

SETTING MODES OF ORDER

OPPORTUNITIES AND THREATS FOR INTERDISCIPLINARY EDUCATION IN
A FRAGMENTED YEMENI WATER SECTOR



Quat chewing Yemeni on the Wadi Sayla embankment, Sana'a El Kadiem

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August 2005
Irrigation and Water Engineering Group



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August 2005

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Internship research Irrigation and Water Engineering submitted in partial fulfillment of the degree of Master of Science in International Land and Water Management at Wageningen University, the Netherlands

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PREFACE

The magic of education lays in the art of 'inspiring'. Good education is more than transferring knowledge and truths, it depends on the ability of the educator to build the bridges between the 'existing' and the 'new'. This 'bridge building' is basically the art of ordering reality, learning the pupils to use new concepts derived from analyzing reality, concepts useful for ordering and rebuilding this reality to the needs of mankind.

To me, the order behind the conceptualization of our 'reality' has always been a magical thing that goes beyond the idea of objective knowledge. It has always been one of the things why cultural differences and their linguistic implications had my interest. Especially the Arab world with its beautiful linguistics immortalized in the fundamentals of its holy Koran has always fascinated me. It is this world, with a conceptual 'order' that is still closely linked to the original linguistics as used by Mohammed fourteen hundred years ago, that represents a challenging environment for working on the development of new concepts, order and education. Hence, I was happily surprised to get the opportunity of doing a final internship for my academic studies in establishing a new educational program on interdisciplinary water topics in Yemen.

The working on interdisciplinary education in Yemen has been to me as working on new 'orders' in understanding reality. To me it has gone beyond the classic disciplinary order in which each discipline is based on its own conceptual order. By stepping into the reality of the water sector in Yemen I discovered a tremendous diversity in 'orders' all creating and legitimizing small parts of the current water situation in the area. I experienced the importance of understanding these 'orders' and translating this into recommendations for a new interdisciplinary program on IWRM.

Aside of these modes of 'order' concerned with the development of a new educational program, my time in Yemen made me acquainted with the magic of the complete different cultural 'order' known as the 'Arab world'. It gave me the opportunity to walk through the ancient cities of the Arabian Peninsula known as Shibam, Shabwa, Mukala and the villages of Wadi Duwan, to taste the traditional food of the proud Yemenis, to chew quat and to learn the language that holds the magic of bedoine poetry, religion and eternity.

To me three months in Yemen where both fantastic and intriguing; it was like experiencing a new order, a new reality. If Yemen was my teacher it was a good one that knew how to inspire.

I want to thank all the Yemenis that have been so honest, hospitable and good to me, but in special I would like to thank dr. Babaqi, dr Richard Soppe and dr. Frans Huibers who gave me the opportunity to spend three months in Yemen. I would like to thank all the people of the WEC; Ismael, Abdallah, dr Abdallah Oman and dr Rafieq who helped me in organizing all my trips and meetings, the people of the Mercillia Hotel that became my 'Arab home' with all the enjoyments of speaking Arabic, chewing quad and drinking thee. And finally I would like to thank Hani without whom I would never have experienced Yemen as I did it now.

To all, I definitely hope to come back to chew the quad and let me be inspired again.

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INTRODUCTION

THE NEED FOR AN INTEGRATED WATER RESOURCE MANAGEMENT MSC PROGRAM

In Yemen higher education is given in a highly segregated form. The educational programs at the public universities are shaped according to the classic disciplinary order as represented in traditional western science. Most available programs represent the classic knowledge systems of disciplines like law, geology, engineering and agriculture.

For years these educational programs have represented a firm disciplinary base behind the academic skills needed to manage this ancient society. Agriculturalists worked as extensions servants, engineers worked as designers or calculators for road construction projects and the people who graduated their law study became lawyers. In short we might say that the modern academic world in Yemen has, as long as it exists, represented the narrow base for technological, agricultural and institutional development in a highly disciplinary form. Speaking with an engineer will yield a story that explains the essential importance of engineering for the society as a whole. A conversation with a lawyer will give you the same impression for the concept of law. Confronting these visions or actors will mainly result in a long discussion heading nowhere. In an academic society where reality has always been represented in a highly segregated form, problem oriented thinking or learning and translating another's concepts has become threatening.

Different from the academic order representing reality in the Yemeni context, reality itself has changed a lot. Considering the environmental reality over the last hundred years, water has become extremely scarce, population grows faster than ever before and environmental pollution has entered the scene with great uproar.

It becomes clear that the severe environmental threats, with their highly integrated base (Michels) as they are currently facing the Yemeni society, are not easily solved. Especially when considering the current academic order based on fundamental disciplines which do not appear to be able of proper communication or problem oriented cooperation, reality might become frightening. Uniform answers do not exist and it is to the scientists, policy makers and local involvers to understand the current reality as good as possible and work together to solutions. The central concept currently developing itself in the central discussions on water and environment is the Integrated Water Management approach. This approach appears to go beyond the disciplinary basics of the existing sciences. With the problem as a starting point and sustainability as the goal, the IWRM approach might crosscut the disciplinary boundaries hampering the run towards solutions for the looming environmental crisis currently facing Yemen.

THE WEC / NUFFIC COOPERATION

The Water and Environment Center (WEC) has been established in 1999 as a separate center at Sana'a University in Yemen. The centre has been the provider for advanced training in the water sector through its *Graduate Programme in Water and Environment Science*. The increasing problems in the water sector that threaten the development of the country have urged WEC to look for new approaches to water management in crisis areas. Recently Integrated Water Resource Management (IWRM) has come to the fore and has been embraced by the Government of Yemen. This approach views the water crisis as a multifaceted socio-economic problem and advocates multidisciplinary solutions to water use instead of a purely technical approach.

Currently the WEC is aiming for:

- The establishment of a Diploma Course in IWRM for policy and decision makers as well as for managers from Yemen and the Arabic Region that have working experience in the water and environment
- A Course Programme leading to an MSc in IWRM. NPT assistance is requested for the institutional strengthening of WEC to become a sustainable centre offering a high quality IWRM Diploma and MSc Course by WEC trainers upgraded in the latest IWRM knowledge and skilled to conduct training to senior staff using up-to-date adult teaching methodologies and techniques. The project is expected to commence in July 2004 and finish in August 2008.

Among the various programmes of development cooperation, the Directorate-General for International Cooperation (DGIS) of the Dutch Ministry of Foreign Affairs has three 'International Education (IE) programmes'. One of these is the Dutch Programme for the Institutional Strengthening of Post-secondary Education and Training Capacity (NPT). The other two are scholarship programmes: one for the pursuit of an academic degree and one for short courses and periods of training. The Ministry of Foreign Affairs has commissioned Nuffic, the Dutch Organization for International Cooperation in Higher Education; to implement the three programmes (*Nuffic tender document nr. NPT/YEM/036*).

The Nuffic cooperation with the WEC was established within the context of the first program. The cooperation is currently known as the "Strengthening the Water and Environment Centre of Sana'a University Graduate Programme in Integrated Water Resource Management" project nr. NPT/YEM/036. A Dutch – Egyptian consortium of Wageningen University, Delft University, Cairo University, MetaMeta and Arcadis are chosen for implementing the project.

INTERNSHIP

Being part of the consortium, Wageningen University gave me the opportunity to fulfill a four months internship in association with the strengthening project at the WEC. As an internee I was to work on a project in which I aimed to study the opportunities and threats for an IWRM curriculum in the context of the Yemeni water sector. The internship was partly funded by the project and included three months of fieldwork in Yemen.

STAKEHOLDER ANALYSES

During the four months of study I was able to compile a brief stakeholder analyses in the Yemeni water sector. The analysis contained fieldwork in which discussions and inquiries took place among a wide variety of stakeholders ranging from farmers to deputy ministers and from extension workers to researchers. The aim was to obtain an overview of the current water management discourses at the different hierarchical levels and in the different institutional settings of the Yemeni water sector. From this analysis we could deduce what created the current water situation and what could be proposed in order to enforce 'interdisciplinary management' in the water sector. In other words the main question: What does the sector ask for, and how can the IWRM curriculum suit these needs?

