
HarmoniQuA Training Material

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1. GENERAL INTRODUCTION

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1.1 The Problem

The Water Framework Directive (WFD) provides European policy at the river basin scale. It explicitly states that water resource models should be applied. Although models are widely used in modern river basin management, in many cases the adoption of inappropriate Quality Assurance (QA) procedures has compromised their credibility.

The following are required for the successful implementation of many models:

- Standardization and harmonisation (to allow audit);
- Using homogeneous and improved software (enhance quality);
- Development of methodologies and software enabling quantification of uncertainties and sensitivities;
- Integration of hydrological, socio-economic and legal-political issues; and
- Development of tools for evaluation of appropriate model use.

Existing modelling guidelines, mostly nationally based, focus on a single domain in contrast to integrated models. Furthermore, these guidelines vary throughout Europe. The resulting models and decisions based on them are often: non-transparent, irreproducible, non-auditable and not fully comparable among different countries.

1.2 Broad Aim of HarmoniQuA

HarmoniQuA forms part of the CATCHMOD cluster of projects; supporting the implementation of the WFD. It aims to provide a user friendly guidance and QA framework for use in model based river management. It will prompt users with the appropriate 'next step' in the modelling process and provide an audit trail to check previous decisions. The approach targets management at catchment and river basin scales with the overall goal of improving the quality of modelling and therefore enhancing the confidence of all stakeholders in them.

Model based decision support has several dimensions, which hinder a 'one-size-fits-all'-approach. HarmoniQuA attempts to serve several types of users in a series of water management domains, in jobs of diverse complexity and diverse application. In this way, users working on a specific job will only be confronted with guidelines, instructions, decisions and activities, which are relevant for them in their then present context.

1.3 Who will be served?

All people involved in model based water management will benefit from HarmoniQuA. Managers will be helped to manage resources and to define and negotiate what will be included in modelling studies. Modellers will be guided through the maze of do's and don'ts, assisted in documenting what has been done and advised on how it was done in previous projects. Other stakeholders, including planners, decision-makers

and concerned members of the public will get a transparent view of the modelling process.

1.4 Specific Objectives

Workpackage 1: To develop a scientifically based methodology as a base for generic and domain specific guidelines for the modelling process.

The methodology was produced by reviewing existing methodologies and guidelines (generic and domain specific). Review available in State-of-the-Art Report (Jens C. Refsgaard, ed.). This methodology has been transformed into guidelines for seven specific domains.

Workpackage 2: To organise knowledge in a structured database and develop a toolbox to provide its functionality. The tools will support modellers and water managers throughout the QA process.

The knowledge database has been developed by decomposing the modelling process into a series of five steps consisting of many tasks. Each task is further decomposed into task describing components. The knowledge is both generic and domain specific. It includes consistent glossaries of terms and concepts, accepted methodologies, sensitivities and pitfalls and a consideration of software specific aspects.

The knowledge is linked to the toolbox, which is able to:

1. **Guide:** to ensure a model has been properly applied;
2. **Monitor:** to record decisions, methods and data used in these tasks;
3. **Report:** to provide reports suitable for managers/clients, modellers, auditors and the general public; and
4. **Advise:** to make experiences from previous modelling studies available to the modeller.

Workpackage 3: To test the methodology/guidelines and toolbox in real-life cases.

The knowledge base and its functionality will be tested on a large number of test cases covering a range of regimes and management conditions both for single domain and multi-domains/integrated models.

Workpackage 4: To disseminate the results of HarmoniQuA to users in the academic education sector, the water managers and model users and other interested stakeholders.

This will be achieved through producing education material, brochures, posters, web-based information and by organising several workshops targeted at different stakeholders.

1.5 Main Deliverables and Expected Impacts

The two major outputs from HarmoniQuA are:

1. the harmonised, generic methodology with associated guidelines for good modelling practice (the knowledge base); and
2. the web-based HarmoniQuA MoST (Modelling Support Tool) to support the model user and the water manager throughout the QA process.

It is expected that both of these novel outputs can contribute significantly towards improving the quality of modelling and harmonisation of river basin management practices throughout Europe. Such harmonisation of modelling procedures in relation to the Water Framework Directive will stimulate the compatibility and the consistency of modelling and will therefore effectively support the development of a consistent water management policy across Europe.

1.6 How HarmoniQuA will reach its goals

Each of the 4 work packages (section 1.4) consist of a series of tasks. The products generated by the work packages will be realised in three versions: prototype version, full version and final version. An exception forms WP-3, which consists of testing the prototype version and the full version. The results of testing the full version will be included in the final version.

The work packages co-operate with each other in the following structure.

