



**European Cooperation  
in the field of Scientific  
and Technical Research  
- COST -**

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**Secretariat**

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**Brussels, 21 May 2003**

**COST 236/03**

**DRAFT MEMORANDUM OF UNDERSTANDING**

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Subject : Draft Memorandum of Understanding for the implementation of a European Concerted Research Action designated as COST Action C18 "Performance assessment of urban infrastructure services: the case of water supply, wastewater and solid waste "

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Attached is the text of the abovementioned Memorandum of Understanding.

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**DRAFT**  
**MEMORANDUM OF UNDERSTANDING**  
**FOR THE IMPLEMENTATION OF A EUROPEAN CONCERTED RESEARCH ACTION**  
**DESIGNATED AS**  
**COST C18**  
**“PERFORMANCE ASSESSMENT OF URBAN INFRASTRUCTURE SERVICES:**  
**THE CASE OF WATER SUPPLY, WASTEWATER AND SOLID WASTE”**

The Signatories to this Memorandum of Understanding, declaring their common intention to participate in the concerned Action referred to above and described in the Technical Annex of the Memorandum have reached the following understanding.

1. The Action will be carried out in accordance with the provisions of document COST 400/01 “Rules and Procedures for Implementing COST Actions”, the contents of which the Signatories are fully aware of.
2. The main objective of the Action is to increase the knowledge and to promote the use of effective, scientifically robust and well devised methodologies for decision-making based on the use of performance indicators for urban infrastructure services, able to attract utilities to use them as routine management tools.
3. The economic dimension of the activities carried out under the Action has been estimated, on the basis of information available during the planning of the Action, at Euro 5.8 million in 2003 prices.
4. The Memorandum of Understanding will take effect on being signed by at least five Signatories.
5. The Memorandum of Understanding will remain in force for a period of four years, calculated from the date of first meeting of the Management Committee, unless the duration of the Action is modified according to the provisions of Chapter 6 of the document referred to in Point 1 above.

**COST ACTION C18**

**"PERFORMANCE ASSESSMENT OF URBAN INFRASTRUCTURE SERVICES: THE  
CASE OF WATER SUPPLY, WASTEWATER AND SOLID WASTE"**

**A. BACKGROUND**

Performance assessment of urban infrastructure services, mainly in the case of water supply and wastewater, is becoming a major issue worldwide, and particularly in Europe. The importance of providing safe water and sanitation services in a cost efficient and sustainable way will not decrease in the future. Also the recently observed climate changes, resulting in serious droughts and floods, have rather focused more attention on these issues. As a response to stakeholders needs, not only the utilities but also several R&D organisations<sup>1</sup>, universities<sup>2</sup>, consultants, regulators<sup>3</sup>, financing bodies<sup>4</sup>, standardisation organisations<sup>5</sup> and waterworks associations or groups of undertakings<sup>6</sup> have been concentrating a lot of time and effort on this topic.

One of the paradigmatic examples is the project undertaken by the International Water Association "Performance indicators for water supply services". Born as a project "By the industry for the industry" in 1997, it established a standardised reference language of performance indicators (**PI**) that aims to fit the basic needs of different types of users, with special emphasis on the utilities themselves. The results were published in a manual of best practice in 2000<sup>7</sup>. LNEC played a key role in the leadership of this project, which also had the active contribution of almost 200 persons/organisations from all the continents. The system is currently being field-tested, for a period of two years, in 69 volunteer undertakings from about 20 countries in Europe, Africa, Middle and Far East, South America and Asia-Pacific.

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<sup>1</sup> In Europe, e.g. LNEC - Portugal, WRc - UK, Hydrocontrol - Italy, IWW Rhenish - Westfalian Institute for Water Research - Germany, SINTEF - Norway.

<sup>2</sup> In Europe, e.g. ENGREF - France, Polytechnic University of Valencia - Spain, Technical University of Lisbon -Portugal, University of Catania - Italy, Brno University - Czech Republic, Chalmers Tekniska Högskola of Göteborg - Sweden.

<sup>3</sup> In Europe, OfWat, in the UK (ref.: the levels-of-service system).

