

YEMEN, WATER, AND THE POLITICS OF KNOWLEDGE

Steven C. Caton
Anthropology
Harvard University

Environmental Politics Workshop,
University of California, Berkeley
October 26, 2007

I was invited by a friend, Gerhard Lichtenthäler, a political geographer and water specialist who works for the GTZ (Deutsche Gesellschaft für Technische Zusammenarbeit), to attend the Third International Conference on Water Hydrology in Sana'a, Yemen in mid-December, 2005. Opening the occasion at the four-star hotel where the conference was held were the heads of the UNESCO Cairo Office as well as the Arab League's Educational, Cultural and Scientific Organization, but we would not see them again after the first day; no doubt they were jet-setting to their next conference destination in a cushier place than Yemen. (Indeed, it came as a mild surprise and was considered nothing less than a coup that such a relatively prestigious international scientific conference should be hosted in this poor country.) After the departure of these luminaries the floor was left to the rest of the attendees, which included the Yemeni Minister and Deputy Minister of Water and Environment and numerous experts in wadi hydrology from a number of different Middle East countries including Yemen, Jac Van Gun from Holland, an acknowledged leader in the field who had spent many years in Yemen studying its complex geography and hydrology, and many development workers like my friend Gerhard.

The conference was one of those venues at which knowledge experts gather that Ken Conca talks about in his book, Governing Water: Contentious Transnational Politics and Global Institution Building (2006), and this year's theme, "Towards an Integrated

Water Management of Wadi Systems,” was very much in keeping with one of his book’s arguments that a new concept, “Integrated Management of Water Resources (IWRM),” had replaced “Sustainability” in the field of water development and become hegemonic in scientific and development discourse. The reason for this, according to Conca, is that IWRM (and other concepts like it) were part of a global framework that has emerged in the last two decades to “govern” water. This international order of powerful donor agencies such as the World Bank, expert networks such as the one that had convened at our conference, social movements opposing big-dam construction, and the global struggle surrounding the privatization and commodification of water had all displaced nation-state regimes and international treaty agreements as the most powerful agents “managing” water resources today.

For Yemen, the picture as Conca paints it does not come into focus quite so clearly. Because the Yemeni state has been historically “weak” if not absent on the local level, it begs the question of whether there ever was a centralized, top-down management structure (except on paper) of the sort that Conca says has failed to govern water resources satisfactorily and therefore must be circumvented by an international order. Also noteworthy, is the fact that two other elements that Conca claims are present in this international framework are virtually absent in Yemen. It has almost no social movements to speak of (nor the NGO’s usually connected with them) and the privatization of water – which is hardly on the same scale as in water-rich countries – is not a hot-button political issue. On the other hand, as my paper will show, there is much to be said about the influence of transnational knowledge networks in a country such as Yemen, yet the question still arises as to the “uptake” concepts such as IWRM may or

may not have in the various venues and at different levels of scale in which such knowledge circulates in Yemen. In a year of fieldwork in Yemen (2005-2006), I had become fascinated with the multifarious and complex ways in which knowledge about water problems and their proposed solutions, if any, was produced and reproduced, and the political problems such re-production encountered along its complex routes of transmission. How does one make sense of such a complicated politics of knowledge?

To begin with, it is helpful to remind ourselves about a peculiar materiality of water as opposed to other natural exploitable substances such as oil, coal, forests or gas. Even when it is scarce, as in the case of Yemen, it is nevertheless everywhere – it comes from under the ground in wells, flows across the ground in floods and rivers or man-made channels such as qanats, from the sky in the form of rain, and it collects in pools, reservoirs, and lakes. It is also necessary not only for agriculture but also industry, tourism, and every other economic sector and because of this continuous circulation (its liquidity, if you will) of water throughout our daily lives, it is what Marcel Mauss called a “total social fact,” at once connected to the most basic needs of life as well as of the most profound if also taken-for-granted practices in society, economics, politics, religion and so forth.

Because of its materiality and its characteristic as a total social fact, water is difficult to control. Drill for oil, and you trap the outtake in a pipeline, send it to a refinery for processing, transport it to fuel stations at various sites, and deliver it to the customer. How do you control water in the same way when you can’t limit it to a particular location, sector or use (though some have argued that a sector like agriculture can be targeted, making the problem of control more manageable)? And if controlling

water is seen primarily as a technocratic-managerial problem, then the question of its control becomes one largely of knowledge and bureaucracy rather than politics, the latter of which is almost nightmarish in its scale and complexity. Bureaus spring up to treat water in this sector and that, in the rural realm as opposed to the urban, nationally and internationally, and so forth. A multi-headed hydra is constituted, and it is no wonder that “integrating” the various sectors that manage water individually is seen to be a key issue. The political tensions haunt any bureaucracy, and yet one could argue that those tensions are exacerbated in the bureaucracy of water partly because of its materiality and that it is a total social fact.

IWRM

What does IWRM mean? Is there an official definition? Conca gives a useful working definition, gleaned from dozens of policy reports issued by research and policy institutions over the years, but it is not a definition that any world body would necessarily endorse. “As a conceptual approach to water problems, planning, and practice, IWRM typically stresses three interrelated themes: recognition of the full range of social, economic, and ecological uses of water; ‘cross-cultural’ water management, in the sense of integrating planning and practices related to agricultural, industrial, municipal, and ecosystemic or in-stream demands for water; and water management at multiple scales and levels, in the sense of coordinating local, regional, national, and transnational practices and institutions” (Conca 2006:124). I will have more to say about this definition later. In the conference I attended, only a few scientists attempted to explain what they meant by “integrated water resource management.” Is this because they felt they did not

need to because, as Conca claims, it is already a well-known and established concept? Even if that were the case, that does not mean it goes uncontested. Are there real political struggles going on over IWRM which only a detailed attention to local context can reveal? The scientists at the conference who explicitly invoked IWRM were for the most part non-Yemeni (Lebanese, Turkish, Syrian and various Europeans) with only one notable exception I will get to momentarily. I would claim that this says something about the degree to which Yemeni scientists are not part of Conca's international expert networks in which key ideas like IWRM "trickle down" from elite academics or experts to less mobile and less "networked" ones. This is a political fact and yet these hierarchies of knowledge exchange are hardly ever mentioned in the rationalist, technocratic discourse of IWRM.

Given how all-encompassing and elastic the concept is, it is not surprising that those who did use it, did not do so in a consistent fashion. A renowned, French-educated water expert from Syria said that IWRM meant integrating water resources from surface to ground, upstream to downstream, water to land, and nature to society. Someone else suggested it meant coordinating various groups of people and their activities in managing and using water in different ways, be they international aid donors, national-level bureaucrats or local consumers. Both of these definitions fit in some part of Conca's omnibus definition above, but what it and they leave out is just as telling. Scrutinizing those definitions more closely one realizes that that they split the problem of IWRM into two categories, managers (which is not surprising, given that the concept stresses "management") and consumers (who in an important sense are also managers of their own resources, if not in the bureaucratic sense): what is left out are the producers of

knowledge about water and its management – the scientists and experts – as if they solely studied the problem and need not be studied as part of it. This was what I proposed to do in my fieldwork.

