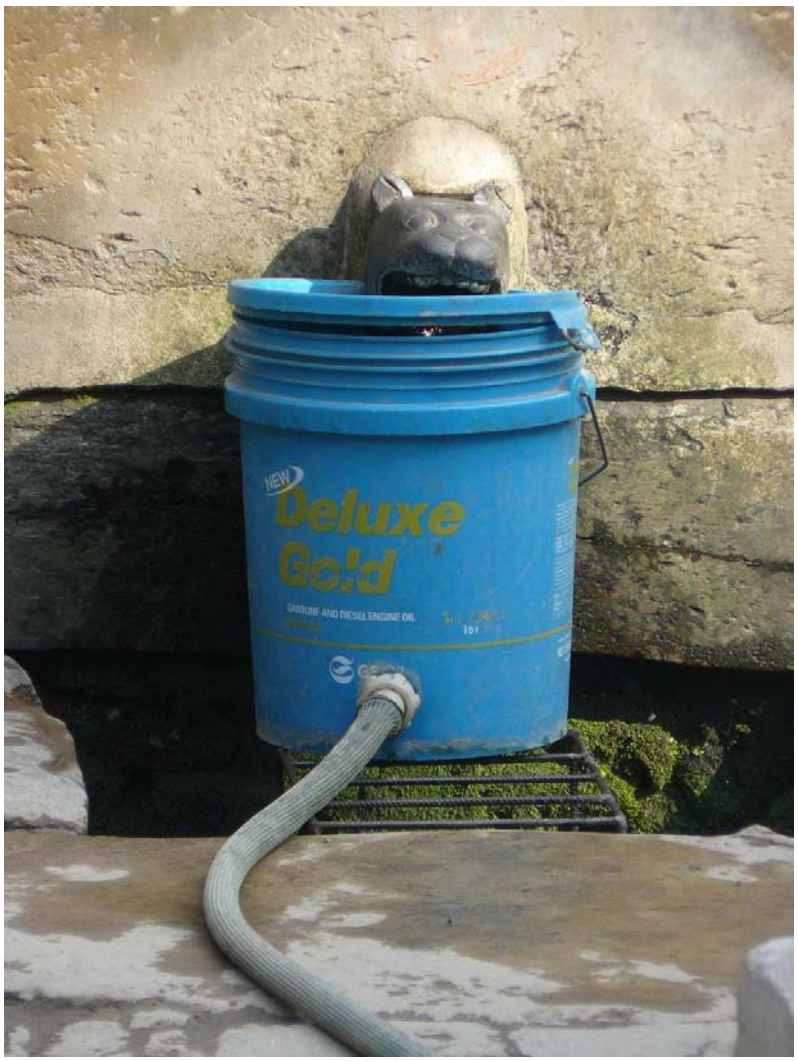
From water profiteers to distribution caretakers

A case study on how to integrate water vendors into Kathmandu's water supply system



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List of abbreviations

ADB: Asian Development Bank

CLEP: Commission on the Legal Empowerment of the Poor

DFID: Department For International Development (UK)

DWSS: Department for Water Supply and Sanitation.

KUKL: Kathmandu Upatyaka Khanepani Limited

KVWSMB: Kathmandu Valley Water Supply Management Board

LICSU: Low Income Consumer Support Unit

MPPW: Ministry for Physical Planning and Works

NGO: Non Governmental Organization.

NGOFUWS: NGO Forum for Urban Water and Sanitation.

PESTEL: Michael Porter's matrix on Political, Economic, Sociological, Technological, Environmental and Legal drivers.

SSPWP: Small-scale Private Water Providers

UNDP: United Nations Development Programme

UNICEF: United Nations' Children Fund

WSTFC:The Water Supply Tariff Fixation Commission

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Key words

Water supply, water vendors, Small-Scale Private Water Providers, urban poor, Kathmandu Valley, Nepal, business strategy, market mechanism, entrepreneur

Abstract

Water supply is inadequate in many cities in the developing world; this has significant consequences for public health and economic development. The failure of water utilities to deliver has driven scholars and professionals to argue for other options such as the recognition of Small-Scale private providers (SSPWP) in the water system. Beyond the debate over SSPWP legitimacy, the thesis looks at how water authorities could let private providers participate in delivering water without compromising the long term performance of the water supply system. Kathmandu Valley's water sector was used as a case study to investigate how private initiatives are hindered from delivering to the most inaccessible customers: poorer customers. A case study based on fieldwork discusses the prospects for enhancement of water supply to the poor through SSPWP participation. In essence, the study shows that Kathmandu Valley's business context is not conducive to the medium term investment required for provision of water to the low-income segment of the population. However, there is no guaranty that opportunities for such investment will be grabbed. The thesis argues that recognizing SSPWP might accelerate the growth of private initiatives but would not guaranty long term benefits to the water supply system. The current governance context in Kathmandu's cannot afford to enforce an adequate regulatory framework for the water vending industry. Instead of regularizing all water vendors, the best option is to use market based mechanisms to make desirable forms of water vending more competitive than their informal counterparts. For such mechanisms to be effective, it is argued that a degree of decentralization of authority is necessary, including participatory water agreements involving the private sector.