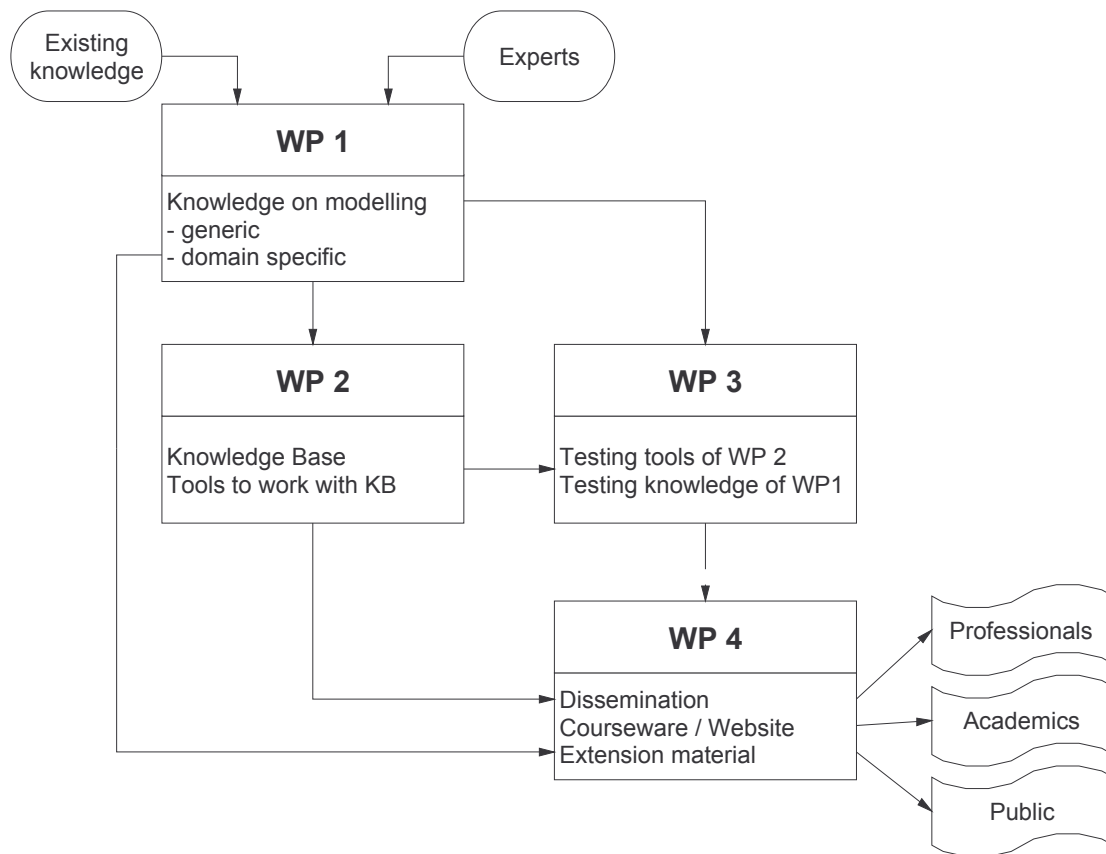


Figure 1. Decomposition of the HarmoniQuA project in workpackages.

1.7 Aims of this document

Chapter 2 of this report specifies the content and utility of the training material whilst its design and requirements are presented in Chapter 3. Testing of training material is

outlined in Chapter 4. A workplan and consideration of project risks are presented in Chapter 5.

This report is written to be used by the partners involved in developing training material for HarmoniQuA (CEH, WU and NTUA). It serves as a specification of the content, utility and testing of training material. This report can be used to prepare the testing of training material, as it specifies the content and utility that will be developed. Workpackage 4 can use this document in its dissemination tasks and in communicating with interested professionals.

1.8 Acknowledgement

The present work was carried out within the Project ‘Harmonising Quality Assurance in model based catchments and river basin management (HarmoniQuA)’, which is partly funded by the EC Energy, Environment and Sustainable Development programme (Contract EVK1-CT2001-00097).

2. OUTLINE OF THE HARMONIQUA TRAINING MATERIAL

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2.1 Introduction to the HarmoniQuA training material

The training material developed by the HarmoniQuA project (WP-4) will be dedicated to the target group and to the conditions in which it will be used. This chapter will specify:

- the intended target groups (students and professionals);
- the general characteristics of the training material;
- specific requirements of training material for professional workshops and student courses;
- the didactic basics on which the training material will be developed, and
- other requirements of the HarmoniQuA training material.

2.2 Target group

The HarmoniQuA training material has two target groups:

1. **Students**, or inexperienced modellers, who typically have more time than experience in modelling for water management purposes; students should be encouraged to learn model based water management according to the HarmoniQuA guidelines.
2. **Professionals**, who typically have more experience than time; professionals should be encouraged to use the HarmoniQuA tools in their professional work.

Both groups will require training material with specific features. These requirements will manifest themselves through the duration of training and level of difficulty.

This leads to two categories of training material:

1. **Professional workshopware** for use in training professionals (managers/clients and modellers). Training is likely to range from 1 hour to two days in duration;
2. **Student courseware** for use in training students and inexperienced modellers. HarmoniQuA MoST may be presented to students in a lecture (0.5 to 1 hour). Alternatively, students may spend between 4 hours and 2.5 days on a course in which the HarmoniQuA tools play a central role, but other topics (models, modelling) can be merged with the HarmoniQuA training material objectives.

Although certain parts of the training material will be common to both categories some parts will be different. The requirements of the training material common to both categories will be specified before separately presenting the requirements specific to each category.

2.3 Common requirements

The training material will be in the form of a website, available on a web server (the HarmoniQuA web server). It will also be available on other media, e.g. CD-ROM, USB Mass Storage Device. To generate the website, common software like FrontPage will be used, which is familiar to many and provides an easy way to check the integrity of the links.

Other general characteristics can be summarised as follows:

- All training material will be stored on the training website that will be hosted on the HarmoniQuA web server;
- To prepare for a training session the training material base (website) should be copied to a local machine and adapted by making it specific for a particular target group;
- A specific training session can be uploaded to the HarmoniQuA web server (in a separate specific training session directory, not overwriting the training material base);
- The training material base should be structured in a way that facilitates modification for a specific target group, e.g.:
 - Root (empty, except for index.htm)
 - General pages
 - On this training
 - On this website / training material
 - On HarmoniQuA
 - Student courseware
 - Course outline
 - Instructor's presentations
 - Course modules (with exercises)
 - Other
 - Professional workshopware
 - Workshop outline
 - Instructor's presentations
 - Workshop modules (with exercises)
 - Other
 - Media room
 - Instructional movies
 - General (=non-target group specific) presentations
 - Papers and reports
 - HarmoniQuA products
 - Guideline Tool
 - HarmoniQuA MoST (incl. Monitoring, reporting, advice)
 - Other
 - Links
 - HarmoniQuA public website
 - HarmoniQuA QuickPlace
 - Harmoni-CA
 - Other
 - Other

All material will be developed in English, but training material translated by a partner into other languages should be uploaded onto the website.

