Sixth Framework Programme

SWIFT-WFD

Screening methods for Water data InFormaTion in support of the implementation of the Water Framework Directive

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PUBLISHABLE FINAL ACTIVITY REPORT

OF THE SWIFT-WFD PROJECT

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Project coordinator organisation name: ARMINES Revision:

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SWIFT-WFD PROJECT

The **adoption of the European Union Water Framework Directive** (WFD) has set new requirements for water quality monitoring in Europe. It has created an impetus for Member States to review and upgrade existing monitoring systems - matching the new demands of the WFD with the characteristics of the existing monitoring system, budgetary constraints, and broader organisational and legal frameworks.

This situation is a unique opportunity for new Screening Methods and Emerging tools (SMETs) to be considered and integrated in regulatory monitoring – for example as a complement to more traditional (spot-sampling/laboratory-analysis-based) approaches.

How could SMETs help to address the new monitoring challenges of the WFD? was identified as the central question of the EU-funded SWIFT-WFD research project. To address this question, more than 40 European partners with expertise in laboratory analysis, the development of innovative methods, water quality monitoring or socio-economics joined efforts between January 2004 and March 2007 and contributed to research activities including: an inventory of existing and emerging tools; the development of new technologies; the development of new quality control and quality assessment protocols; testing of screening tools under field conditions and comparing obtained results with results from traditional laboratory analyses; interaction with end-users and policy makers; training and e-learning; and the dissemination of research results.

OVERVIEW OF GENERAL PROJECT OBJECTIVES

The monitoring requirements for implementing the WFD successfully will directly depend upon available measurement techniques of demonstrated quality, which will be able to deliver reliable data at affordable costs. Besides the necessary "classical" laboratory analyses, screening methods will play a complementary role in the implementation of the WFD for improving quality monitoring. The WFD will only be a powerful management tool if monitoring data are reliable and of comparable quality.

In this context, the aims of the EU-funded SWIFT-WFD research project were to review existing and emerging tools and techniques for (chemical) water quality monitoring, to assess the quality of the information obtained from the implementation of these tools, to identify the main constraints concerning their application, and to discuss the relevance of these tools for WFD monitoring. The objective of SWIFT-WFD was to develop and apply robust quality control and validation methods for existing and emerging tools/methods that have the potential to comply with the monitoring requirements of the Water Framework Directive. On the basis of the outcome of several pilot case studies, SWIFT-WFD investigated the potential impact of integrating new monitoring devices into WFD monitoring strategies on monitoring costs and on decision making processes relevant to river basin management planning and the implementation of the WFD.

Finally, the SWIFT-WFD project produced a "Best Practice Document" that integrates project findings and guides experts and stakeholders involved in water policy and management to select field monitoring methods (existing and emerging) adapted to specific conditions and monitoring demands at reasonable costs. The Best Practice Document is the synthesis of the findings of all the SWIFT-WFD activities that extrapolates results into wider conclusions based on results of case studies[1].

METHODOLOGIES AND APPROACH EMPLOYED

To reach these objectives, a sound methodology was developed. It includes six main steps as presented in Figure 1 to investigate the wide range of issues relevant to the integration of screening methods and emerging tools (SMETs) into WFD monitoring strategies.

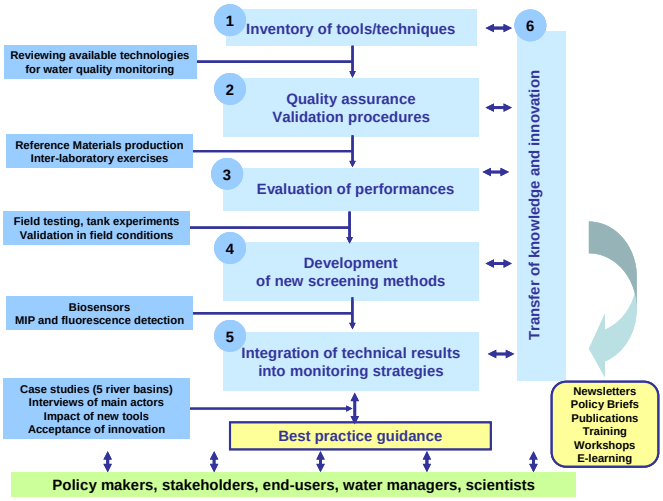

Figure 1: Developed methodology during 3 years project

1. Inventory of screening methods

The aim of this inventory or directory was to develop a toolbox of existing and more importantly emerging methods that may respond to the needs of one or more mode of monitoring (surveillance, operational, or investigative monitoring) as required by the European WFD[2]. The aim of the directory is to provide access in a cost effective way to consistent and reliable data that can be used for water quality management (at the river basin level) and comparison across national boundaries.