HOW TO READ THE REPORT

In general the report presents two things. First of all the report represents a sample of about thirty stakeholders out of the Yemeni water sector explaining their ideas, concepts and truth claims of the water situation in Yemen. In this case one may read this sample, presented in the annexes at the end, in order to get a better view on how the Yemeni water sector looks like. Aside of this overview the report represents an analysis on how the WECs new curriculum on IWRM may fit the sector. What are the opportunities and what may be threats.

RESEARCH METHODOLOGY

RESEARCH SETUP

In order to understand the logical frame in which the study took place a brief presentation will be given on the research setup, methods and constrains.

To get familiar with the stakeholder-arena in which the WEC is operating, the study started with a quick stakeholder scan. By existing literature, library research and contacts available at the WEC, a list was made of available stakeholders. The list was categorized in for groups according to their expected interests:

- **Governmental agencies.** The group of government agencies mainly consisted of ministries, and ministerial authorities concerned with the water sector in Yemen. Several hierarchical levels were of concern. The assumption was made that these stakeholder representatives mainly would act out of public interest.
- **Research and educational agencies.** The research and educational group consisted out of university representatives at the several hierarchical levels of concern. The assumption was made that these stakeholder representatives would mainly focus on the ‘knowledge’ side of the story. In other words their basic interest was assumed to be knowledge driven.
- **Donors** The donor group consisted of the bigger non-governmental organizations that funded water or educational projects in the region. The assumption was made that these organizations acted out of a specific ‘discourse’ with which they legitimize their existence, actions and projects. Mainly the higher decision making levels were of concern.
- **Private (commercial) agencies.** The private agency group is the most diverse group of stakeholders represented. The central concept of concern was the relatively independent ‘private’ profit making status of these stakeholders which is only possible with a clear stake in the water(sector). For example farmers where assumed to be categorized in this group conforming their profit making status highly depending on the water. Local non-governmental organizations where categorized the same because of their programs focusing on the water sector with a clear independent (profit making) ideal.

With the stakeholder categorization as a base the next step consisted of contacting the stakeholder representatives. Most representatives where contacted by phone and spoke English. The meetings with the other selected stakeholder representatives where mainly organized and structured by my self. The stakeholder representatives were interviewed in a semi structured way. Farmers were contacted by means of random field visits around the capital Sana’a and in Wadi Hadramaut, the eastern part of Yemen. During these visits there was support from a translator and locally well-known person.

THE SEMI-STRUCTURED INTERVIEWS

Because of the variety of stakeholder representatives involved, the choice was made to interview them in a semi structured way. The most important issue during these meetings was to get an idea about the conceptual arena in which the WEC should operate and which part of the arena was represented by the specific stakeholder representative.

During the meetings a short list of topics was used in order to guarantee a standard variety of aspects spoken about. The list of topics used by structuring the interviews looked as follows:

- The institutions stake/situation in the Yemeni water sector
- The institutions conceptualisation of the environment- / economic- / water problems
- What are the major problems in terms of an hampered developing; political, economical, social, educational, infrastructure, agriculture, industry, gas & oil, etc.
- The institutions conceptualisation of the current and future opportunities in Yemen
- What is needed in the Yemen water sector?
- What are alternative opportunities in terms of development, leaving agriculture for industrial or small scale crafts & trade development
- The institutions current activities / projects
- The institutions expectations of the sector (as a whole) in the future
- The institutions ideas on research opportunities and needed skills in the future water sector
- Opportunities for the WEC

ANALYSES

HOW TO ANALYZE WHAT?

If we want to understand what the opportunities and threats are for the WEC in the current Yemeni water sector, we need a clear picture of this sector. In order to be able to create this picture we need an ordering principle (the ‘things’ that will compose the picture). Because we are talking about ‘education’ and the role this might play in this water sector, we basically will discuss ideas, truth-claims, knowledge, and discourses that will be the curriculum contents and hence (partly) the basis for the future water sector. Hence, if we want to know how the WEC will fit the water sector we have to analyze its conceptual basis. Our ordering principle will be the ‘concepts’ and truth claims that compose the conceptual arena driving the current water sector. In other words, in order to know where and how the WEC might fit the water sector, we have to understand what concepts are used and what truths are claimed in this sector.

The water sector will not be uniform. A basic classification of the water sector has already been made according to expected interests. Also the concepts and truth claims will differ according to the different stakes, hierarchical levels and backgrounds. This analysis will try to compose the conceptual picture out of the different concepts and claims used in different parts of the sector. Important will be who claims what and why, and what this representative expects from a new IWRM curriculum.

INCONSISTANT CONCEPTUALIZATIONS IN THE YEMENI WATER SECTOR

The first thing that emerges is a clear difference in conceptualizations between the different stakes and different hierarchical levels in the water sector. The only thing on what all stakes agree is that the water in Yemen has become scarce. However, farmers sometimes even appear not to be aware of this. In general we might say that there is not one general discourse that provides broadly accepted concepts, truth claims and answers to the looming national water crisis. Most of this inconsistency appears when stakeholder representatives talk about solutions and opportunities for the water sector. Many start reconfirming their own professional identity; geo-hydrologists claim the solution should come from the discipline of geo-hydrology and more students should be educated in the basics of geo-hydrology. Civil engineers do the same for the discipline of engineering. Little policy makers directly claim the importance of a broader view and the multi-disciplinary basis of the problem and some people claim the importance for more multi disciplinary cooperation, more management and more education on these concepts. Farmers claim that there is no problem, that the problem is the governments or that the solution is in gods hands.

We can conclude that the inconsistency in ideas and concepts throughout the water sector is the basis for a fragmented reality. Also in the practices, plans and policies we see little consistency. A new ministry of water resources has been established two years ago, but because of political reasons the irrigation still is under the responsibility of the ministry of agriculture. In a country where inter-ministerial communication is not indisputable, the making of a national policy on the use of water resources is still restricted to the 10% of water that is not used for irrigation. However it has to be said that since the new minister of water has entered the scene and the new overall policy on the Yemeni water resources has been written, things appear to get on line.

DISCIPLINARY SKILLS

As mentioned before a lot of stakeholders start with the claim that (their) disciplinary knowledge will solve the problem. They claim that the most important thing is to educate the engineers of tomorrow with the proper skills and disciplinary knowledge. If you want to call yourself an engineer you should know how to work with Auto-Cad, how to design a dam in a difficult terrain and where

to find the right aquifers. Technology is essential for the future and the engineers are the access to technology. However it has to be said that most people come up with more things than the disciplinary knowledge. Most of the time the real problems are claimed to be the inadequate working conditions for the engineers, the lack of experience of the engineering graduates and the narrow disciplinary base when the engineers have to work in a wide range of real life situations. In many cases the stated need for proper disciplinary skills also appears to represent a need for engineers that know how to deal with complex situations in reality.

THE GAP BETWEEN THEORY & PRACTICE

Although the inconsistent conceptualization of the water situation in Yemen, one of the things that is often mentioned as problematic (or as an opportunity for further development) is the gap between theory and practice. Especially the ‘middle layers’ of the water sector claim that the theory available does not support answers due to bad translation into practice. Office managers, planners and trainers claim that useful academic graduates are difficult to find because of their highly theoretical base. Most of these graduates only know how to make calculations in a lab environment, they do not have any experience in working in the field, let alone in communicating with the lower hierarchical operational levels. It is interesting to see that this claim mainly originates from the middle management levels; the levels where the translation from policy into practice is usually made.

In former Southern Yemen the middle layers mainly focus on the monitoring of the water situation. The actual intervention or translation of the findings into practice should come from the top layers, they claim. It is interesting to see that also the lower layers like the extension workers and farmers claim the government to be responsible for the lack of practical interventions. Different than with the more liberal oriented northern neighbors these remains of the socialistic era result in a more laid back and awaiting motion towards water scarcity; “solutions are all in the hands of the policy makers” they claim.

In the north, where the policies are being made, the ideas on theory and practice are different. Especially the foreign private sector; consultants and donors, claim a need for policy enforcement and awareness among the lower layers. They claim a need to theorize the lower levels, to make them aware of the holistic picture and to let them (the farmers and pump operators) make the translation between their practice and the holistic (theoretic) picture. It has to be said that policy enforcement and the translation of theory into practice becomes a complex thing in a country where the government has only recently gained power over the full national territory and where tribes do not hesitate enforcing their own will aggressively on the nation.