Chapter I Introduction

Urban water scarcity and poor people

Water is vital. Humans depend on it for drinking and feeding purposes and as an essential component of economic development and poverty alleviation (UN water, 2005). Deprived populations endure a burdensome access to water with the price of access paid by women who carry the drudgery of fetching water and children who suffer most of the health consequences of water scarcity (Kjellén, 2006, pp.270). In addition, the combination of opportunity costs such as spending time fetching water rather than pursuing productive activities and water related health issues further hamper the capacity of poor households to grab opportunities for economic development (Kjellén, 2006, pp.270).

In low-income cities, water stress primarily touches the poor who are more exposed and more vulnerable to the lack of access to water than the rest of the population. Indeed, in urban areas poverty has consequences on the types of accommodation and on the location of one's home within the city and it is well established that the poor are more likely to be excluded from conventional infrastructure (Kjellén and McGranahan, 2006). Slums for example are often situated in places in the city that are forbidden or disregarded by legitimate purchasers because these areas are not suitable for construction (NGOFUWS, 2005). The access to water directly derives from such factors and as Kjellén and McGranahan (2006, p.2) put it: “great differences within low income cities give room for parallel systems and variegated supply conditions. It is the urban poor who have to make do with the worst options”. Additionally, water access issues have greater impact on poorer populations since they have fewer coping mechanisms than richer dwellers. Thus, the author of this paper asserts that adequate supply to low-income households is the goal to aim for if the integration of water vendors is to serve the overall water system performance.

Water vendors as an interim solution

Sustainable water supply to the urban poor is a complex challenge and the changes needed are interrelated and overarching. In the absence of continuous supply of piped water, poor dwellers pick and mix a variety of informal sources such as open public sources, private boring and local water vendors. In many cases, the poverty of the countries themselves, as well as widespread poor governance, renders the implementation of the required change difficult and slow (McIntosh, 2003).

Meanwhile, it is necessary to find how to enhance water supply in the transition towards ideal solutions such as universal pipe water supply (Conan, 2003). Water entrepreneurs are undoubtedly part of this transition, both because they already provide a significant amount of water throughout the global south and because they find innovative ways to reach customers where utilities[1] fail to reach them. (Kjellén and McGranahan 2006). A survey made by the Asian Development Bank covered eight representative cities of south and south-east Asia to understand and scope Small-Scale Independent Private Water Providers (SSPWP). It found that SSPWP deliver to an estimated 20% of the urban population in the area. This percentage is extremely variable and ranges from 5-7% to more than 50% in some cities, and consists of customers of all social categories (Conan, 2003).Therefore, it is critical to look at how water vendors can participate to the long term sustainability of urban water supply system. Understanding the entrepreneurial perspective can provide practical solutions to enhance water supply on the short term and it allows decision makers to prepare a smoother transition to ideal solutions on the long term.

[1] A public utility is an organization that maintains the infrastructure for a public service (often also providing a service using that infrastructure).

Kathmandu as a case study

Considering both the complexity of such systems, and how connected water supply solutions are with local socio-ecological conditions, it is the work of the researcher to disentangle the water vendors' phenomenon from their context. A case study aims at doing precisely this;

> It investigates an empirical phenomenon within its real life context. It is a useful approach when one needs to probe deep into a complex issue where the boundaries between phenomenon and context are not clearly distinct (Yin, 2003, p.13).

Many cosmopolitan cities show increasing reliance on water vending activities. Kathmandu Valley was chosen as a single case study because its shares many of the pressures which precondition a water vending boom in a city : the utility is failing to deliver adequate water services to its populations and a rapidly increasing population are partly or fully reliant on alternative sources to tap water. Figure 1 illustrates the rate of change in land use in Kathmandu Valley between 1978 and 2000:

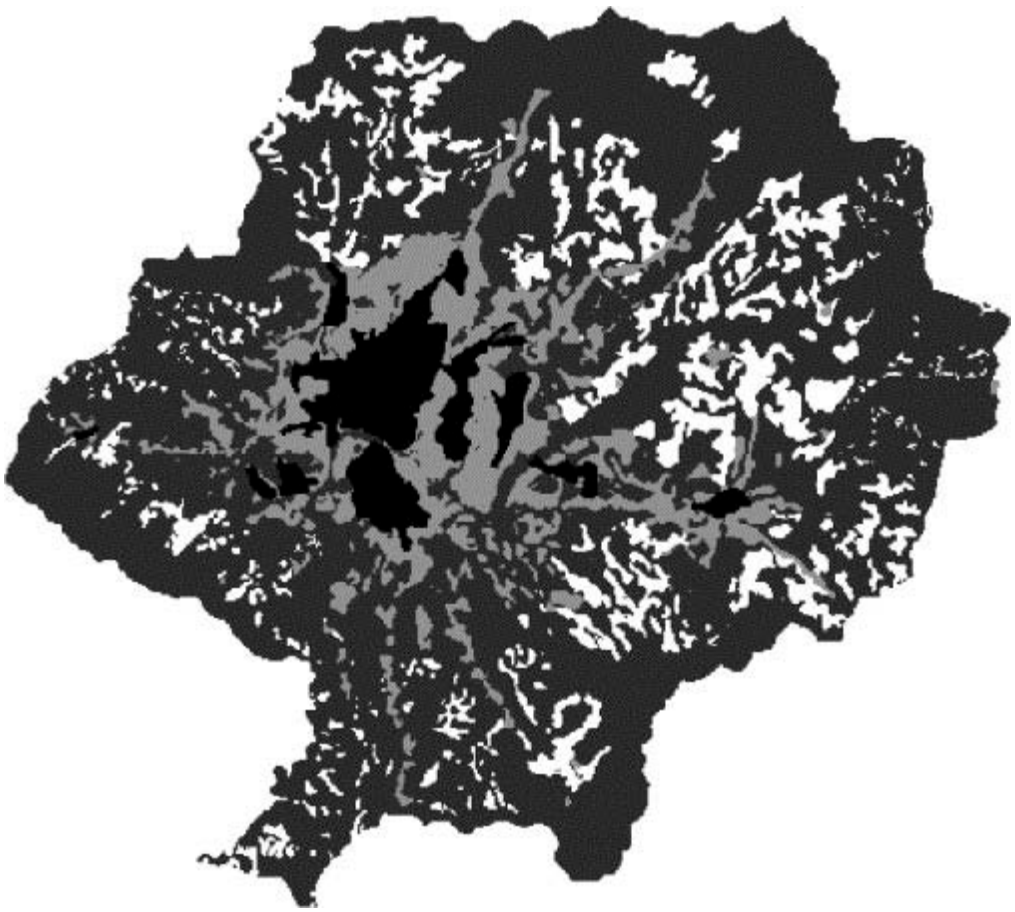


Fig 1, the 1978–2000 matrix of change map after smoothing. Black, continuous urban; light gray, agriculture to urban; white, agriculture to rural settlement and dark gray, continuous agriculture or forest. Approximate figure width is 35 km. (N. Haack B., Rafter A. 2006).

Despite the utility’s backlog, in 2002 water vendors were still delivering only 7% of water supply to the population which has been explained by the presence of alternative free sources of water such as standpipes and stonespout networks. Nowadays, these alternatives cannot cope with growing demand and falling water table. (NGOFUWS 2005)

Kathmandu is an excellent case study as the tipping point in water supply has recently been reached which has translated into the birth of a market for SSPWP. Since Kathmandu's mounting water issues are unlikely to be solved in the next decade, the demand for alternative water services is likely to experience significant growth in coming years. With or without regulation, Kathmandu is potentially transitioning towards vending water constituting a more significant share of its overall supply. For a researcher, this context provides a situation where SSPWP integration is less likely to be subject the resistance to change of a mature water vending industry.

Aim and scope of the study

If SSPWP are to take a significant share in the water supply of low-income cities, ignoring them could be detrimental to public health and economic development. This study undertakes the challenge of looking at how public policies can channel and boost entrepreneurial forces to assist the existing pipe system to provide quality water in an equitable way. In this sense, better comprehension of the entrepreneurial perspective is key to ensure policies that will not be only on paper but also in use. This thesis aims to uncover the gap which separates a situation “a” where SSPWP are unable to provide adequate and affordable water services to a situation “A” where SSPWP strive for good practice and can reliably provide to the poor. This transition occurs at the industry level and must address three questions:

- What is the role of water vendors in the water system? How is it likely to evolve?
- Which are the prerequisites for SSPWP to pass from “a” to “A”?
- How can authorities make sure that A is sustained over time?

The information and arguments needed to provide meaningful answers to these questions will be structured in four sections. In the first part, the research design will be described. It aims to explain the research process in Kathmandu and the conceptual framework guiding the project. In the second section, an overview of water providers will be presented. It will allow the reader to become acquainted with private water providers and their relationship to the rest of the water system, including poor urban customers. Thirdly, field findings will help to contextualize water vendors and to answer question 1 and 2 mentioned above. Finally, theories will be applied to the findings in order to reflect on question 3 and to discuss it within a larger context.

Chapter II Methodology and Theory

Research strategy

This study aims to explore how public policies can sustainably integrate water vendors within larger plans for a better water supply. An enquiry that explores possible pathways to encourage entrepreneurs to participate in water supply is inherently embedded in a social context. Indeed, people's needs and behaviour in relation to water are tied to cultural, socio economical and physical parameters (Ostrom, 2007). Consequently, the research strategy has taken the form of a case study. Case studies have proven their strength at understanding situations where context and phenomenon overlaps are unclear (Yin, 2003).