Another thing to be noted about IWRM is that it is the brain child largely of hydrologists and geographers (some of this history is discussed below on Dutch engineering institutions). The conference was almost entirely dominated by them. What was uncontested by them, or so it seemed to me, was the acceptance of the “watershed” or the “water basin” as the basic unit of analysis and “management” for IWRM. It is a “natural” unit, in the sense that water collects through run-off into a basin where it then can become tapped for agriculture and become important for settlements that require water and markets that provide goods for that settlement. In other words, nature determines in this view the units (differing by scale) that have to be integrated for water management. When I asked a famous hydrologist at the conference why the watershed became so important for IWRM, when this concept was meant to engage social, economic, and political issues, he did not go back to the genealogy of the concept in hydrology and geography, he simply thought the question irrelevant. I pointed out that watersheds are porous, that settlements that depend on water are not neatly correlated to them, and that they are in turn connected to other regions that have a deep effect on the watershed’s resources, so why assume that a naturally defined hydrological unit like the basin is the starting point, the building block for integrated management of water resources. This assumption can be found in the national water plan and in the curriculum taught at one of the key sites of knowledge about water in Yemen that I will talk about

later. The point is that the social, political and economic integration that is supposed to take place in this management vision is reductively naturalistic.

As I said, there was one Yemeni scientist whose paper did address the question of IWRM but it also created one of the tensest political moments in the conference. He was making the basic point that people's management of water will not change until their perceptions of water-use have changed, and he gave an extended example of this problem from one of the main wadis in Yemen in which he had worked as a water engineer. This seemingly uncontroversial, even banal point received a heated response. "It takes a long time to change people's behavior," said his interlocutor, "we have been trying it at NWRA for thirty years." The person speaking was a high-ranking official in the National Water Resource Authority, which for years had been the most powerful and important government body in charge of managing Yemen's water resources. The scientist whom he was addressing was a professor of hydrology at Sana'a University, the protégé of the founder of its Water and Environment Center (see below) which teaches the "integrated" approach. Over the course of a year I learned to interpret these encounters for the deeper politics they contained: NWRA had long been criticized for failing to manage Yemen's resources well, and one of the reasons given was that its engineering staff – trained in building infrastructural water works such as dams – was not sensitive to the social contexts in which their projects were built. The NWRA official was arguing that in fact engineers of an older generation were well aware of the problem the scientist was pointing to and perhaps understood the difficulties of trying to redress it better than he did. At stake in their argument was a typification of scientific knowledge that was relevant for IWRM and an implicit categorization of Yemeni scientists as either

competent in that regard or not, based on where they obtained their scientific training and when. Implicitly, European and US training ranked above the former Soviet bloc countries, the latter above Middle Eastern countries and within these, Lebanon and Jordan above Egypt, Syria, and Iraq – and finally, there were countries like Yemen with their own engineering faculties that ranked last.

It is time to give a bit of background on the country's water resources and the Yemeni government's management of them. Arguably the most powerful government agency in this regard is the Ministry of Agriculture and Irrigation (MAI). Roughly 90% of water consumed in the country is done so in the agricultural sector. The rest of the water sector is managed by agencies in charge of rural and urban water and sanitation.

In spite of the fact that Yemen is a semi-arid country with one of lowest annual rainfalls per annum in the world, it has throughout its millennia-long history been a major agricultural producer, relying mainly on monsoon-season water-runoff, collected in underground cisterns, for terraced cultivation. The agricultural sector expanded dramatically in the modern period; the discovery of oil in the 1980's (which was not of a high enough grade to be truly lucrative for the country) provided part of the subsidy for this growth. As happened in so many other developing countries in the world, Yemen became an exporter of its agricultural products in the 1980's, an economic move made possible by the discovery of a vast underground aquifer below the Sana'a Basin. Borrowing from the World Bank, farmers were able to buy bore hole drilling equipment to install artesian wells.

What this market-driven development scheme did not fully take into account (though it was scientifically understood at the time) was that the aquifer contained “fossil” water which could not be recharged as it was being drawn down. The problem was exacerbated by a years-long drought. But this was not all. Not only were water resources dwindling, they were not used in the most economically productive way. Crops were being grown like wheat which required large amounts of water in a country that was running out of it or like qat, a cash crop which has virtually no usefulness other than for entertainment (it is chewed for the slight “high” it gives in public settings that are enjoyed for social reasons). Indeed, qat cultivation now consumes about 60% of the water used in the agricultural sector.

Realizing that it was in trouble, various of Yemen’s top-level officials got together in the 1990’s to form what became NWRA (1995), a powerful agency that was supposed to oversee all of Yemen’s water resources and set policy that would help conserve and sustain them. Though technically with more authority than the MAI, it was impossible to rein in its uncontrolled drilling of wells and its building of water-harvesting structures such as dams (Yemen has no internal rivers and so relies entirely on surface water run-off to collect in reservoirs with a high evaporation rate), which were highly lucrative to officials and entrepreneurs. Matters were not helped by the fact that the head of NWRA, though an able politician and scientist, was an indecisive and ineffectual administrator who ended up thoroughly demoralizing his staff before his premature death. By the late 1990’s, a paradigm-shift had occurred in development discourse from “sustainability” to IWRM, and it was clear that the NWRA staff was not up to date in this thinking. However, as will become clearer, there were Yemeni engineering students

being trained in IWRM who would return to Yemen around 2000, and their arrival was both welcomed but also feared by older specialists whose knowledge of water management began to be seen as out-of-date. What institutional home would these new engineers have in Yemen?

In 2003, a new entity was created, the Ministry of Water and Environment, which was supposed to oversee and direct NWRA as well as the other agencies responsible for handling domestic rural and urban water supplies – excluding the MAI. Background discussions had been split between forming an entity that would be directly under the president's or the prime minister's office, relying essentially on their power to enforce its recommendations, or to form a separate ministry on a par with the MAI. The former solution would have made the new entity the most powerful government body in charge of managing water resources in the country; the decision to make it a separate ministry effectively put it in a collision course with the MAI, a competition it seemed destined to lose.

