management

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Abstract
IPIECA has developed a framework for studying air quality management in urban areas in developing countries. It sets out a process for assessing local issues, understanding problems, and evaluating strategies in order to reduce emissions and meet air quality targets. The aim of this initiative is to encourage development of practical, science-based and cost-effective approaches to help meet health-driven air quality standards.

Résumé
Pour les études sur la gestion de la qualité de l'air, IPIECA a mis au point un cadre qui peut être appliqué aux agglomérations des pays en développement. Ce cadre propose une méthode pour évaluer la situation locale, comprendre les problèmes et déterminer les stratégies qui permettent de réduire les émissions et d'atteindre les objectifs de qualité de l'air. Le but de cette initiative est d'encourager l’élaboration d’approches pratiques, scientifiques et rentables pour respecter les normes de qualité de l’air dictées par des considérations sanitaires.

Resumen
La IPIECA ha desarrollado una estructura para los estudios de gestión de la calidad eólica, aplicable en las áreas urbanas de los países en desarrollo. Pone en marcha un proceso de valoración de los aspectos locales, a través del pleno entendimiento de los problemas y la evaluación de las estrategias destinadas a reducir las emisiones y lograr la calidad de aire deseada. La finalidad de esta iniciativa es fomentar el desarrollo de proyectos prácticos, basados en fundamentos científicos y rentables que permitan alcanzar los estándares sanitarios de calidad eólica.

IPIECA is an industry association with an international membership of over 40 petroleum companies and related trade organizations. Its primary aims are to develop industry-government partnerships in order to tackle global environmental problems, and to identify practical, scientifically sound and cost-effective solutions to these problems. IPIECA currently runs programmes on oil spill preparedness and response, global climate change, biodiversity and urban air quality management. Through a Strategic Issue Assessment Forum, it also helps members identify new global environmental issues and assess their potential impact on the oil industry. These programmes are carried out in cooperation with industry, government, regulatory bodies, international agencies, academia and NGOs.

Managing urban air quality is a problem facing most cities worldwide. For many years it has received considerable attention in OECD countries. More recently, under pressure of rapid economic and social development, major cities in Asia, Latin America, the Middle East and Africa have been recognizing and addressing this problem. Work carried out in OECD countries has created a rich portfolio of experience, from which IPIECA has drawn valuable lessons. IPIECA is now actively communicating these lessons through its urban air quality management programme. IPIECA’s Urban Air Quality Management (UAQM) Programme is the medium through which the international petroleum industry collectively contributes to air quality debate. Drawing on expertise within the industry, the UAQM Group has developed a framework that charts a series of step-by-step processes to assist in developing quality management plans. The framework encourages the development of cost-effective policies to improve air quality, based on thorough and objective assessment of all emission sources.

To communicate this framework, IPIECA has visited a number of countries in Southeast Asia, culminating in an air quality workshop in Kuala Lumpur in 1997. The workshop provided an opportunity for these countries to share experiences with air quality management. Similar visits to Latin America have resulted in an ongoing partnership with the Regional Association of Oil and Natural Gas Companies in Latin America and the Caribbean (ARPEL) and participation in their air quality management programme (ARPEL/CIDA Environmental Programme, Phase 2: EMATM). IPIECA has produced a series of publications (IPIECA 1999, IPIECA 2000) and developed a PC-based emission forecasting model, the UAQM Toolkit. The Toolkit is designed to build emission inventory databases and help advance the search for scientifically based long-term air quality management strategies.

This article describes the principles behind IPIECA’s UAQM programme and illustrates the role of the UAQM Toolkit in encouraging adoption of a structured approach to air quality management.

Principles of the IPIECA framework

Background

In 1990, IPIECA formed a “Transportation Network” of key petroleum industry representatives who recognized the importance of the companies’ role in the growing global discussions on air quality problems. Shortly thereafter, an IPIECA article on “Automotive options and air quality management in developing countries” appeared in UNEP’s Industry and Environment review as a first collective industry contribution to the debate (Saville 1993). This article highlighted the need for information exchange on the experiences of “clean vehicle” and “clean fuels” programmes, to ensure that policies being implemented in rapidly expanding cities do not replicate unsuccessful strategies carried out elsewhere.

The IPIECA Urban Air Quality Management programme was established in 1995, resulting from these earlier studies and the petroleum industry’s experience with Auto-Oil programmes in Europe and the United States, Japan and other OECD countries. These Auto-Oil programmes were designed to identify optimum engine fuel solutions to meet legislative air quality standards. More recent studies also acknowledge the need for an “integrated approach” to air quality management that considers stationary sources (i.e. residential developments, factories, power plants, etc.) as well as mobile sources of pollution from transport systems. The experience with Auto-Oil programmes was subsequently concentrated into key principles endorsed by the petroleum industry through IPIECA as essential to the development of successful air quality management programmes.

Principles

The principles of the UAQM framework include sharing experience and expertise, basing regulatory decisions on objective assessments, and ensuring that management plans are cost-effective and that emission control strategies are appropriate to local situations. These principles recognize that stakeholders must work in partner-
Designing cost-effective management plans. As governments and industry will be required to make considerable investments in order to realize and manage local air quality programmes, thorough cost-effective analysis should be carried out to ensure the best application of scarce resources (e.g. evaluating the cost per tonne of reduced emissions resulting from an emission reduction strategy).

Developing locally appropriate solutions. Air quality management strategies vary in effectiveness and costs. They may be successfully adopted in one location but not similarly effective in others, either technically, financially, environmentally, socially or politically.

Working in partnership. Experience has shown that developing partnerships between all stakeholders is key to the implementation of a successful urban air quality management plan. Government, industry and the public must be involved in the development of, and commitment to achieving, air quality goals. In this context, IPIECA is currently working closely with the World Bank’s Clean Air Initiative, national and regional governments, academic institutions and NGOs (Box 1).

Prioritizing issues. Air quality management plans must prioritize key issues and sources of pollutants to ensure that emission reduction strategies tackle problems in the order of their significance. For example, it has been assumed that implementing technical improvements will automatically result in less pollution. However, this assumption must consider that a reduction in emissions per source may not compensate for the growth in the number of sources, and that the sources targeted may not be the priority ones.

Encouraging transparency and peer review. To establish and maintain the credibility of any programme, all stages should be open and transparent and the findings made available for challenge and debate. Given the wide range of interested parties, collection.

Stage 3: The next stage requires the establishment of an emission inventory database that considers stationary, mobile and natural sources. Box 2 provides an example of how the UAO M Toolkit has assisted this process in Lima- Callao, as part of IPIECA’s contribution to the World Bank Clean Air Initiative.

Stage 4: An emission inventory database, combined with socio-economic growth factors, allows forecasts to be made of future patterns in pollutant emissions. Having established future emission.
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Figure 2: Stages of the IPIECA framework that can be explored using the IPIECA UAQM Toolkit (shaded in blue)

Stage 5: Alternative strategies, and combinations of strategies, can then be evaluated to quantify the effect they have on reducing emissions, and consequently to achieve associated improvements in air quality. Examples of emission reduction strategies for mobile source emissions include the introduction of catalysts, Euro II technologies, traffic management, fuel reformulation, and taxation on fuels, vehicles and road usage. Strategies to reduce emissions from stationary sources might include switching to cleaner fuel (e.g. natural gas), applying end-of-pipe controls such as a cyclone filter, or introducing energy efficiency measures in domestic/commercial sectors.

Stage 6: Having identified suitable strategies and combinations of strategies that meet the required reductions in emissions to achieve air quality targets, the costs associated with investing, operating and regulating each strategy need to be determined. From this, the relative cost-effectiveness of alternative scenarios can be determined and ranked. Once the most cost-effective strategies have been identified, the process of tempering the strategies with public opinion and political will can begin.

The IPIECA Urban Air Quality Management (UAQM) Toolkit

The IPIECA UAQM Toolkit is a PC-based model developed to assist in communicating and implementing the IPIECA structured approach to air quality management. It explores those steps in the framework highlighted in Figure 2 and encourages multi-stakeholder involvement and sound scientific analysis throughout the process. The UAQM Toolkit is designed as a series of Excel worksheets and is driven by equations enshrined in Visual Basic “add-ins.”