In short, it becomes clear that the relation between theory and practice is conceptualized as problematic in the current water management. However, the exact hierarchical location where this translation should take place or who should be responsible remains unclear. What does become clear is that the water sector as a system on itself is not clearly defined. There are no clear task descriptions, well-defined responsibilities or proper stated expectations among the different stakes. This results in an overall discussion where many stakeholders are aware of the gap between policy and practice but where nobody comes up with solutions or wants to take the responsibility for this. This is why we may conclude that the relation theory and practice (or policy and practice) is an important point of discussion when we talk about the Yemeni water sector, but facing the diverse reasons behind this claim we should not too easily take the “applied” engineer or policy maker as the solution.

LACK OF VISION

An other concept that frequently popped up was the idea of a ‘vision’ that is needed in a proper water management system. As discussed before there is not a clear national discourse or idea how the

water should be managed or as some policy makers claimed, there is a general lack of ‘vision’. Indeed few stakeholders came up with a clear picture on how they thought the Yemeni water situation would look like in twenty years. Also the conceptualization of the future water sector as an institutional system appeared to be difficult. Questions like what should be done with the enormous water consuming quad production and especially how the rural country side would get their income without this cash crop, appeared not to be easy to answer. This might also explain why, at the lower layers, the idea of theory/practice gap is so strong represented. Because a lack of vision at the top the water management system has never been properly defined, including the communication and translation between the different hierarchical layers. What remains is a system run by a few ministers and deputy ministers who make the policies and a lot of grass root operators who try to do their best without any constant instructions from above. The distance between the two is big and everything in-between is vague and little defined. Logically translation of policy into workable practice is absent.

NEED FOR MANAGEMENT

As a result of the discussion on the importance of a clear water management vision, often the question of what is ‘management’ arises. Some middle layers in the hierarchy simply called it “the capacity to work with people”. It becomes clear that the idea of management is a central one when the stakeholders discuss the problems of the water sector. Only the very traditional disciplinary identities in the water sector deny the lack of management. What management is, remains undefined but most stakeholders do confirm that there is currently nobody in the system that coordinates and tunes the activities being practiced. Broadly, the sector is defined as little focused and highly fragmented. Inter-ministerial cooperation is claimed to be limited, and systematic workers are hard to find. As claimed before, communication between hierarchical levels is poor and efficient project management is absent. Well-educated disciplinary identities are not able to work in an effective way simply due to the fact that bad management limits their disciplinary qualities. In other words, it was often claimed that one seldom finds the right man in the right place.

THE IMPORTANCE OF SPEAKING THE LANGUAGE

Although the fact that most stakeholder representatives spoke sufficient English for participating in the interviews, language was often mentioned as one of the major problems in the sector. The educational system is claimed to lack proper English and even Phd graduates often do not speak English, especially when they did their Phd in Yemen. Many times it was said that this incapability of speaking an international language did reduce the opportunities for people and organizations in the international (science) market. Also from the international contractors and consultancy scene complains came that working in Yemen was sometimes dramatically impeded because of the difficulties in communication. If the aim is to work towards solutions for the looming water crisis, this will mean an important claim on the international water-engineering arena. Hence English becomes a must, a first condition for the further development of international funded and assisted (research) projects. Aside of this language issue, the communication in general is mentioned as a problem in the Yemeni water sector. Language in the more broad sense like the language differences between hierarchical levels, disciplines and ministries is mentioned as a base for bad communication. In other words not seldom the engineer is not able to communicate properly towards the pump operator. In short, again the concept of ‘working with people’ or ‘management’ enters the scene as one of the main opportunities for a more successful water management.

CONCLUSION & DISCUSSION

THE NEED FOR ORDERING PRINCIPLES IN A FRAGMENTED WATERSECTOR

First of all we can conclude that the setting in which the WEC should fit is a fragmented one. Especially the conceptual arena shaping the reality of the Yemeni water sector is highly inconsistent. There does not appear to be one or two broadly accepted clear discourses that form a basis for systematic and synchronized practices.

On the other hand, during the discussions with the different stakeholder representatives concepts, truth claims and opportunities emerge as parts of the conceptual arena shaping the water sector. These concepts are often discussed in different contexts and frameworks but do appear as ordering principles. For example, some stakeholder representatives claim an insufficient government support towards the lowest layers in the water supply, others claim a serious lack in communication between the different hierarchical levels and some claim an importance for better planning and inter ministerial cooperation. If the concept of 'management' is proposed as a possible opportunity to further development, most stakeholders agree that this concept might represent the things mentioned before. How the concept should be applied remains vague but does definitely represent possibilities for further development. In other words, apparently the concept of 'management' could be useful as a new principle in ordering reality. In a new educational curriculum that deals with the problems mentioned before, such principles might represent the opportunities to tackle the problem of the classic disciplinary order that has hampered the development of interdisciplinary problem oriented thinking.

The possible ordering principles that can be derived out of the discussions with the different stakeholders are:

- Skills
- Relation theory/practice
- Vision
- Management
- Language

Different than the more classic engineering way of thinking, it became clear that these concepts currently represent the opportunities for further development and training throughout big parts of the Yemeni water sector.

THE NEED FOR CHOICES

After the statement of these five possible principles in ordering reality for a future water sector, the question arises what principles or concepts can properly be educated in a two years Msc program. In order to keep the curriculum workable and solid one should make choices in where to focus on. A focus on the relation 'theory / practice' would apply to the problems and dilemma's discussed with the middle layers of the water sector, a focus on the 'vision development' would apply to the problems stated by the policy makers. In other words, the real question is whom you want to educate for what?

It can definitely be said that all concepts discussed are important. However, seeing the condition

of two years curriculum, making choices is probably most important. Developing a general profile of the graduates the program is aiming to deliver is something fundamental to the curriculum.

Hence the question becomes: what do we need in Yemen, skilled engineers, visionaries, or managers. A lousy answer is of course that Yemen needs them all; cleverer it might be to ask what educational program does not yet exist? For becoming a skilled engineer there are several options in Yemen, for becoming a manager less and for becoming a vision developer none.

If choices are made on the profile of the future WEC graduates, this will implicitly say something about the commercial character of the WEC program. Basically the program can fulfill two roles in the water sector: a market driven (commercial) role in which the program provides what the sector asks, or the more political role of a program with its own mission and vision, regardless of the sectors' needs. In general we can say that there appears to be a need for explicit choices. Not only in order to create a curriculum that develops students into solid academic thinkers (instead of fragmented products of a too broad curriculum) but also in order to create a clear trustable identity in a fragmented water sector.

SETTING THE MODES OF ORDER

To state this new identity in the Middle Eastern water arena, the publishing of 'The' central guidelines on Integrated Water Resource Management for Yemen should be the start. Regardless the commercial nature of the WEC, a sector wide statement should be made on what the WEC stands for. These guidelines on IWRM should be presented as the Yemeni (or Middle Eastern) fundament on which the curriculum should be based. If we want to be successful in the fragmented water sector we have to be more than just a multi disciplinary (fragmented) educational curriculum. Aside of the existing disciplines we will need to represent a new additional value in the existing water sector. To be able of providing this additional value in a fragmented arena of disciplinary knowledge, a curriculum that just represents a summary of these disciplines is not enough. If the IWRM curriculum has to represent additional value in the fragmented disciplinary arena, the WEC will first have to develop an 'ordering' vision on IWRM. In other words, a realistic guideline that leads us to how Yemen should look like in about twenty years, education on water resource management then just becomes a derivative.

Aside of the need for a guideline in order to know where the curriculum is heading to, the method of interdisciplinary education will need more conceptual attention. If the program will provide a summary of the existing disciplines it risks fragmentation due to its too broad and too shallow nature. The WEC will have to find ordering principles that stand above the disciplines. These principles could be the concepts as derived from the discussions with the water sector stakeholders. This means you have to make things more than just a nice holistic story, you have to find a concept that binds the disciplines. Management can be such a concept. Actually it is already in the name IWRM as the forth (still undefined) concept of the program. Develop and deepen the concept, cooperate with MBA's teach the students what management is and why it is so essential. Teach the students the links between the disciplines, let them make plans, let them work with Microsoft Project to give them an idea of how classic disciplines, hierarchical levels, aims, expectations, macro and micro economy, public and private sectors, road construction, resettlement and water resources are all strongly related.

