

Corruption risks and governance challenges in the irrigation sector

What are priorities for water integrity

WIN Thematic Paper



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The Water Integrity Network (WIN)

The Water Integrity Network, formed in 2006, aims to fight corruption in the water sector. It stimulates anti-corruption activities in the water sector locally, nationally and globally. It promotes solutions-oriented action and coalition-building between civil society, the private and public sectors, media and governments.

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Irrigation water supply can significantly improve the lives of poor households in developing countries. However, the reliable supply of irrigation is often hindered by corrupt practices at different levels of the irrigation sector. The main corruption risks identified in this study result from poor irrigation governance. Canal irrigation, tubewell irrigation and wastewater irrigation are identified as three types of irrigation systems with specific governance and corruption risks. In public canal irrigation, the largest risk is related to capital intensive investments, and operation and maintenance by irrigation officials. In tubewell irrigation, corruption risks are mainly related to the regulation of groundwater overdraft. Wastewater irrigation is an informal practice with few corruption risks. However, the lack of formal governance increases health risks related to wastewater use. As formalisation of the sector is on its way, vigilance is required to prevent corruption in the future. The identified corruption risks can be addressed by taking case-specific action to increase transparency, accountability and participation at different levels of the irrigation sector.

INTRODUCTION

During recent decades, the increasing scarcity of our world's water resources has been picked up as a key challenge by decision makers and scientists. As the effects of climate change emerge and the world population continues to grow, a global water crisis is looming. In this light, good water governance will be of key importance to safeguard our scarce water resources. At the same time, water scarcity and growing competition over the resource increase the value of water, which creates conflicts of interest and raises people's willingness to engage in corrupt practices. Corruption is identified as one of the largest challenges to achieving good governance and guaranteeing a safe and reliable water supply to cities, industries and agriculture (Transparency International, 2008). Tackling corruption risks in the water sector is needed to assure responsible and sustainable use of our water resources, now and in the future.

As a vital resource for life, water has a wide range of uses. It is used for drinking and sanitation purposes, industrial processes and agricultural food production. Of all water users, the agricultural sector is by the far the largest, accounting for 70 per cent of the world's total freshwater withdrawal. Water supply for agriculture is essential to maintain world food security, as 40 per cent of our food is produced through irrigated agriculture. Besides being essential for global food production, irrigation water is an important element for securing the livelihoods of rural populations in developing countries.

Although the urban population is growing rapidly, the majority of the world's poor still lives in rural areas. Improved access to water for irrigation is widely seen as a powerful tool to alleviate rural poverty. Access to irrigation water increases direct food supply, crop production and income generation, and reduces vulnerability to droughts caused by seasonal variability or climatic change (Hussain, 2003). While the poor are the people who could possibly benefit most from effective irrigation management, they have also been identified as the ones who suffer most from poor governance and corruption in the water sector (Plummer, 2007). Lacking formal education, and/or being dispelled from political networks, the poor usually do not have the capacity to defend their rights and withstand corrupt practices.

In a broad sense corruption can be understood as 'the misuse of entrusted power for private gain'¹. Under this definition, corruption entails a wide range of practices which take place both within and outside legal frameworks. It is therefore important to understand the nature of corruption and what lies at its core. Among others, a lack of transparency, accountability and participation in decision-making have been identified as key issues that allow corruption to take place. This is not essentially different in the water sector compared to any other sector where corruption occurs. However, to take action against corruption, it is necessary to understand how these three values can be strengthened in a particular context. This context is defined by specific cultural habits, but also by the specific sectoral set-up. A sectoral anti-corruption approach has proven to be an efficient way to open up the debate on sensitive corruption issues, even when the cultural or political context may be at the root of recurrent corrupt practices. The Water Integrity Network (WIN), founded in 2006, is an exemplary initiative which engages in anti-corruption activities from a sectoral angle.

It is not surprising that a sector-specific anti-corruption initiative was born for the water sector. The sector deals with a basic human need and is thus socially and politically sensitive. This, as well as the monopolistic and capital intensive character of water supply services, creates an enabling environment for corruption. As an important sub-sector, the irrigation sector is similarly prone to corruption. The sector's susceptibility to corruption and its potential to improve the livelihood of the poor emphasise the importance of prioritising activities against corruption in the irrigation sector.

Whereas action is needed for more integrity in the irrigation sector, few studies exist which analyse corruption in the sector and identify best practices for more transparency, accountability and participation. The objective of this paper is to identify the main corruption risks and governance challenges in the irrigation sector, particularly those which hinder reliable water access for the poor. Based on the identified risks, recommendations are made for strategies and best practices which prevent corruption and target reliable water supply for the poor.