2.4 Professional workshop / Student course outline

2.4.1 Summary

Professional workshop: Professional workshopware will be used in workshops to train professionals (modellers and managers/clients) how to improve their performance in model based water management studies by using the HarmoniQuA MoST and Knowledge Base.

Student course: The student courseware will train students how to use models for water management by using the HarmoniQuA MoST and Knowledge Base.

2.4.2 Aim

Workshops / courses will introduce the principles of the HarmoniQuA approach to model based water management. The decomposition of the modelling process into 5 steps and further into about 50 tasks will be demonstrated. Training will facilitate hands-on experience of the HarmoniQuA MoST including the Knowledge Base. For professionals, workshops will be used to demonstrate and discuss how the HarmoniQuA MoST and Knowledge Base are useful instruments in the daily practice of professionals in model based water management. For students, the courseware will be a platform to evaluate and discuss the usefulness of the HarmoniQuA MoST and Knowledge Base to improve modelling skills for model based water management.

2.4.3 Target group

Training at workshops is intended for professionals working as modellers, as managers/clients or auditors, all participating in model based water management studies.

The student courses are intended for students at universities in curricula focussing on modelling, civil engineering, environmental science and other water related studies.

2.4.4 Content

HarmoniQuA provides a user-friendly guidance and Quality Assurance (QA) framework for use in model based river management. It will guide professional users through the modelling process and provide an audit trail to facilitate modelling decisions and testing the overall quality of the modelling process in peer reviews and audits. HarmoniQuA attempts to serve several types of users in a series of water management domains, in jobs of diverse complexity and diverse application. In this way, users working on a specific job will only be confronted with guidelines, instructions, decisions and activities, which are relevant for them in their present context.

The HarmoniQuA products consist of the HarmoniQuA MoST and an integrated Knowledge Base to support the work of all involved in model based water management. The Knowledge Base has been developed by decomposing the modelling process into 50 tasks, organised in five steps. Each task is further decomposed into task describing components (name, definition, explanation, previous task, next task, activities with their associated methods, references/websites, input and output). Some tasks include a decision to continue with the next task or to go back to a previous task and some decision tasks focus on the interaction between modellers and managers/clients

The modelling knowledge is partly generic but also dedicated for four types of users, seven specific domains, three types of application purposes and three levels of job complexity. It includes consistent glossaries of terms and concepts, accepted methodologies, sensitivities and pitfalls and a consideration of software specific aspects.

The KB is linked to the web based HarmoniQuA MoST, which is able to:

Guide: To ensure a model has been properly applied.
The guidance provided is generic and dedicated to four types of users (*water manager, modeller (consultant), auditor, stakeholder and general public*), seven specific domains (*groundwater, precipitation-runoff, hydrodynamics, flood forecasting, surface water quality, biota/ecology and socio-economics*), three types of application purposes (*planning, design and operational management*) and three levels of job complexity (*basic, intermediate and comprehensive*).

- **Monitor:** To record decisions, methods and data used in these tasks.
Complete model studies are monitored and recorded in model journals before being stored in a model archive;
- **Report:** To provide reports suitable for managers/clients, modellers, auditors of models and the general public.
Different kinds of reports are produced for each type of user: summary reports for managers/clients, detailed reports for modellers, reports allowing an assessment of the modelling study for auditors and understandable summaries for the general public;
- **Advise:** To provide advice on the modelling process.
Advice is available based on experiences gained from previous modelling studies.

It is expected that all **professionals** involved in model based water management will benefit from HarmoniQuA. Managers will be helped to manage resources and to define and negotiate what will be included in modelling studies. Modellers will be guided through the maze of *do's* and *don'ts*, assisted in documenting what has been done and advised on how it was done in previous projects. Other stakeholders, including planners, decision-makers and concerned members of the public will get a transparent view on the modelling process.

Students will be guided through the maze of *do's* and *don'ts* in modelling for water management, assisted in documenting what they have done and advised on how it was done in modelling projects accomplished by others. Course leaders will get a transparent view on the modelling process carried out by their students.

2.4.5 Training material

All training material for professional workshops and students courses will be assembled using materials from the training material base. Training material will be structured according to that specified in section 2.3.

The most important parts of the workshop / course website are the *training material pages*, the *media room* and the *HarmoniQuA products* page.

The **Professional workshopware pages** and the **Student courseware pages**, respectively, are the heart of the course / workshop. They consist of:

- the *course/workshop outline* with information similar to section 2.4, but more workshop specific;
- *presentations* that are specific to the course / workshop;
- *course / workshop modules*; these follow Rob Hartog's implementation of the John Keller didactic model and always consists of triplets covering (see also section 2.5):
 - introduction to a topic;
 - an assignment for the student / workshop participant;
 - feedback.

The format of these triplets can be a choice of PowerPoint presentations, some text pages in the website, MS-Word documents or (flash) movies.

The number of modules determines to a large extent how much time is needed (for the workshop typically ranging from 1 hour to 2 days; for the course typically ranging from 0.5 hours to 2.5 days).

- *Other* can contain additional information related to the workshop (lunch, building, administrative issues).

The **Media room** contains the instructional movies to train persons how to use and work with the HarmoniQuA software. It also contains other information and documents, which are not specific for the workshop or course at hand. Most of these will be used both in the student training material and in the professional workshopware.

The **HarmoniQuA products page provides** download options for all the HarmoniQuA products. Alternatively, the HarmoniQuA products can be found on the website CD.

2.4.6 Approach

The course / workshop will be organised at a location where participants can use computers (or are able to use their notebooks), preferably with web access. In the room there should be a projector allowing the workshop leader or the course leader(s) to give presentations to the group of students / professionals.