One of the first things the new ministry did was to create the equivalent of a multi-year national water plan, officially called the National Water Sector Strategy and Investment Program, 2005-2009 (NWSSIP). It was the brain child of its minister, Dr. Mohammed al Eriyani and his deputy, Dr. Mohammed al-Hamdi, both scions of powerful political figures in Yemen and trained engineers (Arizona and the Netherlands, respectively). The idea was to create a multi-sector strategy for managing Yemen's water resources which would require "investment" (either in the form of direct financial outlay or the equivalent in technical assistance) from various western nations, primary among them being the Dutch, the Germans and the British. (USAID left Yemen when the latter

supported Iraq in the first Gulf War and is only now rather half-heartedly attempting to return). If Yemen could not put its house in order, foreign donors would use the carrot and the stick to do so (primarily by withholding or withdrawing investments). Of course, I leave out many other things that prompted this accountancy arrangement, chief among them being a “corruption discourse” in which foreign donors complained of not knowing where their money was being spent by Yemeni bureaucrats. NWSSIP would have an accountability clause written into it to address this concern, one that would impact the MAI as we shall see. Now, another kind of knowledge and knowledge practices came into being, stemming in part from the principles of IWRM but also from such concepts as “transparency” and “accountability” in development discourse which are part of what anthropologist Marilyn Strathern and others have called an “audit culture,” a rational and instrumental knowledge upon which sectors would be rewarded or punished (or at least severely reprimanded) by international donor groups when IWRM was not being carried out.

The plan, a document of some 67 pp., printed on glossy pages with photographs and statistics, is full of IWRM discourse. Here is but one example. “The Ministry of Water and Environment (MWE) was established in May 2003 to reorganize the water sector, with the aim of creating an institutional structure for integrated water management and to prepare the necessary institutional and investment conditions to face the exacerbating water problem in Yemen” (p. 1). Development has now shifted into “investment” in accord with neo-liberal thinking. We are told that it was important to involve all the relevant stakeholders in Yemen’s water resources in the formulation of the plan (a process that took eight months). Also important was a mechanism by which to

monitor the efforts of each sector to realize the goals set forth in the plan, including, of course, agriculture and irrigation. “NWSSIP is an ambitious program demanding substantial resource allocation. Hence, monitoring and evaluation are essential to show outputs and impacts. The MWE, in collaboration with relevant agencies, will be responsible for monitoring” (p. 39).

In 2007 I would witness an example of both the kind of audit knowledge that was now expected and how it fit into an international framework of water governance in the Second Joint Annual Review (the first of which was conducted, one year after the announcement of the plan). As stipulated by the plan, the review was in the hands of the Ministry of Water and Environment (specifically, Muhammad al-Hamdi, the deputy minister for water). The first JAR was a more than usually difficult time for the Ministry. Its head, Muhammad al Eriyani, had just been dismissed months earlier as part of a general government shake-up that occurs every five years or so. Different reasons were given for his removal, none of which could be corroborated (corruption, stepping on too many toes in the MAI or in enforcing the water law prohibiting “wild cat” drilling), but everyone seemed to be in agreement that it could not have been due to lack of competence -- he was the most highly regarded specialist in the field of water management in Yemen. The deputy minister had to scramble to find the time and resources to conduct the review and the results were probably inevitably disappointing. Speaking for the donors, the head of the water section in the Dutch Ministry read the MWE the riot act. But the MWE was not the brunt of the Dutch specialist’s ire, it was the Ministry of Agriculture and Irrigation which hadn’t bothered to participate. I wasn’t invited to attend JAR I, it being deemed inappropriate that I should be present when the

water sector was airing its problems and getting a drubbing for them. It was only once again through the efforts of my friend, Gerhard, that I got an invitation to attend JAR II.

Predictably, the session was held at the Sheraton Hotel. Day one was devoted to the presentations of the findings of each sub-sector group (Urban Water Supply and Sanitation, Rural Water Supply and Sanitation, Irrigation in MAI, and Water Resource Management under the jurisdiction of NWRA). Al-Hamdi announced that the session on MAI's work, which I wanted to attend, would be held in the hotel's nightclub; the audience sniggered because of what this signified and everyone suspected all along, namely that the MAI wasn't serious about IWRM and just "playing around." Gerhard went to this working group because he had participated in the review of qat cultivation for this sector which the donor groups wanted to address. Al-Hamdi also came and told the participants at the start of the session that he hoped there would be a vigorous debate or discussion of the sector's findings. Tellingly, the session was also attended by the regional head of the Deutsche Bank, one of the two major donors of NWSSIP, and a powerful figure in the donor world.

Among the basic issues the irrigation group kept revisiting was the need to restructure the AFPPF (The Fund for Encouraging Agricultural and Fishery Production) in order to make more funds available for many of the irrigation group's objectives, especially for training new staff. AFPPF had been set up by NWSSIP as a structure through which financing of water management and efficiency could be increased. The donors, however, appeared to be reluctant to increase this financing, not being satisfied with the progress MAI was making. This was the stick that was to be applied to MAI in order to bring it into line with IWRM as it was envisioned by its rival, the MWE.

The irrigation director's presentation, a mind-numbing succession of facts and figures, went unremarked until he got to p. 5, at the top of which was written, "The necessary increase of investments of modern irrigation technology and extension services must NOT be at the expense of current and planned water harvesting schemes; therefore separate funds for MIT are needed." Suddenly there was an eruption in the room, and I was startled to realize that someone was not only attention but actually cared about what was being said. The person was none other than al-Hamdi, who had evidently been waiting for the presentation to reach this point so that he could make his objection. Al-Hamdi interpreted "water harvesting schemes" in this statement to include the construction of dams; he reminded us of the national water law (passed in 2002) and what it says about investments in dams as opposed to water conservation schemes. As he was talking, he showed with one hand how investment in dams was supposed to decline over time and with the other how water conservation was supposed to increase. The director tried to interrupt al-Hamdi but the latter shouted him down, the former alternately looking "put upon" or "peeved." He kept asking al-Hamdi, "when will you allow me to answer, when will you allow me to answer?"

One of the director's cronies at the MAI came to his rescue by asking that the data in section 2, page 6 of the document be considered. In line 2.1, "New Dams," he pointed out that construction had decreased annually from 58 in 2006, with a much lower target of 18 in 2007. In 2.2 one could see that "rehabilitation of existing dams" was 0 for 2006 and 2007. At the same time, the number of Water User Groups, local water associations which are supposed to manage water use locally, with technical assistance from the government (in accordance with decentralization laws in effect since 2001 and with local

stakeholder participation called for in IWRM), had increased dramatically, as had the number of beneficiaries from irrigation techniques. Together, these data suggested that MAI was in compliance with the water law, or so the director and his supporters argued. But there is also ambiguous evidence on p. 5/6 of the document that talks about spate irrigation and water harvesting “schemes” and their beneficiaries being very much on the increase. What does “schemes” mean, and does it include dams or not? In any case, al-Hamdi backed off from pressing for clarification, but it was not clear he was convinced; instead, he let the director finish his presentation without further interruption. It took a monumental effort on my part (and probably also on the part of this paper’s readers) to pay attention to these numbers and the discussions about them, but the point is that political struggles over knowledge (pace information) often takes the form of a struggle over numbers and their interpretation. What seem like tempests in a teapot are actually about large amounts of resources, about who “manages” them and about how that management is to be carried out and in whose interest.