This case study can be classified as an embedded case study (Yin, 2003). The main unit of analysis is the water sector, but we can distinguish two sub-units which experience water vending from different angle:

- The experts of Kathmandu's water sector (NGO, Politicians, technicians, managers and researchers).
- The water vendors (a variety of small scale water providers, both workers and owners were interviewed.)

For the author, there is a degree of interpretation needed in the case study research process. Sometimes, data cannot be distinguished from point of views and theories act as a navigating compass amongst entangled masses of information.

The complexity and underlying politics of the water milieu can lead to both information bias and researcher mistakes. The researcher hence relies on a multitude of sources of evidence in order to increase the validity of the analysis (Bryman, 2004). A case study aims to create a dialogue between theories and empirical findings in order to increase understanding of the phenomenon and to enrich theoretical knowledge in light of this phenomenon (Bryman 2004, Yin 2003). For this research project, a period of 40 days in the field allowed the researcher to probe deep in the process and to ensure a high level of congruence between concepts and observations. As expressed by Bryman, to bridge concepts and reality is critical to the internal validity of a case study (2004, pp273).

However Yin's (2003) perception of internal validity states that it is the causal relationships that are

unavoidably inferred in each case study which must be grounded in theory or proven through test. In the case of this study, an extensive literature review has been used to provide foundation to the inferences made. Albeit mainly inductive, the researcher strived to continually reflect on the knowledge acquired during the research process in order to deduce some of his findings. It is hoped that Yin's “explanation-building tactic” behind each argument will be robust enough to prove its validity (Yin, 2003, p.34).

Bryman argues that transferability stipulates the external validity of a case study (Bryman, 2004, pp. 273). Choosing a single case study as a research strategy could subsequently bring limitations to this paper since one case is rarely representative. Indeed, the uniqueness of each case study's context makes findings difficult to transfer. However, Yin (2003) argues that external validity does not depend upon transferability to other social settings; transferability happens indirectly through analytical generalisation. The case study does not explain other case studies; it enriches a theory as an intermediary step to explain other case studies. Thus, when a case study analysis is justifiably bridged to a theory, it credibly illustrates theoretical causal links between a phenomenon and its determinants which can explain other contexts (Yin, 2003, p.39). The choice of theory which frames the focus of this thesis will be justified afterwards in the conceptual framework section.

Finally, the reliability of the methods used could be criticized since this study relies heavily on open-ended questions and technical difficulties forced the author to rely on notes rather than on recordings (one recorder did not work and the other was corrupted before some of the files were backed up). However, the author kept a study database (contact of each actor, interview guides, and protocols) which makes this study reproducible in similar conditions. The author is confident that a data construction made by somebody else would have led to similar findings. Nevertheless, it has to be recognized that the deductive work made does create a gap between data gathering and findings which hampers reliability. As a constructivist, the author of this paper believes that, as long as it is consistent, deduction is overall beneficial to this study's contribution to the field.

Methods and procedures

Secondary data

Water vending is still a fairly new area of research Kjellén and McGranahan 2006) and the author proceeded by theoretical sampling. Documents addressing SSPWP, waters vendors and water supply to the urban poor were read throughout the study. The topics of interest evolved and led to a succession of narrowing and widening key search words. When the author finalized his narrative, the cross references among the literature on water vendors informed him that he approached theoretical saturation (Bryman, 2008).

Consequently, the case study benefits from middle range theories formulated by scholars and practitioners as guidance for data collection and analysis (Yin 2003). Once in the field, further documentation was gathered in the form of local reports, leaflets and websites, which completed the secondary data for research. These sources were mainly given or referenced by experts during interviews.

Semi-structured interviews

Semi-structured focused interviews were chosen for both experts and company owners. This method was preferred for its superior ability to collect rich and in depth information from experts and company owners (Bryman, 2004 p.543; Yin, 2003, p.90). Two interview guides were devised; one for the experts and one for company owners. Experts were asked how they perceive the future of the water system and the role water vendors could potentially take in this scenario. The interview with company owners focused on costs structure, relations with other actors and perceived ways to enhance their situation.

A pilot interview guide was tested three times: once with the fieldwork's interpreter, once with an informant and once with an NGO. The company owners' interview guide was reviewed by three fellow researchers from Lund University. It did not change throughout the interviews as it was judged effective after the first debriefing with the Nepali interpreter.

Experts from various sectors were selected in order to maximise the heterogeneity of the sample. Extensive web based investigation was undertaken about the people that were currently in charge of the case study issue in four sectors: the private sector, the government, the academic/consultant sector and finally NGO/lobbyers. The aim of the researcher was not to obtain a statistically representative sample of informants but rather to gain access to the maximum number of the

exclusive group who deal with water supply to the urban poor. Purposive sampling was used in order to manage the narrow category of informants related to the research question (Bryman 2008, p.415.) The response rate was high and the author met nine out of thirteen executives from organisations contacted.