The directory covers a range of tools for physico-chemical monitoring, methodologies for biological/ecological monitoring, water quality evaluation through biological community/diversity assemblages, non-specific or pollutant-specific biosensors and biological early warning systems (BEWS), emerging tools for the measurement of time-integrated chemical concentrations through the use/deployment of passive samplers, available analytical tools for the measurement of chemical levels, and tools based on the use of biological material for pollutant-specific concentration measurements.

2. *QA/QC in compliance with water monitoring requirements (WFD)*

The quality control (QC) of monitoring measurements as required by the WFD requires various types of tools, e.g. calibrants, reference materials (internal quality control), and ways to ensure the best achievable comparability of results through interlaboratory proficiency testing (external quality control). Within the SWIFT-WFD Project, a series of activities were dedicated to review existing QC tools related to the parameters and water matrices covered by the WFD[3], to produce a provision of missing tools (reference materials of various types of waters, quality control kits, guidelines), to support and evaluate the analytical performances of European monitoring laboratories[4] involved in the WFD implementation and to evaluate and validate screening/emerging methods[5].

Within the SWIFT-WFD project, three PT scheme campaigns were carried out at European level with the participation of around hundred laboratories from twenty countries (in particular from Central and Eastern Europe). The large amount of available data obtained offers a valuable and unique opportunity to draw general conclusion at European level on laboratories analytical performances in monitoring analyses related to the WFD implementation.

Within the three inter-comparison campaigns, laboratories using screening methods and emerging tools (SMETs) were also invited. A specific report has been provided and gives details on performance of these methods that participated to the PT schemes. The results have been reviewed in comparison with the state of the art performances of all European laboratories participating in the SWIFT-WFD PTs. The SWIFT-WFD experience showed that in some case, SMETs applied in the PTs can be considered to be under control (e.g. the ELISA and portable spectrophotometer). These methods could be included systematically from now on in PTs without any need for specifically designed PTs. For other methods, the main constraints are the limit of detection (too high), the lack of specificity/selectivity, being prone to matrix effect, and scarce repeatability and reproducibility.

In addition, two main inter-laboratory comparisons of bioassays studies were organised. The first one was performed on bioassays for toxicity screening and the second one for endocrine disruption assay. Overall, bioassays tested show in general a good correlation with expected values from chemical analysis[6]. It was proposed that these tests could be employed for preliminary screening of water samples so that the application of chemical analysis (in particular when expensive analyses are required) is restricted to those samples that have measurable biological effects.

Concerning the validation of screening methods, there is a need to further develop QA/QC. In order to contribute to fill the gap in this specific area, the SWIFT-WFD consortium produced a guidance of method validation in two editions; the 1st edition containing all the basic information for method validation for within laboratory measurements[7]; the 2nd edition dedicated to the validation of screening methods, used outside laboratories[8]. The 2nd edition presents general issues related to screening methods validation and focuses on *on-site* and *in-situ* methods.

3. *Potential use of screening methods and evaluation of their performances*

In order to assess and evaluate *in situ* methods and laboratory-based methods for screening for pollutant levels in water bodies, field trials have been organised in several European sites.

