

**COST**  
Domain Committee "ESSEM"

**COST Action 636**  
**Start Date 14/03/2005**  
**End Date 13/03/2009**

*Xenobiotics in the Urban Water Cycle*

**FINAL EVALUATION REPORT**

This Report stems from the relevant Domain Committee.  
It contains four parts:

- I. Management Report** prepared by the COST Office/Grant Holder
- II. Scientific Report** prepared by the Chair of the Management Committee of the Action.
- III. Evaluation Report** prepared by the "ad hoc" Evaluation Panel, established by the Domain Committee, and edited by the COST Office.
- IV. DC General Assessment** prepared by the Domain Committee

**Appendices:**

Ledin et al., "Final Scientific Report for COST Action 636 Xenobiotics in the urban water Cycle",

Confidentiality: the documents will be made available to the public via the COST Action web page except for chapter *II.D. Self evaluation* and *IV. DC General Assessment*.

**Executive summary of the Scientific Report (max.250 words):**

*Xenobiotics are of rising concern in the urban water cycle. The major reason is that water supply; urban drainage and wastewater treatment systems originally were designed to solve conventional problems such as supply of potable water, flooding prevention, and sanitation. Pollutants of interest have mainly been the conventional parameters (BOD, COD, N, P, SS and micro-organisms). Thus, there is a need to understand, in an integrated manner, the sources, flow paths, fate (transport, treatment, natural attenuation) and impact of xenobiotics on both humans and environment in this technical system. The xenobiotics (here heavy metals, metalloids and man-made organic compounds) are of importance in the whole urban water cycle as illustrated on Fig. 1. There are numerous sources of xenobiotics in urban water systems. Chemical pollution in rainfall-runoff and wastewater resulting from atmospheric washout, erosion of building materials, traffic emissions, pesticides application, industrial production, use of household chemicals, personal care products and pharmaceuticals. Increased focus on use of rainwater and reuse of wastewater for industrial as well as domestic non-potable purposes further increase the exposure to xenobiotics, but the conventional urban water cycle approaches are not designed to deal with xenobiotics. Innovative approaches are therefore needed to prevent xenobiotics from being discharged into surface waters where they may give rise to impacts on the chemical water quality and ecological status of receiving waters as already recognised by the EU-Water Framework Directive.*

## ***I. Management Report prepared by the COST Office/Grant Holder***

### ***I.A. COST Action Fact Sheet***

- **COST Action** 636- *Xenobiotics in the Urban Water Cycle*
- **Domain** *Earth System Science and Environmental Management "ESSEM"*

- **Action details:**

Draft MoU : 327/04		MoU: 218/05	
Start of Action: 14/03/2005		CSO approval date: 01/12/2004	
Entry into force: 16/02/2005		End of Action: 13/03/2009	

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- **Objectives** *(from DB as in About COST)*

*The main objective of the Action is to **assess the role of xenobiotics in the urban water cycle and to set up strategies for minimizing their impact on humans and ecosystems.***

*This can be obtained by fulfilling the following secondary objectives:*

- *Identification of the most critical problems related to xenobiotics in the urban water cycle.*
- *Suggestion of different strategies for solving these problems, incl. identification of future research needs.*
- *Creation of a strong network between researchers and other experts all over Europe working on issues related to xenobiotics and the urban water cycle.*
- *Creation of a strong network among young researchers all over Europe working on issues related to xenobiotics and the urban water cycle.*
- *Stimulation of an active dialog between researchers/experts and stakeholders all over Europe dealing with issues related to the urban water cycle.*

**Parties:** list of countries and date of acceptance

Country	Date	Country	Date	Country	Date	Country	Date
Austria	18/03/2005	Belgium	16/02/2005	Bulgaria	18/02/2005	Croatia	18/02/2005
Cyprus	19/08/2005	Czech Republic	18/02/2005	Denmark	16/02/2005	Estonia	15/03/2005
Finland	03/03/2005	Former Yugoslav Republic of Macedonia	08/03/2006	France	16/02/2005	Germany	16/02/2005
Greece	02/05/2007	Ireland	21/03/2006	Israel	05/05/2006	Italy	18/02/2005
Latvia	16/02/2005	Lithuania	30/05/2005	Luxembourg	28/02/2005	Netherlands	18/02/2005
Norway	09/03/2005	Poland	21/09/2005	Portugal	18/04/2005	Romania	12/05/2005
Serbia	21/03/2006	Slovenia	18/02/2005	Spain	14/02/2005	Sweden	17/02/2005
Switzerland	28/09/2005	Turkey	21/03/2006	United Kingdom	16/02/2005		
<b>Total:</b>	<b>31</b>						