¹ Definition of corruption by Transparency International

THE IRRIGATION SECTOR

Many developing countries are situated in climatic zones where a lack of rainfall constrains agricultural production. In arid regions, water scarcity constrains production all year round, while in more humid tropical and sub-tropical regions, water scarcity appears only seasonally. Since ancient history, irrigation techniques have helped societies in these regions to increase their food production. Although irrigation is not a new invention, the scale on which it is practised increased immensely during the 20th century. Irrigation was not only seen as a way to secure food production, but also as a driver of economic development. Research shows that increased yields through irrigation can support rural households to generate a surplus income besides crop production for subsistence. For example, a study from India illustrates that increased agricultural production and reduced poverty can to a large extent be explained by the expansion of irrigated areas (Narayanamoorthy, 2003). Another study carried out in Sri Lanka shows that households with access to irrigation water have about 25 per cent more to spend than households without access to irrigation water (Hussain and others, 2003).

With this rationale in mind, states and international donors invested in irrigation technologies, constructing dams, canals and tubewells in developing countries. Through the creation of access to water from rivers, lakes and underground reservoirs, rural economies were supposed to flourish and become the driving force of national economies. In China numerous irrigation systems were built under the famous slogan: 'We will produce much in times of no rain, and have a rich harvest in times of drought!' Despite visionary dreams and promises, the actual effect of irrigation investments on poverty alleviation has not been homogeneous. In the context of the overall reduction in rural poverty, some argue that landowners have benefitted, but the landless have been disadvantaged (Chambers, 1988). Many studies show how the allocation of irrigation water has reproduced existing inequalities, disregarding water use by women and prioritising large-scale farmers or those located upstream².

This paper discusses how mismanagement and corruption are related to the sector's poor performance and the persisting inequalities in rural societies. The irrigation sector is complex and diverse, therefore its governance cannot be captured under one umbrella. Irrigation governance is shaped by many different factors, including the type of irrigation technique, the agricultural system and the socio-political conditions of a country. This paper highlights large-scale canal irrigation, private tubewell irrigation and informal wastewater irrigation as distinct irrigation systems which face particular corruption risks (Table 1). These systems can be typified according to the irrigation technique used, but are more importantly characterised by the institutional setting and mode of governance.

- Canal irrigation means that water is channelled from dammed reservoirs and river diversions through canals over a large stretch of cultivated land. Canal irrigation systems are either large-scale, financed by state or donor money and managed through centralised water bureaucracies, or small-scale, locally developed and managed by farm communities³.
- Tubewell irrigation means that water is pumped up from groundwater reservoirs to irrigate the overlying land. Tubewell irrigation is largely developed by private investment and directly managed by water users.
- Wastewater irrigation is practised in urban areas; the water is tapped directly from city drains and lead onto adjacent plots. Wastewater irrigation is typically an informal practice, initiated and operated by urban dwellers.

Why are these systems highlighted? Firstly, they present the diversity of the irrigation sector. Secondly, they made an important contribution to the world's expansion of irrigated land over the last century. Worldwide an approximate area of 2.6 million km² is irrigated annually. About 40 per cent of this area is supplied with water through state-owned canal irrigation (Vuren and Mastebroek, 2000). A similar area is currently under groundwater irrigation; this area rose from 0.3 million km² in the 1950s to one million km² by 2000 (Shah and others, 2007). Whereas it can be

² See for instance: Boelens and others (1998); Van Koppen and others (2002); Zwarteveen (1994)

assumed that the area under wastewater irrigation in urban areas is significantly lower, it is estimated that about a fifth of the world's food is produced in these areas (Armar-Klemesu, 2000). Moreover, the wastewater irrigation sector is becoming more and more important due to the rapid urbanisation of developing countries.

TABLE 1: IRRIGATION SYSTEMS

	Irrigation technique	Dominant mode of governance
Canal irrigation	Surface water led through canals after capture by dams and river diversion	Public, centrally managed by water bureaucracy
		Public, locally managed by farm communities
Tubewell irrigation	Groundwater pumped up through tubewells	Private, managed by water users
Wastewater irrigation	Wastewater directly abstracted from city drains	Informal, managed by water users

³ Note that this paper focuses on corruption risks in large-scale canal irrigation systems.

CORRUPTION IN THE IRRIGATION SECTOR

In three different sections, this paper will discuss the main corruption risks for the above-mentioned irrigations systems. Risk areas are primarily related to the characteristic institutional setting and mode of governance of each irrigation system. Corruption risks are identified by analysing: 1) different phases of service delivery or project cycles and 2) relationships between actors, and opportunities for them to engage in corrupt practices (based on González de Asís and others, 2009). At the end of each section, the major corruption risks are summarised (Tables 2 and 3).