The first field trial of SMETs was held at RIZA's Eijsden monitoring station on the River Meuse (south of Maastrich) at the border between Belgium and Netherlands. The categories of technologies tested included passive samplers, biological early warning systems, sensors, direct toxicity assays, toxicity profiling, neutron pulse beam spectrometry, immunoassays, in-field test kits[9]. All methods were run alongside repeated spot sampling with classical chemical analysis, and for the field trials also alongside continuous monitoring (SAMOS system) for organic pollutants, and weekly sampling for metals. Most existing and available passive sampling tools were tested. All samplers were tested both in the field (deployment periods of 7, 14 and 28 days) and in tank experiments (deployment period 5 days). The design of the tank tests provided a clear advantage for testing scenarios that are difficult or impossible to re-create under field conditions. This is also a major step forward in the development of novel protocols and procedures for quality assurance and control of screening tools. Generally, the analysis of results and the evaluation of these tools during this field trial confirm the potential for some of these techniques to be used for monitoring under the WFD. Advantages of some of these tools over standard spot sampling were clearly illustrated, especially in comparison to routine chemical analysis undertaken by laboratories based on spot samples.

The selected tools were also tested under real conditions at several European sites[10]. Some sites were retained for field studies (performances evaluation, validation studies and field demonstrations). The objectives of the testing activities were to compare current monitoring systems and screening methods (passive samplers, probes, lab-based methods, test kits, sensors, immunoassays, biological methods, BEWSs) and to demonstrate the potential use of these tools in monitoring strategies (surveillance, operative and investigative monitoring). Six field trials were organized in the Ribble River (UK), Daugava River (LV), Orlice River (CZ), Aller River (DE), Lower Rhine River (FR), and Tevere River (IT) basins. During the last field trial, laboratory and field validations were carried out using reference materials in order to allow comparison with reference analysis. Performance criteria (reproducibility, repeatability, linear range, robustness, detection and quantification limits) were evaluated under both laboratory and field conditions[11].

4. *New screening tools development, potential performances of biosystems*

The availability of powerful tools from biochemistry, molecular biology and genetics has contributed to development of sensitive and specialised biosensors. Research and development has stimulated the development of a series of novel biosensors that are promising and that are different from conventional sensors.

As a result, efforts has been targeted during recent years in the development and use of different biosensors for toxicity evaluation of water samples. Whole organisms are used to measure the toxicity of a water or soil sample. Biological tools have shown interest especially for toxicity assessment and identification of pressure points. Moreover, biosensors have been shown to have great potential as analytical tools for effective water monitoring and could be used as environmental quality monitoring tools in the assessment of biological/ecological quality elements required under the WFD or for the chemical monitoring of both inorganic and organic priority pollutants.

In this context, the RTD activity of the SWIFT-WFD project has been devoted to the development of bio-electrochemical sensor and biosensors based on molecular recognition coupled with a fluorescent system (results are confidential and not published on the web site). These studies were mainly dedicated to the optimization and the evaluation of their performances in laboratory conditions using standard solution or reference materials. Other new screening tools have been developed using biomimetic systems (Molecular Imprinted Polymers) for targeted pollutants as for example fluoranthene and carbamate pesticides.

5. *Integration of screening methods in water monitoring strategies*

Case studies (pilot river basins) were conducted in parallel to field trial activities in five river basins[12], i.e. the Ribble Estuary in the UK (one of the pilot river basins of the EU Common Implementation Strategy developed at EU level for supporting the implementation of the WFD), the Aller River in Germany, the Daugava River in Latvia, the Alsace aquifer in France and the Orlice River in the Czech Republic. These activities built on: the analysis of technical and socio-economic information collected from the different sites[13]; real-life testing and demonstration of screening methods and emerging tools; and interviews with various stakeholders (laboratory staff, experts from water management authorities, etc) and potential users of the screening/emerging tools. The perception and acceptance of screening tools by potential users was assessed on the basis of questionnaires (Latvia, the Czech Republic) and face-to-face interviews (Latvia, France).
In order to link SWIFT-WFD research activities to policy making, national and local workshops as well as demonstration days were organised in each case study country. Discussions and feedback from these workshops and demonstration activities helped identify barriers and opportunities for using SMETs. They also provided material for understanding perception and acceptance of potential end-users of SMETs. Finally, a market study assessed the market potential for SMETs, including key factors influencing success or failure of innovation take-up in the field of water quality monitoring[14].

In each of the five case studies, the case study work was conducted in four main steps as indicated in Figure 2.