Professional workshop: Workshops should be organised in half day sessions on consecutive days or split into two periods (in case the participants have homework).

Workshops have typically an alternation of work forms, including presentations, instructions, assignments, feedback, role-plays, etc.

Workshops have a clear program, available to all participants before the date of the workshop, which instructs participants on what is expected from them (fees?, notebook, their own model(s), etc.).

Student course: Courses should be organised in half-day sessions within a time schedule (depending on the curricula of the university).

Courses have typically an alternation of work forms, including presentations, instructions, assignments, feedback, role-plays, etc.

Courses have a clear program, published or sent to the students with all information as in section 2.4.

2.4.7 Program

Programs of training sessions of different duration (for professional workshops typically 1 hour, 4 hours, 2 days; for student courses typically: 1 hour, 4 hours and 5 half days) will be provided at the HarmoniQuA training material website. These have to be adapted for specific workshops.

2.4.8 Role-playing as work form in training

In order to simulate the interaction between the water manager and different groups of modellers, common in most modelling projects, we will use role-plays in the training material of the longer courses and workshops. These interactions are essential in step 1 of a modelling project (model study plan) and to a lesser extent in the other steps. Attendants of courses and workshops can become familiar with the HarmoniQuA view on modelling for water management by role-playing the interactions between the different counterparts in a modelling project. Through role-playing participants will better appreciate the benefits of HarmoniQuA MoST for their daily practise (professionals) or for learning the model based water management methodology (students).

2.4.9 Prerequisites

Professional workshop: The only prerequisite to participants of Professional HarmoniQuA Workshops is the requirement that participants should be professionals in model based water management with experience as modeller, as problem owner / client or as auditor.

Student course: The prerequisite to students of HarmoniQuA Student Courses have to be defined but may include basic knowledge of mathematics, computer science, (programming), modelling, English, some model for water management, basics in water management process and theories.

2.5 Didactic basics

2.5.1 The ARCS-model

John Keller introduced the ARCS model (Keller, 1987), which forms the basis for the didactic approach that will be adopted for training material. In this model it is recommended that every learning item in a learning trajectory meets the 'ARCS'-requirements: the item draws the Attention (A) of the student, shows its Relevance (R), increases the student's Confidence (C) and achieves Satisfaction (S) in the sense that the student's results are in accordance with his efforts.

The ARCS-model states that motivation (*attention*) is crucial for any learning process. If students are not motivated to learn, they are unlikely to learn. Motivation can be achieved by offering well chosen examples that raise curiosity, or by asking thought provoking questions, and by variance in exercises and use of media.

It is not enough to have only motivation: the motivation needs to be enhanced by a belief of *relevance*. It should be clear to the trainees why a particular topic is relevant for them to learn. If there is a clear benefit, like increased efficiency or reduced frustration, then the trainees will appreciate the training material to a greater extent.

The next factor is *confidence*. If trainees are not confident that they can achieve a particular task with the knowledge and skills they possess and within the available time, then their motivation to learn will decrease. Confidence can be enhanced, for example, by clearly stating the time that trainees are expected to work on a particular item.

Finally, it is important that the trainees experience some type of *satisfaction* from the learning experience: if they like what they are doing, experience that they can do it, feel rewarded for what they are doing, then they will continue learning. This can be achieved by keeping exercises interesting, challenging, but not too difficult.

It is important that every learning element has its own ARCS-score, and that all four ARCS-requirements are positive in every score. For example, a trainee should not be motivated only once, at the beginning of a course, but over and over again at the start of every new item in a course. The same holds for the other ARCS-requirements.

2.5.2 How the ARCS-model is implemented in training material

Wageningen University is experienced in providing courses that are based upon the principles of the ARCS-model. Rob Hartog started the first course in September 1994, and since then there have always been several courses in the curriculum. During the past nine years, thousands of students have followed the courses, and the overall impression and evaluations of these courses are positive.

In all courses, Lotus ScreenCam ® movies, TechSmith Camtasia ® movies or Macromedia Flash ® movies have been used as part of the training material. Such movies are computer screen recordings, usually accompanied by an instructor's voice. They allow students to work individually, at their own pace. Using the movies also allows the instructor both to explain in words and to show by demonstration. Using movies is not a necessary requirement for implementing the ARCS-model in training material, but experience shows that they are very effective.

One way of achieving good ARCS-scores is to offer training material in the form of triplets: *topic, exercise, answer*. Rob Hartog introduced this concept in the Wageningen courses, and it has proven its worth. Ideally, the *topic* (which can be a movie) introduces one (and only one) learning goal. The topic should be short, a few minutes only, but it should be interesting enough to be motivational. Next comes an *exercise* that has a direct relation with the topic. Actually the exercise is the leading element in every triplet: students will learn most by actively experiencing and working on an item, more than by passively watching or reading about an item. The exercise can be a movie too (providing some extra information, or encouragement), but it can also be a written

exercise. In the Wageningen courses, there is always an *answer*, which can again be a movie that offers a standard solution for the exercise. Such an answer movie can serve as a means of increasing both confidence (to help a student when he is stuck with an exercise) and satisfaction. In order for the topic-exercise-answer structure to work, it is of vital importance that there are enough motivational, relevant examples available.

In the HarmoniQuA training material movies will be used to demonstrate the use of the HarmoniQuA MoST and Knowledge Base. For the student training material, the topic-exercise-answer structure will be adopted. For the professional workshop, it will sometimes be sufficient to provide instructional movies only on the working of the tools. At other times the topic-exercise-answer structure will be of value. In all training material, there will be material available from relevant case studies, to provide the necessary examples.