The little literature available on corruption in the irrigation sector has mainly focused on public canal irrigation⁴. State-owned canal irrigation systems are known to be particularly vulnerable to corruption. Decisions at policymaking level tend to overrate capital intensive solutions, which disadvantage the poor. Moreover, as the construction of irrigation systems is costly and hard to standardise, this easily goes hand in hand with the misallocation of funds and the delivery of sub-standard work. The maintenance and operation of most large-scale irrigation systems are prone to corruption due to the limited participation of water users in decision-making processes.

Due to the private nature of tubewell irrigation, the governance challenges for this sector are substantially different from canal irrigation. In tubewell irrigation, a lack of accountable governance leads to the over-exploitation of groundwater resources, threatening farmers' livelihoods and their environment. This especially works against the poor when rich farmers seize this opportunity to monopolise the resource. Attempts to regulate groundwater use are easily hindered by politicians who prioritise their own short-term interests (such as re-election). Moreover, when regulation measures are implemented, there is still the risk of rules being circumvented through the falsification of documents or the payment of bribes.

Wastewater irrigation is generally an informal sector, and as such suffers from a lack of formal institutions. In this context corruption risks cannot easily be identified. However, the current state of wastewater irrigation as an unauthorised but tolerated practice is not sustainable and threatens

the health of poor urban farmers. In the past, politicians focused on capital intensive solutions, but few investments were made or investments were not beneficial for urban farmers. Recently the political discourse shifted to more hands-on solutions. Wastewater governance for urban agriculture is about to be formalised through new guidelines. As new institutions will be created, fresh risk areas for corruption may appear. Therefore vigilance is needed throughout the formalisation process to prevent corruption in the future.

⁴ This is reflected by the section on 'Water for food' in the Global Corruption Report 2008, which mainly focuses on corruption in canal irrigation systems.

PUBLIC CANAL IRRIGATION

Canal irrigation systems are based on the principle of gravity flow, which automatically transports irrigation water from a surface water body located upstream to farmland located downstream. Despite this basic technical principle, the institutional governance of public irrigation systems varies from country to country. At first glance, water distribution seems to depend on the size of the dam, the shape of the canals and the type of division structures. However, it is the human dimension behind those technologies that makes irrigation systems susceptible to corruption.

Below, the corruption risks of large-scale canal irrigation systems are discussed. The first part depicts the inception phases of the project cycle, where investment decisions are made and the system is designed and constructed. At these phases opportunities for corruption appear mainly among public actors (including donor agencies) and between public and private actors (Table 2). The second part discusses the last stage of the project cycle, where the main activities are operation and maintenance, and the payment of services. Here corruption risks generally arise between public actors and water users (Table 2).

INVESTMENTS IN INFRASTRUCTURE

Costs for large-scale irrigation systems are usually very high: investments may range between tens and hundreds of millions of US dollars. Hence, decisions over irrigation projects involve the interests of many actors. Political decisions often favour large-scale, capital intensive projects, for which large sums of money flow directly into the construction sector (Repetto, 1986). Sometimes the major political decision does not even concern the irrigation system itself, but rather the construction of a large hydropower dam. In that case, the construction of an irrigation system is used as an argument to allow for much higher state investments.

Amita Baviskar, a well-known Indian scholar and social activist, describes the situation in her country as follows: 'The nexus between politicians, project-granting authorities, builders and contractors is an open secret in Indian

public life – everyone knows that powerful private players drive decisions that are meant to represent the public interest' (Baviskar, 2010). Although these decisions may not in themselves be illegal, they can be harmful to the poor. For poor people, large-scale infrastructure often entails uncompensated loss of land, the contribution of free labour and little benefit from improved water access (Africa, 2008). Capital intensive infrastructure also bears a high risk of corruption beyond the decision-making level. During the procurement and construction phases, irrigation projects may face a risk of misallocation of funds or under-performance of construction companies. In numerous cases, states or donors make large investments without ensuring adequate and timely construction. The construction of a 150-million-dollar irrigation system in the Philippines is an example of such a scandalous case (Africa, 2008). The irrigation system was designed in the mid-1990s and was meant to be built parallel to the construction of a large hydropower dam. Whereas the dam arose within five years, the irrigation system was not even completed or functioning after 10 years. Similar misconduct occurs in other countries. It can be assumed that worldwide, hundreds of irrigation projects are delivered with sub-standard quality or remain 'under construction' while costs keep rising.