The UAQM Toolkit has been designed to allow mobile and stationary sources of air pollutant emissions to be characterized over periods as long as 100 years, or as short as 24 hours. The characterization may be chosen to represent, and hence validate, historical conditions, and/or to project into the future to understand future trends in emissions. Forecasts of future emission trends are based on economic growth factors and energy usage. Data are entered on the energy demand from mobile emission sources (e.g. cars, motorcycles, buses, etc.) and stationary emission sources (e.g. industry, domestic dwellings) and natural emission sources (e.g. crop/forest burning, volcanoes).

Examples of data required in order to characterize and determine factors affecting emissions from mobile and stationary sources are shown in Table 1.

The UAQM Toolkit calculates the quantity of carbon monoxide, volatile organic compounds, nitrogen oxides, particulate matter, sulphur oxides and lead released from these sources using scientifically established emission factors (see, for example, EP EF E 1995). Once the emissions of each of these pollutants are known, the user can begin to assess the priority sources of pollution that will be targeted by emission reduction strategies.

The “base case” of emissions over a chosen timeframe having been established, alternative emission reduction strategies can be assessed to test the effects on one or several pollutants. The UAQM Toolkit uses established relationships to determine the effect of control strategies on emissions. To assess the cost-effectiveness of emission reduction strategies, the UAQM Toolkit determines which strategy or combination of strategies can reduce emissions to levels that meet future air quality targets at minimum cost. For each strategy, investment, operating, regulatory and welfare costs need to be established for the given urban area. An example of output from the UAQM Toolkit cost-effectiveness studies is shown in Figure 3. Using this output, a policy-maker can identify strategies to reduce emissions

Box 2: Preparing an emission inventory for Lima-Callao, Peru

IPIECA and consultants from Enstrat International Ltd have been working with the Lima-Callao Clean Air Initiative (CAI) Committee, a part of the World Bank CAI Initiative, since the beginning of 2000. This programme aims to develop an air quality management plan for the Lima-Callao metropolitan area. IPIECA’s involvement in the programme has three phases:
1. gathering data for a preliminary emission inventory database to be used in the UAQM Toolkit;
2. running a workshop on use of the UAQM Toolkit and the review of emission inventory data;
3. providing help desk support for the development of a final emission inventory and guidance on assessing the effect of emission control strategies.

Emission data for the Lima-Callao metropolitan area were provided by representatives of the CAI Committee and reviewed by participants in the Toolkit Training Workshop in June 2000. Representatives from government ministries, the Lima and Callao City Councils, the local petroleum industry, auto associations, the World Bank and Swiss-contact international consultants attended the Training Workshop.

Emission data from mobile and stationary sources were gathered for years in which data were readily available. Historical and future data profiles were then developed for the period 1970-2025, using the Toolkit’s capacity to generate data based on socio-economic indicators available from several international studies carried out for Peru. Once a finalized emission inventory database has been agreed, emission reduction strategies can be tested. Participants trained in using the Toolkit will then have a valuable forecasting and decision-making tool to assist in the development of cost-effective urban air quality management plans for the city.
Validation of the UAQM Toolkit

IPIECA members and several agencies responsible for national air quality programmes have reviewed the capabilities of the UAQM Toolkit. These reviews highlight the value of the Toolkit for cities in developing economies that do not currently have access to emission inventory models with the capacity to evaluate potential emissions control scenarios. The World Bank, which has also reviewed the UAQM Toolkit, recognizes its value in developing comprehensive emission factor databases and calculating multiple fuel scenarios. As part of the World Bank CAI initiative, the UAQM Toolkit has been used to prepare emission inventories in Lima-Callao (Box 2) and the potential for application is being looked at in Rio de Janeiro.

The UAQM Toolkit is also being used to assist World Bank studies focusing on two-stroke vehicle emission studies in Delhi and Dhaka.

The case study in Box 3 shows how the UAQM Toolkit has recently been applied by Shell Global Solutions to assess policy options to improve air quality in New Zealand. This study compared the predicted total emissions (kilotonnes/year) from the UAQM Toolkit with official figures from the New Zealand Government. The results showed that the UAQM Toolkit produced predicted values in line with official figures, with a difference of 1% for NO\textsubscript{x}, 4% for CO and 4% for VOC.

Conclusion

To produce effective air quality management plans for rapidly expanding cities, policies need to be based on a sound understanding of all sources of emissions, be cost-effective and locally appropriate, and be achieved through the development of strong relationships between the private and public sectors.

The IPIECA framework has been developed to communicate these principles. It provides a step-by-step approach to guide policy-makers through a structured approach to the assessment of policy options. IPIECA is working closely with the World Bank and partners in the Clean Air Initiative.
References
For further information about the IPIECA framework work and UAQM Toolkit, contact D. Mansell-Moullin at mansell_moullin@ipieca.org or at the address shown above.
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The APELL process has ten steps:
1. Identify emergency response participants and establish their roles, resources and concerns.
2. Evaluate hazards and risks that may result in emergency situations in the community.
3. Have participants review their own emergency response plans to ensure a coordinated response.
4. Identify required response tasks not covered by existing plans.
5. Match these tasks to the resources of the identified participants.
6. Make the changes necessary to improve existing plans, integrate them into an overall community plan and obtain agreement.
7. Commit the integrated community plan to writing and obtain approval from local governments.
8. Educate participating groups about the integrated plan and ensure that all emergency responders are trained.
9. Establish procedures for periodic testing, review and updating of the plan.
10. Educate the community about the integrated plan.

APELL as a tool for implementing Agenda 21

The importance of preventive measures to protect the environment was clearly identified in Agenda 21, particularly Chapter 19 (48), where reference is made to activities that reduce technological risks. This chapter encourages local governments to eliminate unacceptable or unreasonable risks and, to the extent economically feasible, to reduce risks posed by toxic chemicals by employing a broad-based approach involving a wide range of risk reduction options and by taking precautionary measures derived from a broad-based life-cycle analysis.

Among the activities recommended in 19 (49), governments should:
- Develop national policies and adopt the necessary regulatory framework for prevention of accidents, preparedness and response, inter alia, through land-use planning, permit systems and reporting requirements on accidents, and work with the OECD/UNEP international directory of regional response centres and the APELL programme.
- A number of countries have adopted these objectives and introduced APELL as the central component of their disaster management regulations.
- UNEP Technical Report No. 12, Hazard Identification and Evaluation in a Local Community, prepared with the help of Sweden, discusses in more detail the steps communities can take to identify the risks they face when they deal with different types of disasters. It also presents case studies and examples of risks posed by natural disasters, fires, chemical reactions and incidents that pose more than one type of risk.

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Basic principles of the APELL process: communication and cooperation

The APELL process assists disaster planning in urban areas. The APELL programme's purpose is to improve prevention of, and response to, technological accidents, especially in developing countries. APELL provides a structured, detailed description of how to develop coordinated, integrated and well-functioning emergency response plans for local communities. These plans have two main parts: the "awareness" function (provision of information to the community) and the "preparedness" function (formulation of plans to protect people, property and the environment). Creation of an emergency response plan should involve the whole community, including industry managers, local authorities and community leaders.

Every disaster, whatever its cause, can have environmental as well as human impacts. Disaster planning is critical for urban areas, which bring together high concentrations of people with high densities of facilities that use, store or make hazardous substances. Natural disasters like storms and earthquakes can result in releases of dangerous materials from industrial and commercial sites. Sometimes major industrial accidents can be contained within the boundaries of a plant. In other cases they affect the surrounding area, with adverse short- or long-term impacts on life, property and the environment.

The risks from accidents related to transport of dangerous goods by road, rail or pipeline, either through or close to populated areas, can be especially great. By definition, there is no boundary fence in such cases. The extent of the damage, particularly from accidents, depends largely on the first responders' actions at the accident scene and within the surrounding community.

Adequate response to such situations requires cooperation between various institutions and individuals. This can be achieved only if the community is aware of possible risks, and of the need for joint preparedness to cope with the consequences of accidents and disasters.

Community planning for disasters: UNEP's APELL programme
Des villes et de leur patrimoine : origines et conditions de préservation

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Abstract
How to promote both conservation and appropriate use of the urban heritage can present public authorities with difficult choices. This article, which briefly considers how cities develop, suggests ways to establish a balance between use and preservation

Résumé
La conservation et l'utilisation du patrimoine urbain placent les responsables de la gestion des villes devant des choix difficiles. L'article ci-dessous propose un court rappel historique de la constitution des villes qui permet de dégager les conditions d'un équilibre entre l'usage du lieu et sa préservation.