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- **Action Web site:** <http://COST636Xenobiotics.er.dtu.dk>
- **Grant Holder Representative**(name, e-mail)
- **Working Groups** (list of WGs and names and affiliations of participants)

WG 1 Identification, sources and fluxes: Cajsa Wahlberg (S) and Kai Bester (DK)  
 WG2 Methods for treatment: Norbert Kreuzinger (A) and Mike Revitt (UK)  
 WG 3 Impact assessment: Ralph Hobby (D) and Anders Baun (DK)  
 WG4 Analytical issues: Ester Heath (SI) and Frank Sacher (D)

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<b>Workshops</b>						
Title	Date	Place		Cost	Status	Total
						<b>0</b>
<b>General Support Grants</b>						
Title	Date			Cost	Status	Total
General	01-Apr-2006			2,000	Paid	
General	26-Mar-2007			2,000	Paid	
website	01-Jan-2008			2,000	Paid	
						<b>6,000</b>
<b>Schools</b>						
Type	Date	Place	title	Cost	Status	Total
						<b>0</b>
<b>Honoraria</b>						
Title	Date	Expert		Cost	Status	Total
	11-Mar-2009	HALLING-SOERENSEN BENT		500	TBR	
	11-Mar-2009	KLAVINS MARIS		500	TBR	
						<b>1,000</b>
<b>Grant</b>						
Grant Holder	Date			Cost	Status	Total
						<b>0</b>
<b>Dissemination</b>						
Title	Date			Cost	Status	Total
						<b>0</b>
					<b>Action Total</b>	<b>401998.2</b>

## **II. Scientific Report**

A short version of the scientific report is given below under III **Previous scientific report(s)** which presents the major activities in the action. A much more comprehensive description is given in “Final Scientific Report for COST Action 636 Xenobiotic in the urban water Cycle”, written by Ledin, et.al., and appended to this report.

### **II.A. Innovative networking**

- *Innovative knowledge resulting from COST networking through the Action. (Specific examples of Results vs. Objectives)*
- *Significant scientific breakthroughs as part of the COST Action. (Specific examples)*
- *Tangible medium term socio-economic impacts achieved or expected. (Specific examples)*
- *Spin off of new EC RTD Framework Programme proposals/projects. (List)*
- *Spin off of new National Programme proposals/projects. (List)*

All these topics are addressed in Ledin et al., “Final Scientific Report for COST Action 636 Xenobiotic in the urban water Cycle”, appended to this report.

### **II.B. Inter-disciplinary networking**

- *Additional knowledge obtained from working with other disciplines within the COST framework. (Specific examples)*
- *Evaluation of whether the level of inter-disciplinarity is sufficient to potentially provide scientific impacts. (Specific examples)*
- *Evaluation of whether the level of inter-disciplinarity is sufficient to potentially provide socio-economic impacts. (Specific examples)*

All these topics are addressed in Ledin et al., “Final Scientific Report for COST Action 636 Xenobiotic in the urban water Cycle”, appended to this report.

### **II.C. New networking**

- *Additional new members joining the Action during its life.*

The action was kept open for anyone that would like to join. Invitations to the workshops organised within the action were sent out to more than 200 researchers and experts around Europe. Selection of participants for reimbursement from COST was based on a specific set of criteria decided by the Management Committee, including e.g. activity in the action (giving oral presentations and contribution to the discussions, contributing with work in between the meetings, local host for workshops, etc). We also took age into consideration (young researchers were prioritized) and tried to achieve an equal distribution over Europe.

- *Total number of individual participants involved in the Action work. (Number of participants. Give % of female and of Early Stage Researcher participants)*

These numbers will be very time consuming to compile, based on the material on hand (list with participants attending any of the 14 workshops and the final conference organised within the action). The COST office has been asked to supply us with this information, but we have not

received it yet.

- *Involvement of Early Stage Researchers in the Action, in particular with respect to STSMs, networking activities, and Training Schools. In addition, justification should be provided if less than 4 STSMs were carried out during the year.*

Special emphasis was given to involve young researchers in the action, e.g. by prioritising them when selecting participants given reimbursement. Although not knowing the correct number or percentage of young researchers joining and being active in the action, it is my strong believe that at least 40% of the active participants in the action have achieved their PhD within the last 5 years, or are still working in their PhD.