Some countries try to keep investment costs within reasonable limits by setting legal restrictions, for example, in Peru a maximum of US \$1,500 per hectare is allowed to be invested in irrigation projects (Minag, 2003 in Vos, 2008). However, despite this legal restriction, the investment in numerous projects still rose above this limit. A good tool for avoiding corruption during the procurement phase and preventing the inflation of construction costs is to implement an Integrity Pact. The Integrity Pact is an agreement between all actors involved in the contracting process to avert corruption. An independent monitor oversees the process and ensures that the contract is awarded according to the agreement. This tool was originally developed by Transparency International and has been used in several public procurement processes. Whereas the impact of the Integrity Pact is hard to measure, previous

experiences show that it can prevent conflicts during the procurement process, reduce project implementation costs and assure the accurate fulfilment of contracts. In cooperation with WIN, an Integrity Pact Manual has been developed which is specifically adapted to the water sector (Transparency International, 2010). The manual draws practical examples from two case studies. One of these covers the use of an Integrity Pact during the El Cajon hydropower project in Mexico in 2002. With support from the Mexican chapter of Transparency International, which served as the independent monitor, the contract was assigned and the project was carried out according to schedule.

MANAGEMENT OF THE IRRIGATION SYSTEM

Since the early 20th century, many canal irrigation systems have been built with public money or donor funds. The maintenance and operation of these irrigation systems automatically became a public service. Operation of these state-owned systems is centrally organised through government agencies. Depending on the size of the irrigation system, the area is usually divided over a number of irrigation districts which serve as management units. Each district has an irrigation department responsible for water delivery up to the 'farm level'. Subject to the country, the size of these delivery units can range from 50 to 200ha. In many developing countries, smallholders only own a few hectares of land or even less. Here, water still has to be distributed from plot to plot among groups of farmers.

In such centrally managed irrigation systems, water users have little decision-making power over water distribution. This has been identified as one of the main causes of corruption in large-scale irrigation systems. As early as 1982 a well-known study on corruption in India's canal irrigation described how state officials from the irrigation department abused their power by accepting bribes in the form of money or harvest shares (Wade, 1982). The farmers were largely kept uninformed about water availability in the dry season and relied on the auspices of the system's operators. The author concludes his observations by stating that corruption prevails

due to the large difference in levels of education and status between officials and common farmers. Today and in the past, similar conditions hinder the participation of water users, who do not have any means of keeping irrigation officials accountable for equal water distribution and maintenance activities.

In response to the poor performance of irrigation systems, more than 50 countries went through an institutional reform of irrigation management. Most of those so-called irrigation management transfers took place during the 1990s. Like other institutional reforms in the water sector, irrigation management transfers usually focus on increasing the effectiveness of water services without the explicit formulation of anti-corruption strategies (Harpe and Butterworth, 2009). To overcome the gap between officials and water users, irrigation management was transferred from state agencies to Water Users' Associations (WUAs). Although the participation of water users in management can be a measure to ensure transparent and accountable water distribution, the main objective was to increase farmers' willingness to pay water fees and contribute labour for maintenance activities (Garces and others, 2007).

Worldwide, the process of irrigation management transfers enjoys varying rates of success. Most experiences demonstrate that institutional change is hard to bring about and depends on local actors and the institutional setting. A study on an irrigation system in Peru shows that irrigation management by WUAs increased the efficiency of water distribution and the collection of water fees (Vos, 2008). Yet the elected WUA leaders, who hire irrigation operators, still seek additional payments. Illegal payments represent a value of about 10 per cent compared to the value of the official fee recovery. Whereas this bonus of 10 per cent seems to motivate WUA leaders to provide accurate water delivery (and thereby assure re-election), related illegal water delivery continues to disadvantage poor farmers.

The above example shows how corruption can be 'persistent and manifest itself dynamically' within a corrupted system (Harpe and Butterworth, 2009). Several other studies similarly show

how individual cases of petty corruption (such as accepting a bribe in return for water, or embezzling maintenance funds) are embedded in a corrupt political system. According to the study from India cited above (Wade, 1982), corruption between irrigation officials and waters users is in return driven by the officials' need to bribe higher authorities. Another study on irrigation systems in the Philippines shows how politicians and irrigation officials cooperatively neglected maintenance activities to benefit from subsidies or multi-lateral donor funds which come along with rehabilitation projects (Araral, 2005). These findings show that corruption can have a systemic nature and solutions must thus take into account the cultural and political setting of a country.

TABLE 2: MAIN CORRUPTION RISKS IN PUBLIC CANAL IRRIGATION (BASED ON GONZALEZ DE ASÍS AND OTHERS, 2009)

Principal actors	Risk area	Corruption risks
Public actors (and donors)	<ul style="list-style-type: none"> • Policy making • Regulation • Planning and budgeting • Donor financing 	<ul style="list-style-type: none"> • Distortion in decision making on irrigation projects (bias towards capital intensive projects) • Weak formulation of anti-corruption measures in institutional reform
Public and private actors	<ul style="list-style-type: none"> • Management and project design • Tendering and procurement • Construction 	<ul style="list-style-type: none"> • Distortion in infrastructure design (such as material and site selection) • Inflated estimates of construction costs • Under-performance of construction companies
Public actors and water users	<ul style="list-style-type: none"> • Operation and maintenance • Payment for services 	<ul style="list-style-type: none"> • Poor access to information on water distribution • Bribery to influence water distribution; elite capture • Embezzlement of funds for infrastructure maintenance

PRIVATE TUBEWELL IRRIGATION

Whereas the use of wells to lift groundwater is an ancient practice, for irrigation purposes the technique has only spread rapidly since the innovation of affordable motor pumps in the 1970s. Groundwater irrigation has mainly developed through private investments by individual farmers or groups of farmers. In some countries, the government invested in tubewell drilling, but even here groundwater abstraction and distribution is not widely controlled by the state.