Among the experts interviewed, Mr Kumar Gurung, Mr Shah and Mr Lal Joshi were approached through snowball technique (Silvermann, 2007). A snowball sampling is a form of purposive sampling where one interviewee introduces his own acquaintances for further interview (Bryman, 2004). Despite the possible adverse effect on the heterogeneity of the respondent sample, the snowball approach was the only way to identify experts since it was impossible to enumerate who could talk about water vendors or not in Kathmandu's water system. Furthermore, the author believes that the people interviewed were among a very narrow target population; experts must have knowledge about water vendors and have a decision-making position in the water sector. Professionals were categorized into 4 groups NGO, government, private sector, utility and consultants (former professionals were considered consultants) l (see appendix 2).

For the water vendors, sampling proved more difficult than originally expected. Water vending companies were geographically clustered in Kathmandu which could have facilitated a randomized trial. However, after reluctance and distrust on the part of company owners to answer to questions relative to their business, the author finally relied on a snowball approach to interview water vendors. It was possible to interview each type of company present in Kathmandu: water bottlers, tankers and community owned networks (see appendix 2). The author was introduced by Guna Ram who had been teaching in the local school for 20 years. He knew a lot of water vendors and he arranged meetings with the widest range of company profiles he could think of. To be introduced and accompanied by a mentor during respondent interviews encouraged a strong feeling of trust from water vendors and it helped getting answers from the entrepreneurs.

For all interviews, the same “meaning condensation” approach was used (Kvale, 1996). First, notes were taken with constant recapitulation to avoid bias. Then, the full notes were transcribed in a more concise way and the answers were reorganized to better fit with the initial structure of the interview. Third, a recapitulative table was made with regards to the general purpose of the study. In this table each interview was assigned an entry row and each identified knowledge gap constituted an entry column. The table was filled with key words or quotes from the interviewees. Finally, the narrative of the thesis dictated which elements were integrated in the paper. This final

choice depended on the perceived importance of each element which was based on the number of interviewees referencing it, as well as the logical validity and the credibility of the argument.

Narrative walks

Workers from two tanker companies, one water bottling company and two community small-piped-network companies were interviewed through a method called narrative walks. Narrative walks is a method by which a respondent will guide the researcher on a visit of a familiar environment. The interviewee is free to talk as he pleases, about a topic he knows well. It enhances confidence for the respondent and questions can be added by the interviewer (Olsson, 2009). In each case in this study, the researcher and his interpreter followed a drop of water from the source to consumer (or to the final product in the case of water bottling) not only in order to learn about the process itself but also to ask opportunist questions about the determinants of efficiency, accountability and resilience. Support operations (like accounting, administration etc.) were asked separately when possible. A protocol again framed the issues to be scrutinized, even if no questions were written in advance (see appendix 1).

Observation is always core to a fieldwork and it was a main driver for questions in narrative walks. Finally, people's interactions and behaviours, as well as environmental conditions, were important factors to consider for the analytical work (Yin, p. 92). Significant elements were added by note taking or to a diary systematically.

Manish, the interpreter, approaching truck drivers for narrative walks.

Conceptual framework

This thesis is entirely structured from established theories. The discussion about Private Sector Participation in sustainable water supply was the justification for this thesis. A review of "Middle ground theories" serves the purpose of building knowledge of water vendors which is critical to understand key areas for research and to separate context from phenomenon. Middle-ground theories are theories formulated in light of experience or case studies (Yin, 2003). Next the PESTEL framework was used to classify the findings. Using business strategy tools allow policy makers to learn from the perspective of water vendors and to reflect on the way their policies influence private actors. Finally, the 5 forces framework, another business tool employed in the discussion section, will show how understanding the underlying structure of competition can help to steer an industry in a desired direction.

Private sector participation in water supply

Theories and concept associated with private sector privatization will not directly answer any of the research questions. What they do, however, is place the research within those wider questions that underpin and justify this thesis. This research would not make sense if it was not embedded in broader issues such as the water goals that a society must strive for and the role(s) that private actors can take in this domain. A whole debate about water privatisation falls outside of the scope of this study. However, it is important to remind the reader about the conflicting viewpoints that drive the reflection process in this paper.

Two approaches are generally shown as antagonistic in the privatisation debate. Atone end of the spectrum are the proponents of access to water as a human right. Their position can be summarized with the following UN statement which formulates the right to water in legislative terms.

> Water is a limited natural resource and a public good fundamental for life and health. The human right to water is indispensable for leading a life in human dignity. It is a prerequisite for the realization of other human rights. UNCESCR (2002), p.1.

Water is consequently a human rights and it should be governed by clear regulations and defined responsibilities between the private sector and the government (Gutierrez, 2001).