<sup>4</sup> Such as the World Bank and the European Investment Bank.

<sup>5</sup> For instance AFNOR and ISO (ref: ISO/TC224: 'Performance indicators for water supply and wastewater services', launched in mid 2002).

<sup>6</sup> E.g. in Germany, Norway, Portugal, Sweden, Australia, Japan, US and in many other countries. A special reference is due to the 6-cities group of the Nordic Countries.

<sup>7</sup> Alegre, H.; Hirner, W. Baptista, J.M.; Parena, R. (2000) – Performance indicators for water supply services, Manual of Best Practice Series, IWA Publishing, Londres, ISBN 1 900222 18 3 (150 pp.).

In parallel, a new project regarding the expansion of a similar PI system to wastewater services is being finalised and will be published by IWA in July 2003. The results of these projects are two comprehensive and flexible PI systems that cover all the key areas of activity of the water and wastewater services.

This system comprises of environmental, physical, personnel, operational, quality of service and economic & financial performance indicators and includes very detailed definitions of all the data required and of the processing rule for each indicator.

The IWA PI systems are also the basis for the on-going work in the scope of the two Working Packages 1 (Construction of a control panel of performance indicators for rehabilitation) of the 5<sup>th</sup> Framework Programme of the European Union **CARE-W** and **CARE-S**, respectively related to water distribution and to wastewater networks rehabilitation. In these projects, the subsets of IWA-PIs relevant for rehabilitation decision-making were selected, and further developed for these specific applications. CARE-W and CARE-S software prototypes will include a module for rehab PI assessment and reporting. Another specific application of performance assessment techniques is being developed in the scope of the 5<sup>th</sup> FP project **APUSS**, on infiltration and exfiltration of urban wastewater systems. Also the 5<sup>th</sup> FP projects **AISWRS** (Assessing and Improving Sustainability of urban Water Resources and Systems), **DAYWATER** (Adaptive decision support system for the integration of stormwater source control into sustainable urban water management strategies), **CD4WC** (Cost-effective development of urban wastewater systems for water framework directive compliance) include activities related to the development of decision support systems. All of them will produce more or less sophisticated tools, often incorporating simulation, forecasting, optimisation, etc. However, none of them seems to generate any general and standardised methodology that can help urban infrastructure managers to make their decisions on performance indicators. The 6 projects mentioned form the cluster **CityNet** of the 5<sup>th</sup> FP, the object of which is to create synergies among them<sup>1</sup>. In conclusion, all these 5<sup>th</sup> FP activities can provide relevant contributions for the COST Action, the aim of which is mainly to provide a forum for brainstorming sessions on how to better use multidimensional (and frequently conflicting) performance information, although their objectives are different.

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<sup>1</sup> The first practical example of exchange within CityNet will probably be the use by the APUSS team of the PI-tools developed by CARE-W and CARE-S.

In summary, several comprehensive PI systems for water supply and wastewater services are already available as a standardised platform and a good number of scientific works have already been published in Europe. Utility managers can now implement one of these PI systems, which enable them to analyse the evolution from one year to the other, to compare targets and results and to compare themselves with others. They can also identify and implement measures for improvement when the results are clearly out of the expected range. However, when they need to make a management decision, they have to analyse several PI at the same time, and **techniques for an integrated interpretation are still missing**. For instance, if a utility is interested in improving its strategy with regard to water losses, it must analyse internal aspects such as volume of water lost, mains failures, and rehabilitation and maintenance investments. If networks of similar materials and age are compared, it is likely that results show lower water losses and failure rates for the utilities that invest more in rehabilitation and preventive maintenance. This comparison is important, and is sufficient to identify situations with very poor or very good performance, but it is not enough to help managers identifying who is globally performing better in most situations and what the right decisions are to proceed.

In fact, **there is still a knowledge gap between the current know-how and an effective global assessment** of areas of activity involving several – sometimes conflicting – viewpoints.