Resumen
El problema de fomentar tanto la preservación como el uso apropiado del legado urbano planearía a las ciudades alternativas complicadas. Este artículo, que presenta concisamente el desarrollo de las ciudades, estudia diversos modos de establecer un equilibrio entre el uso y la preservación histórica.

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L a protection du patrimoine est devenue de
nos jours une activité importante de la vie des
pays. C'est un enjeu politique et économique
qui revêut régulièrement dans les choix des diri-
gents et des citoyens.

Dans les villes, la conservation et l'utilisation du patrimoine relève d'enjeux fonciers et écono-
miques encore plus importants que dans les zones rurales. Le patrimoine urbain, parce que plus pro-
che de nous et concentré dans des zones à forte
defense du lieu. La circulation à l'intérieur se fai-
sait par les toits, accessibles par des trappes.

Çatal Höyük était devenue une vraie ville avec ses
terres agricoles où les habitants cultivaient une
grand variété de graines et d'arbres fruitiers. On y
fabriquait du huile et la viande des animaux y
étaient domestiques. La ressource la plus impor-
tante de la ville restait cependant le commerce,
avec un quasi monopole sur le commerce de
l'obsidienne qui provenait de deux volcans en acti-
vité à sa proximité et qu'elle vendait à l'ouest de
l'Anatolie, à Chypre et au Levant. En échange,
Çatal Höyük recevait du sel et coquillages de Syrie,
de la côte orientale de la Méditerranée, pierres,
désert, marbre, cuivre qui alimentaient un arti-
sran élaboré.

C'est surtout l'art sacré, la richesse de ses lieux
cultuels qui fait la singularité de Çatal Höyük. Un
matériau très riche - reliefs et peintures sur plâtre
fin, la sévérité de la fécondité que l'on y retrouve
tres souvent - pousse à croire qu'une certaine
forme d'économie urbaine y était déjà assez déve-
loppée pour autoriser l'utilisation d'un important
plus en faveur des sanctuaires de la ville.

C'est à la ville que l’évolution de Çatal Höyük
mène : division du travail, commerce avec l’exté-
rût, division géographique de l’agglomération
par quartiers rassemblés autour des sanctuaires,
protection contre les agressions de l’extérieur.
Tous les ingrédients sont là pour éclore et se
développer le phénomène urbain, base de notre
civilisation.

Autre lieu totalement différent, autre centre de
développement pré-urbain proche de grandes
tarres de l’Orient : Pétra la nabatéenne, qui
était totalement tissée dans le grès tendre de ses mon-
tages et dont elle a su utiliser la topographie pour
son urbanisme, ses besoins en eau et sa protection
contre les agressions extérieures.

Pétra est née du commerce de l’encens et a été
bâtie sans doute par les tribus de la région d’Arabie
nord qui en faisaient le commerce et celui des
géspel entre l’Arabie Héreus et le Monde Médi-
terranéen. Comme à Çatal Höyük, ici encore
l'économie était plurielle : agriculture développée,
ressources hydrauliques maîtrisées, artisanat,
commerce florissant avec le monde extérieur, religion
fortement établie. Tous les ingrédients pour assu-
rir la durabilité de l'installation humaine dans un
mêmes lieux étaient présents. L'occupation du site
de Pétra a pu prospérer sans discontinuer jusqu'au
dernier millénaire av. J.C., jusqu'au VIIIème siècle de notre ère lorsque Pétra a été détruite par
un tremblement de terre. Entre-temps, elle a
connu le sort de plusieurs autres villes : périodes
Pétra est un étrange mélange de monuments concentrés dans une vallée étroite et taillés dans le grès local, avec des vestiges romains et byzantins que l'on commence à mettre à jour. La richesse de ses temples, de ses voies principales et de ses monuments funéraires, légèreté et l'extrême complexité de son système hydraulique, démontrent amplement l'importance de cette concentration quasi-urbaine d'habitants ainsi que l'importance de son économie et des échanges commerciaux et culturels qu'elle a entretenus avec ses voisins. A sa façon particulière, Pétra est aussi une ville.

Une ville, c'est ainsi le résultat d'une multitude de facteurs qui, combinés, fournissent les conditions nécessaires (mais pas toujours suffisantes) pour l'éclosion d'une forme de vie urbaine. Ce qui fait une ville, c'est d'abord et avant tout une économie capable de la créer et de l'alimenter continuellement. Pour qu'une agglomération, de concentration d'habitats ruraux devienne ville, il lui faut les moyens nécessaires : surplus économique, spécialisation des métiers, législation et organisation sociale, religion, système politique. Combinés, ces moyens mèneront progressivement à la spécialisation spatiale : lieux de culte, espaces publics, lieux de rassemblement, lieux de pouvoir, marchés et commerces, industries, etc. Progressivement, l'espace sera modelé pour accueillir les diverses fonctionnalités qui font la ville. Des rues, des places, des avenues, assureront la communication entre ces différents espaces et sépareront en quartiers les différentes parties de la ville qui continuera à grandir aussi longtemps que son rôle économique, politique, religieux ou culturel durera.

Fernand Braudel explique fort bien ce processus de constitution des villes:

« Les civilisations naissent au long de fleuves qu'il a fallu discipliner pour que se mette en place, avec l'irrigation artificielle, la saisie des terres limoneuses, facilitée de cultiver, d'une fertilité spontanément renouvelée. Le résultat est à la mesure de la peine : la naissance, à la fois, d'une force globale sans égale et d'une sujétion évidente des individus. Ces disciplines ne peuvent s'édifier qu'avec des réseaux de villes qui naissent des surplus agricoles de campagnes proches. Il a fallu, en outre, pour que le dialogue inégal ville-campagne fût assuré, une certaine modernité des liens économiques, une certaine division du travail, une certaine religion ou fondée sur une religion exigeante, une royalité de droit divin. Tout cela, la religion, la royauté, le prince, la ville, le canal d'irrigation, l'écriture sans quoi aucun ordre ne peut être transmis au loin, aucune comptabilité mise en mémoire, tout cela a dû être construit à neuf. Le reste se déduit normalement. Ces villes urbaines ont eu des besoins impérieux : sel, bois de construction, pierre (même la plus ordinaire). Puis, comme toute société qui se sofistiche et se perfectionne, elles en sont créées de nouveaux qui deviennent nécessaires : l'or, l'argent, le cuivre, l'étain, l'huile, le vin, les pierres précieuses, l'ivoire, les bois rares, les parfums ... Ces biens, la société riche ira les chercher au loin. Bref, l'éventail de besoins sera large. Il y a ainsi rupture de cercles économiques qui, autrement, auraient pu se former sur eux-mêmes. »

Spatialement, une ville est ainsi une combinaison de constructions vernaculaires d'habitation et d'agriculture avec des monuments fonctionnels religieux, funéraires ou publics et des voies connectant ces éléments entre eux. L'évolution dans le temps de l'environnement urbain peut se résumer dans les dessins qui suivent. Du point de vue de l'économie, c'est un ensemble complexe d'activités allant depuis l'artisanat jusqu'au commerce et aux autres types de services et d'échanges.

Notes
La Alhambra y Granada: turismo y sostenibilidad
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La Alhambra y Granada se enfrentan, al igual que otros destinos de turismo cultural, al reto de integrar el turismo, en el marco de estrategias innovadoras en el campo de la conservación, gestión y buen uso del patrimonio cultural. En este marco se sitúa el Estudio Previo para la Revisión del Plan Especial de la Alhambra y Aljafres, cuyo marco de reflexión y de acción ha tenido como referencias básicas: La sostenibilidad, la toma en consideración de las motivaciones de los visitantes, la singularidad del «Territorio Alhambra», la calificación de la visita en sus dimensiones culturales y experiencia vital, y la búsqueda de un modelo de relaciones amables de la Alhambra con Granada y su entorno territorial.

La singularidad del «Territorio Alhambra»
El territorio Alhambra-Aljafres configura una realidad de gran complejidad y singularidad en términos urbanísticos, funcionales, paisajísticos y medioambientales. Se trata de un ámbito diferenciado físicamente, que ha conocido transformaciones diversas a lo largo de los siglos y que necesita de miradas diversas, al ser un espacio modelado por el hombre en momentos cumbre del refinamiento urbano y en un emplazamiento con unas condiciones geográficas excepcionales.

