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## **Post Project Continuity**

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HarmoniQuA is a project to carry out research, technological development and demonstration under the European Commission's "Energy, Environment and Sustainable Development" programme, Key Action 1 "Sustainable Management and Quality of Water", 1.1 Integrated management and sustainable use of water resources at catchment, river basin or sub-basin scale, 1.1.1 Strategic planning and integrated management methodologies and tools at catchment/river basin scale under contract EVK1-CT2001-00097.

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# 1 Introduction

## 1.1 *The HarmoniQuA Project*

Harmonising Quality Assurance in model based catchment and river basin management (HarmoniQuA) is a 4 year project (2002 to 2005) supported by the European Commission. The HarmoniQuA project consortium is made up of 12 partner organizations from 10 European countries. Partners have expertise in 7 domains of model based water management.

HarmoniQuA has developed a software-based Modelling Support Tool (MoST) and an associated Knowledge Base (KB) to provide guidance and harmonised Quality Assurance procedures across a range of selected scientific domains (groundwater, precipitation-runoff, hydrodynamics, flood-forecasting, water quality, biota, and socio-economics). MoST prompts users with the appropriate 'next step' in the modelling process, provides an audit trail to check previous decisions and accommodates the following user types: water managers, modellers, auditors, stakeholders and members of the public. It should enhance the credibility of catchment and river basin modelling. More specifically, MoST has the functionality to:

- Guide: to ensure a model is properly applied;
- Monitor: to record decisions, methods and data used in these tasks; and
- Report: to provide reports suitable for managers/clients, modellers, auditors, stakeholders and the general public.

For further information see the project website: [www.HarmoniQuA.org](http://www.HarmoniQuA.org)

## 1.2 *Aim of this document*

The success of HarmoniQuA MoST depends on its adoption by the modelling community. Continuing efforts to encourage the adoption of MoST will ensure that a high profile for quality assurance for modelling in water management is maintained. This report presents plans for encouraging the adoption and/or development of MoST after the end of the project (2005). The following are considered:

- Quality assurance for modelling for water management: the current profile and its maintenance into the future;
- Future development and application of MoST; and
- A framework for the continuation of MoST beyond the HarmoniQuA project.

# 2 Quality assurance for modelling for water management

## 2.1 *Current profile*

The level of quality assurance adopted during modelling for water management is extremely variable as demonstrated in the State of the Art report (Refsgaard, 2002). It varies between domains, within countries and throughout Europe. Inadequate quality assurance often results in modelling studies that are non transparent, non repeatable,

and extremely difficult to audit. These issues often reduce the credibility of modelling studies and their results.

The dissemination work package of HarmoniQuA has invested considerable effort in raising the profile of quality assurance for modelling across Europe. The project has targeted more than 1500 professionals and stakeholders. Brochures, questionnaires, newsletters and links to the public website have been distributed to all contacts. Consideration of stakeholder views on quality assurance (Old et al., 2005) suggested that some groups need convincing of its value in modelling. To address this need, a dedicated stakeholder newsletter was produced and distributed. Articles have also been published in scientific and professional literature.

HarmoniQuA project partners have organised European and national workshops. Presentations and demonstrations held at HarmoniCA events have introduced HarmoniQuA to European organisations (e.g. the European Environment Agency and the Joint Research Centre). National workshops have been well attended, attracted wide audiences and generated lively discussions (e.g. 60 persons: Wallingford January 2004). Plans for future events and reports from past workshops can be found on the project website.

Undergraduate students have been taught the importance of quality assurance and introduced to the aims of HarmoniQuA through courses that have utilised the training material developed within the project. Courses have taken place at Wageningen University (Netherlands) and the National Technical University of Athens (Greece).

The project team are confident that these dissemination activities have contributed to raising the profile of quality assurance in modelling. In particular, the project has harmonised awareness of the importance of quality assurance between countries and domains, and MoST has illustrated a way in which it can be implemented. Feedback from the consultation of professionals and stakeholders clearly illustrates that there is general support for quality assurance (see Old and Packman, 2005 and Old et al., 2005; available at: <http://harmoniqua.wau.nl/public/News/news.htm>). In addition, more than 100 persons have downloaded MoST from the project website. Furthermore, national agencies in several European countries have shown specific interest in the outputs of HarmoniQuA. The UK Environment Agency make reference to HarmoniQuA in their 2005 strategy for Hydrology and a workshop has been arranged to discuss the possibilities for the future development/implementation of HarmoniQuA. In Denmark, a project has been funded to test and adapt MoST to Danish modelling studies relevant to the WFD implementation.

## **2.2 Maintaining a high profile into the future**

The current awareness of the importance of quality assurance for modelling provides the essential basis for its survival into the future. Following the completion of the HarmoniQuA project in December 2005 conference presentations will be used to maintain a high profile of quality assurance. Project partners are being encouraged to present on the importance of quality assurance in modelling and the potential benefits of implementing HarmoniQuA MoST.