Due to its comparatively low capital costs and flexible water distribution (at least in times of water abundance), tubewell irrigation has initially been more successful in creating rural wealth and lifting inequalities than canal irrigation (Kemper, 2007). Especially in Asia, which has 75 per cent of the global area irrigated by groundwater, easy access to groundwater has enabled many households to increase their income (Shah and others, 2007). Alongside the use of new crop varieties and (subsidised) pesticides, the boost of groundwater irrigation through motor pumps played a major role in increasing crop yields and income.

However, some claim that inequalities in rural societies have been enhanced with the intensification of groundwater use, particularly in South Asia, where the development of groundwater irrigation frequently led to the formation of informal water markets where tubewell owners sell water to other farmers. As long as surplus water is available, each farmer gets his share. But when water starts to become scarce, tubewell owners can easily exclude marginalised farmers or over-price the marketed water (Prakash, 2005). A similar risk is created by the expansion of unreliable rural electricity supplies. In India, electricity for groundwater pumping is usually supplied at a low rate or even free of charge. However, according to experts, a timely and adequate electricity supply is only provided to rich farmers who can afford to pay a bribe. As with many corrupt practices, this proceeding is generally known, but poorly documented⁵.

While the absence of governmental interference in groundwater irrigation enables farmers

to extract the groundwater freely and at low cost, the lack of monitoring and regulation also has its downside. Excessive uncontrolled groundwater use can lead to falling water tables, causing pumping costs to rise and risking land subsidence or salt-water intrusion in coastal areas. In some regions, the over-exploitation of groundwater resources has forced people to abandon their land and look for a livelihood elsewhere. In this light, corruption as such may not be the largest threat, but rather the lack of accountable governance, which endangers people's livelihoods and their environment (Rijsberman, 2008).

Since the 1990s many governments have taken note of the threats posed by groundwater over-exploitation and have started to include groundwater management in national water policies. These have been designed to regulate groundwater abstraction and keep its use sustainable. However, attempts to restrict groundwater use and/or tubewell drilling through permit systems have frequently failed. Failure can often be linked to a lack of political accountability as well as corruption.

Especially at the local level, there is little support to push for groundwater regulation. For example, in India, national policies hardly reach the local level, since local politicians win votes by advocating against groundwater restriction policies and subsidising free electricity instead (Badiani and Jessoe, 2010). Similarly in Mexico, initiatives to restrict groundwater use through consensus by water users have not been widely effective. With no mechanism in place to keep water users accountable, users were not convinced that agreements would be kept by others. As a result, they were little motivated to agree on self-regulation (Wester and others, 2011).

Beyond the phase of decision making, the actual implementation of permit systems has proven problematic due to high immediate costs and a slow rate of return. Permit systems are often implemented when groundwater use has matured and reached the state of over-exploitation. At this stage, the lack of accurate data on the widely extended use of

⁵ The role of corruption only appears marginally in documentation on the groundwater-electricity nexus; however, in the public debate it is recognised as one of the main challenges. Economic Times of India, 2 April 2011: 'Persistent power-supply deficit, high level of losses, theft and corruption, inability of the power sector to fully finance the needed investments, poor quality supply and the budgetary burden imposed by the sector is a formidable list of challenges.'

groundwater by numerous private users makes the implementation procedure susceptible to falsification of documents. In Mexico, water users falsified the registration of primary water rights by over-estimating their water use (Kemper, 2007). A similar case is reported in China, where water users tried to circumvent the forced closure of wells by registering long-abandoned wells as newly closed (Aarnoudse, 2010). Moreover, experts assume that unofficial payments disturb the distribution of groundwater permits. However, little data is available to estimate the actual scale at which this practice takes place.

These findings show that to prevent corruption and maintain equitable groundwater use, permit systems need to go hand in hand with transparent registration and accountable monitoring of tubewell drilling and groundwater use. This can be achieved with the support of technical solutions, as presented by the case of pre-paid meters in Bangladesh (Textbox 1). According to Stålgren (2006), 'standardised information systems reduce the likelihood of individual actors engaging in fraud and embezzlement, since deviations from regular processes can be detected much more easily'. However, technical solutions are never a guarantee for success. A case study from China, where similar pre-paid meters were installed, illustrates that technical solutions fail when no one is interested in keeping the system functioning (Aarnoudse, 2010).