- *Involvement of researchers from outside of COST Countries. (Number of participants from non-COST Countries approved by the CSO. Give % of such participants from countries with reciprocal agreements. Specify their contribution)*

Attempts were made during the first year to involve researchers from outside COST countries (U.S., Australia, Canada, and Ukraine). However, the researchers in these countries reported large difficulties to get national funding in their countries to be spent on COST action 636 activities. Furthermore, when the number of COST countries that signed the action continued to increase, and finally ended at 31, it was decided to focus on involving researchers from all these countries instead of focusing on some few researchers from outside COST countries.

- *Advancement and promotion of scientific knowledge through publications and other outreach activities.*

These are:

- A special issue of Water, Air and Soil Pollution Focus: Xenobiotics in the Urban Water Cycle: Sources and Fluxes 8, 5-6, p 405-585, 2008 (Editors Eriksson and Scholes). For details see appendix 2.
- A special issue of Environmental Science and Pollution is in preparation (Editors Kassinos and Ledin)
- A special issue of Environmental Pollution is in preparation (Editors Kassinos and Ledin)
- A special issue Water Science and Technology is in preparation (Editors Ledin and Kassinos)
- Textbook Environmental Analysis-Standard and Emerging Strategies in Water Sciences in preparation (editors Düring, Hummel and Ledin), Springer Publishing
- Textbook "Xenobiotics in the Urban Water Cycle: Mass Flows, Environmental Processes and Mitigation Strategies" (Editors Kassinos, Bester and Kümmerer), Springer Publishing
- Webpage for the action (editor Eriksson)
- Webpage on Impact assessment of xenobiotics potential users are the public (Editors Hobby and Baun)
- International conference Xenowac 2009, Cyprus 11-13 March 2009
- DVD publication with papers presented at Xenowac 2009 (Editor Kassinos)
- Chapter presenting COST action 636 in "Pharmaceuticals in the Environment – Sources, fate, Effects and Risks written by Ledin and Patureau (Editor Kümmerer) Springer Publishing
- Chapter presenting COST Action 636 in Macedonian journal of chemistry and chemical engineering written by Meshko.
- Report and Abstracts presenting the intercalibration study submitted to conferences
- A number of papers, prepared and published as a result of the action

For more details see Ledin et al., "Final Scientific Report for COST Action 636 Xenobiotic in the urban water Cycle", appended to this report.

- *Activities and projects with COST network colleagues*

Reported in Ledin et al., "Final Scientific Report for COST Action 636 Xenobiotic in the urban water Cycle", appended to this report.

- *The capacity of the Action members to raise research funds.*

Partly reported in Ledin et al., "Final Scientific Report for COST Action 636 Xenobiotic in the urban water Cycle", appended to this report and presented on the webpage.

### **III. Previous scientific report(s)**

#### **III.A. Results achieved during the period 15 March 2005 to 13 March 2009**

One of the major achievements obtained by running COST Action 636 is the establishment of a very well-known and well working network in Europe within the area of xenobiotics and urban waters. 31 countries signed this action, which corresponds to almost all eligible countries within the COST organisation.

Another very important achievement was the establishment of an open atmosphere welcoming all participants in attending and contributing to the discussions. All workshops organised within the action have been open for anyone that would like to attend them. However, reimbursement was restricted to those that were actively contributing to the success of the action by e.g.:

- Giving oral presentations and actively contribute in the discussions
- Organise meetings
- Organise and contributing to other activities within the action such as the intercalibration study
- Writing articles about the action in different journals and textbooks
- Giving oral presentations at conferences and meeting promoting the action
- Acting as editors for the publication of COST action 636 related papers in a special issue of the international journal Water, Air and Soil Pollution and for the two textbooks (see below).

The MC decided, in an early stage of the action, that anyone with interest within this very important area are welcome to contribute to the work in order to fulfil the goals that were set up for the action:

- To assess the role of xenobiotics in the urban water cycle.
- To set up strategies for minimizing their impact on humans and ecosystems.

The number of participants attending the workshops that have been organized within the action was high and increasing during the time for the action. There have been numbers of participants attending the workshops without getting reimbursement and instead attending on there own expenses. This is illustrating that the action had a very good reputation for organizing inspiring

workshops on relevant topics. It also shows that the action was fulfilling one of the secondary objectives; to create of a strong network between researchers and other experts all over Europe working on issues related to xenobiotics and the urban water cycle.