To assess the performance of a utility system it is necessary to make an integrated analysis of a variety of factors. The relationships between these factors often form a very complex puzzle. In performance assessment, indicators are used together with other types of information (system characteristics, environmental factors, etc.). One goal of performance assessment is to rate the global efficiency in integrated and quantifiable terms. Neither the IWA system nor any other published PI system comprises guidelines for PI combined interpretation and use for decision-making.

Therefore, the industry still **feels the need for effective decision support tools based on the adequate interpretation of groups of performance indicators** assessed on the referred platform, **in order to orientate actions prioritisation**. According to the information available, none of the on-going 5<sup>th</sup> FP projects will provide an answer to this problem either.

Another important area of future research refers to the development of sustainability indicators based on performance assessment tools and decision support systems. However, COST Action C8 (Best practice in sustainable urban infrastructure) and several projects under the 5th FP deal with this problem. Some IWA PIs can be used for sustainability assessment as well, although the system has not been designed for this specific aim. Therefore, to prevent overlapping, this Action will track the on-going activities in this domain but will not include the development of sustainability PI. Nevertheless, any sustainability analysis requires a multi-dimensional approach, and the activities of the COST Action can contribute from the methodological viewpoints to this area of knowledge.

Another related area of knowledge still to be adequately explored regards the **use of PIs as part of other existing engineering tools**. For instance the 5<sup>th</sup> FP projects CARE-W and CARE-S, where PIs are associated to diagnosis and rehabilitation planning tools, show that a considerable added value can be achieved, increasing significantly the effectiveness of these tools. Similar approaches can be explored in the scope of the COST Action with regard to areas such as hydraulics and water quality network analysis, optimal design, energy optimisation, real time control or reliability analysis. The use of key PIs associated to these types of tools will allow for a more quantifiable assessment of the phenomena involved. Using the hydraulic and water quality network analysis as an example, selected performance measures can be used to compare in a synthetic way the network behaviour for different design configurations, operation procedures, or demand scenarios from various points of view, such as service pressure, water travelling times, energy consumption and reliability.

Conversely, other areas of urban infrastructure management (e.g. solid waste, energy, transports) have shown their interest for this type of approach, although they tend to be in a less advanced stage of development in this regard. **The framework developed for water and wastewater services can be adapted to other urban infrastructure services**. This is particularly so in the case of **solid waste**, where very little has been done so far in the scope of performance assessment measures and there is much in common with the previously mentioned services. Among the urban infrastructure services, water supply, wastewater and solid waste form a very important group with major impacts on public health. It is envisaged that this Cost Action can contribute positively – regarding performance assessment – to the EU waste management policy within the 6th FP, where research is orientated towards the subject of ‘Forecasting and developing innovative policies for sustainability in the medium and long term’.

So that Europe can play a relevant role both internally and outside of its geographical limits, it has to develop solid scientific and technical know-how in this domain, consolidating and developing current knowledge.

A considerable amount of performance information will be generated by the multiple performance indicators and benchmarking projects taking place. Conversely, a good number of organisations currently focus on performance assessment. These two facts create a unique opportunity for **sharing ideas, experiences and know-how**. This could lead to really **effective and innovative methods** for the **interpretation of the performance indicators** in order to support **management strategies and decision making processes**, to enhance the **integration of performance measures in other existing decision-support tools** and in promoting this methodology to **other public infrastructure services**. This can be made possible by a **COST-assisted initiative**.

## **B. OBJECTIVES AND BENEFITS**

### **B.1 - Objective**

The main objective of the Action is **to increase the knowledge and to promote the use of effective, scientifically robust and well devised methodologies for decision-making based on the use of performance indicators for urban infrastructure services, able to attract utilities to use them as routine management tools**.

Based on the use of the existing PI systems for water supply and wastewater services, a specific objective is the **establishment of effective, scientifically robust and well devised interpretation methodologies** for better use of multidimensional (and frequently conflicting) performance information.

Another specific objective is the **definition of research priorities regarding the integration of performance measures into other engineering tools**, as referred to in the previous section.

The third specific objective is **to promote the use of performance indicators as a routine management tool in other areas of urban infrastructures, using the sector of solid waste as a case study**.