On the other extreme, are those who rely on the concept of water as an economic good[2] to advance

[2] Based on Dunlin's fourth Principle of Integrated Water Resource Management, C.F. http://www.gwpforum.org/servlet/PSP?iNodeID=1345

liberal theories which encourage market forces to allocate water, between competing uses, in the most efficient way. Since market conditions in many poor countries are rarely ideal, it is often argued that private actors should set tariffs under commercial, economically viable principles. Under these principles, subsidies - or other types of economic mechanisms which artificially lower costs - are opposed because they distort the true costs of service provision (Budds & McGranahan, 2003, p. 95).

However, this approach was criticized after evidence suggested that private actors would favourite richer clients willing to pay more, particularly in the absence of pro-poor subsidies. For Elinor Ostrom water is a particularly difficult product to handle because consumers compete to access it and a providers can have difficultydenying access to any of them. Striking a balance between consumers' willingness to pay and rules to ensure equity is extremely complex and there is no panacea to resolve the issue (Ostrom, 2007). Ethical dilemmas could arise in a situation where a company has to choose between selling water at high price or making sure poorer consumer get their water. The difficulty lies in keeping businesses accountable, especially in countries where information is lacking and corruption widespread. Specific approaches need to reflect socio-hydrological contexts and there may be cases where private participation is not appropriate. In other cases, the level of participation from the private sector is adaptable and can vary widely from passive private investment to full divestiture, with ownership of assets being the key step between private participation and privatization (Gutierrez, 2001).

Finally, a point of contention is often raised about the decency of making profit on water (Gutierrez, 2001). Nevertheless, without the promise of profit, there can be no private participation which then closes the debate for this thesis. In essence, the legitimacy of private participation boils down to a political or ideological debate about what solutions the free market can provide. Beyond this question, one can ask under which conditions the promise of profit can drive desirable private participation.

Middle ground theories on water vendors

Scholars and practitioners who have worked (sometimes for decades)on the field have accumulated a body of knowledge about the diversity of SSPWP profiles and the relations between SSPWP, their consumers and other actors of the system (such as authorities, regulators, other water providers and NGO)s. This knowledge is indispensable in appreciating why SSPWP behave like they do and in being able to pinpoint when their behaviour differs from what one would expect under given circumstances. These concepts will be used in Chapter II to present the current knowledge about water vendors and to formulate hypotheses against which SSPWP were studied in the field.

It is difficult to differentiate the SSPWP phenomenon from its context.

Firm theories: PESTEL and 5 forces

The PESTEL framework, which guides and structures data construction, and the 5 forces framework used in the discussion section in relation to how SSPWP could be assisted are taught in all business schools. They are business strategy tools to inform decision makers of the determinants which shape an industry over time. They are often taught to business strategist allowing them to anticipate, adapt or even create change in their industry. The researcher stresses that the very same knowledge can be used by authorities to steer an industry in the direction it desires. Market based mechanisms are used by many policy makers, often without the theoretical understanding which ensures that strategists focus on the structural, not the transient. (Porter, 2008)

Business management operates under a certain mindset that must be made clear, as it is constitutive of the author's basic assumptions when discussing entrepreneurs and private firms:

- A business is a money-making machine. It is a legal entity which operates within a legal framework, with the overarching goal of making a profit. The morality of a business is defined by legal framework, it is not inherent. Exceptions exist: some entrepreneurs create businesses with a philanthropic mission and with values; but they do not form part of the overwhelming majority, and most often ethical dilemmas will be solved through a profitability calculus (Crane and Matten; 2007).
- Within an industry, competitiveness is a matter of survival. A very profitable company which fails to utilise part of its profits to stay competitive, is doomed on the longer term. This is the business perspective on the “creative destruction” theory of economic development by Schumpeter[3].

[3] In his book Capitalism, Socialism and Democracy (1942).

Chapter III Understanding SSPWP

This section draws on middle ground theories presented above. It aims to clarify two main points. First, it explores the commonalities that can explain the endemic presence of water vendors throughout the developing world by considering scholars literature reviews and practitioners' reports which show the development of middle range theories about water vendors. Secondly, it takes a closer look at water vendors in relation to the poor. By the end of this chapter, the reader more fully grasp the comparisons between water vendors in poor urban centres in the world, as well as the vendor's potential to deliver to the poor.[4]

What are SSPWP?

Researchers dealing with water vendors have defined and categorized them in various ways. A historical recollection of the definitions used since the first significant survey about water vendors has been made by Kjellén and McGranahan (2006, p.8)

For this paper, however, Conan's definition (2003, p.7-9) of SSPWP was chosen because it is the most inclusive and operational one. Small-scale water providers (SSPWP) are independent commercial ventures specialized in either water production or provision. They are independent of the main utility. They enter the market freely and invest at their own risk in order to make a profit. They display three common characteristics:

- They are small in scale. They cover only a neighbourhood or part of a neighbourhood and do not employ more than 100 people.
- They are independent. They do not receive external help of any sort, be it subsidies or support from NGOs.
- They are private: It is private funds, and the profit that constitutes the owners livelihood. Communities operations managed by NGO funds and volunteer work are not considered SSPWP.