It appears that the regional success of the WEC curriculum highly depends on three essentials:

- 1) **If the WEC will set clear modes of order.** On the profile of its future graduates, and especially on the new concepts that will have to stand above the old disciplinary identities. Interdisciplinary education is more than the summary of the disciplines represented in the water sector. New concepts like Management &

Vision will have to create the new order (coherence) that is needed to properly understand the holistic picture of reality.

- 2) **If the WEC knows its client, and if the client knows the WEC.** If the WEC will actually communicate with the water sector by careful listening to all layers concerned and by developing the central guideline on IWRM. In other words if the WEC is able to set a new identity that differs from all that exists, and if this identity will be able to gain trust with the sector.
- 3) **If the WEC will speak the proper language.** If the WEC aims for a regional role of concern and graduates able to work in the international water scene, education in English is the first condition. Not only the books should be in English but all communication should be based on an internationally accepted professional level.

ANNEXES

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INTERVIEWS CONCERNING 'GOVERNMENT AGENCIES'

MINISTRY OF WATER AND ENVIRONMENT

Mohammed Al Hamdi, Deputy Minister

The Deputy Minister is part-time associated with the WEC, I decided to meet him in his Ministry office and asked him to speak in behalf of his function as Deputy Minister for the water and environment ministry.

This ministry exists only for two years and Mohammed al Hamdi starts to explain why. There used to be a ministry of water and electricity, which was responsible for the social services of water supply and electricity supply. In the line of the 'supply' concept the National Water Supply Authority was established and later on the Rural Water Supply Authority. In the seventies people started to talk about water resources and in the nineties the high water council was established out of a UN project. However, this council did not appear to have a lot of political backing or political legitimacy; the council was established by the UN and so did not have a firm base in the existing political regime. Although the council was directly situated under the minister it did not do a lot either, probably due to the wrong personalities at the wrong places. Out of this council the Ministry of Water and Environment was established. A big mistake was that because of a strong lobby in the ministry of agriculture and irrigation, the 'irrigation' was not transferred to the ministry of water, probably because of the huge financial interests involved in the irrigation constructions. As a result the ministry of water and environment still has only say over less than 10% of the national water resources because 90% is used for irrigation.

Mohammed Hamdi claims that aside of the 'irrigation' mistake, the supply and resource interests should be split up in different departments. Now the supply and resource interests are represented in one organisation (the ministry of water and environment), which makes the resource management and control little transparent. A good alternative would be to create a national 'Water Security Council' directly under the responsibility of the president so that the water resource problems are dealt with as national security issues with equivalent priority.

The Yemeni water problems mainly concern two things:

1. The depletion of water resources (due to economic purposes)
2. The low coverage of water supply and sanitation services

The low coverage of the water supply and sanitation services is mainly a matter of money. In a country where there are over 100.000 settlements in a generally rough terrain it is unrealistic to think that all these villages should be connected to a drinking water system.

In terms of the environment depletion of the groundwater is the biggest problem Mohammed Hamdi continues. One of the current solutions is the implementation of many small interventions like small dams and irrigation improvements. However this will maybe postpone the crisis but will never solve the problem of depletion completely. The only possibility to work towards sustainability is to work towards a broader solution like the resettlement of the people in the places where there are sufficient renewable resources. Keep in mind that the main basics behind sustainable development concern humans, land and water, these three concepts should be interrelated and be available. This explains too that the water problem will probably solve itself. You see already small-scale resettlement from the places where resources have vanished to places where people know how to deal with scarcity or where there are economic alternatives.

One of the main policy interventions should concern the planning and coaching of these economic alternatives and resettlements. Unfortunately until now many mistakes in planning and ministerial co-operation have resulted in resettlements in the wrong places. For example the development of a new road to San'a does not only bring new travel possibilities but an unforeseen tremendous amount of private investments along the road as well. This creates opportunities in a place where we are seriously running out of resources; where the water table drops with more than 6 meters a year. The ministry of planning should take this into account and encourage the development of roads and other economic opportunities elsewhere, where there are sufficient resources.

Opportunities for the WEC:

- In short, engineering is not the solution, engineers should become visionaries or managers
- Training should not be short-term but should give a firm and broad theoretical background on the current problems
- In order to let the WEC succeed in reaching these goals the first focus should be on the trainers; the trainers are the crux for the WECs potential.
- First establish a stronger WEC background, until now the trainers' conceptual luggage is too little developed.
- It is essential to widen the view of the WEC staff; they should become truly multidisciplinary.

WADI HADRAMAUT DEVELOPMENT PROJECT (SAYWUN), MINISTRY OF WATER AND ENVIRONMENT

Ali Baraka (section water resources)

Saleh Shaqhdara (section irrigation)

Via Mohammed Ma'ray (Hadramaut University) and Achmed Kreshan (Ministry of Water and Environment) I came in contact with Ali Baraka and Saleh Shaqhdara from the water and soil resource project of the Ministry of Water and Environment in Saywun, Wadi Hadramaut. The persons I spoke with presented themselves firstly as friends or relations of others that I visited before or was advised to visit later, before they associated themselves with e.g. the Hadramaut University or Ministry of Water and Environment. Local friendships and relationships clearly close-link the University departments and Ministerial projects.

Ali Baraka is the responsible for the water resources department of the project. His job mainly concerns the monitoring of the groundwater levels. All farmers are using the groundwater for irrigation, they do not have to pay and his hand-written graphs show a clear drop in the groundwater table of Wadi Hadramaut.

He clearly indicates that he is only monitoring and is not really responsible for solutions. However, after talking on he mentions the rain as the best solution, not for direct irrigation purpose but for recharging the groundwater. His graphs indicate that there has been a slight raise in the groundwater level after some wet years. Low irrigation efficiency is one of the big disadvantages of this time, in the past, before the reunification of Yemen the socialistic system used to provide the farmers subsidises for all agricultural improvements. Today a change to drip-irrigation is impossible for any farmer (except for some army officers' farms) because of the enormous investment costs compared to the low marginal benefits. On the other hand the government changed its policy towards the drilling of new wells, now the farmers have to ask permission first and can get some funds in return. This at least prevents the bad drilling that causes the pollution and salinisation of the deeper groundwater layers from the shallow salty layers above.

Dr. Saleh Shaqhdara is responsible for the

Irrigation section of the resource project

Hadramaut of the Ministry and appears to be much more involved in the practice of the management at field level. He starts his speech by stating the biggest problems: erosion, over irrigation and the limited recharge of the groundwater. He manages the development of diversion structures that lead the floods to places where the water is retained in order to recharge the groundwater. Until now some of these structures have been established but many more are needed. Still most of the floodwater is flowing to the sea. NWRA is responsible. There are also projects to develop water-harvesting pounds on the mountain-plato. These pounds, locally known as “Kreef”, are in fact part of a policy to keep the indigenous nomads on the plato and prevent the fertile Wadi from being overpopulated by nomads and their livestock. The capacity of these ‘Kreefs’ is low and they are mainly used for drinking water purpose. Solutions are simple, let the farmer pay for his irrigation -to enforce more efficient use- and construct more diversion structures for the groundwater recharge. In fact the problems are not yet that big as in the San’a region.

In general both Dr. Shaqhdara and Dr. Baraka agree that quat is one of the main economical problems for many regions in Yemen. In many cases half of the livelihood income goes to quat. Aside of the quat problem most farmers are ignorant, unaware of their future perspectives and the importance of a decreasing groundwater table. Primary education in the area is extremely poor; half of the farmers are illiterate.

MINISTRY OF AGRICULTURE AND IRRIGATION

Dr. Ezzadin Al Gonaid, Director of ‘Large Dams’

Dr. Ezzadin Al Gonaid is employed as the ministerial director of the big dams that will be constructed in the Western regions of Yemen. These dams will encourage the recharge of groundwater and provide irrigation water after the floods. The director claims that the future drinking water source should come from the desalinisation of seawater. For irrigation purposes a lot of small dam interventions and the promotion of more efficient irrigation techniques will bring the solution for the creeping water crisis. He claims this that several projects in western Yemen have succeeded in more efficient irrigation practices and new cash crops like coffee instead of quat. What the success formula behind these changes is remains vague; the director persists in stressing the importance of explaining farmers the need for new irrigation practices after which he thinks other farmers will follow in changing their practices considering their neighbours increased benefits. Why benefits will increase when growing coffee instead of quat, and after investing in expensive irrigation techniques while water is still an open excess resource, remains unclear.