Presentations on quality assurance for modelling and/or HarmoniQuA MoST are planned for the following conferences (2006+):

**Modflow and More**, Colorado, May 2006. Jens Christian Refsgaard is on the Technical Committee and has a keynote on uncertainty/QA  
<http://www.mines.edu/igwmc/events/modflow2006/modflow2006.shtml>

**NORDIC WATER 2006**, Denmark August 2006. Jens Christian Refsgaard is organising the event and GEUS will present MoST. It is a northern European event focusing on WFD implementation <http://www.danva.dk/sw3710.asp>

**ModelCARE2007**, which will be held in Copenhagen in September 2007, GEUS is the key organiser.

**HarmoniCA Conference and Forum, April 2006**, Osnabrück, Germany.

Participation in the following conferences is also being considered:

**3rd Int. Symp. On Integrated Water Resource management** (26-28 September 2006, Bochum, D, <http://conventus.de/water/> )

**HydroInformatics 2006**, (<http://www.hic06.org/> )

In the UK, a one-day meeting on quality assurance for modelling is being planned for 2007.

### 3 Future development and application of MoST

Although considerable effort has been invested in raising the profile of quality assurance for modelling, and disseminating HarmoniQuA, MoST has yet to be widely adopted by practitioners. There are several reasons that prevent the widespread adoption of MoST. Firstly, MoST is still very new and undergoing continual development. The more advanced (end of project) version of MoST is likely to be more widely used. Secondly, consultation of professionals has indicated that the guidance within MoST is too general. However, it should be emphasised that MoST provides a procedural framework that should be considered a minimum standard for modelling. Countries/organisations with advanced modelling capabilities are likely to want more detailed guidance to support modelling in specific domains or using specific software. In such cases future developments of MoST are likely to be driven at a national level by specific user organisations. Finally, MoST is only currently available in English. In some European countries translation of MoST and its KB into their native language is crucial for its adoption. The requirements for translation of MoST have been reported by the project (Old and Packman, 2005). Support is being sought from HarmoniCA to translate MoST (technical expertise is required). Project partners using the KB editor developed within the project may translate the text in the KB easily.

Now that a mature version of MoST is available, workshops that are currently being held throughout Europe (see [www.harmoniqua.org](http://www.harmoniqua.org)) are encouraging its implementation and/or development. Modellers, model study clients and academics are being encouraged to attend. The adoption of MoST will depend upon it either

being taken up by consultants or specified by model study clients. Several current or planned projects are likely to use MoST and these include:

- Quality Assurance in NOVANA: Denmark (Contact: [jcr@geus.dk](mailto:jcr@geus.dk));
- BSIK Leven met Water: Netherlands (Contact: [p.w.dirksen@riza.rws.minvenw.nl](mailto:p.w.dirksen@riza.rws.minvenw.nl));
- GLOWA-Elbe II or III: Germany and Czech Republic (Contact: [helmut.fischer@bafg.de](mailto:helmut.fischer@bafg.de));
- DEMO-project: Sweden (Contact: [Jonas.Olsson@smhi.se](mailto:Jonas.Olsson@smhi.se));
- AquaStress: International (Contact: [Huib.Scholten@wur.nl](mailto:Huib.Scholten@wur.nl)); and
- NeWater: International (Contact: [jcr@geus.dk](mailto:jcr@geus.dk)).

In the UK the Environment Agency has demonstrated its interest in the products of HarmoniQuA. Furthermore, the project team are encouraging European organisations to consider adopting MoST. For example, the project team are currently organising a workshop in Italy at the Joint Research Centre. This will provide an opportunity to demonstrate the functionalities of MoST to those involved in the Water Framework Directive Pilot River Basin project. The European Environment Agency is also being made aware of the latest version of MoST.

Training material and a detailed online Help system have been developed within the HarmoniQuA project to support the implementation of MoST beyond the life of the project (see <http://harmoniqua.wau.nl/training/>).

## **4 Framework for the continuation of HarmoniQuA beyond 2005**

Project partners have carefully considered the continuation of HarmoniQuA beyond 2005. A Technical Implementation Plan has been developed throughout the project although project partners do not feel that its format is well suited to the HarmoniQuA project. Therefore, an independent Consortium Agreement has been prepared for the continuation of HarmoniQuA. HarmoniQuA could be continued by either utilising project team expertise, or by an external party independently developing HarmoniQuA ideas.

### **4.1 Utilising Project Expertise**

It was decided that a successful framework for continuation of HarmoniQuA, utilising project team expertise, would need the following elements:

1. A clear organisational structure;
2. A user community;
3. Plans for financial support; and
4. Widespread recognition of the need for quality assurance amongst stakeholders and professionals.