When I later had occasion to engage al-Hamdi in conversation, I said, “It’s an old argument, isn’t it?” referring to his spat with the irrigation director over dam construction. “Yes, it is,” he answered, “and it’s not clear we are winning the argument. The agricultural lobby is powerful in this country.” The MAI, which had for years acted like an independent agency, was being pulled into the orbit of IWRM but resisted its gravitational force in every way it could. What interested me was how auditing information was manipulated to make it appear as though MAI were in compliance with NWSSIP, and thereby to allow for the release of funds that could simultaneously be used for purposes directly contrary to the spirit of IWRM.

The problem with water management in Yemen, as IWRM sees it, is not only one of monitoring the water sector, it is also, according to the Dutch, about retraining civil engineers (which are in the majority in NWRA and the MAI) to become “social engineers,” as al-Hamdi was to put it to me. This is in keeping with a IWRM perspective, where the rational/instrumental and the social/cultural/political have to be integrated. All very good, but the “social” and the “political” get invoked without unpacking what these might mean or who has the “authority” to define them. In much of the discussion about “embedding” the technocratic within the “social,” it seemed as though the latter was collapsed into a “system concept” that is derived from engineering (or cybernetics), thereby reducing the social to the informational systematic.

Al-Hamdi was about forty-one years old, with clipped brown hair and cropped beard, neither of which showed much, if any, gray. His face lit up with warm eyes and a broad dimpled smile. His aggressive, outspoken intervention at the JARII session belied a usually soft-spoken and gentle demeanor. With a BA from Georgetown University in Washington, D.C., he also spoke impeccable English but more important than his fluency was the thoughtfulness of his responses and the astuteness of his analysis. There was no question he was a highly intelligent and insightful person

While still an undergraduate at Georgetown University, he came under the spell of a terrific teacher, J. C. Lamb (an environmental engineer) who taught a class mainly for non-Americans on scientific issues, and Muhammad became hooked. He majored in civil engineering and after graduation returned to Yemen in 1989 and joined GARW (the rural water authority), with the intention of working on a water project, when questions

were raised about his plan by “the authorities” who wondered what a former President’s son was doing going to the rural hinterlands. It was put to him that he might consider technical training at Sana’a University, so in 1990 he was admitted into the Faculty of Engineering where for two years he worked on water projects.

In 1993, he received a scholarship to study “Sanitary Engineering” in Delft, Netherlands. He referred to it as a “sandwich program,” which he explained meant that his studies had to be relevant to Yemen. Thus, for his MSc, he did a longitudinal field study of groundwater contamination in a large number of wells located in the Sana’a Basin (see Chapter 3 of his book, Competition for Scarce Groundwater in the Sana’a Plain, Yemen). He followed this up with some computer modeling, but insisted that it was the field study that was more important.

What he discovered was that water depletion not contamination was the main problem in the Sana’a Basin. Depletion had been studied before in the Basin but the approach had been positivistic and too narrow. Exact rates of depletion were not in themselves very useful, he remarked, other than to demonstrate that it was occurring and at what rates. I understood his criticism to mean that the explanations for this depletion were often lacking in these studies, that scientists couldn’t see “the big picture” or the system of relations among a number of factors, natural (drought), economic (qat), legal (water rights and conflict resolution), and so forth, that were behind the problem. Here again, one sees a loose concept of integration that informs knowledge about water. He said that the background of most people who are in charge of water management in Yemen today is narrowly technical, due to their training in civil engineering, as a result of which they can’t see the forest before the trees. “The challenge,” he remarked, “is to

convert civil engineers into ‘social engineers’” and he clarified that they must look at technical issues in light of the community’s needs. This picture is what came to be known in his Ph D program as “integrated water management,” and it was reflected in his PhD proposal.

It came out later in the interview that Muhammad’s training was part of a long range plan, consisting of three phases, by which the Dutch hoped to change water-use in Yemen. I can’t remember whether he said he was part of phase one or two, but he did say that the establishment of the Water and Environment Center (WEC) at Sana’a University was phase three. A link seems to have been forged over a decade and a half ago in Holland between an inter-disciplinary scientific training of students on the one hand, and problems of water management in Yemen on the other (hence, it was fully expected that the scientist would become the enlightened bureaucrat); but the site for this training had shifted from Delft and Wageningen University (the two major water engineering programs in the Netherlands) to WEC (a local Yemeni institution).

I asked al-Hamdi if he could recall in his research when he realized that a “big picture” was needed. He said it came to him as he developed his methodology. He realized he needed new tools and had to learn how to use them himself. (He was proud of the fact that he collected his own data rather than farming this task out to a field assistant). In the process of testing the questions, he knew how they had to be adapted. He saw that questions had to be tailored to the farmers he was interviewing (this, of course, is old hat in survey methodology) and that he had to conduct the survey at a precise time of day, between 2-3:30: anytime earlier they weren’t in their fields; anytime

later, they were chewing qat. This was the time when he could acquire local knowledge about water problems in agriculture.

The conversation returned to the problem of water managers in Yemen. Their training is too narrow and technical, because it does not incorporate the social variables that are part of water management. Al-Hamdi was quite passionate about this point. This shortcoming is particularly true of managers in the Ministry of Water and Irrigation but is also apparent in his own ministry. Only the former Minister, Muhammad Lotf al-Iriyani, shared al-Hamdi's views, as well as his replacement, Abdul Rahman al-Iriyani, who was a "social mediator" in the World Bank (doing assessment of social impacts of various projects) and would understand where the two were coming from. Notwithstanding this shortcoming, al-Hamdi admitted that things were changing, due largely to external (foreign) pressures from donor agencies like the World Bank (community participation in water projects through local water associations), the Dutch, and the Germans. These donors were increasingly insistent that water management attend to social variables, and Yemenis are thus pushed into this kind of thinking even though it may not be from their own conviction. The two things being the case – that most bureaucrats/scientists managing water in Yemen don't have the "big picture" outlook, especially as concerns social contexts in which water projects have to operate, and that donor agencies are increasingly stressing this approach – what, then, could be done, I asked, to convert civil engineers into "social engineer"? The answer, al-Hamdi thought, might lie in the Dutch initiative (Wageningen University) to establish a Water and Environment Center at Sana'a University that could help retrain them. Employees of MWE would take classes there and familiarize themselves with the new IWRM approach.

The Water and Environment Center (WEC) is a semi-independent, fully functioning institution within Sana'a University. WEC is training people in different sectors of Yemeni society, particularly water managers in the Yemeni government, be they in the Ministry of Water and Environment, the Ministry of Agriculture and Irrigation, or a number of other important and powerful institutions. I have been doing fieldwork in all of these sites to see how knowledge of water is produced and exchanged. I have not had the chance to do fieldwork in the Netherlands where arguably our story has one of its most important beginnings.