The suggestion of Adnan Hayee (Associated Consulting Engineers) to subsidise the coffee trees and the new irrigation techniques, director Ezzadin Al Gonaid claims to be a responsibility of the foreign donors; if they will remain sponsoring projects will succeed. Aside of these projects the new water law insists on the registration of boreholes and wells. This law should be enforced, unfortunately there are to little policeman and civil servants to do so.

Opportunities for the WEC:

- Hydrogeology
- How to make surveys

MINISTRY OF AGRICULTURE AND IRRIGATION (SAYWUN)

Hashim (agricultural extension service in Saywun, Wadi Haydramuwt)

Via Dr. Baraka I meet eng. Hashim who works for more than 20 years for the agricultural extension service in Wadi Hadramaut. The problem is that after the reunification of Yemen everything is

centralized to San'a and little attention is paid to this 'far-away' remote area. There is little or no policy for this area and little support or money goes to the agricultural sector in this region. Wages for the extension servants are extremely low and since the reunification the number of extension servants has decreased dramatically. There are no extension cars anymore and courses for farmers are rare. Extension information is now put in a newsletter that is not read by the illiterate farmers. There are no subsidies anymore for agricultural improvement so farmers keep on practicing their unsustainable but pragmatic farm and irrigation practices. They simply have to because they do not have the money for improvement, there is no organization that supports them and they need the water for their income. In many cases this results in bad managed and illegally drilled bore holes mining and polluting the groundwater. The only solution for the creeping water crisis is more subsidies for farm improvements like drip irrigation and the promotion of less water consuming crops, aside of the reinforcement of a proper extension service that is strongly presented in the ongoing agricultural activities in the field.

MINISTRY OF OIL AND MINERALS (MUKALA)

Eng. Yahya M. Ali Yoser (General Director Geological Survey and Mineral Resources Board)

It takes some time before it becomes clear where Eng. Yehia is working for; he blames the government naïve practices in the building of dams in porous areas or places with geological folds but he does not propose changes in policy or alternatives in the overall resource use. It becomes clear that he speaks as the board of the Geological Survey and Mineral Resources department of the ministry of Oil and Minerals. He is representing the governmental resource researchers. He explains a lot about the geological situation in Hadramaut, the problem of the free water pumping out of the geological sandstone Hadramaut formation, how Mukala is facing the problem of drying wells, and the search for good deep groundwater. Alternatives are mainly concerning possible new aquifers or the restriction of agricultural groundwater pumping. Restoring the groundwater is also a possibility but the places of dams should be chosen well and rains have not been abundant last years. The same counts for the use of wady water, because of the irregularities in discharge not suitable for urban drinking water purposes but maybe an opportunity for agriculture or rural settlements. He persists in mentioning the need for good geo-hydrological research and well-constructed dams.

Opportunities for the WEC

- Focusing on geo-hydrological skills and knowledge
- Teaching on where to place the dams
- Planning

NATIONAL WATER RESOURCE AUTHORITY (NWRA)

Salem Bashaib, President

NWRA divided Yemen in 14 watersheds. Five watersheds are critical in terms of water shortage and related problems. Until now NWRA mainly monitors the basins in terms of changing situations. Out of this monitoring water plans will be made for the specific basins. In Taiz the monitoring resulted already in a plan concerning awareness raising, water rights, Water User Associations for higher water efficiency. Aside of this, the plan contains technical measures concerning the recharging of the aquifer, water harvesting and cropping patterns.

Before 1995 there was no national policy on the national water recourses. Since two years the Ministry of Water and Environment has been established. This created the first institutional possibility to bring the different water aspects, uses and resources under one name together.

Now there is a policy that supports the licensing of new wells and focuses on the accounting of water in order to monitor what is extracted.

Other opportunities might be the importation of quat in order to create an artificial drop in its price. The introduction of drip irrigation after WUA have been established that will be able of teaching the farmers how to drip.

What is lacking in the Yemeni water sector are the good engineers with the right skills and knowledge. Engineers are mostly unaware of the geo-hydrological context of the water. What are mainly needed are geo-hydrologists with the ability of working in reality

Opportunities WEC:

- Hydrogeology
- Skill development and better data interpretation
- Start from BSc

NATIONAL WATER & SANITATION AUTHORITY (NWSA)

Eng Abdulmoamen M. A. Mutahar, President

In General the problems in the Yemeni water sector concern mostly a lack of skilled stakeholders and the lack of management. In general it is hard to find managers. Unfortunately the new ministry for water and environment, which should represent the overall management of all the water, is only responsible for 10% of the water use since the ministry of Agriculture and Irrigation represents the 90% of use for irrigation. This should be changed.

The country is drying out with dramatic speed. 250 million m³ is used annually and only one third of this amount is annually coming back; we have to find alternatives.

The biggest problem concerns quat. 75% of the 90% goes to the quat. We have to think of alternative crops, and for example, the importation of quat from Ethiopia in order to artificially drop the prices.

In order to make these kind of changes possible public awareness is the crux, the public has to become aware and will have to change their practises. Aside of that, we have to find them economic alternatives, which has not yet been done! Until now ministers are working in their own way, there is little co-operation between the different ministerial sectors. There should be more concern to minister selection. In general many ministries are characterised by their bad inter ministerial communication, bad management and bad funding. Nobody is accounted for what he achieved, everything is accounted on the titles of projects. The World Bank only looks at the amount of money spend, not where is went or what has been achieved. In some cases there are serious fights going on between the ministries. In the past NWSA was completely put out of power just because the minister wanted it all. In general there is no coherence between the stakeholders involved in the sector. Fortunately the current minister of water is capable and he will be able of putting the different stakes in the sector on line.

Currently NWSA works mainly with the local water corporations, which are working towards half-commercial. Unfortunately they are not able of working on their own, annually they receive two billion YR from the NWSA. Now the decrees are being reviewed and they will have to work towards cost recovery. Management is the biggest problem, incentives are low and corruption is high.

Opportunities WEC:

- On the job ‘management’ training: “how to deal with people”
- Decision making
- Skill development, if educating engineers: AutoCAD, otherwise they are no engineers
- English

LOCAL CORPORATION FOR WATER & SANITATION ADEN GOVERNORATE

Ihab Qader (head training centre)

Ihab Qader studied English and has been applied as ‘head of training’ because there were no trainers available that spoke English. The training centre trains in three fields: Technical, administration and finance. All training is “on the job” which means less theoretical but more applied training, how this specifically looks like remains unclear. Generally the idea is to train within the disciplines. Aims are to train as much people as possible and personnel development for more efficiency in the organisation. People from San’a University and GTZ are coming to train as well.

Opportunities WEC

- On the job training

Eng. Nagib Mohamed A. Noman (General Manager Planning, Statistics & Investments) &

Iskinder PO box 4600 Crater Yemen (former head training centre)

I meet Eng Nagib Mohammed and Iskinder in the central office of the local corporation for water & Sanitation. The corporation works towards half commercial supply. What is missing in the Yemeni water sector is the link between theory and practice. Both agree that the central vision in the water management is missing too but continue that the road towards the vision is more important. We should monitor the operationalisation of the vision. What is missing in Yemen is proper education, not only at the top level where the WEC is currently focussing but already at the bottom of the educational system essential elements are missing. In general the engineers are not able of understanding the reality, do not speak English, do not understand new technologies and are incapable of working with the low layers of craftsmen and operators. The craftsmen and operators know how to use a spanner but are unable of understanding how to maintain an engine in a sustainable way. They do not understand the complex system of which their work is part of and are incapable of reading manuals and working towards policy.

Opportunities WEC:

- Do not focus on the top level only
- Learn them the new technologies
- How to work with the lower levels
- Communication
- Management

- English

INTERVIEWS CONCERNING ‘RESEARCH AND EDUCATION’

WATER AND ENVIRONMENT CENTRE (UNIVERSITY OF SANA'A)

Workshop 20-02-05

In general the workshop could be experienced as a success in the sense that there was a lot of attendance. Especially the fact that there were about three ministerial members indicates (for what ever reason) the priority of the WEC on the local ministerial agenda. On the other hand, the choice for Arabic as the main language during the conference could indicate that the majority of the participants is Yemeni oriented, they identify with their own problems and role in the Yemeni setting, which is not wrong!! It might too indicate the level of the participants English.