La diferenciación, tanto física como simbólica, constituye uno de los pilares de su configuración como hito turístico-cultural. Se trata de un territo- rio de cruces y también de equilibrios precarios donde resulta fundamental su entendimiento como ciudad palaciega, diferenciada en el conjunto de la ciudad histórica. De ahí que su utilización como recurso turístico, nunca debería desvirtuar la permeabilidad secuencial por recintos.

La lectura dinámica de la funcionalidad, desde los orígenes del conjunto monumental hasta el momento actual (ciudad real y administrativa, residencia real, espacio turístico, monumento a recuperar, centro de servicios culturales y foco de atracción turística), nos ayuda a una reinterpretación de la Alhambra como una ciudad compleja y a superar el efecto negativo de una simplista lectura como palacio árabe.

La diversidad y complejidad paisajística guardan estrecha relación con las variadas formas de ocupación humana que se han ido acomodando al marco físico que las acoge, una colina alta, alargada e individualizada por la impresión profunda de los ríos Darro y Genil. El cruce de múltiples lecturas, urbanísticas, paisajísticas, funcionales, medioambientales, culturales y simbólicas, aporta claves para construir un modelo de relaciones y de gestión válido para las necesidades de la Alhambra y Granada en el siglo XXI.

El recinto monumental: un espacio urbano de múltiples funciones
El conjunto monumental Alhambra-Generalife y su entorno constituyen una pieza urbana singular y unas realidades funcionales complejas, se diferencian físicamente de Granada pero ello no significa ausencia de relaciones. Estas relaciones han ido cambiando con el transcurrir del tiempo, pasando de ser las propias de una ciudad palatina a las de un hito turístico-cultural.

La conformación histórica del recinto de la Alhambra es el resultado de la interacción de tres funciones básicas que perduran hasta el siglo XIX: fortaleza militar, sitio real y ciudadanía civil. La declaración de la Alhambra como Monumento Nacional (1870) marca el inicio de una nueva etapa en la intervención y en el uso del conjunto monumental, hasta configurarse en un hito turístico-cultural, que recibe 2.000.000 visitantes al año.

En los últimos años se han potenciado los aspectos relacionados con la función básica del monumento, tanto que se ha potenciado la infraestructura, la oferta museística, la oferta de actividades, la oferta cultural y la oferta gastronómica.

La accesibilidad y la movilidad: un ámbito de conflicto y una necesidad de racionalidad
La relación de la Alhambra con el resto de Granada sigue la tradición oriental de las ciudades que forman parte de una ciudad mayor. Su diferenciación física, quiebra asiduo, se fundamenta en razones topográficas, urbanísticas, culturales y simbólicas. Las conexiones con la ciudad se dan a través de un eje relacionado con la funcionalidad histórica: plaza Nueva-Cuesta de Gomérez-Alamedas, y otro con la moderna funcionalidad turística, el acceso sur.

El modelo actual de accesibilidad, solventando algunos problemas pendientes y mejorando las conexiones peatonales y urbanísticas con el entorno, puede permitir la configuración de un sistema razonable y sostenible de movilidad.

Presión turística y capacidad de acogida: los riesgos de la saturación
El conjunto de la Alhambra contiene, con cerca de 2.000.000 visitantes al año, uno de los hitos turísticos más importantes de España, estando próximo a su capacidad de acogida, estimada legalmente en 2.900.000 visitantes al año.
A nivel general la ocupación de la Alhambra está al 70% de sus posibilidades. Los días con un nivel de aforo superior al 90% se acercan a un tercio, y por presiones horarias, cercados a la mitad superan el umbral del 95% de ocupación.

Los Palacios Nazaríes, el hito de referencia simbólica del conjunto de la Alhambra, con una capacidad física estimada en 1998 de 444 visitantes cada media hora, son el punto de referencia de la gestión de los flujos de visitantes. Por el efecto acumulación, la presión real de visitantes se sitúa en 600 personas como media a lo largo del día, y en horas punta se podían alcanzar las 800. Para no superar la capacidad de acogida, el Patronato de la Alhambra ha reducido las personas que acceden cada media hora y ha aumentado el horario de visita.

Los espacios más visitados son los Palacios Nazaríes, aunque en momentos de aforo completo se tiende a visitar todas las partes del conjunto. La mayor aglomeración se produce en las horas centrales del día, con un volumen total de visitantes acumulados en el interior del recinto monumental, en días de saturación, que puede estimarse en 4.000 personas.

El aforo medio de los visitantes es bastante bajo, el 46%, a pesar de los 5.000 peatones, pero también es en el nivel de 15% de más de 13.000 visitantes al día. En la Alhambra, incluyendo la entrada, el grueso de los visitantes, un 79,3%, gasta menos de 2.500 pesetas. Los visitantes valoran muy positivamente el nivel de ruido y el comportamiento de los visitantes y no se detecta una especial preocupación por el problema de la congestión.

La atención y el trato por parte del personal de la Alhambra resultan muy bien valorados, aunque la limpieza y el estado de conservación del recinto. La valoración de la visita a los Palacios Nazaríes, apesar de los problemas de saturación, es muy positiva, al igual que el grado de satisfacción con la visita al conjunto de la Alhambra.

El colectivo de visitantes a la Alhambra y Granada es muy heterogéneo, en general, se corresponde con las características propias de un turismo de masas donde el factor cultural es una componente más entre las motivaciones para visitar.

Cuestiones resueltas y problemas pendientes

La gestión de un conjunto histórico, sea un recinto monumental o el centro histórico de una ciudad, es un tema complejo y normal que se plantea nuevas cuestiones y debates. La Alhambra no debería ser un arma arrojadiza entre administraciones y agentes urbanos con intereses, políticos o económicos, no siempre coincidentes.

La creación del actual Patronato de la Alhambra y Generalife, en 1986, ha abierto un nuevo ciclo en la complejidad y, con frecuencia, conflictiva gestión del Conjunto Monumental. El Plan Especial de Protección y Reforma Interior de la Alhambra y Aljibares, aprobado en 1989, ha tenido que abordar, con resultado desigual, las problemáticas relacionadas con la gestión urbanística de la Alhambra y su entorno. Con independencia de pequeñas cuestiones, los problemas de acceso a la Alhambra y la regulación de tránsitos y aparcamientos cuentan con las infraestructuras adecuadas.

Las acciones desarrolladas por el Patronato, rehabilitación del palacio de Carlos V, venta anticipada de entradas, audiogías, contigüidad de grupos de visita, etc., han permitido reforzar la funcionalidad cultural y cualificar la visita pública. Las acciones previstas en el Plan Especial y las inversiones del Patronato en labor de investigación, conservación, restauración y rehabilitación han permitido avanzar en una línea de conservación activa, que persigue compatibilizar la visita pública, algo más de dos millones de visitantes al año, con la protección y conservación del patrimonio cultural y territorial del conjunto de la Alhambra y los Aljibares.

Al turismo hay que asignarle el papel que le corresponde, al ser un motor de la economía de Granada, una ciudad con 12.000 plazas hoteleras y niveles medios de ocupación superiores al 70%, y dotarle de las infraestructuras y los equipamientos que requiere. Los problemas funcionales del recinto monumental de la Alhambra, parte fundamental de la imagen y simbología cultural y turística de Granada, no deberían plantearse de forma aislada, ni sólo en relación con el entorno urbanístico inmediato. Se trata de una cuestión urbana mayor y por ello debe situarse en el contexto de una estrategia urbana global donde los temas relacionados con la conservación del patrimonio, la accesibilidad y la movilidad, el turismo y la cultura ocupen un lugar destacado.

Granada tiene que asumir la singularidad física, simbólica y funcional de la Alhambra y no pedir al conjunto monumental mas de lo que este puede y debe dar, pues se trata de un recurso muy frágil, que por sus valores universales está bajo la tutela de la UNESCO. El Patronato de la Alhambra permite unidad de gestión y está apostando por una estrategia cualitativa, consensuada con los diversos agentes sociales; pues pedirle demasiado a la Alhambra significa aventurarse por el peligroso camino de la insostenibilidad, tanto cultural como turística.

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“Measuring up?”: implementing EMS in urban areas

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Abstract
Until recently, governments and urban areas were concerned mainly with responsible management of public funds. This did not necessarily extend to environmental issues. With the current trend towards a more environmentally responsible society, a closer look is being given to the emerging ISO 14001 standards. International cooperation increases the ability to address the growing number of common environmental problems, leading to better global solutions.