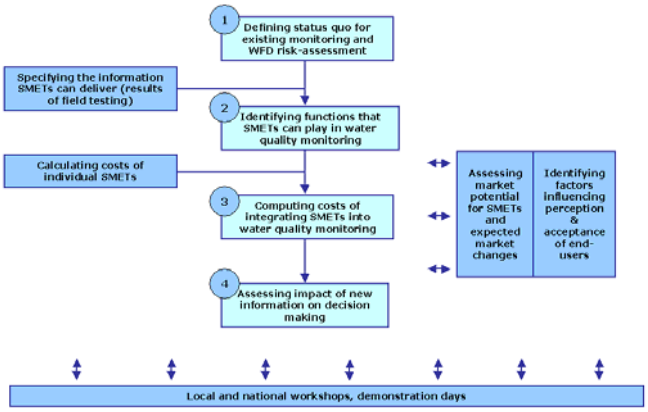

Figure 2: Methodology developed for case studies

The main conclusions that could be drawn on the basis of the five case studies are presented below:

- There is a very limited use of SMETs in today's (regulatory) monitoring – some exceptions being found in the Netherlands and in the United-Kingdom where SMETs are used among other things to capture the temporal variability of concentrations, to group water bodies or to check the first risk-assessment carried out as part of the Article 5 reports.
- This will not change drastically with the implementation of the WFD monitoring requirements. Indeed, the first monitoring strategies developed by Member States do very rarely include SMETs. Further windows of opportunity for integrating SMETs into WFD monitoring might come between 2009-2012. Overall, SMETs will mostly be used in the context of investigative monitoring – or in complement to existing classical (spot sampling and laboratory analyses) methods.
- The absence of quality control/quality assessment, the absence of accreditation, too high (investment) costs or limited awareness on how to use SMETs and interpret their results are some of the constraints explaining today's limited use. At the same time, the current cultural bias in laboratories towards large and sophisticated equipments also explains the lack of interest for such tools.
- The cost-advantageousness of SMETs is very dependent on the national cost framework, the characteristics of the monitoring campaigns in terms of frequency and spatial location or labour costs. Similar cost assessments proved to come to different results in different countries. The derivation of a general statement on the cost-saving potential of SMETs or even an extrapolation to the European level would thus be inappropriate.
- However, some conclusions on the cost saving potential of SMETs can be drawn from their general cost framework and the cost assessments of the case studies. This cost saving potential differs according to the role which SMETs will be able to play in future monitoring networks.
- Some SMETs have the potential to replace traditional methods as they deliver comparable information on water quality (quantitative snap shot information).

Other SMETs are likely to be used complementary to traditional methods and deliver additional information on water quality concerning temporal and spatial variability. A third role SMETs can take is to deliver additional information on water quality which is totally new and which cannot be obtained under the existing approach.

- SMETs can help reduce uncertainties that come with infrequent spot samples. Thus, they can decrease the risk of misclassification of water bodies in both directions, false-positive (identifying a water body as being at risk which is truly not at risk) and false-negative (identifying a water body as being not at risk which truly is at risk). Moreover, SMETs can provide additional information to identify the origin of existing water quality problems. Altogether, SMETs can help to tailor measures more clearly to problem thus preventing cost of unnecessary measures and cost to the environment.

6. Transfer of knowledge and public awareness

In addition to the national and local workshops mentioned above, the results of the SWIFT-WFD project were disseminated through training activities (courses, workshops and e-learning tools). These activities were devoted to the provision of training and the development of training tools related to a discussion on the potential use of screening methods and integrating sampling tools for implementation in monitoring programmes in support of the Water Framework Directive. An e-learning package on "Monitoring Methods and Quality Assurance: Requirements for the implementation of the WFD" was created and the main outcomes of the SWIFT-WFD project illustrated and developed. This e-learning package is intended for a wide audience involved in monitoring for the WFD: it will be a welcome tool for supporting laboratory staff, laboratory managers and/or policy makers/implementers. This e-learning programme is available on the web site of the SWIFT-WFD project (www.swft-wfd.com).

The dissemination of results was performed through the website and the publication of a SWIFT-WFD newsletter (seven newsletters available on the web). Policy Briefs (twelve Policy briefs in total) were also published and are available on the web.