The contents of the speeches were good. The speeches made clear that the forum members did understand the mission of the WEC and could indicate that they more or less believe in this mission.

What might need more attention is the conceptual difference between skills, knowledge and mission. These concepts are (unconsciously) much mixed up in the discussions. People talk about what is needed and link this with skills students should have. The conclusion remains in many cases “so groundwater hydraulics should definitely be in the program” What the exact skill or solution is the students will than represent remains unclear.

Some participants are aware that interdisciplinary “management” is needed but until now is not represented in the existing study programs. This is a good sign; management is a skill one could say that you could “teach” the students, different as for example IWRM that is much more a paradigm on itself of which a student becomes “aware” during the program. However, if the participants state management as important, still the content behind this etiquette remains vague. If the choice will be to go for integrated water “management” a good opportunity might be to further define or conceptualize “management” together with the Yemeni teachers or stakeholders. For example by a workshop or simple meetings in which the stakeholders together simply will define interdisciplinary links; so is water efficiency really that important if the overall goal is better welfare for the rural areas, or might crop patterns or employment rates be of much more essence. And of course how do these concepts interrelate?

This might be a very ambiguous demand from the stakeholders involved, but to choose a central skill around which the paradigm of IWR is slowly build, might be a way to avoid the risk of sliding off towards an IWRM curriculum based on a long list of separate summarized disciplines.

Summary of your discussion group items at workshop

- Interesting discussion, especially because of the confrontation between the director of the gender institute and the traditional engineers. The director or head of the Agrarian Economy department (Al Heibshy) was a good intermediary and able of overlooking different disciplines.
- A lot of discussion started on the question if students should obtain knowledge or skills and what the difference is between those concepts. Discussion popped up also because of a bad translation of “knowledge” into Arabic, after which the Arabic concept (skills) was further, used. The choice for the Arabic variant is an interesting phenomenon, because apparently the group members did prefer their own language

or they think more in terms of teaching students certain skills.

- The engineers in the group started immediately with stating their topic as essential for “solving” the Yemeni problems. What was the initial product of the discussion was a list of disciplines, however without linking these with concrete skills.
- The director of the gender institute initiated this focus on the skills students should have; she did not immediately enter the discussion but clearly acted as the agenda setter. After the list of disciplines was completed she reentered the scene by stating that the link between water and society was missing. “Water is politics” she started her claim. We have to open ourselves and find the essential links between our disciplines and how society acts, including the gender aspects. The discussion continued between the gender lady and the director of the economy department. After a short while the engineers started to speak in the same direction and most of them could follow quite well.
- What I considered as essential during the session is that many people act as if they still have to fight a little for their own discipline. In this situation the gender lady broke the ice by saying that everything is important but only if we should find the social relevance. Most of the participants realize this quite well but do not feel confident in this situation. They do not know how to tackle the concept of linking their disciplines with others, and above all the idea of linking multiple truths is new, they might lose their stable ground / job opportunities / status / identity, etc.

UNIVERSITY OF ADEN

Dr. Zaki Othman (Associated Professor University of Aden)

Dr. Zaki Othman is mainly my contact person in Aden. As in Mukala and Saywun also Dr. Zaki Othman introduces me to his friends and business relations, who in this case mainly appear to be employed at the drinking water corporation. Dr. Zaki Othman studied and did his PhD in Uzbekistan on highly developed water efficiency theories in irrigation practices. He speaks good English. He starts his speech with the notion that the government has no clear plans for the future, a lot of government officials are ignorant and do not have proper knowledge on water management. He sees his task as to convince the government officials who often do not obtain their legitimacy because of their good ideas and vision on the water problems in the region. When we talk about the far future we will have to change to the desalinization of seawater. Although in the more near future there are other cheaper options available in the use and treatment of brackish water that is now intruding the coastal aquifers. The thing is that many policy makers do not know this or only think about the ‘label’ desalinization but do not know what it embraces. If we think about desalinization, we will need a huge infrastructure and energy supply, in fact this is much more of a concern than a factory on itself.

We need to convince the government step by step that this is an important topic for the future to create policy on that goes beyond the water factory on itself.

There is little applied science on these kind of topics

Opportunities for the WEC:

- More applied science
- Planning
- Creating the right institutional infrastructure for working towards the policies of the future; big research institutes like in Uzbekistan have the advantage of being national knowledge centers with good legitimacy towards policy makers.

UNIVERSITY OF HADRAMAUT

Dr. Mohammed Ma'ray (faculty of applied sciences)

Dr. Ma'ray is like a spin in the 'water' web, he knows a lot about everything and is continuously busy with all kind of water related research and management activities. He works for the applied science faculty for which he does research on boring, and sustainable boreholes. Aside of that he does all kind of small side research on the efficiency of sprinklers, drip irrigation and irrigation of municipality gardens. He is thinking a lot about possibilities for the use and exploitation of water from the wadies, which is today totally neglected. He has a lot of ideas and vision on how water could be used more efficient and in a multiple-use manner. Water harvesting combined with tourism, urban irrigation out of wadies, boring at the right places and refilling the fast depleting aquifers with rainwater harvesting. Aside of this he manages the development of the new university gardens and their water supply. "Everything should look better and people should be able of proper managing their projects". Because of an ignorant contractor and insufficient awareness at the top or just bad communication, inferior tubes had been used for the drip irrigation of the trees along the 500-meter long road to the new university building. Each young trees is now standing in a little pond of water, and while one of the workers opens the dripper of one of the dead trees even more Dr. Ma'ray says: "Because of this ignorance and bad management a lot of young trees already died; this is what makes a lot of projects a failure". Dr. Ma'ray is capable of making the problems in the Region very clear, he shows where things go wrong and knows what good indicators are to see the things change. He says we need people who want to make 'nice' things, who have good creative ideas how to combine the demands for water with the available resources and other possible demands or opportunities like tourism, gardening and comfortable settlements. He explains ignorance by a story of an old well out of the British era, which he lately visited. The people in the village of this well complained about water shortage and asked for a well. There was already the British well but that was closed for years, when he went there the people told him it was closed because the devil was hosing inside. The fact that the well contained a lot of high quality water nobody seemed to remember, the story of the devil was enough to know about this well. If some ignorant engineer would have come there, he would just have drilled a new well.

Local situation and initiatives differ a lot; this has a something to do with the strength of the specific society, the will to make something out of the situation and the capacity so see the windows of opportunity.

Aside of being an inspiring and helpful role model for the Yemeni engineer of tomorrow Dr. Ma'ray mainly was my contact person who let me meet some other water sector stakeholders in Mukala.

Dr. Salim Rubaya Bazar (Dean of faculty of environmental Science & Marine Biology)

Dr. Rubaya did his PhD on air pollution in Russia and speaks little English. Dr. Salam A. Khalil from Iraq joins the discussion and translates if necessary.

The faculty has been established in 1996 and is divided in two departments. The dean is mainly talking about the disciplines involved and the disciplinary studies that have been done by the students for their Msc thesis and by the teachers that are attached to the faculty's consultant department. Because of new environmental laws companies and big projects will now first have to come up with an environmental impact assessment before the government will provide the needed permits for the building or establishment. The government assigns the agent or institution to do the assessment and sometimes this faculty is chosen to do so. The main project for which they did an assessment was the establishment of a fish factory just outside Mukala. Main topics where, noise, air pollution and water pollution. The government seems to have the lead in making the choices in the environmental assessment; what institution and who will do the assessment.

Water problems are mainly considered to embrace pollution, pollution of groundwater and pollution of the sea and student research has a clear disciplinary focus.

Little attention appears to exist for more integrated topics. A clear vision of how the Yemeni environment will have to be managed in twenty years seems to be absent or is limited to pieces of general discourse concerning global warming or pollution of the sea. The quest for vision development and theory operationalisation of these general environmental problems concerning specific cases in Yemen seems not being picked up as an opportunity for the faculty.