TABLE 3: MAIN CORRUPTION RISKS IN PUBLIC CANAL IRRIGATION (BASED ON GONZALEZ DE ASÍS AND OTHERS, 2009)

Principal actors	Risk area	Corruption risks
Public actors (and donors)	<ul style="list-style-type: none"> • Policy making • Regulation • Planning and budgeting 	<ul style="list-style-type: none"> • Distortion in decision making on groundwater management by local politicians (bias towards short-term benefits)
Public and private actors	<ul style="list-style-type: none"> • Construction 	<ul style="list-style-type: none"> • Drilling of illegal tubewells
Public actors and water users	<ul style="list-style-type: none"> • Payment for services • Implementation of regulation 	<ul style="list-style-type: none"> • Avoiding compliance with regulations on groundwater use • Falsification of documents to conceal tubewell connections • Over-pricing of water by tubewell owners

Box 1: MAIN CORRUPTION RISKS IN PUBLIC CANAL IRRIGATION (BASED ON GONZALEZ DE ASÍS AND OTHERS, 2009)

Until 1985 tubewell irrigation was not common in the Barind region in Bangladesh. Rain-fed rice used to be the main crop in the semi-arid area. In 1985 the local authorities initiated a project to develop the use of groundwater for irrigation. A few years later the Barind Multipurpose Development Authority (BMDA) took over the project. For the project design, earlier experiences with groundwater development in Bangladesh were taken into consideration. Accountable regulation to keep the groundwater abstraction rate below the groundwater recharge capacity was known to be the biggest challenge. In 1992 the BMDA introduced the use of pre-paid meters and smart cards as an innovative way to regulate groundwater pumping in a sustainable and accountable manner.

Pre-paid meters were gradually to be installed on each tubewell drilled by the Barind project. To turn on wells connected to a pre-paid meter, farmers need to keep a smart card against the reader. Each farmer can upload his/her own card at vending machines. The price is calculated per pumping hour and includes the electricity bill, the operator's salary, repair and maintenance costs, and a portion of the initial investment.

At the first stage of the project, groups of farmers could apply to drill a tubewell. The project only accepted applications when the location of the proposed well was at least 2,500 feet away from existing deep tubewells. Part of the drilling cost was paid directly by the farmers (approximately US \$3,000); the rest of the initial investment is recovered through a process of amortisation. Per well the command area is fixed. For wells with a closed pipeline system, the command area cannot be above 40ha. For wells without such a water-saving pipeline system, the command area cannot be above 32ha

At present, about 10,000 tubewells drilled within the scope of the project have been connected to a pre-paid meter. Whereas the well density and the command area per well are limited, there is no maximum limit on the amount of water farmers can pump with their smart card. However, in most cases, farmers' financial capacity restricts water use. Farmers usually have to recharge their card several times during the growing season, as they do not have enough cash available to buy more water than strictly needed per irrigation turn.

The regulatory system of the Barind project is an innovative solution to render groundwater use transparent and regulation accountable. Contrary to other irrigation systems, the water is paid for by volume and payments are made without cash transactions between individuals. The automatic payment at vending machines assures that everyone pays the same price and reduces the risk of unofficial payments. Moreover, the registration of wells and the enforcement of a well spacing limit at the initial stage of the project were facilitated by the under-developed state of groundwater irrigation in Barind. By starting from scratch, fraud during the registration process could largely be avoided.

The groundwater irrigation project in Barind is a good example of a groundwater governance system with reduced corruption risks. However, due to limited control over independent private tubewell drilling, the BMDA cannot completely assure the sustainability of groundwater use in the Barind region.

Source: Contribution of Dr. Asaduz Zaman, WIN member since 2010

INFORMAL WASTEWATER IRRIGATION

More and more urban dwellers are starting to cultivate crops on open spaces in the cities they live in. Urban agriculture is becoming the largest source of vegetable production for most cities in the developing world. In West African cities, 60 to 100 per cent of fresh vegetable consumption is produced within the city boundaries (Drechsel and others, 2006). In some of those cities, urban farmers earn up to US \$300 per month with vegetable production. Most of the urban crops are irrigated with water directly or indirectly extracted from the city's drainage system. This practice is known as 'wastewater irrigation'.

Wastewater usually contains high concentrations of nitrate and phosphate, and can thus be seen as a free fertiliser. Despite this advantage, untreated water is generally of low quality, as it contains high amounts of pathogens⁶. These contaminants regularly cause sicknesses such as skin irritation and diarrhoea. In addition, wastewater is likely to be polluted by chemicals and heavy metals from industries located in and around the city. Depending on the type of

industries, these pollutants can significantly increase the health risk of wastewater use for irrigation⁷.