Young researchers actively participating in the workshops by giving presentations were prioritized when the selection for reimbursement was made in order to create of a strong network among young researchers all over Europe, which was also on of the secondary objectives. Young researchers have also been prioritised by sending 10 of them on STSM to senior researchers within the action. The reason for this relatively low number is that the MC decided during the first years of the action to limiting the number of STSM due to the limited budget available. The MC thought it was more efficient to organise workshops and prioritise that young scientists got reimbursement when they actively contributed in these workshops.

To stimulate an active dialog between researchers/experts and stakeholders all over Europe dealing with issues related to the urban water cycle is another secondary objective which at least partly has been fulfilled by inviting stakeholders to the workshops and the final conference. However, an even larger number of stakeholders participating would have been an advantage.

An intercalibration study was organised by WG4. Fourteen laboratories from all over Europe joined the intercalibration study and the results were very good. The activity was coordinated by the chairs for WG 4 Ester Heath, SI and Frank Sacher, G. Samples were prepared by a team at Technical University of Denmark lead by Henrik Andersen and Hans-Christian Holten Lützhøft. Statistical evaluation was performed by Liliana Crucero, R.

An international conference on “Xenobiotics in the Urban Water Cycle” (Xenowac) was organised in Paphos on Cyprus in March 2009, within the frame of COST Action 636. The conferences had almost 200 participants listening to almost 113 oral presentations and looking upon and discussing around 46 posters.

### ***III.B. Dissemination of results***

- *Action related Publications and Reports*
  - A special issue of *Water, Air and Soil Pollution Focus: Xenobiotics in the Urban Water Cycle: Sources and Fluxes* 8, 5-6, p 405-585, 2008 (Editors Eriksson and Scholes)
  - Textbook *Environmental Analysis-Standard and Emerging Strategies in Water Sciences* in preparation (editors Düring, Hummel and Ledin), Springer Publishing
  - Textbook “*Xenobiotics in the Urban Water Cycle: Mass Flows, Environmental Processes and Mitigation Strategies*” (Editors Kassinos, Bester and Kümmeren), Springer Publishing
  - Webpage for the action (editor Eriksson)

- Webpage on Impact assessment of xenobiotics potential users are the public (Editors Hobby and Baun)
  - International conference Xenowac 2009, Cyprus 11-13 March 2009
  - DVD publication with papers presented at Xenowac 2009 (Editor Kassinos)
  - Chapter presenting COST action 636 in “Pharmaceuticals in the Environment – Sources, fate, Effects and Risks written by Ledin and Patureau (Editor Kümmeren) Springer Publishing
  - Chapter presenting COST Action 636 in Macedonian journal of chemistry and chemical engineering written by Meshko.
  - Report and Abstracts presenting the intercalibration study submitted to conferences
- *Workshops*
    - COST 636 Workshop in Copenhagen, 6-8 September 2005 – WG 1, 2, 3 and 4. The workshop aimed at formulating action plans for all four working groups and to establish strong and fruitful collaboration between the groups.
    - COST 636 Workshop in Ljubljana, 3-4 April 2006 – WG 4. The WG organized a workshop on analysis of xenobiotics in different environments. An intercalibration study was planned and the possibility for preparing a book or review issues was discussed.
    - COST 636 Workshop in Lisboa, 24-25 April 2006 – WG 1. The WG organized a workshop on sources for xenobiotics in the urban water cycle.
    - COST 636 Workshop in Nancy, 27-28 April 2006 – WG 2. The WG organized a workshop regarding general aspects in assessing removal of xenobiotics.
    - COST 636 Workshop in Duisburg, 20-21 June 2006 – WG 3. The WG organized a workshop on impact thresholds in the environment & humans.
    - COST 636 Workshop in Vienna, 25-27 September 2006 - WG 1, 2, 3 and 4. WG 1 had a workshop with focus on sinks, processes and chemical properties. WG 2 had a workshop that was a continuation of the work initiated in Nancy regarding fact sheet on processes and mechanisms in treatment technologies for drinking water, wastewater and stormwater. WG 3 had a workshop regarding impact assessment of xenobiotics in the urban water cycle, started to prepare for a document on “the best biotest battery” and initiated the planning for a research school. WG 4 had a workshop on sampling and continued the discussions regarding organizing an intercalibration study on estrogens in wastewater and to write a textbook regarding analysis of xenobiotics in urban waters.
    - COST 636 Workshop in Karlsruhe, 29-30 March 2007 – WG3 and 4. WG 3 had a workshop regarding impact assessment of xenobiotics in different compartments and on gaps in impact assessment. WG 4 had a workshop on analysis of endocrine disrupting compounds and continued the planning of both an intercalibration study and a textbook. The two WGs had a common workshop on “Effect-related analytical methods – The game of gaps”.
    - COST 636 Workshop in Stockholm 19-20 April 2007 – WG1 had a workshop together with the EU project ScorePP on Mitigation – upstream control.
    - COST 636 Workshop in Rome 23-25 May 2007 – WG2 had a workshop on biological processes.