Dr. Salam A. Khalil (Head of Environmental Science Department)

Dr A. Khalil is Iraqi and works in Yemen because of temporary safety reasons. He speaks English and is mainly concerned with agro-meteorology. After the Dean left the discussion he tells about his projects with the students. He teaches the best students how to make meteorological computer models and how to use (interpret) these computer models. He complains about the low development rate in Yemen and tells that the students mostly do not have the skills to work in reality; skills like working with computer models.

Opportunities for the WEC:

- Teaching the proper skills
- Practicing in reality
- Interpretation of data

INTERVIEWS CONCERNING 'DONORS'

WORLD BANK & WATER AND SANITATION PROGRAM

Tim W. Kennedy, Sr. Water & Sanitation Specialist

The Water and Sanitation Program has a clear Policy development focus on the rural water supply and sanitation. They are working towards a supply focus; water as an economic good. Until now there are 55000 wells that are uncontrolled and illegally drilled. Because of bad management private companies deliver where the government does not cover the supply. Half of the supply is done by private companies, no quality control, but they do a good job.

Don't focus too much on a lack of policy, there is a good policy, there is a National Water Supply vision. The problem is the enforcement of the vision, and the realisation of the policy.

Yes, 75% of Yemen will dry out, desalinisation of seawater is too expensive so more focus should be on the conservation of water. But, if the time will be there "they will smell the coffee" and work towards alternatives. Problem is how to enforce these alternatives.

The city of Taiz is already out of water; commercial companies bring the water in from far, where the problems will continue. Problems will arise like who owns the water, until now the property on top determines the owner of the water. The problem remains that whatever policy you come up with the enforcement will be the crux. Until now there is no enforcement at all. Develop communication; communication towards the lower levels, towards the public is poor.

Capacity building of the lowest levels is important, if we talk about enforcing policy we will have to give the lowest levels the responsibility, without giving them responsibility we can not account them on anything and they will remain free riders. If we give them responsibility we can give them small subsidies in return for which we can account them. Important is for example that sanitation is not included in the government package. However, it is extremely important for the rural public, we should work towards institutional systems that are able of functioning with these kind of topics, all through the lowest levels, let them own the concept, and account them on that. Make 'hygiene and sanitation' a label, 'a thing' that they can own.

Opportunities for WEC

- In general engineers should be more 'hands on'
- Education until now too theoretical
- How to enforce policy rather than how to make policy
- Students should learn about the alternatives for the rural water supply
- A focus should be on water and sanitation. Health is an extremely important factor in the rural economy and until now there is little knowledge among the local engineers on the relation health and sanitation. 'In this country nobody wants to work with dirty stuff.'
- Practical education on institutionalisation, no theoretical analyses but how to establish a system that works from grass root to top, how to establish a community

action group; how to create workable roadmaps.

DUTCH EMBASSY

Ton Negenman

Yemen is facing a looming water crisis.

For a long time development work was mainly focussing on the agriculture, but since the agriculture is no longer a focus most attention goes to the support of a water strategy. The World Bank started this in 1997.

Solutions for the looming crisis might be found in alternatives for the Agriculture and the diversification of the rural economy. One thing is certain, on the one hand we have to try to postpone the crisis and in the mean time we search for alternatives. The natural recourse will end. Fortunately things are slowly getting in place now in Yemen. The Ministries are working and there is even a water strategy now. This resources plan is the basis for getting grip on the water in Yemen. However, more time is needed, application is still far behind.

Until now most organisations working in the water business have different working strategies, this creates problems. Most of the institutions have little capacity and a serious lack of educated people. There is no structural management aiming for the same goal. Nobody knows where the money goes and little is done efficiently.

Management problems go hand in hand with little monitoring, no Terms Of References or other agreements that make things accountable.

The WEC should provide good educational capacity with a broad base in order to be pragmatic and applied.

Maybe the WEC could work together with local MBA's for the management aspect of the IWRM program. It is important that the WEC should create some kind of 'ownership' so that the 'manager' feels responsible for his product. The product is the answer to the problem, so he becomes 'the problem owner'.

Opportunities for WEC:

- Introduction to Management (with MBA)
- Contract management
- Fill the gap between the educated people who went abroad and the ones today that do not longer go abroad
- Institutional context, where are the engineers going to work, they should know and understand their role.
- Think about the WEC sustainability, student fees are essential; business plan
- Contract research

- Think about the future, plan A has been accomplished, now create plan B!

NUFFIC

Han Blom

The starting point should be the uniqueness of the WEC in its IWRM MSc program. The WEC should be a centre where one is educated something unique. The question is then what this uniqueness should be and how the educational program should be arranged and sustained.

In the end WEC will have to run the program on its own. They will have to come up with a feasible business plan that fits the possibilities. In the past this went wrong and the WEC was sustained by the money from the external donors. It is of great importance that there is proper monitoring during the process of setting up the program, the strengths and weaknesses of the staff and the WEC will have to become visible and should be taken up in the business plan.

In order to obtain a unique program there should be proper input from the faculties involved, maybe there should be even more faculties involved to ensure the interdisciplinary character of the program.

Since management should be a central concept in the program, cooperation with the NUFFIC funded MBA programs at Sana'a University might be a good idea. Develop courses together or send the WEC staff to the MBA's in order to let them understand the concept of management

The important thing for Wageningen is that you should do more than just the facilitation of the curriculum development. Facilitating is only possible when there is a central vision where to go. Since the current vision of the WEC is weak and little defined Wageningen should assist in developing this vision on IWRM. The main risk is an undefined and fragmented program that does not represent the Integrated Management aspect of IWRM. The WEC staff should be able of presenting a clear vision for the future water management in Yemen and the Middle Eastern Region. They should be able of teaching theory behind IWRM. Understanding the coherence in IWRM is essential.

This should involve the raising of questions like: 'What is the current gap between theory and practice' and there should be more discussion on the contents of the program.

Opportunities for the WEC

- Until now things are too fragmented

INTERVIEWS CONCERNING 'PRIVATE SECTOR'

IDDEALE, FRENCH / YEMENI BASED NGO

Frederic Pelat

Frederic came to Yemen in 1998 and worked for the French embassy. IDDEALE is working towards sustainability through the combination of indigenous knowledge and modern knowledge. Change of minds of farmers, engineers and politicians.

They mostly focus on Rain-fed agriculture. After the revolution there is a clear decrease in productivity because of the loss of indigenous knowledge. The aim is to increase this productivity again by reinforcement of the indigenous knowledge; so first find the traditional best practices.

Education of the local people is not a big problem, they are intelligent. The problem is the change of the social system, farmers became dependent of the government and do not see the opportunities themselves anymore. The government does not provide the farmers anymore with the things they used to do in the socialistic time and so the system lost its productivity. Farmers know how to complain but not how they used to solve their problems themselves the hundreds of years before the socialistic system.

Opportunities WEC:

- Social aspects of water
- Technical is easy to fall back on but not enough
- In 1998 Kahtan Abdu Malik taught the students that farmers are now using groundwater in a traditional spate irrigation manner as if they still use the floods as they did for the hundreds of years before the availability of the groundwater. Today he teaches the same discourse, apparently there has been no change in reality, this indicates a lack of contact or communication with the farmers, this is something that the WEC should take in consideration.
- More attention to the use of alternatives of the past
- Water chain management, everything is linked

DEUTSCHE GESELLSCHAFT FUR TECHNISCHE ZUSAMMENARBEIT (GTZ)

Dr. Gerhard Lichtenthaler

Dr. Lichtenthaler is advisor Water Resource Management for the German Technical Cooperation. He now works for three months in several GTZ projects in Amran and Sad'a. Before he lived and worked for several years in same region in the health care.

The main point is that we should look for alternatives in the water use for economic purposes. Aside of that, we should better understand the organisational structure a lot is unclear and the institutional arena does not function in a proper way. We should work towards more integration of the different fields of concern and this should be co-ordinated in a proper way. For example we all talk about the coming water crisis, but already 20 years ago the same thing was said and in the year 2000 Yemen

should have no water anymore. However Yemen still has water and in twenty years the prognoses did not change at all, we still have about 20 years to go is the general discourse. So it might be interesting to start with a properly co-ordinated search for what the real water situation is.

Opportunities for the WEC:

- Start with a proper selection of students, it is unrealistic to think that you can make good water visionaries of any student.
- A focus should be on the capacity building of students to make them good community builders
- Graduates should know how to work in the field and be able of creating something in reality.