Résumé
Récemment encore, la préoccupation majeure des gouvernements et des autorités locales était la gestion responsable des fonds publics, préoccupation qui ne s'étendait pas nécessairement aux questions d'environnement. L'évolution actuelle vers une société écologiquement plus responsable a amené ces autorités à s'intéresser de plus près aux toutes nouvelles normes ISO 14001. Grâce à la coopération internationale, la capacité de faire face aux problèmes d'environnement communs, toujours plus nombreux, se développe.

Resumen
Hasta hace poco, una de las mayores preocupaciones de gobiernos y municipalidades era la gestión responsable de los fondos públicos. Sin embargo, las prioridades no se extendían necesariamente a los asuntos medioambientales. En la actualidad, la sociedad se está volviendo más responsable en materia ambiental y tanto los gobiernos como las municipalidades tienen la vista puesta en los nuevos estándares ISO 14001. La cooperación internacional contribuye a incrementar la capacidad para hacer frente a los numerosos problemas ambientales comunes, que a su vez permite encontrar mejores soluciones a escala mundial.

The environment is a shared legacy that requires collective solutions reached through international cooperation. Domestic actions alone are not enough to protect the health of a country's citizens. All the world's nations need to pool their efforts to ensure a healthier environment. International cooperation increases each country's ability to deal with the growing number of common environmental problems, which can lead to better global solutions.

In the next century, one of the world's largest environmental challenges will be cities and their increasing populations. Coping with the increase in urban populations will require better management of the environment and its resources. One way countries are improving their environmental performance is through implementation of Environmental Management Systems (EMS).

Good management and improved environmental performance are assets for city facilities, or any organization for that matter, in terms of building their credibility and accountability with regard to the public at large. As a result, EMS has become a widely discussed topic in environmental circles. Many businesses are now certified for the International Organization for Standardization's ISO 9000 standard and are moving towards ISO 14001 certification. The trend from ISO 9000 to ISO 14001 certification is evident in governments and urban areas around the world. They are starting to see the environmental and financial benefits of implementing an EMS, as well as the opportunities to do so.

There are numerous definitions of environmental management systems. For the purposes of this article, an EMS is defined as "a systematic approach to incorporating environmental considerations into every business decision. It provides governments with a framework for managing their environmental agendas and for tracking, evaluating, and communicating environmental performance. An integral part of the overall management structure of an organization, an EMS helps ensure that major environmental risks and liabilities are properly identified, minimized and managed. The development and application of an EMS is a dynamic and continuous (life-long) improvement process and represents a long-term commitment to environmentally responsible management."

EMS implementation and the bottom line
While there are health, legal and ethical reasons for implementing EMS, there is also a strong financial argument in its favour that motivates many cities to move forward in this area.

Urban areas and governments notice a decrease in costs as they require fewer materials to do their services and activities. With an increasing number of global companies registered under ISO 14001, which is an internationally recognized standard, there are fewer costs for meeting different product standards. Operational duplication is reduced. These savings can then be reinvested by cities in future projects.

Studies have shown that when a business improves its corporate environmental practices, shareholders' wealth increases. A company that is not at risk for environmental liabilities is more attractive to investors. Indeed, a growing number of investors are actively seeking out companies that demonstrate environmental responsibility for ethical as well as financial reasons. At the same time, a growing number of governments and urban areas, especially in the United Kingdom, are promoting the use of products from ISO 14001 certified companies.

There is also reason to suggest that an urban area encountering legal problems with a particular facility has a better chance of avoiding or reducing the probability of financial liability if it can prove it was following environmentally sound procedures such as ISO 14001.

EMS: A five-phase process
There are five phases in the EMS process: commitment and policy; planning; implementation; measurement and evaluation; and review and continual improvement.

Commitment and policy are the cornerstones of a successful EMS. Initial senior management support is crucial, not only in terms of ensuring the necessary financial and human resources to take the EMS through to completion, but also in encouraging communications and enthusiasm in all parts of the urban department as it moves through to the certification process. At the Canadian Federal Department of Environment (like many other departments of the Federal Government), EMS has become an essential element of our Sustainable Development Strategy (SDS), the action plan all federal departments and agencies are required to provide to Parliament showing how they integrate environmental, economic and social considerations into policies, programmes and operations.

Before launching an EMS, a city should conduct an Initial Environmental Review (IER) to establish the performance baseline upon which it will improve. The IER is an essential foundation for planning and implementing an EMS, as it provides a comprehensive overview of the environmental performance of the city, the strengths and weaknesses of its current management practices, and the opportunities for improvement. This information is crucial for developing an effective EMS that addresses the specific needs and challenges of the city. The process of implementing an EMS is an ongoing effort that requires continuous improvement and adaptation to changing circumstances.
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will indicate elements of the strategy that already exist. An IER consists of a series of questions pertaining to areas of operation within a city or government department. For example, an IER can look at questions of location (environmentally sensitive areas), community support, environmental impacts, and training. An initial environmental review can also be beneficial in determining whether employee training programmes are adequate or in need of improvement. After conducting an IER, many urban areas find they are further along the path to EM S than expected, a discovery that is both encouraging and cost saving. Once an urban area or government decides to develop an EMS, it needs to create a thorough and detailed plan for the various stages of implementation. The plan should be sufficiently flexible not only to address future liabilities, but also to capture possible business or reinvestment opportunities that may arise throughout implementation. The implementation plan must be communicated to staff at all levels, clearly identifying their roles and responsibilities and ensuring that they are understood and accepted by everyone within the department. In fact, employee awareness and training are key components of any EMS implementation plan. Measures should be taken to keep staff up-to-date on the latest greening initiatives, policies and procedures, and to encourage their personal commitment to effective environmental management.

North American context

When governments first became more environmentally responsible approximately 20 years ago, they proceeded without any real structure, often depending on the goodwill of environmentally conscious managers. This worked on an individual basis in parts of an organization, but there was not an overarching structure in place to address issues across the organization or to address all environmental issues or opportunities.

In the early 1990s the Canadian government created the Code of Federal Environmental Stewardship, which introduced more structured guidelines requiring all departments to develop environmental action plans. These plans indicated how each department would meet the commitments made in the Code and became the basis of a future environmental management system. The government of Canada uses an EMS based on ISO 14004, as a tool to ensure that major environmental risks and liabilities are properly identified, minimized and managed, providing structure and consistency to the greening process. In the case of Environment Canada (EC), it ensures the consistent and diligent environmental management of all EC facilities and operations. It also helps integrate environmental considerations into overall management and planning. It improves the environmental performance of a department's operations, identifies areas of legal non-compliance, demonstrates due diligence, and ensures a management system that can be audited. Finally, it offers a structure that encourages involvement of all employees in the department's responsibilities on a day-to-day basis.

Environment Canada has the primary responsibility for administering legislation pertaining to the environment. It is also the Federal government's technical expert on certain environmental matters. Although EC is not the leader of EMS, within the Government of Canada it is looked upon by other departments as a role model for action on environmental responsibility. For example, the Office of Federal Environmental Stewardship (1992-94) was established to coordinate and facilitate adoption of the Code of Environmental Stewardship. The Office also offered workshops, ranging from environmental assessment to water reduction and environmental recognition programmes. This series of workshops was open to other departments and officials from local governments. Environment Canada continues to make the information available through other courses it offers on EMS and the greening of government operations.

These workshops are one way the Federal Government of Canada can educate and influence people's behaviour and purchasing strategies. The Federal Government is one of the largest owners of land and purchasers of goods and services. This may be similar to the case in many cities. Where the government is the largest landowner, with significant purchasing power within the community, it can also have an impact on the employment market and create demand for more environmental products, services and industries. Individuals who work for the local government may be involved in decision-making processes that can affect their own work and behaviour patterns, e.g. separating waste for recycling and reducing use of electricity. These actions and others can also have a spin-off impact on the city when they leave the office.

When governments implement new policies and ways of doing business, it will have an effect on the products and services they purchase. Since many purchases will be made through local businesses, demand will be put on them to provide the necessary products. If businesses don't currently carry the products to meet these new requirements, they will educate themselves and begin to stock these goods in order to maintain their business. When the government begins purchasing with the environment in mind, this has an impact on businesses and cities that interact with them.