- COST 636 Workshop in Santiago de Compostella 25-27 September 2007 – WG1, 2, 3 and 4. WG 1 had a workshop on Fluxes. WG2 had a workshop on Assessing treatment efficiency. WG 3 had a workshop with focus on following up on the “Game of Gaps” from the Karlsruhe workshop and discussed available biotests. WG 4 had a workshop on Analytical methods for determination of pharmaceutical compounds and their degradation products.
  - COST 636 Workshop in Copenhagen 10-12 April 2008 – WG3 had a workshop on Best biotest battery.
  - COST 636 Workshop in Berlin 10-11 April 2008 – WG 1 had a workshop on Sinks in the urban environment.
  - COST 636 Workshop in Dübendorf 14-15 April 2008 – WG2 and 4. WG2 had a workshop on Monitoring and assessment of treatment efficiency, while WG 4 focused on the results from the intercalibration study. A session for both WGs was also organised regarding sampling strategies for different purposes.
  - COST 636 Workshop in Novi Sad 6-8 October 2008 – WG1, 2, 3 and 4. WG 1 had a workshop on Stormwater. WG2 had a workshop on Treatment trains. WG 3 had a workshop with focus on development of the webpage on impact assessment. WG 4 had a workshop on Emerging contaminants.
  - COST 636 International Conference on Xenobiotics in the Urban Water Cycle in Paphos 11-13 March 2009.
- *Web site*  
The action has had both an Internet (<http://636xenobiotics.er.dtu.dk>) and an Intranet site, where the latter is open for those that have express interest for the activities in the action. The website presents the action with respect to aim and activities. It also presents a database regarding on-going research projects within the area of xenobiotics and urban waters.
  - *Scientific and Technical Cooperation*  
The action is open for anyone that would like to participate in the activities and it is therefore not possible to identify cooperation outside the action.

***III. Evaluation Report prepared by the “ad hoc” Evaluation Panel established by the Domain Committee and edited by the COST Office (approximately 2 pages)***

*1. Evaluation panel and evaluation procedures*

List the members of the panel: *Title, name, affiliation, Tel., Fax, E-mail.*

Describe briefly the Action’s activities and documents used by the members of the panel and the procedures followed for the evaluation.

*2. Results versus objectives*

Describe how and to what extent the results obtained match the objectives.

3. *Innovative networking*

Describe the outcome and achievements in terms of :

- innovative knowledge which resulted from COST networking through the Action,
- significant scientific breakthroughs as part of the COST Action,
- tangible and important socio-economic impacts,
- spin off of new EC RTD FP and/or National Programme proposals.

4. *Inter-disciplinary networking*

Describe the level of inter-disciplinarity, its benefits and impacts :

- additional knowledge obtained from working with other disciplines within the COST framework,
- evaluation of whether the level of inter-disciplinarity was sufficient to potentially provide scientific and/or socio-economic impacts.

5. *New networking*

Describe the main outcome and achievements in terms of :

- evolution of members joining the Action,
- total number of individual participants involved in the Action work,
- involvement and contribution of Early Stage Researchers (ESR), female researchers, and researchers from outside of COST Countries,
- advancement, promotion, and dissemination of scientific knowledge through publications (by Action members that resulted from COST networking through the Action) and other outreach activities,
- activities and projects with COST colleagues, including from other Actions,
- capacity of the Action members to raise research funds.

6. *Coordination and management*

Describe the effectiveness of coordination and management.

7. *Strengths and weaknesses*

Describe the main strengths and weaknesses shown by the Action.

***IV. DC General Assessment prepared by the Domain Committee***

DC comments on the quality of the Action in no more than one page. It should illustrate the “success story” (if applicable) of the Action, with concrete examples and names of persons who can be contacted for further details.