ARCADIS

Jack van Hoorn,

13 years in Yemen, Arcadis drinking water and sanitation projects in Gredda

Now mostly in institutional strengthening projects, management projects and some hardware-projects with participation of local inhabitants and users.

Conceptualisation of the Yemeni water sector,

Government and politics is difficult, most of the water management policies and actions concern the urban context. Water management for agricultural purpose is mostly taking place on the very local level and appears only to be constrained by tribal rules. This is the reason that a national policy might look nice but will probably not be executed because of the danger of tribal response.

In the urban context there are quite some water management developments of significance. Aside of the many drinking water and sanitation projects from the public side, the private sector does a good job in providing water for those areas where the government or foreign projects did not focus. In Taiz nearly the complete drinking water supply depends on the uncontrolled private sector that brings in the water by trucks; natural water resources are limited. The major disadvantage of this heavily fragmented but quite effective private sector is that, because of this fragmentation, involvement in any project or policy is difficult. Any policy for quality standards or water pricing will need a complex framework of rules, definitions and actions in order to fit and not spoil the current reality.

The awareness among farmers concerning the creeping water crisis and the need for 'sustainable use' is generally low. Awareness raising and schooling might be opportunities to create legitimacy for the implementation of a new more sustainable water management. Currently little awareness raising or schooling is done among the rural population. The reasons for that remain unclear.

An interesting illustration might be the government policies concerning the quat production. Awareness raising on water efficiency in the quat production will never be part of a policy since one of the major but unrealistic aims among government agencies is to quit the production as a whole because of its enormous water consumption. As a result the quat is still produced, and nobody dares to state that it might be an opportunity to promote a less water consuming quat

production. The combination of a highly legitimate tribal system in the rural countryside, a highly profitable crop and a national policy discourse that completely discards its production creates an unchangeable situation. The inflexible policy statements in combination with the strong tribal identities rather reinforce the current reality than it might enforce a change.

A lot of government agencies are bureaucratic systems in which only two or three authorities really create the flow of activities. The lower layers within the system mostly are not well educated, are there because of their references and not because of their proved academic skills and mostly function as marionettes of the authority of concern. However, the system is very open and everybody is generally able of giving his input. Though, to actually decentralise or to delegate is generally unknown; the authority takes it all.

NWRA who supposed to represent the overall policy making authority on the natural water resources, is in fact still developing itself as an identity in the water sector and did not yet come with a clear water resource policy.

Economically spoken water efficiency might not be the best policy. Working towards quality standards and a quality controlling authority might open the borders with the rest of the Arabian peninsula which now get its fruits and vegetables mainly from Europe because of the European quality standards. The current fish export to Japan might indicate a good example of what the opportunities are for better-organised export. This fish export is currently good business and might embrace more development opportunities as alternatives for the water consuming agricultural production. Think of a possible shift towards food import and the development of different economic sectors with more sustainable perspectives. These topics should be framed within proper policy (how to use what resources?), but proper vision seems to be absent at the governmental layers of concern.

Opportunities WEC:

- More Vision Development
- More lead taking, until now too much the followers of what governmental organisations stand for
- Try to focus less on the specific academic disciplinaries of concern.
- Try to focus on more levels, not only on the academic disciplines
- NIAS gives management courses, co-operation might be a possibility
- The development of a “middle management” course should be a good opportunity; this is the ‘in-between’ level where a lot of management appears to be missing.
- Step out of the academic world, be applied at all layers of concern.

ASSOCIATED CONSULTING ENGINEERS- ACE (PVT) LTD (THE "THREE LARGE DAMS PROJECT")

Adnan Hayee

Mr Hayee is Pakistani and works for the Pakistan consultant company that is designing the three big dams that will provide water for irrigation in several areas in western Yemen. A 4 million-dollar project. He is clear about the (water) problems in Yemen; the management is a mess, people are uneducated and do not think about the problems of their country. They only learn to think about how to get their daily quid. There are plenty ideas and opportunities for developing the agricultural sector in a more sustainable way but apparently no body seems to bother. Nobody in the ministry thinks about providing incentives for the farmers, nobody thinks about how to implement tree planting ideas and crop changes, they only talk about these things, they work from 8.00 until 11.00 in the morning after which they go home to chew their quid.

Provide free coffee trees and drip systems and the farmers will abandon the quid production, but only claiming that things will have to change into more efficient water use will never make a farmer change.

Opportunities for the WEC

- Education in English! Communication is sometimes impossible, even at the higher levels, this dramatically reduces the chances for Yemen in the international scene.

FARMERS (AROUND SANA'A)

During two days around 15 farmers were visited North of San'a around the Airport area close to the village Baith Halalil.

The area around the airport has been used for agriculture since ages. Farmers grow the common fields of their families of villages, no specific personal ownership was mentioned. For about thirty years the farmers pump groundwater for irrigation purpose, they still use the old spate irrigation method. In ten years the shallow ground water table dropped in depth from ten to more than hundred meters. However the rapid growing city of San'a constructed a waste water treatment plant close to the airport having its drain along the agricultural area. This drain resulted in the refilling of the shallow groundwater aquifer, which currently is almost completely restored with this (treated) wastewater. Sometimes the treatment plant does not have enough capacity for the wastewater discharge and flushes the wastewater directly into the drain without treatment. Most farmers pump the restored groundwater for irrigation purpose, most of them know out of experience that this water is not suitable for domestic purposes, however it is used for the washing in the Mosque.

Other farmers which have their fields close to the drain pump directly from the drain and lead the water with small channels to their fields. Their fields look black, stink and are crusted with white salt crusts. Farmers generally do not complain, the only thing they have a problem with is the absence of a proper source for drinking water. The groundwater table is generally constant at a depth of around thirty meters. However, this might slightly differ from place to place. Farmers consider no problems in the high salt contents of the water, because of this high mineral contents it makes the plant grow faster and fertilises the ground. Other farmers, further away from the drain but having good access to groundwater, even claim to bring water from the drain directly to their fields because of its fertility and anti-insect effect. It became clear that the concepts of fertilising and the anti-insect effect are generally used for one and the same thing; faster growing plants. One specific farmer with

two heavy Japanese diesel pumps stored the water in his own reservoir close to the road from where he sold it to water trucks bringing the water to dryer regions where there was said to be grown quat. To fill a big heavy oil truck (20m³) cost 150 YR (0,60 Euro).

All farmers see no problems for the future and appreciate the sewage drain, alternative income opportunities are being laughed away, if the water will vanish they will pray to god. However, one man with a small dirty field that lived in a house / tent aside of the road, kept bees as well from which he could make his living.

The PhD student Hani...doing his PhD on groundwater pollution accompanied me during these field trips. He claimed that the water was of very poor quality, especially the nitrate content of the water was way above the appropriate. Irrigating with this water was as directly polluting your field. The reason that the farmers were still using the water was because the water was there only for about seven years and the ground was not yet that saline that crops were suffering. "These farmers are ignorant"

FARMERS (WADI HADRAMAUT)

With eng. Hashim from the agricultural extension service I visited about six farmers on their fields in Wadi Hadramaut. As common in the area, none of them owned the farm, all worked on the fields of landlords that live somewhere in the city and take 20% of the farm profit. Most farmers crop unions and date palms, some have garlic and tomato's. In general there is a need for salt-resistant crops because of a decreasing groundwater quality. Most farmers work with open channels and the traditional spate irrigation. However they do not use the wadi floods for their irrigation but the water from a well owned by the landlord or a neighbouring landlord. Some wells have decreased in capacity over the years and together with the inefficient spate irrigation farmers are not able anymore to provide enough water for their date palms. However the price of the less water consuming unions decreased dramatically since Saudi Arabia closed its borders for Yemeni vegetables (reasons remain vague). As a result many farmers consider having problems with the water availability as well as its quality.

Asking farmers if they thought about alternative sources of income or opportunities for changing farm practices in case of ebbing groundwater resulted in little creative solutions. Most farmers would ask their neighbours if they could buy water from them or would pray to god. Maybe they would immigrate to different areas where there would be water. Only one farmer mentioned the option of changing his job. Another farmer had his small business out of compressing, drying and packing his dates, which increased and sustained the value of his crop. However, he took this skill from his father; it was a traditional family business being there already for ages.