MAIN ACHIEVEMENTS RELATED TO CURRENT STATE-OF -THE ART

Selected achievements of the SWIFT-WFD research project can be illustrated:

- The SWIFT-WFD project provided the first PT schemes that integrated SMETs, and compared their results with results from classical methods using external validation. Even though only a few laboratories using SMETs took part in the PT campaign, it is hoped that these first promising results will encourage and convince laboratories of the value of participating in future PT schemes. The SWIFT-WFD project carried out also the first European inter-laboratory exercise based on the assessment water toxicity using assays based on the inhibition of bioluminescence of *Vibrio fischeri*. This involved ten laboratories from eight countries (Austria, Cyprus, Germany, Greece, Italy, Portugal, Romania and Spain). The inter laboratory study on the assessment of endocrine disrupting activity was the first to use environmental samples, and to compare bioassay results with results from chemical target analysis. The latter approach gave valuable information that facilitated the evaluation of the data from the biological assay.
- Considering the evolution of the regulation which asks for more and more measures of surveillance and the constant appearance of new substances in aqueous environments, a strong need for alternative monitoring methods complementary to classical approaches has emerged in recent years in order to propose a better management of the environmental liquid flows. So far, the control of waters quality is generally connected with the collection, at defined periods of time, of spot samples followed by an extraction (sometimes) and by an analysis in laboratory both for organic or inorganic compounds. In most cases, the sample is analyzed to measure total concentrations of a given analyte or group of analytes. However, this approach is valid only if it produces a representative picture of the chemical quality of the water in a particular site.
- In this context, SWIFT-WFD project developed field trials for comparative studies at scales rarely achieved before in particular when considering the efforts made, the number of methods tested and the results of the field trial held in Eijsden. This will provide large amount of valuable information on the relative merits of the various approaches tested. And these results will help research and development of techniques such as passive sampling devices, where novel and important results were obtained, to progress in relevant directions.
- The tank test developed during the field trial was a first attempt to develop a quality assurance procedure for some of these tools. This helped testing tools under conditions of fluctuations of contaminant concentrations that would be difficult to obtain in a natural environment since it is difficult to predict when they will occur. This approach allowed the assessment of the fitness-for-purpose and comparability of screening tools under conditions that are reasonable simulations of events that are known to occur in the natural environment. The use of reference materials may not be practically useful for the assessment of reproducibility of some screening techniques, (e.g., passive sampling devices). However, these test tanks may provide a useful alternative to the use of reference materials when suitable ones do not exist or are impractical because of the need for large volumes (hundreds of litres).
- Concerning screening methods, there is not standardized protocol for their validation and this issue is one of the main barriers to their application in water quality monitoring. Indeed, none of existing standards (such as ISO 15839 or NF 90-210) is directly and strictly applicable to field methods because these standards are based primarily on laboratory analytical considerations and do not take into account really specificities and constraints of on site methods in terms notably of sampling, flow rate, environmental conditions. Moreover, a distinction must be brought according to the objective of the measure (concentration, effect, and evolution), the type of measure (quantitative, qualitative,

semi-quantitative) and the principle of the measure (chemical, physical or biological).

- The validation of biological methods becomes more complex because of the difficult comparison of incomparable parameters (for example a toxic effect in presence of organic compounds). Finally, the comparison of screening methods (subjected to different environmental and sometimes not controllable constraints), with a reference method (realized in laboratory in well established assurance quality conditions) requires to be defined and has to integrate notably the differences of implementation of two methods.
- There is very limited information on socio-economic issues linked to monitoring in general and to SMETs in particular. Furthermore, the integration of SMETs and innovation into monitoring strategies and practical implementation is very limited. In this context, the SWIFT-WFD project has initiated novelty work and has proposed a framework for assessing the impact of innovations in the field of water quality measurement and monitoring. Also, information on costs of SMETs has been collected and developed, and a cost database has been constructed – stressing in particular the different cost components that are to be considered when computing total costs of water quality monitoring programmes. Although this might have been obvious for some, the research stressed that referring to "low cost" devices did not have much meaning – as indeed the cost of a given measurement or device application clearly depends on the way the device is used within an overall monitoring programme.
- The SWIFT-WFD project has also initiated research on perception and acceptance of innovation in the field of water quality monitoring. This has clearly helped identifying the main constraints considered by potential end-users explaining the limited use of most SMETs today. It has also helped identifying cultural and psychological reasons that explain people's views on SMETs.