2.6 Other requirements of the HarmoniQuA training material

- Flexible (to adapt to different workshops and courses)
- Well structured (for easy maintenance/translation)
- Produced with widely available and easy to handle tools such as FrontPage
- On web server and CD-ROM
- Accessible from the HarmoniQuA MoST by web?
- Use easily understood language

2.7 Some definitions

| | |
|---------------------------|---|
| Training material | All material to be used to train persons in the use of the HarmoniQuA MoST and Knowledge Base. |
| Professional workshopware | Part of the training material that is specific for workshops for professionals |
| Student courseware | Part of the training material that is specific for courses for students |
| Training material base | Website with all training material |
| Workshop | An informal meeting organised to introduce HarmoniQuA to professionals with active two-way discussion. It will involve guidance from experienced users and hands-on experience. |
| Course | Formal training to introduce HarmoniQuA to students. It will involve guidance from experienced users and hands-on experience. |
| Role-playing | Trainees (professionals or students) should play a part of the interactive process between the role of water manager and (groups of) modellers, typically in the first stages of a modelling project. |

2.8 References

Keller, J. M. (1987). "Development and use of the ARCS model of motivational design." Journal of instructional development **10**(3): 2-11.

3. DESIGN OF THE HARMONIQUA TRAINING MATERIAL

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3.1 Introduction to the training material and requirements

The training material will be designed in such a way so as to be flexible, illustrative and representative. Furthermore, it should be adapted to the specific characteristics and needs of each target group specified in the previous chapter (see section 2.2), namely **students** and **professionals**. Finally, in order to account for the imposed time constraints, three different durations for delivery are identified: **demonstration, short and long**.

In this chapter the details of the design of the training material are presented and the requirements from other workpackages are determined.

3.2 General characteristics

3.2.1 Training material versions

For each of the two target groups, three versions of training material will be designed, taking into consideration the following crucial factors:

- the available **time** and the **purpose** of the training material (demonstration, short, long)
- the **educational level** and the **role** of the audience ((student) courseware, (professional) workshopware)

As described in Section 2.5, John Keller's ARCS model for motivational design will be implemented in the training material as didactic basics.

3.2.2 The background model

The background model that will be used in all the case studies will be the same: FWBM (Fotopoulos Water Balance Model), a rainfall-runoff lumped model. Its simplicity, reliability and user-friendliness render it ideal for educational purposes.

The model simulates the hydrologic cycle on a monthly time step, receiving as input raw data of hydro-meteorological and hydrometric nature, such as time series of rainfall, temperature and observed stream-flow at the basin's outlet, as well as other climate data (relative humidity, wind speed, relative sunshine-depending on the chosen potential evapotranspiration estimation method). Model output includes such variables as groundwater flow, actual evapotranspiration, computed stream-flow etc.

Its features include the following:

- Potential evapotranspiration estimation, with the option of incorporating three different methods (Thorntwaite, Penman-Montieth and Blaney-Criddle).
- Option to manually define all model parameters
- Full support for climate change scenarios establishment, by altering the temperature and rainfall time series accordingly, for the time horizon of interest
- Option for automatic model calibration, without user interference.

- Automated production of synthetic time series of rainfall and temperature, by making use of the most widely used stochastic models, such as AR(1), AR(2), MA(1) and ARMA(1,1).
- Anderson and Portmanteau tests for evaluation and comparison (respectively) of the produced synthetic time series.
- Establishment of a base climate scenario and of several climate change scenarios.
- Graphical representation of calibration results, on yearly and monthly time steps.
- Graphical representation of the climatic change scenarios outputs, and comparison with the base scenario
- Full analytical output, covering all needs with respect to the particular water balance study.

3.2.3 *Training material base structure*

- **Root** (empty, except for index.htm)
- **General pages**
 - **On this course:**
This section provides a brief introduction to the specific course, as well as information relevant to the material covered.
 - **On HarmoniQuA:**
This will include a brief description of the HarmoniQuA project, highlighting its aims, as well as the novelty of its products.
- **Student courseware** (one for each of the three versions)
 - **Outline:** This will consist of some text stating the need for and the aims of the student courseware, as well as its main format. Information will be given on what issues the course explores, what are its intended outcomes (i.e. what knowledge the participant is expected to gain), what it seeks to enhance, etc.
 - **Modules:** This section will describe in more detail each element of the course, also providing information on the practical assignments that may be completed by the participants during the course.
- **Professional workshopware** (one for each of the three versions)
 - **Outline:** This will consist of some text stating the need for and the aims of the professional workshopware, as well as its main format. Information will be given on what issues the course explores, what are its intended outcomes (i.e. what knowledge the participant is expected to gain), what it seeks to enhance etc.
 - **Modules:** This section will describe in more detail each element of the course, also providing information on the practical assignments that may be completed by the participants during the course.
- **Media room** will contain the bulk of the training material, in a well-structured format.
 - **Films:**
Instructional films will be designed to provide general guidance and familiarisation on the HarmoniQuA MoST including its guidance and monitoring functions. Additionally, a series of short films will be designed for the background model FWBM to demonstrate each of the bullet points in section 3.2.2. Their format must be visually appealing and therefore they will contain such elements as animation and narration. In order to ensure flexibility and stimulate interest, they will all be designed as a series of short-duration films (each having a duration of say 1-3 minutes).
 - **PowerPoint Presentations:**

Long and short versions of five presentations will be provided. These include the following:

- What is the problem that can be solved by the HarmoniQuA approach?
- The decomposition of the modelling process
- What is the HarmoniQuA modelling support tool MoST?
- Knowledge Base and glossary
- The student courseware website
- The professional workshopware website

The PowerPoint presentations must be characterised by completeness and simplicity and must be visually appealing.

- **Other relevant material:**

Papers, reports, presentations related to the HarmoniQuA products and their application, as well as publications on FWBM.

- **HarmoniQuA products**

This page will provide download options for all the HarmoniQuA products, along with a brief description for each, as well as setup instructions.