Albeit numerous, the categorisations used for SSPWP keep a relative continuity. In the present paper, Whittington et al.'s (1989) three categories will be used but with slight clarifications on the terms:

- *Wholesale vendors* obtain water from the source and supply distributing vendors.

[4] This section heavily draws on the work of Kjellén and Mc Granahan (2006), who produced an excellent literature review about water vendors and the Urban Poor.

- *Distributing vendors* carry water from a source or from a wholesale vendor to the customer.
- *Direct vendors* sell directly to customers from a privately owned source. Informal direct vendors will be called *Resellers*. Formal, licensed vendors will be called *Operators*.

Role of water vendors in the water system

In urban settlement -where raw water is abundant but the pipe system fails to deliver enough water to all,-water vending activities have been documented on all continents. (Collignon and Vézina, 2000; Conan, 2003; Conan and Paniagua, 2003; McIntosh, 2003; UN HABITAT, 2003).

Few statistics are available to quantify precisely the share represented by water vendors in the water supplied to customer. Even in extensively studied cities, no study could provide more than a rough approximation as to the number of water vendors in developing urban centres. On average, around 30% of the demand would be covered by independent providers (Kjellén and McGranahan, 2006, p.3). This general lack of information and interest by development actors to a reflection of the widespread idea that water supplied through independent private means is unsafe water. Kjellén and McGranahan (2006, pp.19) summarize the current discourse taken by international agencies about water vendors:

> According to the official indicators, progress towards the water targets of the Millennium Development Goals is achieved as people switch from vendors (and other "unimproved" sources) to piped water connections, or to free public standpipes, boreholes or rainwater cisterns within a kilometre from their home (WHO and UNICEF, 2000).

This observation raises an important question: if private initiatives are one of the main alternatives to bridge the gap between supply and demand of piped water, why are they presented as external to the water system? In the absence of any real prospects for a fully effective piped water system, water vendor should be envisioned as integral to enhancement the wider system. The linkages between them and the rest of the water actors are yet to be established. After reviewing water vendors' studies throughout the world, Kjellén and McGranahan (2006, pp.1) argue for the same kind of approach:

> The challenge is not to promote or suppress water vending, any more than it is to promote or suppress private-sector participation in utility operations. The challenge is to improve currently inadequate water and sanitation services, through the most effective means available, including water vending where appropriate.

Modus operandi of SSPWP

A variety of case studies have been explored by a a number of researchers. All of them confirm that water vendors can reach people by unconventional means and have a potential to complement struggling water systems (Matsinhe et. al., 2008; Collignon and Vézina, 2000; Conan, 2003; Conan and Paniagua, 2003). In his study on Asian water supplies, McIntosh (2003) explains that developing countries' piped systems usually face two types of problem:

- They usually do not match population growth which creates ever increasing coverage issues.
- They have difficulties in ensuring the maintenance and effective operation of existing water systems, which have consequences on water quality, continuous supply, and system efficiency, and which ultimately increases costs.

From an entrepreneur's perspective, these failures are market opportunities (Conan, 2003, pp.13 and no exception is made in developing countries. Where piped water does not reach them, water carriers ensure that paying households are delivered. Where piped water quality is poor, private water treatment and distribution expands water supply. For instance, over the last two decades, bottle businesses have been spreading in the developing world (Conan, 2003; Elinaza, 2000). However it is important to note that the latter evolution is concomitant with an increase in average incomes in the cities studied. Needless to say that in such situation the poorest -who can afford only limited quantities of vended water and who are least connected- are the most exposed to water scarcity.

On the other hand, water vendors can be detrimental to the water system. As in any uncoordinated market, services overlap and competition is fierce. A water utility which has enough resources to be and stay effective over time would mean the end of water vending. Where piped water is nonexistent or is of bad service quality, water vendors take over. When both utility and vendors are struggling, they potentially hinder each other's action. Water vending is rarely facilitated by authorities. Vendors are sometimes prosecuted but are often ignored all together. Indeed, water vendors are seen as a cause of thewater supply problems which must not be encouraged. Conversely, water vendors can help carry water from low pressure areas to high pressure area but they can also exacerbate the problem of pressure in the pipes when they draw water from it. Additionally, cases of sabotage by water vendors have been reported. (Kjellén and McGranahan 2006, pp.4)

SSPWP and poor people

Entrepreneurs are rarely profiteers

For most entrepreneurs, the main driver for business expansion is profit. Numerous cases of water of questionable quality sold at high prices have been documented (Development Workshop, 2002 pp.4; Kjellén and McGranahan 2006, pp.13) and many would be tempted to conclude that the motivation of profit over well being might be a strong incentive for abuse. However, such a causal link has not been proven and many rival theories could explain such type of profiteering equally well; it could be market failure which promotes only short-termism and quick cash; it could be corruption; it could be lack of training; it could be lack of support and infrastructures; it could be lack of enforced regulations and it could be a combination of any of these factors.. SSPWP used to be presented as profiteering of people in dire need for water; there is now evidence that water provider's prices generally reflect their cost, except in occasional times of extreme scarcity (UN HABITAT 2003, Conan 2003, Kjellén and McGranahan 2006). Admittedly, when water becomes temporarily less available, cases of vendors collusion can arise and artificially created temporary water scarcity is, indeed, good for business since demand rockets. Mobile providers may abandon their usual clientele and sell water to richer customers, at higher price (Development Workshop, 2002 pp.13; Kjellén and McGranahan 2006, pp.14).