Decisions and strategies used at one level of government can serve as an incentive and challenge to other levels, and vice versa. Over time there will be increased transfer of knowledge and information flow between the various levels of government concerning their environmental management systems. By sharing best practices, governments can help improve employee awareness and employee involvement in the EMS process and learn from other governments' experiences. Although full implementation of an EMS, especially in large organizations, is a long-term commitment (approximately five to seven years), it will also produce widespread environmental and economic gains.

The US Environmental Protection Agency created a pilot project on EMS involving seven municipalities, one county and one state agency. This pilot was completed in 1997, and the EPA is working on a second one. Results show that it is feasible to apply EMS to facilities managed by local governments. An EMS is seen as an extremely useful tool for managing environmental issues, promoting compliance and pollution prevention approaches, increasing environmental awareness and stewardship, and improving operational efficiency and cost. In the United States, participants in one city were able to analyze and consolidate their compliance issues to the point where only eight air quality permits were required instead of 23. This action alone saved the city US$ 16,000 per year.

Canadian urban examples

In the Canadian context, local governments are not legislated by the Federal Government. The urban managers of these departments have a responsibility for many facilities in their jurisdiction, including water, wastewater, sewage, transport and security. It may not be possible to implement an EMS across an entire city structure at the same time, but this could be achieved on a facility or operational basis. Through a phased approach based on priority and resource levels, local governments will gradually address all issues to improve the water, air and health of the area's inhabitants.

In Canada, several local governments and urban areas have implemented an EMS. The
Regional Municipality of York, part of the greater metropolitan area of Toronto, Ontario (population 4,000,000) is aiming towards ISO 14001 registration at four of its facilities by 2001. The York-Durham Sewage System (YDSS) began the process in the summer of 1999 and plans to be registered by the spring of 2000. By this first registration is completed, the municipality will begin the process with the York Region Wastewater Treatment Plants, the South Urban Area (Lake Ontario) Water System and the Surface and Groundwater System.

Kitchener-Waterloo (population 433,000), a twin-city area west of Toronto, certified its Waste Management Centre in June 1998. This was the first municipal site in Canada to be registered under ISO 14001. Due to its experience with EMS implementation and certification, Kitchener-Waterloo has received many inquiries from other municipalities, both nationally and internationally, concerning the lessons learned.

The above municipalities have either certified or are in the process of certifying certain facilities. Meanwhile, Calgary, Alberta (population 843,000), is examining the possibility of certifying the entire city. Officials are in the process of looking at certification of all 13 operating entities as well as one covering the corporate setting. Calgary plans to have the certification process complete between 2002 and 2004.

Through partnership arrangements, Environment Canada has been able to share the Government of Canada’s experience, best practices and tools in regard to greening of government operations and EMS with various international governments, both urban and federal. For example, the Government of Canada gave a workshop in Mexico on implementing EMS at the national level. On 22 February 1999, the Mexican government released a Presidential Decree calling for the adoption of austerity and budgetary discipline, with the goal of promoting optimal and effective use of public resources in particular, the Decree's 20th articles called for measures to increase energy efficiency and implement EMS in all departments of the Federal Government. Mexico has now taken this approach and is bringing it to state and local governments through various workshops.

In Hungary, Environment Canada worked with both UNEP/ITC and South Africa’s Potchefstroom University on a workshop to provide practical training concerning EMS application in urban settings. Participants included deputy mayors, senior environmental officers, municipal directors and other urban professionals from Eastern European countries. The workshop dealt with topics such as Local Agenda 21, EMS principles (history, background and policy), understanding the legal requirements of EMS, thethreat aspects of an IER and an environmental management programme (EMP), monitoring and measurement, training methods, networking with others from various urban areas, and international case studies. Other sessions of this course are also planned for 2000-01 in various regions of the world.

**Challenges of EMS implementation**

A city can face many challenges when implementing an EMS. There is an institutional challenge, as some laws prevent countries from introducing environmental clauses into procurement specifications. Budgetary challenges occur as people seek to purchase environmentally responsible items for a department within budget guidelines.

It is not always easy to integrate environmental considerations into a department’s priorities. Communicating environmental priorities to various level of decision-makers, who do not always communicate freely with each other, can be difficult. This can be accomplished through the creation of an EMS newsletter or web site, sending daily updates via e-mail or hosting workshops in the lobby, so that employees have an opportunity to view the environmental changes occurring in the department. EMS implementation requires governments to become more transparent and to encourage development of a flexible workforce, open to new structures and technology. Implementing an EMS does not necessarily create extra work, but it will create a new culture and the need to find new ways of executing tasks.

In the manufacturing sector, ISO certification is applied to a particular product and its related production process – both inputs and outputs. It is more difficult to apply these principles at a government level, where the end result is not a particular product. In these cases, local and central governments could look at implementing an EMS in targeted operational areas rather than across entire departments. They should regard some as having many stages that can be implemented over time. For example, the Department of National Defence (DND) recently announced that it has received ISO 14001 certification for one of its Canadian Forces Supply Depot (CFSD) in Montreal, Quebec. DND hopes to certify a similar supply depot in Edmonton, Alberta, by 2002. By choosing a more gradual process for implementing certification, the department can review its progress and make necessary adjustments.

**Global examples**

Environmental Management Systems, especially those structured around the concept of ISO 14001, are a global phenomenon. Between 1997 and 1998, Finland certified its Finnish Forest and Park Service, Helsinki City Transport’s Bus Traffic Unit, Helsinki Mropolitan Area Council Waste Management and the Defence Force’s Liestuvare Epoet. In the Netherlands, EMS was introduced in place since 1998, when the third National Environmental Policy Plan was published. Within the Dutch government, there are incentives for industries to begin EMS implementation. A company able to demonstrate the preliminary stages of EMS will in most cases encounter flexibility in licensing laws. The United Kingdom has received ISO 14001 certification for the Departments of Environment and Transport, the Regional Headquarters buildings, the Department of Economic Development’s Industrial Science Centre in Northern Ireland and the Scottish Office in Switzerlander, Swisscom and Die Post have been certified. In the US in 1997, seven municipalities, one county and one state organization completed an ISO 14001 EMS Initiative. This initiative was sponsored by USEPA’s Wastewater Management and Office of Compliance. The two-year project provided small and medium-sized government departments the opportunity to implement an ISO 14001. Participants involved in this project were the Town of Londonderry, New Hampshire (Department of Public Works); the City of Lowell, Massachusetts (Wastewater Treatment Facility); Wayne County, Michigan (wastewater treatment facility); the City of Indianapolis, Indiana (Department of Public Works); the Massachusetts Department of Corrections – Norfolk State Prison Facility; power plant, wastewater treatment and industries); City of Gathersburg, Maryland (Department of Public Works); Lansing, Michigan (Board of Water and Light: electricity generating facility); New York City (Metropolit Provision Authority: capital programmes management); and the City of Scottsdale, Arizona (Department of Water Resources and Department of Financial Services). These are just a few examples of governments and urban areas around the world in the process of certifying their facilities.

With the rapid urbanization cities are currently experiencing, and the projections on migration of rural inhabitants to urban centres in the next decade, cities will have to deal with increased environmental pressures and demands on limited resources. In some countries, even urban cities are amalgamating to create "megacities" There is a need to combine the numerous environmental practices, by-laws and regulations of each of these entities into a single comprehensive policy. Cities experiencing rapid urbanization will need to examine the impacts of this increased demand for housing, water, health, solid waste and other services on the environment. Sharing information and implementing a functional EMS will help urban managers address the challenges and create sustainable cities for the future.

**Thoughts for the future**

Communities may wonder why they should attempt to certify their facilities if this is such a lengthy and sometimes arduous task. Simply put, ISO 9000 has become a "business-as-usual" standard and it is predicted that ISO 14001 will follow suit. Some countries are already creating legislation that will require ISO 14001 certification for doing business with them. The UK has initiated legislation stating that 75% of its departments will have at least one site registered with ISO 14001 by 2001.

Legislation of this type will also have an effect on companies and governments with which countries interact on the global stage. 0 way to learn more about EMS and certifying your organization or urban area is to contact UNEP/ITC. You can inquire about the Application of Environmental Management Systems (EMS) to Principles to Urban Management, in which you will learn the
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theory and practical sides of EMS through case studies, interacting with others in your position and talking with experts in the field of EMS.

Improving your environmental management of operations will not only reduce your environmental footprint and your costs, but also improve the overall health and well-being of your citizens.