## **B.2 - Benefits**

***For the scientific community:*** The process of creating effective decision-making tools, based on the interpretation algorithms/methods of performance measures, requires a multidisciplinary and multi-viewpoint brainstorming analysis. Conversely, performance indicators are particularly suitable for the establishment of new links between different areas of knowledge related to decision-making tools. The research publications and the discussions during the meetings of the COST network (that can be resumed further along in web-based discussion groups) will feed each other's projects and will lead to better results. Direct links with the industry will allow for a better knowledge of their aspirations, and practical application shortcomings and benefits, therefore leading to continuous adaptation of the research conducted in the real world.

***For the water industry and other urban infrastructure services:*** The results that are expected from this COST Action will be directed to cover the needs of the utilities, and even manufacturers and consultants, key potential users of effective performance assessment tools. On the one hand, integrated performance assessment tools are needed to cope with the increasing complexity of the utility management and the need for creative approaches. On the other hand, these tools allow for efficient and effective communication between the various levels of the utility internal hierarchy.

***For regulators, self-regulating bodies and other authorities:*** With the increasing participation of the private sector in the water industry, the traditional management role of public authorities moves to a new regulatory role on the one hand. The establishment of effective regulation mechanisms is a major challenge in many European countries. The results of this Action are expected to contribute to achieving this target. On the other hand, existing self-management and self-regulation systems based on the division of responsibilities between legislative and supervising authority and the water supply industry, will also benefit from powerful performance assessment and decision support tools. Conversely, policy makers are also potential users of more effective performance assessment tools.

***For other stakeholders:*** Financing bodies can benefit from assistance in assessing investment priorities, project selection and follow-up. For customers, for the media, and for the public in general, an effective performance assessment methodology provides the means of translating complex processes into simple-to-understand information and of transmitting a measure of the quality of service provided. Other stakeholders (e.g. NGO's and insurance companies) can also benefit from a more clear, integrated and comprehensive performance assessment of urban infrastructure services.