With the current high rate of urbanisation in the developing world, the practice of wastewater irrigation for urban agriculture becomes more and more important. Although widespread, wastewater irrigation is usually an informal activity. As such, organisations or institutions addressing issues of wastewater use are often found to be completely absent (Robinson and others, 2010). Despite the lack of responsible institutions, most countries where wastewater irrigation is practised have accepted international guidelines for the use of wastewater in agriculture. The early versions of those guidelines focused on water treatment services and high-quality water delivery⁸ (Keraita and others, 2010). This directly connects wastewater irrigation to the urban water supply sector, which is assumed to deliver the required water quality.

Box 2: GHANA – A FORERUNNER IN ADOPTING INFORMAL IRRIGATION PRACTICES IN NATIONAL WATER POLICY

Wastewater irrigation is an important input for food production in Ghana's urban regions. An estimated area of 40,000ha is informally irrigated in and around cities. Wastewater treatment is only marginally developed in Ghana's cities. Less than five per cent of urban wastewater is treated before it ends up in the environment. As such, farmers in urban areas do not have a choice other than to irrigate with untreated water flowing through urban drains. In the past, municipalities have tried to reduce the health risk by banning the use of contaminated water sources. As early as 1972, a bylaw was issued in Accra, the country's capital, which essentially forbade the use of wastewater for irrigation: 'No crops shall be watered or irrigated by the effluent from a drain from any premises or any surface water from a drain which is fed by water from a street drain.' Although this law intended to reduce citizens' health risk, the municipality did not have the capacity to enforce the law or provide the farmers with alternative water resources.

In 2006, Ghana was the first African state to integrate informal irrigation practices in its national irrigation policy. Since then irrigation practices which do not rely on state-owned irrigation infrastructure also fall under the jurisdiction of the Ghana Irrigation Development Authority. In today's national irrigation policy document, Ghana's Ministry of Food and Agriculture is held responsible for the research and development of safer irrigation practices in urban and peri-urban agriculture. The Ghanaian government openly recognises the importance of wastewater irrigation practices and the need for farm-based measures to reduce health risks.

Source: Government of Ghana, Food and Agriculture Ministry 2010; Obuobie and others, 2006; Drechsel and others, 2006.

6 A pathogen is a bacterium, virus or other microorganism that can cause disease.
7 Note that pollution of irrigation water by disposal of chemicals is not only a problem in urban areas. Industrial pollution also forms a great threat for water use in rural areas. The majority of these incidences can be related to mismanagement or collusion between local governments and industries, for example in China (Wang and others, 2006).

8 In 1973 the WHO published the 'Health Guidelines for the Use of Wastewater in Agriculture and Aquaculture'.

However, urban water utilities in developing countries struggle with significant challenges, including rapid urban growth, weak financial and human resources, and corruption (Bhoem and Bohorquez, forthcoming). Even when treatment plants are constructed, they often fail to function as expected due to a lack of investment in essential facilities and infrastructure, such as 24-hour electricity supply and closed drainage systems. Moreover, the small volume of treated wastewater is usually not allocated to low-profit agricultural use, but rather to luxury hotels or golf courses (Keraita and others, 2010). Under these conditions, bans on wastewater use basically turn wastewater irrigation into an unauthorised but tolerated practice (Textbox 2).

While this doesn't directly indicate corruption concerns, it does expose a lack of good governance. Due to poor wastewater governance, marginalised city dwellers, who are highly dependent on wastewater use, are denied the right to sanitation and a clean environment⁹. The conditions under which wastewater irrigation is practised raise basic questions in terms of accountable governance, such as: who is responsible for the risk of contaminated wastewater use by farmers, how can farmers and consumers be informed about the quality of their irrigation water, and how should they learn about the health risks of using wastewater for food production?

Recognition of this problem is underway. In 2006, the World Health Organisation (WHO) published new international guidelines on wastewater irrigation, which focus on hands-on solutions¹⁰. The guidelines claim that health risks can be reduced significantly when farmers and consumers are aware of those risks and know what measures they can take to reduce them. This new discourse considers wastewater irrigation as an important sector supporting poor people's livelihoods and increasing food security. In line with this, the integration of wastewater irrigation in water management policies is favoured over strict compliance with a ban on unauthorised use (Evers and others, 2010). Ghana is the first African state to have acknowledged the practice of wastewater irrigation in its national irrigation policy (Textbox

2). This is a first step in achieving accountable, pro-poor solutions for the management of wastewater irrigation.