- **Links**

This page will contain links to:

- HarmoniQuA public website
- HarmoniQuA QuickPlace
- Harmoni-CA
- Other relevant websites

3.3 Student courseware design

Case study

User type: Modeller

Domain type: Precipitation-runoff (single domain)

Application purpose: Planning

Job complexity: Basic

3.3.1 1st version (Demonstration)

- **Setting**

The co-ordinator (professor) of a university course with a subject relevant to water management or a representative of the HarmoniQuA project makes a short presentation on the HarmoniQuA MoST. This is perceived to take place during a scheduled lecture, but it may also take place outside the course lecture timeslots. The required equipment for the demonstration is a lecture room with 1 PC and a projector; audiences may range from 10 to 100 persons.

Alternatively, the students visit the web page of the course and attend the presentations and films on their own.

- **Duration:** 0.5-1 hours

- **Content and delivery**

1. **Presentation and discussion:** What is the problem that can be solved by the HarmoniQuA approach? Posing questions that stimulate students to interact with the teacher on the necessity of tools etc.
2. **Presentation:** What is the HarmoniQuA MoST?
3. **Films:** on how to use Guidelines in HarmoniQuA MoST
4. **Films:** on how to Monitor in HarmoniQuA MoST
5. **Films:** on how to report what has been monitored

6. **Presentation:** Evaluation of the HarmoniQuA MoST and Knowledge Base (explain benefits of using MoST)

3.3.2 2nd version (Short)

- **Setting**

The co-ordinator (professor) of a university course with a subject relevant to water management invites a representative of the HarmoniQuA project to present the HarmoniQuA modelling support tool MoST or decides to make the presentation himself/herself making use of our material, either during one of his/her scheduled courses, or additionally, during an extra course. This will take place typically in a computer room with a projector and PC's for every 2-3 students.

- **Duration:** 4 hours

- **Content and delivery**

1. **Presentation and discussion:** What is the problem that can be solved by the HarmoniQuA approach? Posing questions that stimulate students to interact with the teacher on the necessity of tools etc.
2. **Presentation:** What is the HarmoniQuA MoST?
3. **Presentation/demonstration:** the student courseware website; show how to navigate and make clear what is relevant for this specific course.

(Items 1-3 are perceived to have duration of approximately one hour)

4. **Hands on experience with the Guideline part of HarmoniQuA MoST:** (0.5 hours)

- See the films on how to use Guidelines in MoST
- Exploring and testing Knowledge Base
- Playing and testing Glossary

5. **Course modules:** (2 hours)

- The problem to be solved (text on website, simple problem)
- Lecturer sets up a simple project (1 subproject, 1 user)
- See the films on how to monitor in HarmoniQuA MoST
- See the films on how to report what has been monitored
- Playing and testing with monitoring part of HarmoniQuA MoST
- Selection of films on the FWBM
- Applying the HarmoniQuA MoST, and the FWBM model to solve the problem

6. **Discussion and Conclusions** (0.5 hour)

- **Presentation:** Evaluation of the HarmoniQuA MoST and Knowledge Base

3.3.3 3rd version (Long)

- **Setting**

A University, Network of Excellence and/or a research institute organises a course with a subject relevant to water management and a representative of the HarmoniQuA project is accepted to present the HarmoniQuA MoST and Knowledge Base.

- **Duration:** 5 half day sessions = 20 hours

- **Content and delivery**

□ *First session of 4 hours*

1. **Presentation and discussion:** What is the problem that can be solved by the HarmoniQuA approach? Posing questions that stimulate students to interact with the teacher on the necessity of modelling support tools etc.
2. **Presentation:** What is the HarmoniQuA MoST?

3. **Presentation:** Knowledge Base and Glossary
 4. **Presentation/demonstration:** the student courseware website; show how to navigate and make clear what is relevant for this specific course.
(Items 1-4 equal to approximately two hours)
 5. **Exercises:** to make clear that there are many sensitivities and pitfalls to avoid
 6. **Hands-on experience with guideline part of HarmoniQuA MoST:** (0.5 hour)
 - See the films on how to use the Guideline with the HarmoniQuA MoST
 - Exploring and testing the Knowledge Base
 - Exploring and testing Glossary
 - Solving the pitfalls of 5
- *Second session of 4 hours*
7. **Modelling with the HarmoniQuA MoST**
 - Trainees familiarise themselves with the problem to be solved [text on website (case study), multi-domain, multi-user problem]
 - The FWBM model should be used to solve the problem (hands-on experience), so trainees should familiarise with the model by seeing the films on the FWBM model
 - See the films on how to monitor with the HarmoniQuA MoST
 - See the films on how to report what has been monitored
 - Testing and experimenting with the monitor part of the HarmoniQuA MoST
- *Third session of 4 hours*
- Lecturer sets up a project with subprojects and users according to the case study
 - Division of trainees into user groups according to the exercise (each group has a water manager, 3 modellers and an auditor. The water manager defines the problem, the modellers try to get the job by preparing validation documents and presenting their models in a proper way to sell them easily and cover the market demand while the auditor evaluates the modelers' job)
 - Applying the monitor part of HarmoniQuA MoST and the FWBM model to solve the problem (the trainee prepares validation documents and presents the model in a proper way to sell it easily and cover the market demand)
- *Fourth session of 4 hours*
- Completing application of the monitor part of HarmoniQuA MoST and the FWBM model to solve the problem
- *Fifth session of 4 hours*
- Compiling results and preparing presentation
 - Presenting the results (reporting functionality)
8. **Evaluation of the HarmoniQuA approach**
 - **Discussion or Presentation:** Evaluation of the HarmoniQuA MoST and Knowledge Base

3.4 Workshopware design

Case study

User type: Manager / Modeller

Domain type: Precipitation-runoff (single domain)

Application purpose: Operational management

Job complexity: Intermediate

3.4.1 1st version (Demonstration)

- **Setting**

A representative of the HarmoniQuA project makes a short presentation at a conference / symposium with subject relevant to water management. The required equipment for the demonstration is a room with 1 PC and a projector.