### **C. SCIENTIFIC PROGRAMME**

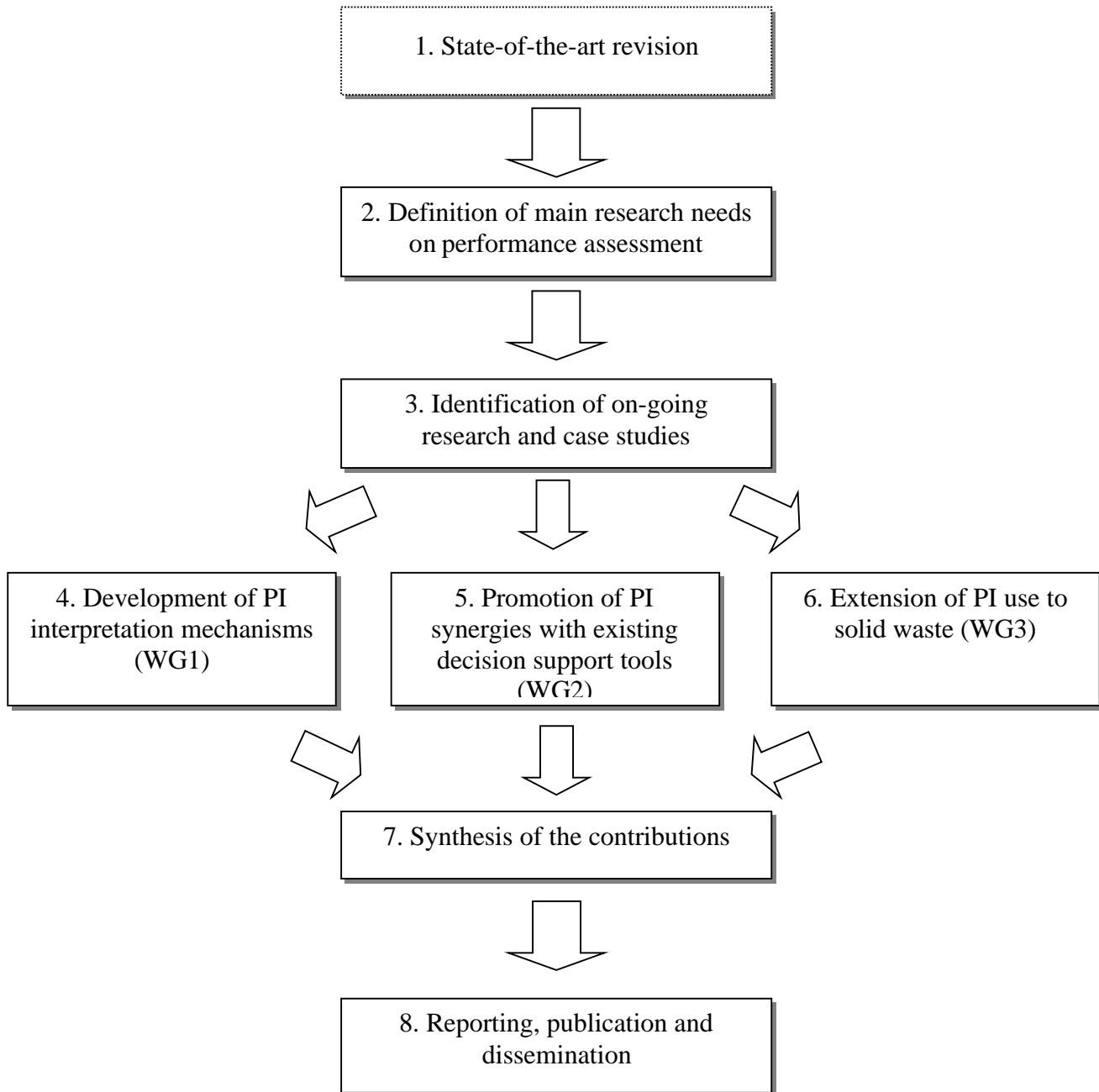
To achieve the objectives established, the scientific programme starts with a review of the state-of-the-art that provides a basis for discussion, proceeds with brain-storming sessions directed to the three sub-objectives defined, and concludes with the elaboration of a report with the synthesis and recommendations, accompanied by various dissemination activities. Restricted meetings will be combined with seminars that will involve not only the members of the Action to be appointed by each COST country (probably mainly PI experts), but also representatives of the above mentioned groups of stakeholders as well as other interested researchers. The structure of the scientific programme is synthesised in the diagram of Figure 1 and includes:

1. ***State-of-the-art revision:*** Current state-of-the-art and the COST members' know-how on performance assessment within water and wastewater sectors (e.g. IWA PI systems, CityNet projects).
2. ***Definition of main research needs on performance assessment:*** Definition of main research needs regarding performance assessment of water and wastewater systems, based on the current state-of-the-art within these sectors of activity and on the COST members' know-how.
3. ***Identification of on-going research and case studies:*** Complementary identification and analysis of the on-going research and case studies in other urban infrastructure sectors, as well as from competitive sectors with more experience of using performance indicators as management tools.

4. ***Development of PI interpretation mechanisms***: Establishment of a working group (WG1), with a clear definition of the expected outputs, that can serve as a catalyser in the process of establishing effective, scientifically robust and well devised methodologies for decision-making, based on the use of performance indicators for water supply and wastewater services.
5. ***Promotion of PI synergies with existing decision support tools***: Establishment of a working group (WG2), with a clear definition of the expected outputs, responsible for the discussion of the interest, feasibility and research priorities of the integration of performance measures into other engineering tools. The recent and expected experience and know-how achieved in specific applications (e.g. CARE-W, CARE-S and APUSS) will be taken into account.
6. ***Extension of PI use to solid waste***: Establishment of a working group (WG3), with a clear definition of the expected outputs, that can serve as a catalyser in the process of promoting the use of performance indicators as a routine management tool in other areas of urban infrastructures, using the sector of solid waste as a case study.
7. ***Synthesis of the contributions***: Synthesis of the contributions collected from the three working groups and final definition of research priorities in the framework of the European Union.
8. ***Reporting, publication and dissemination***: Reporting, publication and dissemination of the results inside and outside Europe in order to promote future R&D activities that allow development of ideas arising from this COST Action.