I began my fieldwork by interviewing some of the people at WEC, Yemeni and non-Yemeni. The aim of the interviews was to find answers to the following questions. What is the history of this institution (how did it get started and why)? Who was involved in it and what was their academic/scientific vision? What is WEC's mission? In general, my aim was to understand what WEC thinks it is up to, and how it produces knowledge about water and environment in Yemen. Interviews were not the only fieldwork I did in this site. Another was to attend classes to see how the exchange of knowledge about water issues works, not only from professor to student but from professor (Dutch) to professor (Yemeni). In the future, I hope to teach a course on the anthropology of water at WEC and become part of this knowledge community. Attending public lectures sponsored by WEC was something else I did. Because it is a new institution, WEC distributes promotional literature about itself. Of course, all institutions, young or old, do so and these days more often through a web site. Through this literature I got at local self-understandings of the institution's goals and initiatives. For example, WEC's curriculum

was designed by Wageningen University, Netherlands, whose brochure, “Making Water Work,” was on prominent display at WEC. It describes WU’s MSc Program, “International Land and Water Management,” describing its “integrated management of water resources” as being highly inter-disciplinary, involving not only water engineering but also economics, politics, social issues, and so forth

WEC’s history is complex and after a month of research, I still wasn’t sure I fully understood it. In 1989, the Dutch created a graduate course on water which eventually led to an MSc in Water and Environmental Engineering in the Faculty of Engineering at Sana’a University. The problem was that the Faculty of Engineering did not focus on water, and the question arose whether a more suitable home in the university could be found for this MSc Program. In the 1990’s, as an awareness campaign about water problems in Yemen grew inside the university and the nation, one of the areas of research being pushed was the environment. A University Environmental Council was formed and discussions took place on it about the need to set up a Water and Environment Center like one in ‘Ammān, Jordan. In 1999, WEC was formally established. In 2000, Professor Babaqi was appointed director of WEC by the university regent, but it needed infusion of money and so a proposal was developed for institution building that was submitted to NUFFIC (the Dutch Government Development Agency) that Wageningen University eventually got. That, in brief, is the history of the institution, as far as I understand it, though I am sure more relevant details could be added.

The issue I want to focus on here are the political problems of the scientific production and exchange of knowledge about water resources management in such an academic institution. Sana’a University was established in the early 1970’s on the model

of Egyptian Universities. At that time, Egypt was exporting many of its university graduates as well as its university administrators to all parts of the Arab world, helping countries in the region establish their institutions of higher learning. I have heard criticisms of this “Egyptian” model -- that it is “rigid” and “traditional” and actively “discourages” inter-disciplinary work – and I have heard from several leading university educators that that system has to be changed (and is, in fact, being changed as we speak). For WEC and its teaching of integrated management of water resources, this educational tradition within Sana’a University posed a political challenge. In a sense, WEC had to go against a certain local “culture” (for lack of a better term) in the university in order to become more inter-disciplinary in teaching and research. That is the challenge of production of scientific knowledge within WEC: how to create an inter-disciplinary program on water resources management that would include not only water engineers but also economists, political scientists, sociologists, and so forth, and to hold a meaningful conversation between them. Since most faculty have been trained in the Egyptian method, they are unsuitable partners in WEC’s interdisciplinary enterprise, and as a result feel excluded from something “cutting edge.” WEC’s other challenge, equally political, has to do with the global exchange of scientific knowledge; in this instance, an exchange of knowledge between Dutch experts on the one hand and Yemeni experts on the other. This challenge is even greater than the first, the creation of an inter-disciplinary program that will not alienate faculty and turn them into opponents. How will WEC sustain this exchange once Dutch experts end their direct participation in the program as is planned by 2009? The production of scientific knowledge about water resources is, as we know, a global enterprise and constantly changing -- and it is not equal. Some countries have

more power in this production and exchange and greater access than others. Yemeni experts will have to read the leading journals, attend international conferences, and contribute research of their own, if they are to participate in and keep up with these global changes and pass them on to their students. How will this be done? Will a donor step forward to provide funding for Yemeni experts to participate in this global exchange of knowledge?

One of the key individuals in Yemen who is a node, so to speak, in this transnational knowledge network is Richard Soppe, a young Dutchman. In high school he developed an interest in plants and biology and decided to go to Wageningen Agricultural University (now WU), going for the BS/MSc program which took six years. There were three fields – forestry, tropical agriculture, and soil erosion control and irrigation – in which he could major, and he chose tropical agriculture, largely because it allowed him the greatest curricular flexibility and range (with the least number of requirements it allowed him to take courses in other fields outside the program such as mathematics, physics, chemistry, irrigation engineering and forest management).

Soppe explained that the program in tropical agriculture arose out of the colonial experience in Indonesia and Surinam. He liked it because it combined the three things he was most interested in: intellectual rigor, “adventure” (through travel, which was incorporated into the program), and the doing of “good deeds” (by helping to improve people’s lives). For his BSc, he traveled to Argentina where he did research for eight months on irrigation. He also traveled to Morocco and Algeria, crossed the Sahara and continued to Burkino Fasso and Ghana (in both places looking at irrigation projects). For

his MSc he did fieldwork in Nepal (a more difficult place to work in because he didn't know the local language and had to work through interpreters). The Nepalese state had centralized management of the reservoir and the main canals but was in the process of turning over the field canals to local people, and Richard wanted to study the transfer. He found out that the process took place at a high level of management sophistication, but that it was monopolized by the wealthier farmers who saw this as a chance to gain greater control over the irrigation system at the local level; thus, the process turned out to be highly inequitable. This made him realize in very concrete terms how important equity is to water management (a theme that WEC stresses).

After his MSc, Richard managed to get a job in Fresno, California, working for three years in the water research lab of the Agricultural Research Service of the USDA. He concentrated on irrigation and drainage problems, especially connected to high concentrations of Selenium (Se) in water which could become toxic. He liked the combination of work involved; technical lab work (for example, physics of water) with field research (to see how plants can grow even in saline soils). The USFA offered to sponsor him for a PhD which he proceeded to get at UC/Davis (Department of Land, Air and Water Resources). He focused his research on a topic he'd already been working on at the USDA, the potential for crop cultivation in saline ground water, but combined it with a theme that had preoccupied him since his undergraduate days, the avoidance of drainage water loss. He completed his PhD in 2000 and went back to work with the USDA for another three years, but after nine and a half years in California, he decided he had to leave and return to Holland.