- **Duration:** 1 hour

- **Content and delivery**

1. **Presentation:** What is the problem that can be solved by the HarmoniQuA approach?
2. **Presentation:** What is the HarmoniQuA MoST?
3. **Presentation:** Definition of a project and subprojects
4. **Presentation:** User handling and user authorisation
5. **Films:** on how to use Guidelines in HarmoniQuA MoST
6. **Films:** on how to Monitor in HarmoniQuA MoST
7. **Films:** on how to report what has been monitored
8. **Presentation:** Evaluation of the HarmoniQuA MoST and Knowledge Base

3.4.2 2nd version (Short)

- **Setting**

A representative of the HarmoniQuA project is accepted in a conference / symposium with a subject relevant to water management to organize a parallel half-day workshop session in order to present the HarmoniQuA MoST and Knowledge Base. Alternatively, the HarmoniQuA project team may decide to organize such a workshop itself. This short workshop may typically take place in a large computer room with a projector and PC's for every 2-3 professionals; however, it is preferable that they have their own laptops.

- **Duration:** 4 hours

- **Content and delivery**

1. **Presentation:** What is the problem that can be solved by the HarmoniQuA approach?
2. **Presentation:** What is the HarmoniQuA MoST?
3. **Presentation:** Definition of a project and subprojects
4. **Presentation:** User handling and user authorisation
5. **Presentation/demonstration:** the workshopware website; show how to navigate and make clear what is relevant for this specific workshop. (Items 1-3 are perceived to have duration of approximately one hour)
6. **Hands-on experience with Guideline part of MoST:** (0.5 hour)
 - Films: on how to use Guidelines in HarmoniQuA MoST
 - Exploring and testing Knowledge Base
 - Exploring and testing Glossary
7. **Course modules:** (2 hours)
 - The problem to be solved (text on website, more complicated than for students)
 - See the films on how to set up a project in MoST
 - See the films on how to monitor with the HarmoniQuA MoST
 - Exploring and testing the monitoring part of HarmoniQuA MoST
 - Selection of films on the FWBM
 - Applying the HarmoniQuA MoST and the FWBM model to solve the problem (simple project setup, 1 subproject, 1 user)
8. **Discussions and Conclusions** (0.5 hour)

3.4.3 3rd version (Long)

- **Setting:**

A representative of the HarmoniQuA project team is accepted in a conference / symposium with subject relevant to water management to organize a parallel 4 half-day workshop in order to present the HarmoniQuA knowledge base and toolbox. Alternatively, HarmoniQuA may decide to organize such a workshop itself.

- **Duration:** 4 half day sessions (16 hours)
- **Content and delivery**

□ *First session of 4 hours*

1. **Long Presentation:** What is the problem that can be solved by the HarmoniQuA approach? To make clear that there are many sensitivities and pitfalls to avoid.
2. **Presentation:** What is the HarmoniQuA MoST?
3. **Long presentation:** Knowledge Base and Glossary
4. **Presentation:** Definition of a project and subprojects
5. **Presentation:** User handling and user authorisation
6. **Presentation/demonstration:** the workshopware website; show how to navigate and make clear what is relevant for this specific workshop.
(Items 1-6 are perceived to have duration of approximately 1.5 hours)
7. **Hands-on experience with the Guideline part of HarmoniQuA MoST:** (0.5 hours)
 - See the films on how to use Guidelines in HarmoniQuA MoST
 - Exploring and testing the Knowledge Base
 - Exploring and testing the Glossary
8. **Modelling with the HarmoniQuA MoST**
 - Trainees familiarise themselves with the problem to be solved [text on website (case study), multi-domain, multi-user problem]
 - The FWBM model should be used to solve the problem (hands-on experience), so trainees should familiarise with the model by seeing the films on the FWBM model
 - See the films on how to set up a project in MoST
 - See the films on how to monitor with the HarmoniQuA MoST
 - See the films on how to report what has been monitored
 - Testing and experimenting with the monitor part of the HarmoniQuA MoST

□ *Second session of 4 hours*

- Division of trainees into user groups according to the exercise (each group has a water manager, 3 modellers and an auditor. The water manager defines the problem, the modellers try to get the job by preparing validation documents and presenting their models in a proper way to sell them easily and cover the market demand while the auditor evaluates the modelers' job)
- Trainees with administrator role set up a new project in MoST with subprojects and users according to the case study and the division of groups
- Applying the monitor part of HarmoniQuA MoST and the FWBM model to solve the problem

□ *Third session of 4 hours*

- Completing application of the monitoring part of the HarmoniQuA MoST and the FWBM model to solve the problem

□ *Fourth session of 4 hours*

- Compiling results and preparing presentation
- Presenting the results (reporting functionality)

9. **Evaluation of the HarmoniQuA approach**

- Present the results of each group application and define the use of MoST as the best advice on good modelling practice and the general guidance on the availability and quality of data, necessary for modelling.

3.5 Requirements from other workpackages

The primary requirement is the HarmoniQuA MoST, which is developed by Workpackage 2. A major constraint for the development of training material is the considerable transformation, which the HarmoniQuA MoST is currently undergoing.

HarmoniQuA MoST has been delivered to Workpackage 3 for testing. The test reports produced by Workpackage 3 have provided useful information that can be incorporated in the design of the training material.

4. TESTING THE TRAINING MATERIAL

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4.1 Introduction to the testing

The testing of training material for the HarmoniQuA MoST and Knowledge Base will be performed at three different levels, internally by the developers, by other HarmoniQuA partners and by persons not involved in HarmoniQuA, each with their own setting and goals.