This Action is expected to enhance the competence of urban infrastructure management – with particular focus on water supply, wastewater and solid waste–management within the partners but also more generally, and to point out necessary future research actions. Special attention will be made to the transfer of information between different types of activity (water and wastewater management to the management of other urban infrastructures and from competitive activities to water and wastewater) and between different countries. The results will be presented in a series of fully available workshop reports.

**Figure 1. General timetable for the Action**



## **D. ORGANISATION**

The structural organisation of the Action is shown below:

- A Management Committee: The Action is led by the Management Committee, established in compliance with the corresponding COST rules and procedures (see doc. COST 400/01). The Management Committee will assume the dual role of managing operational and scientific direction.
- Three working groups, working in separate sessions as well as in plenary sessions. Working group leaders will be responsible for the dissemination of all work done in the working groups. In this case, the working groups are:
  - o WG 1 - Development of PI interpretation mechanisms within water and wastewater
  - o WG 2 - Promotion of PI synergies with existing decision support tools within water and wastewater
  - o WG 3 - Extension of PI use to solid waste services

The work will be developed mainly in plenary sessions, working group meetings, seminars, a conference, short-term scientific missions and e-mail discussion groups.

Plenary sessions (“Plenary COST meetings”) will deal with subjects of joint interest, and will take place at least once a year and whenever the working groups can meet in the same place and location.

Working group meetings will take place twice a year, mostly in conjunction with the Management Committee meetings and the plenary sessions. In these meetings, the progress of the Action will be presented and risk scenarios discussed.

The first seminar will consist of a brainstorming session aiming to feed with new ideas and guide the work of the whole Action, with particular emphasis on WG 1. The second and third seminars will be aimed at evaluating the progress of the working groups and at focusing on common objectives for the remaining years. The second will have a special focus on the activities of WG2 and the third on the activities of WG3. Seminars will also take into consideration problems of the host country.

A conference open to the wider community will take place during the last year of the Action. Its purpose will be to publish the findings of the Action and to present these to local authorities, experts, city managers and teaching and training institutions.

In general, the meetings will consist of three parts:

- a Management Committee meeting;
- a plenary meeting;
- parallel WG meetings;
- a seminar.

Mobility will be promoted through short-term scientific missions of young scientists hosted by R&D research organisations from the COST member countries.