He got a job at Wageningen University, International Institute of Land Reclamation and Improvement [IILRI] (with a focus on drainage and salinity). At first Richard was quite enthusiastic about this institute, largely because ten years earlier, when he was an undergraduate at WU, it had been a dynamic and interesting place, but by the time he joined the faculty, many of the people who had made it lively had retired or left, and he found it a far less compelling place. A deeper malaise set in for him, however, which had to do with the Dutch academic system. There were three major problems with it. One was “more talking than doing” (just the opposite of the American system or so he had found). The second had to do with a bean-counting mentality of the Dutch academic bureaucracy. As he put it, “work was categorized and as long as one did it according to the book, no one really cared whether the research was top notch or original. If you were expected to devote, say, 71.8% of your time to research, then as long as you could prove that you’d done that, no one asked whether the research was any good. You had fulfilled your job contract.” The third drawback was that the research was heavily policy-oriented, and problems that were interesting but would not necessarily have clear practical implications would be side-lined.

Richard decided to quit and enter the private sector. In December 2004 he got a job with Water Watch, a small Dutch company. He’s been there ever since, using remote heat sensing techniques to analyze water consumption (in the Hai Hi plane in China and, I believe, somewhere in Germany). Ironically, he’s found the private sector far more congenial for research because of its creative and intellectually curious atmosphere.

I asked Richard why Wageningen University and the Dutch in particular been inter-disciplinary in their approach to water management? Was this unusual or unique?

Richard pointed out that in the water sector, it's difficult not to be interdisciplinary. He explained that "If you talk to a farmer just about water, you won't get very far because he'll talk about soil, plant cultivation, climate, and so forth. The same thing for any other water sector in society; it is connected to other things that also have to be understood if one is to understand water." (Here we see stated, by a farmer, the idea of water as a total social fact.) This argument, that water is an inherently interdisciplinary subject, I pointed out does not insure an inter-disciplinary approach; after all, the Department of Agriculture and water lab Richard worked in wasn't organized in that way. (Indeed, in an earlier conversation with Babaqi, the director of WEC, Richard had remarked, "The criticism often made about inter-disciplinarity is that one knows something about everything but not enough about one thing. But the question to ask is, 'Why should we be disciplinary in the first place? That is, we should ask what the principle project is in which we are engaged and then ask which disciplines might be drawn together to work on it. This requires collaboration and dialogue.'")

So then why did WU become inter-disciplinary in its approach, I asked? Richard referred back to his WU undergraduate days in tropical agriculture. This was the seventies and eighties when there was a move generally for academic subjects to be handled in inter-disciplinary ways. In the late 1980's there was a turn to "soft engineering" which asked how "people" could be put into the engineering "equation." [I got a rather simple-minded arithmetic equation that goes like this: $\text{technology} + \text{people} = \text{successful irrigation}$.) Of course, there are several things to ask about this equation said Richard: why are the two items, technology and people, thought of as separate to begin with and then combined, when, in fact, they may already be combined

in complex and subtle ways at the start? For example, even western technology depends on the kind of westerners who adopt or apply them and they are already “people” in ways that are unanalyzed. It’s as if westerners, because they are scientists or technicians are not people and therefore need not be part of the equation. People in the equation implicitly means the consumers of water who already have their own technologies, many of them local and ancient, that need to be looked at as well.

In any case, Norman Long, a British sociologist, who taught at WU, looked at stake-holder participation in development projects and kept teaching his students to consider this factor in their engineering projects. He apparently was a very dynamic and effective teacher, and his students were influenced by his views. After they graduated and came back to WU to teach, they brought this integrated management view into their curriculum. The other person Soppe singled out was Linden Vincent, Professor of Irrigation and Water Engineering. She had worked at the Overseas Development Institute (England) before being appointed chair of IWE, and she pushed for a more inter-disciplinary curriculum, partly because this reflected changes ongoing in the development field. Outside the university system, the Dutch government pushed international development cooperation, and therefore absorbed this inter-disciplinary approach coming out of the development field.

One of the more interesting cultural observations to emerge in my conversation with Richard was the long historical interest the Dutch have had in water management (though the problem has been too much water in a country, much of whose land mass is below sea level, causes flooding and drainage problems). That’s one reason certain cultural stereotypes emerge that have become tourist art: dykes, windmills, pumps, as

well as beautiful old houses to be found along urban canals. These stand for traditional “Dutch culture”, but they also, in one way or another, stand for its “age-old, heroic, ingenious and tenacious” battle with water inside the country. In other words, one could argue that the Dutch have long been pre-occupied with water-management as far back as the middle ages and their interest in it now reflects that history.

But Richard admitted that the story might be more complex. In the 1970’s, the Dutch government apparently realized that it could not compete in the world market through either agriculture, manufacturing or shipping (though this had once been one of its great strengths), and that to remain a player in the world market it would have to become a producer and exporter of knowledge. With its expertise in water management, this became a knowledge that was readily marketable, especially to the third world where it could help “poverty alleviation.” NUFFIC (Netherlands Organization for International Cooperation in Higher Education) was established as a government agency to promote knowledge “exchange,” especially to under-developed countries, employing both its university system and its private sector (such as water companies).

As the above remarks on the Dutch government strategy indicate, the exchange or transfer of knowledge is as important as the production of it. This was an important insight for me (though obvious perhaps after a little thought). I’d been thinking of the problem of research as one of knowledge production, and not considering the question of market exchange (or circulation). The Dutch produce or somehow obtain knowledge on water management and then sell it to agencies that then hand it over in the form of development aid to poor countries.

I queried Richard about this notion of exchange. Is it really an exchange or merely export? And how “equal” is the exchange? As for the first question, Richard explained that the Dutch learn a lot about water problems in arid countries which they then apply to other similar regions in the world. For example, he claims they have learned a lot about Yemeni rain-water harvesting which then is applied to water management in China’s Hai Hi Basin (where Peking is located). How is this knowledge learned? I asked. Richard explained that it was not based on research per se but learned “tacitly,” a synthesis of knowledge gained by working as a water expert in different places which is not really marked as knowledge per se (in the textbook sense) but is nevertheless important. He pointed to his own background as an example. He had worked in California, the Netherlands, Argentina, parts of Africa, Yemen and China. Connections are made among all these field experiences and then applied.

This brought to mind the second question: how equal is this exchange of knowledge. Richard had a chance to work in various countries of the world, not so Yemeni water scientists. He disagreed with my basic assumption. Yemenis like Babaqi have, in fact, worked in other countries (Babaqi has apparently worked in Egypt, for example), but Richard admitted that his experience was limited to the Middle East and that Babaqi was unusual among Yemenis in the range of his travel. His “tacit” synthesis of practical or applied knowledge would be limited because his mobility as a scientist is limited. There are hierarchies of itineraries just as there are hierarchies of knowledge exchange.

Another example of an individual who is a critical node in a knowledge network is my friend, Gerhard Lichtenthäler, though his background knowledge and knowledge project is quite different from Soppe's. He has his PhD degree in geography from SOAS and published his dissertation on the political economy of water in the far north of the country (Sa'adah Basin). It was primarily a qualitative study, based on several years of intensive fieldwork, and of all the development experts I met in Yemen, Gerhard understood anthropology the best, especially its long-term study of particular sites.