### **4.2 Proposed framework**

Project partners have agreed on the framework illustrated in Fig. 1. It consists of a co-ordinated series of panels with links to the user community and specific projects. Decisions are made by each panel and approved by the Coordinator. The envisaged scope of each element of this framework will be considered in turn.



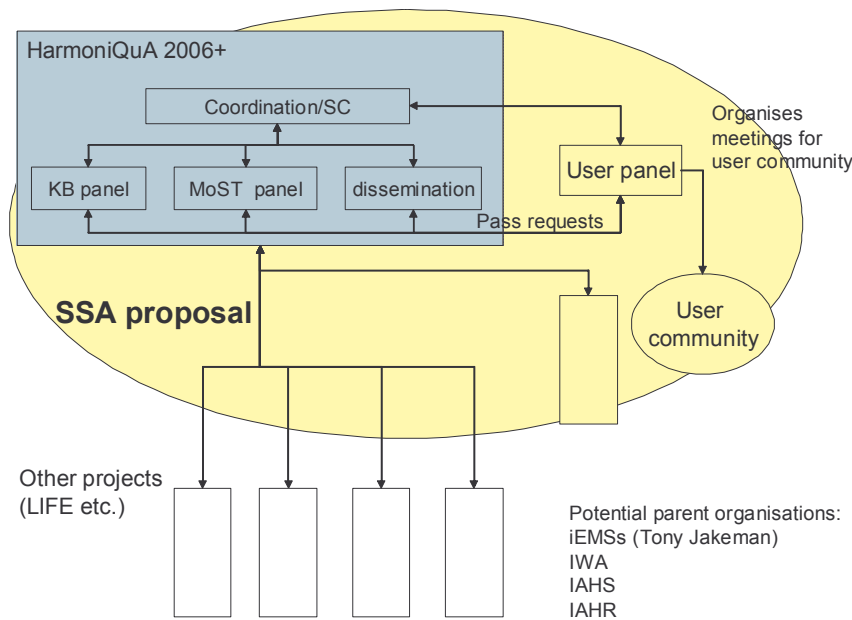


Figure 1 Planned structure for continuation of HarmoniQuA

<b>Co-ordination</b>	
Role:	Co-ordinate the framework and make strategic decisions.
Task:	<ul style="list-style-type: none"> <li>• Co-ordinate activities</li> <li>• Chair steering committee meetings</li> <li>• Approve work</li> </ul>
Representation	<ul style="list-style-type: none"> <li>• An elected co-ordinator and steering committee.</li> <li>• The steering committee would consist of the chairs of the following panels:               <ul style="list-style-type: none"> <li>○ KB Panel;</li> <li>○ MoST Panel;</li> <li>○ User Panel;</li> <li>○ Dissemination group.</li> </ul> </li> </ul>

<b>Knowledge Base (KB) Panel</b>	
Role:	Decision body with regard to content of KB.
Task:	<ul style="list-style-type: none"> <li>• Review proposals for KB improvement.</li> <li>• If feasible, assign implementation task (+budget) to one of the partners.</li> </ul>
Representation	Chair and others. Size depends on budgets. If the budget were small then a large panel would be needed to execute review tasks without payment. However, if a limited budget was available then a small panel could be set up that controls the budget and assigns (paid) review tasks.

<b>Modelling Support Tool (MoST) Panel</b>	
Role:	Decision body with regard to MoST software.
Task:	<ul style="list-style-type: none"> <li>• Set priorities on development requests from user community.</li> <li>• Decide/review requests for development proposed by projects.</li> <li>• If feasible, assign implementation task (+budget) to one of the partners.</li> </ul>
Representation	3-5 persons. Chair and others (to be decided) WU/NTUA 'permanent' member

<b>Dissemination Panel</b>	
Role:	Operational body to attract new users and to communicate the latest news to existing users.
Task:	<ul style="list-style-type: none"> <li>• Create newsletters.</li> <li>• Maintain website.</li> <li>• Organise software demonstrations.</li> </ul>
Representation	<ul style="list-style-type: none"> <li>• 1-2 institutes. Chair and others (to be decided).</li> <li>• Additional persons appointed by user panel (should cover regulators, consultants, academic and developers).</li> <li>• Work will be assigned with payment.</li> </ul>

<b>User Panel</b>	
Role:	The user panel would collate feedback from the user community.
Task:	Organise annual meetings for user community (quarterly meetings?).
Representation	<ul style="list-style-type: none"> <li>• Possibly chaired by a lead member of a professional society.</li> <li>• The panel is likely to consist of 3 to 4 persons elected at user meetings.</li> <li>• During 2006 it would be necessary for HarmoniQuA to elect the first user panel.</li> </ul>