Notes
2 Refer to http://www.ec.gc.ca/eg-oeq for more information.
3 See report by Elaine Geyer-Allély (OECD, 1999).
4 Refer to document on http://www.getf.org/muni.htm.
5 UNEP International Environmental Technology Centre, O saka, Japan. Tel. +81 6 6915 4581; Fax +81 6 6915 0304; E-mail: ietc@unep.or.jp.

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ecoBUDGET - local authority spending within natural limits

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Abstract
ICLEI's ecoBudget® environmental management system has been successfully implemented in pilot local authorities. The German city of Bielefeld, where it has been an integral part of the Local Agenda 21 process, is the first to introduce the ecoBudget system as a permanent administrative procedure. ICLEI has founded the EcoBudget Agency to support the system's further development and its introduction in other interested municipalities worldwide.

Résumé
Le système de gestion de l'environnement ecoBUDGET® du Conseil international pour les initiatives en environnement (ICLEI) a été mis en œuvre avec succès dans des collectivités locales à titre expérimental. La ville allemande de Bielefeld, où ce système fait partie intégrante du processus d'adoption d'Action 21 à l'échelon local, a été la première à faire d'ecoBUDGET® une procédure administrative permanente. L'ICLÉI a fondé l'Agence ecoBUDGET pour soutenir le développement du système et sa mise en place par d'autres municipalités intéressées, partout dans le monde.

Resumen
El sistema de gestión ambiental ecoBUDGET® de ICLEI se ha aplicado exitosamente entre autoridades municipales piloto. La ciudad alemana de Bielefeld, donde dicho sistema se ha inscrito de forma integral en el marco de la Agenda 21, ha sido la primera en introducirlo en tanto que método administrativo permanente. ICLEI subvencionó a la agencia ecoBUDGET con el fin de promover el desarrollo del sistema y su aplicación en otras municipalidades de todo el mundo que estén interesadas.

Steering use and consumption of the local environment through ecoBUDGET
To achieve sustainable development at a time when the capacity limits of nature and natural resources are being reached, environmental management at all levels is becoming more and more significant. Traditional planning instruments are unable to meet sustainable development needs. For that reason, strategies for sustainable development are designed at the national and international level. Local Agenda 21 processes are also taking place in many municipalities. The Local Agenda Action Plan could serve as a basis for local sustainability plans. But how to transform them and link up with other levels of government?

In cities, environmental activities certain problems often occur:

• In politics and administration, the consumption of natural resources is not seen as a central area of responsibility;
• There is no existing instrument available to politics and administrations for steering natural resource use in a systematic and planned way; and
• Dealing with environmental issues is split into isolated aspects.

Individual environmental protection programmes and measures are implemented separately. One environmental measure can produce effects that counteract the effects of another (e.g. air pollution from waste incineration diminishes the effects of requirements for industry with respect to emissions of dangerous air pollutants.)

ecoBUDGET offers help towards a solution of these problems, making it possible for local authorities to steer and control the use and consumption of natural resources by means of an interdisciplinary procedure and to reach a local management quality with natural resources as an integral element. ecoBUDGET reveals areas in which measures need to be taken; other instruments such as EMAS (the EU’s Eco-Management and Auditing Scheme) and ISO 14001 can be used to initiate actions to get back on course for the budget. Using indicators and time-related targets, ecoBUDGET can be taken as the local contribution to sustainability strategies and can link different levels of government.

ecoBUDGET was developed in the field of financial budgeting. The fundamental idea is that a municipality manages its natural resources as efficiently as the artificial resource, money.
The idea of environmental budgeting goes back to 1987, when Konrad Otto-Zimmermann, ICLEI's European Director, published an article concerning a new way to steer natural resources. Otto-Zimmermann wondered why management of natural resources should have less priority for local government than management of the artificial resource, money. Between 1996 and 2000, ICLEI (together with the German cities of Bielefeld, Dresden and Heidelberg and the county of Nordhausen) launched a pilot project to test eco-budget in practice. The project was funded by the German Federal Environmental Foundation.

To follow the "spending" of natural resources, ecoBudget makes use of significant indicators, each representing the municipality's natural resources and environmental problem areas. A set of five to 20 indicators proved practical at the beginning. For each indicator, a mid-term target was agreed (five to 10 years). On the basis of the state of each resource at a certain date (reference year), it could be determined which target should be achieved in the next (and even each) year in order to achieve the agreed mid-term targets (Figure 1).

At the end of the budgetary year, the Council is given the environmental budget balance and environmental budget report, illustrating progress towards the targets. Brief "controlling reports" are drawn up in the course of the budget year to indicate emergencies. If negative deviations occur (i.e. unbudgeted expenditures), measures are to be agreed so as to balance these "ecological debts".

Advantages are also evident for investors and developers, who can make use of the budget information in their planning. Within the scope of Local Agenda 21, commitments by business and individuals can affect the municipality's sustainability targets.

Introduction of ecoBudget in Bielefeld

Bielefeld is the first city that has committed itself politically to introduce ecoBudget as a permanent procedure in its administration. Beforehand, only the county of Nordhausen had introduced the system for managing its natural resources.

The considerations for introducing local environmental budgeting in Bielefeld go back as far as 1995. Following an in-depth examination of the project, the City Council's Policy and Administration Committee decided in June 1997 to take part in the pilot project. In Bielefeld, local environmental budgeting was an important part of the Agenda 21 process. It was also seen as a strategic aid to target-setting in departmental planning, as was the case with implementation of the climate expert report, water provision and protection of open space.

The project started with the drafting of a provisional list of indicators, which served as a basis for discussion for further approval. In August 1997, a project team was set up within Bielefeld's local administration to work on the pilot project. It consisted of two employees of the authority and one ICLEI employee financed by the funding. Subsequently, with approval of the departments concerned, the indicators were selected according to how well they were suited to represent consumption of the "Bielefeld natural resources". Bielefeld, located in northwest Germany, has approximately 325,000 inhabitants. It is known as the "city of three landscapes" (Ravensburger Hügelland, Senne, Osnling, Strang) and does have a wide range of landscape types. Of its total 260 km², at least one-third is developed land. One of its main problems is the excessive increase in developed land in recent years (approximately 60 ha/year). Among other problems increased individual motorized transport, in which the motorway exit directly into the city centre plays a significant part.

After the 15 chosen indicators were established, values for mid-term targets for 2005 and short-term targets for the budget year of 1 August 31 July 1999 were established.

To recognize deviations from these targets as soon as possible, quarterly control values were derived. At the end of each quarter, data were compiled for most of the 15 indicators. As a rule, existing data were used. However, a few data collection actions were carried out to support the environmental budget balance. (Two investigations ascertained river water quality and carried out a digitalization of land area for greenfield substitution measures.)

Intensive exchanges with the other pilot municipalities - Heidelberg, Dresden and the county of Nordhausen - and with the members of the advisory board (the German Federal Environmental Agency, the Association of German Cities and the Wuppertal Institute, among others) made a methodical refinement of the indicator set possible.

Subsequent to the budget balancing period (i.e. after 31 July 1999), evaluation of the trial phase occurred. The results were communicated to the responsible departmental council committee in the form of a report.

One important aspect of the ecoBudget procedure is co-operation between departments, enabling a comprehensive overview of the available resources and activities that affect them. The main effort during the introduction of ecoBudget in Bielefeld was involving all departments relevant to the project's implementation. For this purpose, there were numerous meetings among the various departments, allowing coordination, facilitating exchange and planning the actual budget. The outcome of all consultations, as well as progressthereport, was regularly recorded and conveyed to all administrative levels, keeping staff informed and gathering support for the system.

Since August 1997, the Bielefeld project team has continuously introduced local environmental budgeting to the public. As well as presentations at several Local Agenda 21 events (Bielefelder Agenda 21), with up to 80 participants, local environmental budgeting found its way into the local press (eight newspaper articles and a mention on local radio). The project was also introduced to a large circle of Agenda co-ordinators at a Local Agenda 21 event of the district government of Detmold. Specific circles in the Bielefeld economy and environmental groups were informed about the project at a common event where representatives were given the opportunity to contribute their opinions.

By the conclusion of the pilot project, environmental budgeting was very well integrated into most departments that had a direct involvement in supplying data. Data compilation was very tedious and slow at times, but to all appearances this was not due to lack of attention or willful delays. Generally, it was a result of ecoBudget tasks taking second place to obligatory duties, which were regarded as more urgent. This will be different in the future, as the Bielefeld politicians decided in the spring of 2000 to introduce environmental budgeting into the local authority.