The content of the training material is web based as described in chapter 2 and chapter 3, organised on a web server and available for organisers of training sessions to set up a workshop or a course. Therefore, testing will occur at two levels:

1. organisation of training
2. using the training material

In this chapter these diverse tests will be summarised and discussed in terms of who will test what, how and when.

4.2 Internal testing by developers

The partners that are developing the training material, i.e. *Centre for Ecology & Hydrology in Wallingford (UK)*, *National Technical University of Athens (Greece)* and *Wageningen University, Wageningen (Netherlands)* will do the internal tests. In this first testing round the focus will be on proper functioning of the training material and on checking, if the requirements, as defined in this document, are met.

The training material will be web based and provided through Internet and other media, e.g. CD-ROM. The internal testing is mainly to check the proper working of all links and other software aspects and not to find out if the training material fits its purpose, as internal testing will be performed by the developers of the training material.

Testing will be done during the development and will check both levels of operating, i.e. organisation of training and using training material. As soon as this internal testing is completed, the next phase will start with testing by other HarmoniQuA partners involved in WP-4.

4.3 Testing by the consortium on selected users

The second series of tests will be executed by partners involved in workpackage 4 of HarmoniQuA (all, except BfG, Cemagref and UniDo). These tests aim at dissemination and exploitation of the project results. Partners not involved in workpackage 4 can also use (and test) the training material. These tests have to decide whether the training material is suited to convince others of the returns of using the HarmoniQuA approach in model based water management.

The tests by selected HarmoniQuA partners have to check whether the **Professional Workshopware** is an optimal way of making others familiar with the ideas behind HarmoniQuA. Furthermore it has to find out, whether the material is

suited to be used as introduction for using the HarmoniQuA MoST and Knowledge Base. Finally these tests have to decide whether workshops using this short training material can encourage professionals to use the HarmoniQuA products in their daily practice. This testing is likely to be carried out in national workshops following HarmoniQuA project meetings.

The test for **Student Courseware** to be done by the HarmoniQuA partners in WP-4 has to be performed by NTUA and WU, despite the fact that they developed the training material, as these are the only academic partners in WP-4. Both universities will test courses for small groups of students and provide the material in one-day sessions. Course leaders involved in these test sessions will test for completeness of the material to compose effectively and efficiently courseware from the available material and the participating students will test the usefulness of the courseware.

Both types of tests (for professionals and students) should use surveys of the training organisers and participants. These surveys should help to determine if training can be organised effectively and efficiently, and if the training material is suited to training professionals and students in the HarmoniQuA approach.

4.4 Testing by others

The third series of tests are only partly intended to test the training material. They are mainly a part of dissemination activities to draw interest to the professional community in the HarmoniQuA approach and to persuade course leaders to include the HarmoniQuA approach and supporting tools in their curricula. Comments on training material may be received by distributing questionnaires.

The test related to **Professional Workshopware** should encourage professionals to use the HarmoniQuA MoST and Knowledge Base in their daily practice. This can be arranged at several platforms:

- **National training seminars**, organised by companies that are partners in HarmoniQuA and involved in WP-4;
- **Integrated training seminars** coupled to or included in scientific meetings (workshops, conferences, etc.) at national or international levels;
- **Specific training seminars** asked for by third parties;

Third party testing of the Student Courseware can best be organised in two rounds:

- Testing if the material is suitable to be integrated in (university) curricula;
- Testing by students if it is clear, interesting, etc. by students following courses.

5. PLANNING TRAINING MATERIAL DEVELOPMENT

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Workplan

Details of the workplan for the development, testing and dissemination of training material are presented in the table below.

| Activity | Actions Required | Result? | Who? (Days) | When (start to finish)? | Report to? |
|---------------------------------|---|--|-------------------------------|----------------------------|------------|
| Accept training material report | Discuss at project meeting in Sweden | Training Material Report | All | 5 th May 2004 | GO/JCP |
| Implementing design | Produce Demonstration, Short and Long training material | 1 st Version of Training Material | NTUA(30) WU (30) | May to August 2004 | GO/JCP |
| Present training material | Present at Lisbon meeting | Comments on training material | NTUA WU | September 2004 | GO/JCP |
| Select Test Group 1 | Choose discipline and select students for testing | Appropriate test group identified | NTUA (1) WU (1) | September 2004 | GO/JCP |
| Academic Test 1 | Tested using undergraduate students | Testing and feedback from students | NTUA (6) WU (6) | September to November 2004 | GO/JCP |
| Professional Test 1 | Testing professional training material | Testing and feedback from professionals | CEH (4) | September to November 2004 | GO/JCP |
| Test Report 1 | Report on 1 st Test Round | 1 st Test Report | NTUA (1) WU (1) CEH (1) | December 2004 | GO/JCP |
| Redesign and implementation | Implement new design | Course material prepared for 2 nd round of testing | NTUA(14) WU (14) | January to September 2005 | GO/JCP |
| Select Test Group 2 | Choose discipline and select students for testing | Appropriate test group identified | NTUA (1) WU (1) | September 2005 | GO/JCP |
| Academic Test 2 | Tested using undergraduate students | Testing and feedback from students | NTUA (6) WU (6) | September to November 2005 | GO/JCP |
| Test Report (2) | Report on 2 nd test round | 2 nd test report | NTUA (1) WU (1) | November 2005 | GO/JCP |
| Dissemination | Disseminating training material to academics | Increase awareness and encourage use of academic training material | CEH (15) | November to December 2005 | HS |

Project Risks

The development of training material is dependent on the delivery of HarmoniQuA MoST which will be available to WP4 very soon. However, many aspects of the training material can be developed without HarmoniQuA MoST. Therefore, we do not anticipate any major problems in the development of the training material.