After completing his dissertation, he got a job with GTZ, a technical corporation that is part of the German government for international development corporation (in contrast to the KfW which is a German bank for reconstruction). The GTZ in Yemen is divided into two primary areas, the most important of which is the water sector, which is actually called "the integrated water sector." Gerhard works in this division, and is in charge of the 'Amran Basin, a severely water-stressed region to the north of the capital.

There is a distinct difference in the way the Dutch and the Germans conceive of their interventions in a developing country like Yemen. The GTZ acts more like a conventional development organization in that it gets involved in concrete, on-the-ground projects such as water conservation schemes or institutional "capacity building" whereas the Dutch believe that local institutions have developed to the point where they need money and advice to do their own projects rather than rely on foreign institutions to do them.

Gerhard is responsible for working with NWRA to build local water user groups (officially called Water Basin Committees) in 'Amran and through them to enhance awareness of water problems in the area (and Yemen more generally) and improve

management of local water resources. These local associations are mandated by the Yemen decentralization. Management used to be done primarily at the ministerial and national levels (such as the Ministry of Water and Environment) but has now devolved to the governorate level and particularly the local council majlis-al-maHalli.

Decentralization is supposed to involve and encourage grass roots participation in the efficient, equitable, and enlightened use of water resources by local “stake holders” al-mushārikīn, on the presumption that they know better than government bureaucrats or outside experts what they need, thinking that is in alignment with received wisdom in development discourse about community-based participation. The role of the ministries, scientific experts, and donors is to provide scientific information as well as financial aid. But the question remains: how does one create this grass-roots participation in the first place? This is one important aspect of Gerhard’s work.

Gerhard presented me with a diagram (see insert) that demonstrated his thinking on this issue. It’s entitled “An outline of the integrated stages for the administration of water resources and the role of those in charge (of them) in the ‘Amran Basin.” IWRM is supposed to guide his thinking throughout. He had played around with the visual representation for some time and in the end decided upon an image of concentric circles that looks a like a target. The bull’s-eye is “Useful lessons for the ‘Amran Basin Committee.” To get to these lessons, one works from the outer circle inward. Each circle is composed of links, one dependent on what is before it and influencing the link that comes after, thus illustrating the integrated or interconnected stages of the work. He stressed that the lines between these links are not meant to represent a strict separation (which is why, perhaps, they are dotted or discontinuous). But, given that it is a circle,

where does one begin? Gerhard began with the link labeled al-ta^ʿarruf^ʿan ‘knowledge about,’ though it was unclear whether this starting point was arbitrary or not (I think it is not, because this term is located at the top of the circle, giving it visual priority). This key term is highlighted in black. On either side of it are terms in gray, one of which, al-milkiyyah ‘ownership,’ has an arrow underneath pointing to ‘knowledge about,’ the other of which is al-mushārikah ‘partnership’ (or co-participation) and has an arrow leading away from ‘knowledge about’ to the next term highlighted in black, ar-raghbah fi(h) ‘the desire to know.’ He explained:

We’re always talking (in development discourse) about awareness on the part of those affected by a problem, which is fundamental to any effort to clear it up, but someone has to take ownership of the problem, first, and it is their awareness of the problem we need to work on. At the same time, there has to be an understanding that solving the problem requires co-participation (and collaboration) as well as a desire to do something about it. (Paraphrase, not exact quote)

If the desire is there, along with a basic awareness of the problem and what to do about it, then the practical stage begins, at-taTbīq, followed in sequence by ‘imtilak al-wasīlah ‘ownership of the means (of solving the problem)’ and at-tashghīl ‘implementation.’ The idea is then cycled (naq al-fikrah) to ‘sound administration’ (al-idārah as-salīmah), the precise status of which in the diagram is unclear to me. Is it an idea to be discussed? Is it more simply a portal through which to enter into the next inner circle of the diagram? Seemingly as an afterthought, he had added a cartouche, highlighted in orange with maslaha khassa ‘private or individual authority’ written inside, on the lower right-hand side of the outer circle, as if to suggest the individual level at which the above-mentioned processes are taking place. On the lower left-hand side is a similar cartouche with maslaha ‘amma ‘public authority,’ to indicate a supra-individual or collective level on which the stages unfold. Thus, a distinction is created between the individual and the

collective, the private and the public, whose status seems to be analytical or theoretical rather than cultural.

In the first inner circle, he started with khiTTah al-idārah ‘the administrative plan.’ Before it is al-murāqibah ‘supervision’ of the plan and following it is as-siyāsah ‘politics,’ and they are obviously not only closely linked to each other but also to the administrative plan. Presumably, this takes place on the public or collective authority side of the diagram. But then, there has to be at-taw^ḥīyyah ‘consciousness raising’ which depends in turn on al-iTTiSāl ‘communication’ and ath-thiqqah ‘trust.’ A propos of the latter, one official remarked upon hearing Gerhard talk about his diagram, “Yes, how does one build trust? That seems to be the hardest thing.” Trust, however, is in turn dependent upon as-shafāfiyyah ‘transparency’ (a key word in the discourse on ‘accountability’). That leads to the next key terms, al-kafā’ah or efficiency, and ‘idārat aT-Talab ‘the administration of requests’ (presumably from the majlis al-maHalli). (It’s not clear to me how ‘transparency’ is connected with efficiency so much as it is with questions of equity and non-corruption). From the portal “administration of requests” we enter the third inner circle which seems to be comprised solely of institutions or bureaucratic structures, not activities or processes. There is the jama^ḥat idārat al-miyāh ‘water administration committee,’ ranged on the side of the super-ordinate authority and the jami^ḥah mustakhdamī al-miyāh ‘the association of water users,’ ranged on the side of the individual or community level. Above them both is the majlis al-maHalli or local council, the most important political body. It is to its committee or lajnah that studies about the implementation of water projects will have to be submitted and approved.

Bull’s-eye!

Gerhard's diagram brings together a number of key ideas in IWRM and does so in visually logical and compelling manner. It also compresses an enormous amount of information in its synoptic form. (I had an earlier indication of Gerhard's visual acuity when we passed a roundabout in Sana'a, which is infamous for its bottlenecks at certain times of the day. He had always wanted to photograph it when the traffic was light, such as at this time, and then when it was heavy, and to show the two photographs to water users in Sa^odah and ^oAmran to visualize what happens when water resources are mismanaged.) But I also have questions about the diagram which are related to the epistemological status of some of the key terms and why they are in the diagram. For example, is 'trust' an analytical term here or a cultural one (or both)? If the latter (which it surely is), then it requires ethnographic analysis beforehand. Or consider the term 'transparency,' which, though it has an Arabic translation and is ranged on the side of individual, I doubt that it is on the lips of common water users (and thus has probably little cultural salience or circulation). Rather it is a term that comes out of a certain kind of discourse that is lately being pushed by various global institutions concerned with corruption and accountability. And the two cartouches construct a distinction between two levels of implementation – the individual and grassroots level versus the more general (i.e., super-ordinate) – that makes a certain intuitive sense. But it also has the potential of creating analytical problems. For instance, Gerhard talked about "individuals" taking "ownership" of problems and having the "desire" to change them: an anthropologist like myself asks, "Who is this 'individual'? Why does he seem to act in his 'self-interest'?" The answer to the first question is not denotational (i.e., pointing to or identifying people referred to as individuals) but one of cultural meaning. In other words,

what is meant by the ‘person’ or the ‘subject,’ such that we can talk about him/her having ‘awareness,’ ‘trust,’ and ‘desires’? Finally, there is the term ‘ownership.’ Like ‘transparency,’ this term is also part of a certain developmental discourse, but unlike the former, it has very powerful local cultural resonances like the term ‘trust.’