There have been a significant number of requests from the public and decision-makers for information on environmental budgeting in Bielefeld. Practice in environmental budgeting will show the extent to which a real perception is achieved by these activities.

**ecoBudget as part of the Bielefeld Local Agenda 21**

The basis of sustainability lies in remaining within natural limits. As environmental budgeting allows monitoring and control of natural resource use, it gives the best chance of initiating measures in reaction to unsustainable use of resources and therefore keeping within natural limits. The pro-
Urban environmental management

### Table 1
Pilot Master Budget of the City of Bielefeld (extract)

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>1.2</td>
<td>number of waste disposal sites not redeveloped</td>
<td>302 sites (01.08. 98)</td>
<td>287 sites (1998)</td>
<td>190 sites</td>
<td>Target is oriented on the type of waste deposit and the requirements and feasibility of remediation. In the long term, all waste disposal sites should be remediated.</td>
</tr>
<tr>
<td>1.4</td>
<td>length of rivers with quality class II and better</td>
<td>49,070 m (1995-97)</td>
<td>50,000 m (1996-98)</td>
<td>55,000 m (2003-05)</td>
<td>Water quality class II is respected as a target value by the Bundeland North Rhine Westphalia (Common Ministerial Paper NRW No. 42, 3 July 1991, p. 866)</td>
</tr>
<tr>
<td>1.9</td>
<td>CO₂ emissions through use of fossil fuel energy per inhabitant (not including transport)</td>
<td>5.6 t/person/year (1996)</td>
<td>5.6 t/person/year</td>
<td>5.2 t/person/year</td>
<td>Council resolution to decrease CO₂ emissions by 10% by 2005 in comparison with the 1997 value (5.8 t/person/year)</td>
</tr>
<tr>
<td>1.13</td>
<td>change in open space</td>
<td>-61.1 ha (1996/1997)</td>
<td>-</td>
<td>-</td>
<td>In compliance with Article 1a of the BauGB (planning regulation), while extending settled areas as complementary indicator to open space, soils must be used sparingly.</td>
</tr>
</tbody>
</table>

Table 1: Pilot Master Budget of the City of Bielefeld (extract)
The amount of compost and green waste per inhabitant (indicator 1.1) clearly topped the target value. The fact that the target value for 2005 was already exceeded by over 100% is probably due to the mild winter of 1997-98 and the significant increase in the proportion of the city's electricity generated by atomic energy. For various reasons, other indicators ran in the opposite direction to the forecast.

Concerning compostable waste (indicator 1.1), the responsible department pointed out that encouraging composting at home could have led to the reduction of collected green waste. It should be reconsidered whether the 2005 target value for compostable waste will be retained, as home composting is seen as a positive development.

River water quality (indicator 1.4) did not stick to the 1998-99 budget. Instead of an increase in the length of river with high quality water, this value showed a decrease. Here the deteriorating values were probably due to weathering and possibly the variable measurements the quality.

The air pollution indicators (indicators 1.7 and 1.8) either fell short of or overshot the targets.

The amount of remediation of disposal sites (indicator 1.2) and remediation of groundwater and soil/air pollution (indicator 1.3) had decreased. However, due to the necessity of putting a large proportion of the workforce onto acute cases, the initial inclusion of as yet unidentified cases came out lower than expected. Therefore, the expectation that this figure would decrease was not fulfilled.

The modal split (indicator 1.6) kept to the planned value. It should be noted that the modal split value was based purely on estimates. A computer-based estimate will probably be possible during 2000.

Table 2
First Bielefeld environmental budget balance

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>amount of compost and green waste per inhabitant</td>
<td>63 kg/person/year</td>
<td>59 kg/person/year</td>
<td>67 kg/person/year</td>
<td>67 kg/person/year</td>
<td>-100</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>1.2</td>
<td>amount of contaminated land not redeveloped</td>
<td>302 sites</td>
<td>298 sites</td>
<td>287 sites</td>
<td>190 sites</td>
<td>4</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>1.3</td>
<td>amount of remediation of groundwater and soil/air pollution</td>
<td>56 sites</td>
<td>54 sites</td>
<td>53 sites</td>
<td>45 sites</td>
<td>18</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>1.4</td>
<td>length of rivers with quality class II and better</td>
<td>49,070 m (1995-97)</td>
<td>45,040 m (1996-98)</td>
<td>50,000 m (1996-98)</td>
<td>55,000 m (2003-05)</td>
<td>-68</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>1.5</td>
<td>amount of unrecycled waste per inhabitant</td>
<td>202 kg/person/year</td>
<td>202 kg/person/year</td>
<td>191 kg/person/year</td>
<td>191 kg/person/year</td>
<td>0</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>1.6</td>
<td>motorized personal transport as a proportion of modal split</td>
<td>59% (1994)</td>
<td>59%</td>
<td>59%</td>
<td>57%</td>
<td>0</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>1.7</td>
<td>air pollution level 1</td>
<td>2.16 (1996/97)</td>
<td>2.04 (7/98-2/99)</td>
<td>2.05</td>
<td>1.85</td>
<td>39</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>1.8</td>
<td>air pollution level 2</td>
<td>1.51 (1996/97)</td>
<td>1.62 (7/98-2/99)</td>
<td>1.48</td>
<td>1.36</td>
<td>-73</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>1.9</td>
<td>CO₂ emissions through use of fossil fuel energy, per inhabitant</td>
<td>5.6 t/person/year (1996)</td>
<td>4.7 t/person/year (1998)</td>
<td>5.6 t/person/year</td>
<td>5.2 t/person/year</td>
<td>225</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>1.10</td>
<td>change in areas with high sensitivity to climate</td>
<td>0 ha (1997)</td>
<td>-37 ha/year</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>1.11</td>
<td>change in settled areas</td>
<td>+61.1 ha/year (1996/97)</td>
<td>-57 ha/year</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>1.12</td>
<td>annual area of land designated as replacement for developed greenfield</td>
<td>7.1 ha (1997)</td>
<td>3.1 ha/year</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>1.13</td>
<td>change in open space</td>
<td>-61.1 ha/year (1996/97)</td>
<td>-55 ha/year</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>1.14</td>
<td>change in extent of protected conservation areas</td>
<td>-0.8 ha/year (1997)</td>
<td>-0.3 ha/year</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>1.15</td>
<td>change in extent of landscape with high conservation function</td>
<td>0 ha/year (1997)</td>
<td>-8.7 ha/year</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

Key:
* Distance to target index: How far are we towards the target, in percentage terms?
☑️ target reached or surpassed ☑️ over 25% of the way ☑️ up to 25% of the way ☐ no progress made

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**ecoBudget in routine practice**

Part of the city administration was made sensitive to ecoBudget procedure and a larger part of the deciding bodies were made familiar with the instruments. The Council supported the project. However, the process of refining Local Environmental Budgeting and adapting it to local conditions has not yet been finalized.

Once the Bielefeld City Council’s Policy and Administration Committee had unanimously agreed to introduce local environmental budgeting as a permanent process within the municipal government, its refinement and installation into the existing administration structures could begin immediately.

Of the other participants in the German Environmental Budgeting Pilot Project, the county of Nordhausen also decided to continue using ecoBudget on a regular basis in steering natural resource consumption. The decisions of the Councils of Dresden and Heidelberg are pending.

To support municipalities interested in ecoBudget, ICLEI has set up the ecoBudget Agency. It will aid with information and the introduction of ecoBudget through networking, exchange of experiences, training, certification and consultation. Contact: ecoBudget Agency, ICLEI European Secretariat, Eschholzstr. 86, D-79115 Freiburg, Germany. E-mail: ecobudget@iclei-europe.org. Please visit our website: http://www.ecobudget.com/

**Further information**

- Erdmenger, Christoph, Konrad Otto-Zimmerman, Karen Buchanan and Andrea Burzacchini (1999), Local Environmental Budgeting, 2nd revised edition, 41 S. ICLEI, Freiburg (Germany).

Martin Enderle, Councillor of the City of Bielefeld, is the initiator and person responsible for ecoBudget. Volker Stelzer, an independent environment expert, has been an ICLEI expert for ecoBudget in Bielefeld during the pilot project.

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