<b>User community</b>	
Role:	Provide feedback on application of MoST and its KB
Task:	<ul style="list-style-type: none"> <li>• Implement MoST and its KB</li> <li>• Attend user meetings</li> <li>• Comment on functionality of MoST and its KB</li> <li>• Propose improvements to MoST and its KB</li> <li>• Fund developments</li> </ul>
Representation	<ul style="list-style-type: none"> <li>• The user community would represent all interested professionals and stakeholders.</li> <li>• A select user group may be defined as those who have registered with the HarmoniQuA website. This group may be targeted with specific requests.</li> </ul>

### **4.3 Operating the framework: Funding**

Project partners envisage the following 3 levels of operation of the above framework depending on the level of funding:

- *Level 1*: No funding beyond 2005;
- *Level 2*: Limited funding;
- *Level 3*: Moderate funding from external projects.

#### **4.3.1 Level 1: No funding beyond 2005**

Under these circumstances partners hope that it will be possible to maintain, on a voluntary basis for a year or so, the following:

- Coordinator and steering committee;
- KB Panel;
- MoST Panel;
- Dissemination group.

This represents the minimum group that could keep HarmoniQuA active (blue box in Figure 1). There would be no funds for any travel or development work. Conferences etc may provide potential for holding essential HarmoniQuA meetings.

#### **4.3.2 Level 2: Limited funding beyond 2005**

If limited funds were secured then the panels listed in Level 1 could be augmented with a user panel and consultation of the user community (yellow ellipse in Figure 1). Funds would be available to support a limited amount of travel but not the development of MoST. It was initially hoped that this level of funding could be obtained from an instrument such as a Specific Support Action (SSA: European Commission). However, feedback from the EU commission has suggests that we would be unlikely to be successful. A joint proposal with another CATCHMOD project (e.g. HarmonIT) may be more likely to succeed. Alternatively, a small income may be generated by selling licenses to users of MoST. All project partners have been asked to explore possibilities for future funding. Possible funding sources were discussed at the final project meeting in Koblenz. Proposals may be submitted to the EU Commission if appropriate calls are made within Framework 7. Partners will notify the co-ordinator of any proposal submissions.

#### **4.3.3 Level 3: Moderate funding beyond 2005**

This would enable all of the above (see Level 1 and 2) to be undertaken in addition to the development of MoST. This level of funding is most likely to originate from external projects. For example, national agencies that wish to use MoST may wish to fund its adaptation to their needs. Alternatively, large research projects such as LIFE or Integrated Projects may be encouraged to use MoST and direct a proportion of their budget towards its development. Project partners are exploring these possibilities.

If HarmoniQuA continues with this framework then user community meetings and other dissemination activities will continue to maintain the profile of quality assurance. It is particularly important that the User Panel consists of representatives from professional organisation (e.g. iEMSs, IAHS) to ensure that the meetings they organise attract a wide but focussed audience.

#### **4.4 External party independently developing *HarmoniQuA* ideas**

It is possible that organisations outside the *HarmoniQuA* project may develop the ideas presented within the project. Although extremely useful systems may be developed in this way they would not be harmonised at a European level.

## **5 Conclusions**

Maintaining the profile of quality assurance for modelling and adoption of MoST will rely on the user community, formulated during the project, being convinced of their potential benefits and continuing to implement them after the end of the project. The main points discussed in this report are summarised below.

- *HarmoniQuA* has contributed to harmonising and raising awareness of the benefits of quality assurance for modelling;
- The current high profile of quality assurance for modelling should ensure its continuity into the future. However, after the completion of the *HarmoniQuA* project the implementation of MoST and delivery of conference presentations will provide further support for its continuity;
- MoST has been widely publicised but is not yet being widely applied;
- MoST provides a procedural framework that should be considered a minimum standard for modelling;
- The ‘mature’ end of project version of MoST is likely to be more widely applied than previous versions and this will be supported by available training material and a detailed online Help system;
- MoST is likely to be developed by countries/organisations to provide more specific guidance for particular domains or software applications
- Funding is being sought to translate MoST as this will facilitate its adoption in several European countries;
- A framework for the continuation of *HarmoniQuA* beyond 2005 has been developed by partners;
- The framework may function at 3 levels depending on the funding received:
  - Level 1: No funding: Key panels in place but no funds for meetings or the development of MoST
  - Level 2: Limited funding: Key panels augmented with a user panel and user consultation: Funds available for meetings but no money available for development
  - Level 3: Moderate funding: All panels and user consultation supported. Additional funds contributed from external projects to support development of MoST

At present no funding has been secured to support the continuation of *HarmoniQuA*. Proposals may be submitted to appropriate calls within Framework 7. It seems most likely that *HarmoniQuA* will continue at Level 1 with no funding and developments will take place by specific users at a national level.

- A final Technical Implementation Plan and a draft Consortium Agreement have been produced.

## 6 References

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