IMPACT ON RESEARCH ACTIVITIES AND WFD IMPLEMENTATION

- The SWIFT-WFD project has helped the dissemination of a large amount of information concerning technologies and methodologies that have potential for supporting the monitoring activities that are necessary for the achievement of the aims of the WFD. The directory has brought together important information on technologies from diverse fields in one accessible source. This should help facilitate those involved in developing monitoring strategies to make decisions concerning the relative utility of the diverse methods.
- The production of quality control tools (reference materials) for use in supporting the successful implementation of the WFD, and the composition of guidance aiding the implementation of quality control tools and the validation of methods used in water analysis.

The potential impact of the produced guidance documents on research activities is significant. The document will serve as a good basis for the proper validation and quality control of newly developed methods, enabling them for routine laboratory and out of laboratory applications. Moreover, the 2nd guidance document provides an essential support for the validation and quality control of screening methods where the validation does not necessarily follow the usual steps, but requires additional parameters. The impact on the implementation of the WFD is unquestionable. With the necessary publicity, the document can become a basic document in the everyday use of laboratories active in WFD related activities in support of the quality assurance of measurements to comply with the monitoring requirements set out in the WFD. In addition those involved in the development of new technologies may also benefit.

Novel approaches for the preparation of Reference Materials for analysis of organic compounds in water (PAHs and pesticides) were explored and tested through the SWIFT-WFD PTs, with a positive outcome of the results obtained. These data could serve for future developments in the field of Reference materials for organic compounds in water. Such quality control tools are, at present, missing because of still unsolved technical difficulties related to the stability of these substances in the water matrix.

- The SWIFT-WFD field trials and testing activities experiences allowed the consortium to contribute to the Chemical Monitoring Activity (CMA) guidance document by including SWIFT-WFD results in a section dealing with alternative/complementary methods. In addition, an example of results based on work undertaken during the field trial in Eijsden was proposed as a possible case study for inclusion in the CMA guidance.
  The work performed in the frame of the SWIFT-WFD project results in the following conclusions:
  - ✓ The comparisons of screening methods (on site methods such as tests kits, immunoassays, laboratory based instruments) with classical methods in PT schemes has demonstrated that some of these tools can provide reliable results in particular for samples at fortified level of pollution albeit with a higher uncertainty associated with results.
  - ✓ On-site analytical methods that provide results in a short timescale can reduce the problem sample modification during handling, storage, transport and preparation for analysis. They can provide a rapid mapping and help selecting samples to be brought back to the laboratory for further or more accurate analysis. These methods have the potential to provide representative information on water quality in a more cost-effective way than possible with current practice.
  - ✓ Under the WFD, SMETS (tests kits, immunoassays, laboratory based instruments, bioassays) may allow rapid on-site mapping of a water body, or be used after an accidental pollution. However, their main

purpose will be screening and not assessing current levels of water quality for specific analytes.

- ✓ Among the screening methods tested, some of them provide new information in comparison to classical methods. The most illustrative case concerns passive sampling technologies that provide more representative measures of concentrations of pollutants than spot sampling. They also measure different fractions than those measured using laboratory analysis of spot samples (free dissolved metals rather than total metals). Under the WFD, they can be used for monitoring long-term trends or for screening of a large range of contaminants at very low concentrations. Future challenges are to improve the calibration models, to develop quality assurance procedures and to reduce the limitations associated with field deployment (for instance the impact of biofouling on uptake rate has to be studied).