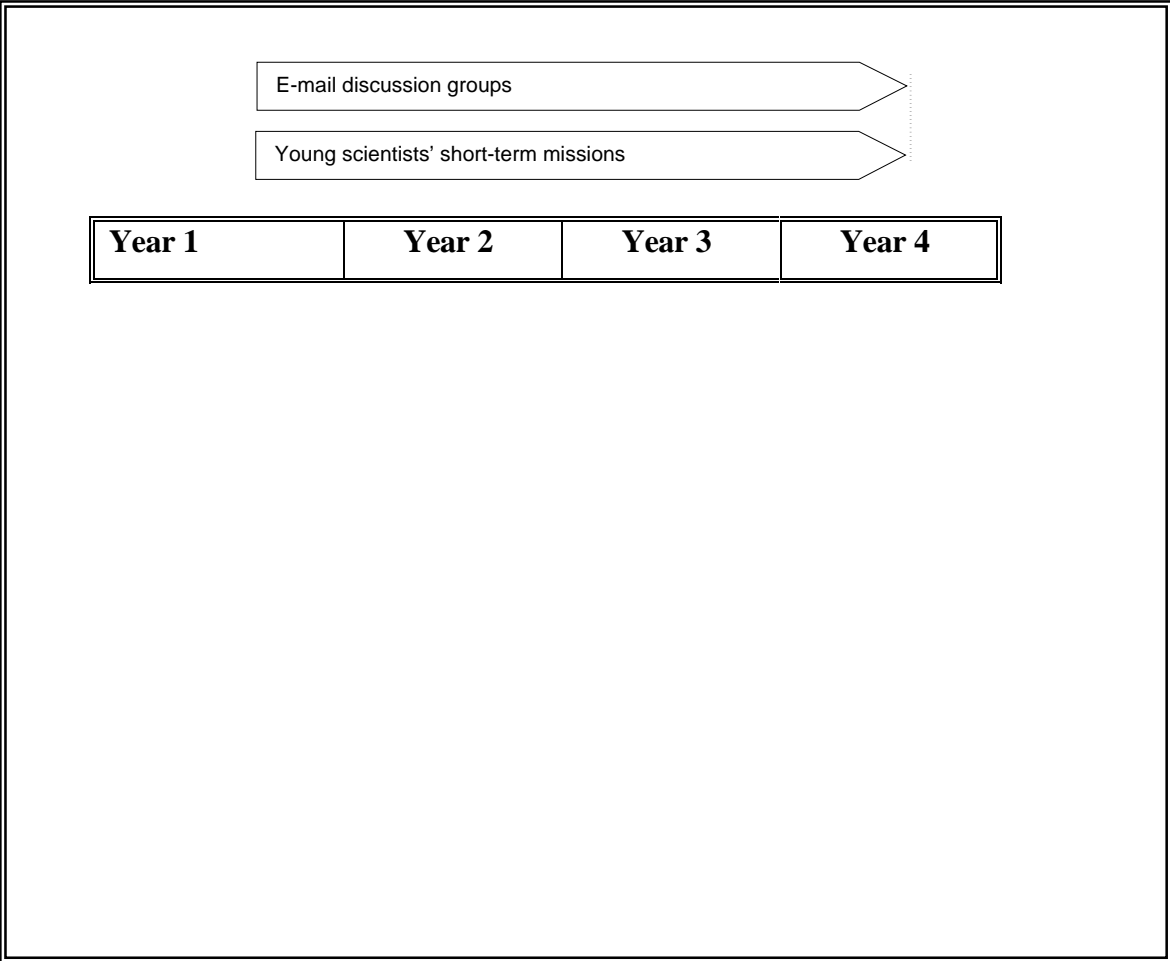
A website for the Action will be set up by the participants and will be maintained through the Action period. The website will be used for communication within the Action (e-mail discussion groups), to convey its aims and objectives to the scientific community and for disseminating its results.

This COST Action will actively trace and interact with related national and international research programmes, through exchange of information, meetings, joint seminars or any other means.

## **E. TIMETABLE**

The timetable of the Action is presented in Figure 2. The Action is planned to last for **4 years**. The final report of the Action should be available at month 48 from kick-off.

**Figure 2. General timetable for the Action**



Progress will be strongly linked to the main activity, which will be meetings and seminars. Figure 2 gives an overview of planned meetings and the topics to be handled. The kick-off plenary meeting would be held in Brussels and each of the following meetings in a different host country.

Reports will be available from each seminar by the partners responsible for the meeting, and from the kick-off and final conferences, in co-ordination with the European Commission.

## **F. ECONOMIC DIMENSION**

The following COST countries have actively participated in the preparation of the Action or otherwise indicated their interest:

- Austria
- Belgium
- Czech Republic
- France
- Germany
- Italy
- Norway
- Portugal (primary subscriber)
- Slovenia
- Spain
- Sweden
- United Kingdom

On the basis of national estimates provided by the representatives of these countries, the economic dimension of the activities to be carried out under the Action has been estimated, in 2003 prices, at roughly Euro 5.8 million.

This estimate is valid under the assumption that all the countries mentioned above but no other countries will participate in the Action. Any departure from this will change the total cost accordingly.

## **G. DISSEMINATION PLAN**

The target audience of this COST Action will be city managers of infrastructure (water supply, wastewater and solid waste), national regulatory bodies, research institutes, industry (represented by manufacturers and service providers), European-level policy makers, Government policy makers, regional planners and the general public.

Dissemination from this COST Action will be conducted by different means:

- posting of general information on a public Web-site;
- posting of working documents on a password-protected website;
- establishment of an e-mail network;
- publications: state-of-the-art reports, interim reports, case study reports, proceedings, guidelines, manuals, final reports;
- events: workshops (see table), seminars and conferences organised by the MC, contributions to other national and international conferences and symposia;
- articles in scientific and technical journals;
- non-technical publications.