In his work, Gerhard has to “diagram” knowledge about IWRM and translate this to members of local basin committees. The end result will not come about by rational understanding of the concept or a rational application of it. For Gerhard as it is for other specialists, it is one of “building trust” so that local communities will work with specialists in GTZ and NWRA. Neither he nor they are the jet-setting networkers such as the ones we saw at the beginning of this paper or the theoreticians at Wageningen University who, along with their Yemeni counterparts, teach IWRM to Yemeni engineers at WEC. They are what we might call “mid level” experts who acquire a great deal of knowledge while working on particular, concrete projects. Much of this knowledge remains tacit as Richard Soppe described it. Yet, it is these knowledge experts who have to work in complex local political contexts to realize their objectives of IWRM.

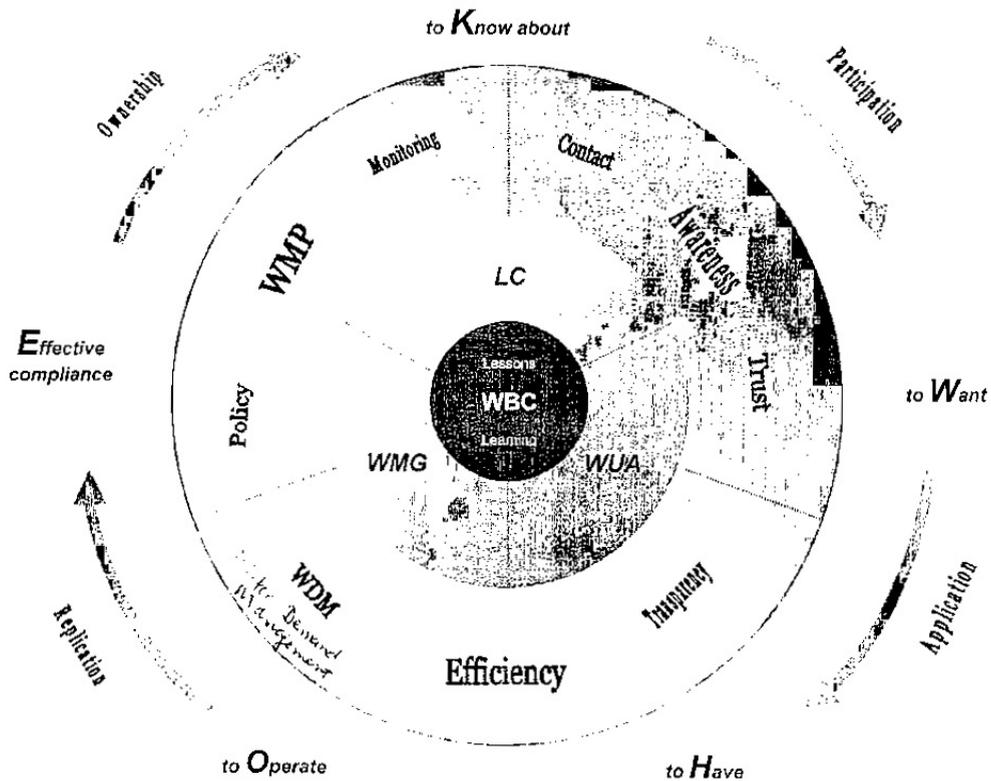
What I like most about Gerhard is that he is always moving back and forth between an “outsider’s knowledge” (such as the discourses of development, geography, and so forth) and a local cultural knowledge of water use and management, between one kind of scientific practice (theoretical) and another that might be called applied. The diagram reflects this intermingling. Gerhard went back forth between his Yemeni colleagues in NWRA and farmers in the water basin to see whether he could come up with a translation of IWRM that would make sense and be applicable. He is not the sort of consultant who flies into a country, networks with other consultants, gleans some

knowledge of the water situation from them, and then plagiarizes this knowledge by writing it up in his own reports. Gerhard has lived in Yemen for many years, does fieldwork collaboratively with other Yemenis, and deeply respects his Yemeni counterparts and local consumers/managers on the ground. After all, they are the ones whose practices he is trying to “reform.”

I wish I could say more about the local water users themselves and their knowledge and the tensions that ensue between different objectifications of knowledge, but I have yet to do this is fieldwork. Instead let me try to recapitulate what I have been arguing. Water, as a material substance and a total social fact, in a way both demands bureaucratic management in the rationalized modern world but for that very reason makes water’s control exponentially more difficult. The peculiar challenges of its bureaucratic management (the fact that it is everywhere and dispersed through a heterogeneous social, political and economic space) exacerbates the kinds of political tensions that one might find in any bureaucratic system (turf warfare, opposition that is often disguised as a problem of “coordination,” and so forth). This modern bureaucratic approach, as nightmarish as it becomes, nevertheless lends itself to looking at water as a “management” problem, and not only that, but a problem of “integrating” sectors through which water flows that have been managed separately. “Integration,” of course, like coordination obscures the real political struggles that go on between competing interests groups, among them different bureaucratic entities. Management, in turn, seems to underline the importance of looking at knowledge about water, the experts who produce it, and the exchanges among them that are or are not possible. Fundamentally, what is being integrated in this view is nature (understood as the watershed, the producer or the

determiner of non-natural units dependent on it) and society, understood essentially as a kind of cybernetic system. The political is hardly ever addressed and is actually obscured but can be teased out in myriad ways ranging from hierarchies of exchange and hierarchies of itineraries, though in Yemen not in terms of social movements nor of the state extending its power to the local level (which it never did in any case). It is, however, an interesting question whether “de-centralization” intended for bureaucratic and democratic reform might offer the state in Yemen the opportunity it always seemed to miss: working in collaboration with the international order of aid agencies and knowledge experts to create governance structures in which its power might be felt for the first and only real time. We will have to wait and see.

Phases of Integrated Water Resources Management and the Role of Local Actors in Amran Basin



Abbreviations

- LC Local Council
- WBC Water Basin Committee
- WDM Water Demand Management
- WMP Water Management Plan
- WUA Water User Association
- WMA Water Management Association