The WASPA project (Wastewater Agriculture and Sanitation for Poverty Alleviation), which was recently carried out in two cities in Sri Lanka and Bangladesh, was also based on the new WHO guidelines (Robinson and others, 2010). The project first of all sought to convince urban water managers to recognise the widespread use of wastewater for food production, and brought together different stakeholders to take responsibility for wastewater irrigation. Two other important pillars of the project were information sharing on water quality and health risks, and the extension of farm-based measures to reduce health risks. Similar steps are likely to be taken in other developing cities to formalise wastewater governance for irrigation. It can be assumed that through the establishment of formal institutions, new risk areas for corruption will be created. To avoid corruption risks (as occur in canal and tubewell irrigation), the formalisation process should be carried out in a participatory manner and include anti-corruption measures.

⁹ In 2010 the UN Human Rights Council recognised drinking water and sanitation as human rights (see: www.righttowater.info). The practice of unprotected wastewater irrigation is in conflict with the right to sanitation.

¹⁰ In 2006 the WHO published the 'Guidelines for the Safe Use of Wastewater, Excreta and Greywater in Agriculture and Aquaculture'.

HOW TO ADDRESS CORRUPTION IN THE IRRIGATION SECTOR?

Corruption in the irrigation sector can have different impacts which go far beyond the misallocation of public funds. Corruption exacerbates unequal water distribution, environmental degradation and public health risks. All these consequences harm the poor disproportionately, hindering their escape from poverty and denying their human rights. Due to the rapid urbanisation of Asia, Latin America and Africa and the growing importance of urban agriculture, integrity issues in the irrigation sector increasingly affect the urban poor. By preventing and curbing corruption in the irrigation sector, the income and food security of both the urban and rural poor can be improved. Therefore, corruption in the irrigation sector needs to be addressed with concrete and effective anti-corruption strategies.

Although corruption is a complex and sensitive issue, much can be done to create irrigation systems which resist it. Possible solutions to increase integrity in the irrigation sector can be derived from methods developed for the water sector or more general anti-corruption tools. Basic principles, such as transparency, accountability and participation, need to be adopted and turned into practice to fight corruption in the irrigation sector. Textbox 3

lists several examples of practical measures to prevent corruption in irrigation. Some of the measures are specific to the sector; others are more general measures which can also be applied to irrigation.

As argued in this paper, there are no blueprints which apply to canal irrigation, tubewell irrigation and wastewater irrigation. The irrigation sector is very diverse and each type of irrigation system runs different risks. These risks need to be analysed in order to address integrity issues adequately. For example, in the case of wastewater irrigation there is an urgent need for more recognition and better infrastructural planning at the policy-making level to achieve change. However, when it comes to public canal irrigation, many decisions made in the past cannot be changed further, due to the rigid infrastructure of existing irrigation systems. Therefore, the empowerment and participation of water users in decision making at the managerial level is the most relevant measure to reduce corruption.

Likewise, it is essential to identify which actors play the most important role in the persistence of corrupt activities. Corruption can usually be identified as taking place between specific actors

BOX 3: PRACTICAL MEASURES TO PREVENT CORRUPTION IN THE IRRIGATION SECTOR

Sector specific:

- Inclusion of informal irrigation practices in national irrigation policies is a step forward to keep urban water managers accountable for reducing health risks in wastewater irrigation.
- A computerised system of card readers at pumping installations can improve the transparency of groundwater withdrawal and water fee payments for tubewell irrigation.
- The foundation of WUAs and the election of WUA leaders offer water users a platform to participate in the management of large-scale canal irrigation systems.

General:

- The Integrity Pact is an anti-corruption tool which can be implemented at the initial stage of a canal irrigation construction or rehabilitation project to reduce the under-performance of construction companies and the inflation of construction costs.
- A civil ombudsman can help to collect and investigate rumours of corruption in irrigation management.
- Through citizen report cards, water users can be asked to 'score' the performance of public irrigation services based on their own experience. This tool diagnoses the manifestation and scale of corruption.

Source: *Transparency International, 2001*

at a certain level of service delivery. However, in some cases the political system itself may actually be part of the cause of recurring corruption. This can have negative consequences for well-intended anti-corruption work. The impact of election procedures to improve the accountability of irrigation operators may, for example, be eradicated by corrupt investment plans at the ministerial level. Although the complexity of corruption cannot be neglected, it is under certain circumstances more effective to be pragmatic and solve larger problems at lower levels, where it is easier to approach sensitive corruption issues.

The use of anti-corruption measures in the irrigation sector should be thoroughly examined against the effect it might have on the poor. When fighting corruption is a goal in itself, the poor might suffer even more. The objective of anti-corruption measures should be well-defined, especially in the case of informal irrigation practices. In principle a strict ban on the unauthorised use of drainage water by urban farmers is in line with the law (and against corruption), but this will also withhold from urban farmers their source of food and income. To avoid such paradoxical outcomes, anti-corruption strategies need to empower the poor to defend their own interests.

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