- Overall, the SWIFT-WFD activities have clearly helped raising awareness on the potential of SMETs in water quality monitoring and in the development of the WFD monitoring strategies. Some of the key messages that were shared and discussed with potential end-users are as follows:
  - ✓ In the WFD context, SMETs have limited potential to be used in surveillance and operational monitoring – apart for passive samplers, multiparameter probe and sensors that might play some role. Potential applications of SMETs are more significant in investigative monitoring where more flexibility is available and the environmental problems and uncertainties to be investigated expected to be highly diverse.
  - ✓ However, within future monitoring systems, they have a potential to deliver better information on water quality and thus enable enhanced decision making. Better information should receive more attention because of its long-term implications – as opposed to sufficient (minimum) information for reporting and for complying with the requirements of the WFD that receives most of the attention of countries when designing their WFD monitoring programmes.
  - ✓ The degree to which SMETs will be applied in the first monitoring cycle of the WFD will vary widely among the EU Member States. Some Member States are already using these tools in their networks (e.g. UK, The Netherlands) some are starting a discussion about potential use and others (the majority) will not consider them in the first cycle at all.

DISSEMINATION AND USE

During the entire duration of the SWIFT-WFD project, the strategy of communication has been focused on three main publics and target groups: policy makers, final end-users of SMETs and the scientific community. In order to ensure communication and knowledge dissemination, specific actions were implemented such as training courses for policy makers and laboratory experts, the development of the e-learning tool, the organisation of technical meetings a workshops (local, national, international levels), the testing of SMETs under field conditions with involvement of local experts and stakeholders. A key element of the information and communication efforts of the SWIFT-WFD research project was to favour the link between science and policy making and to offer the opportunity for a wide audience to benefit from the SWIFT-WFD research project and from its results.

CONSORTIUM

Partner name	Country
Armines Ales	France
University of Portsmouth	United Kingdom
Ente Per le Nuove Tecnologie, l'Energia e l'Ambiente	Italia
Bureau de Recherche Géologique et Minière	France
Ecologic Institut fur Internationale und Eurropaische Umweltpolitik gGmbH	Germany
Consejo Superior de Investigaciones Cientificas	Spain
AlControl UK Ltd	United Kingdom
Universitad Complutense de Madrid	Spain
Mermayde	Netherlands
Chalmers University of Technology	Sweden
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Partner name	Country
Joint Research Centre, Institute for Reference Materials and Measurements	Belgium
Szent Istvan University	Hungary
Université de Pau	France
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XPRO consulting Ltd.	Cyprus
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Secomam	France
National Institute for Research and Development for Environment Protection	Romania
Provodi Lab	Czech Rep.
University of Latvia	Latvia
Latvian Environment Agency	Latvia
Aquametris	France

References

[1]Water monitoring with screening methods and emerging tools- A best practice Guide, Deliverable D66

[2]Directory of "Screening tools" – A toolbox of existing and emerging methods for monitoring under the WFD, Deliverable D5

[3] Inventory of existing RMs for water analysis, Deliverable D11

[4] Comprehensive final report on SWIFT-WFD PTs results (report available on the web site)

[5] Report on the participation of non-classical methods in SWIFT-WFD PTs

[6] Correlation between chemical analysis and toxicity results of the real samples of the SWIFT-WFD inter-laboratory exercise on water toxicity (Deliverable D21)

[7] Guidelines for laboratories carrying measurements outside the laboratory (Deliverable D12 part 1)

[8] Guidelines for screening methods and emerging tools validation (Deliverable D12 part 2)

[9] Field evaluation of screening tools and techniques in response to chemical monitoring requirements of the WFD (Deliverable D25)

[10] Report on performances evaluation of screening methods (field trials results), Deliverable D43

[11] Report on laboratory and field validation of screening tools based on performance criteria evaluation, Deliverable D44

[12] Potential uses of screening methods and emerging tools under WFD, Deliverable D64/3

[13] Synthesis report on the assessment of the impact of SMETs on decision making

[14] Synthesis report on European market study

SMETs DEFINITION:

The inventory made as part of Work Package 1 stressed that the word "screening methods" originally included in the title of the project was rather restrictive as compared to the wide range of methods and tools that were considered. Indeed, screening methods are defined as qualitative or semi-quantitative methods used for a first diagnosis of water quality. But, the inventory demonstrated the existence of quantitative methods used or under development for water quality monitoring. Hence the term "Screening Methods and Emerging Tools" (SMETs) was chosen as reflecting more appropriately the methods and tools considered under the SWIFT-WFD project and the objectives (WFD focus) of the project.

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