For Conan, profit is precisely what makes private entrepreneurs more proactive in expanding and improving their activity. He argues that the commercial approach - as opposed to neighbourhood help approach[5] - has stronger potential to deliver water to under-served and disadvantaged urban neighbourhoods. Profit driven entrepreneurs have a stake in carefully assessing market risks and at investing wisely (Conan, 2003, pp.29). On the other hand, in an earlier study, Kjellén (2006) observed a phenomenon of “spaghettization” where pipe entrepreneurs would answer to demand on a one by one basis creating inefficient network of intertwined small pipes. The latter example shows that while profit maximization encourages entrepreneurs to take precautions against risks, it does not automatically lead to wise investment on the long term. Conan's extensive study of SSPWP (2003) concluded the following:

> Although not particularly inventive, SSPWP strive to keep installation costs down as a response to (i) risky business environments, (ii) limited own capital, (iii) limited debt finance available, and (iv) limited technical skills. Small operators are savvy managers who handle risks well.

[5] Neighbourhood help: ad hoc development of one individual's piped connexion into a network following social pressure.

Not all water businesses can deliver to the Poor

SSPWP fill a market niche; they deliver to a limited market and try to satisfy the needs of a particular section of the population (Angueletou, 2007). Therefore each business is specially designed to deliver a given product, to a given population, at a given quality of service, for a given price. Water tankers and water bottlers target middle to high incomes (Development Workshop, 2005; Conan, 2003).

Water tankers and water bottlers have cost structures that render them incapable of providing a service tailored to low income-households. Indeed, their service is marginally affordable because the operating costs of tanker companies or bottle companies (pumping, sanitation, bottling, transport by truck, etc.) induce high volumetric prices to the consumer (Kjellén and McGranahan 2006, p.14, 18). Even if these companies do have some flexibility in terms of the quantity and quality they distribute, their prices and the billing systems they operate are seldom fit for low income households (Conan, 2003). For instance, a tanker's door to door delivery system requires one time bulk purchase which implies having storage of at least $1m^3$. is inconsistent with the realities of poor householdswho tend to decide on a daily basis how much vending water they can afford. Such minute purchase of small quantities allow no upfront payment, no bulk purchase and no credit; it requires high flexibility in terms of services provided and of billing systems (Kariuki and Shwartz, 2005; Kjellén and McGranahan, 2006, pp.15; McIntosh, 2003, pp.33).

Other business models can meet the standards of affordability, quality, accessibility and reliability commiserate with poor consumers needs. A convincing case was made by Conan about small water networks as the favoured means to deliver to the urban poor. He stated that willingness-to-pay studies show that low-income households are willing to pay for water and that they value attributes that only small piped network are able to deliver (Conan, 2003, pp.36). Regardless of the fact that willingness to pay studies lack complete applicability to the poor (because they do not adjust for the fact that the prices paid for water are only for small quantities in times of scarcity) they do show that piped networks are superior to their determinants because they deliver the services that these people value most. Conan showed from case studies that some piped water companies developed operational tactics to ensure fee collection and reduce delinquencies (Conan, 2003, pp.33).

Typical barriers against SSPWP best practice

Lacking recognition and operating at the fringe of legality, entrepreneurs face a variety of interlinked problems; as a result, they are pushed to invest as little as possible in low cost, short term technical solutions, which reduce both the level of service they could deliver and their own profitability. Specialists argue that simple steps would have potential to enhance accountability since it allows representations and clearer definitions of roles and responsibilities, monitoring and coercion processes. Finally, the attribution of legal status can make the whole water system more resilient since it allows cooperation between various actors in case of ruptures in the system.

A discourse issue

In addition to the idea that water vendors are considered an unimproved source of water, government are eventually faced with the following false dilemma:

> If governments take a negative attitude towards water vending, and enforce strict regulations, they are likely to reduce the amount of water available on the market, driving high prices up still further. But if they take a positive attitude towards water vending, this may be seen as condoning a situation in which the poorest segment of the population has to pay the highest prices for water and sanitation. It is hardly surprising that many governments just ignore vendors altogether. (Kjellén and McGranahan 2006, pp.19).

For many, the question is not whether or not water should be integrated to the water system but how these vendors can be encouraged to have better practice in an activity that they would do anyway; (Kjellén and McGranahan, 2006 ; Matsinhe et. al., 2008 ; McIntosh, 2003).

Concerns with illegal status

Legal status of water vendors can make a difference. First, legality makes businesses more efficient by opening up their relations with other actors of the system and reducing the risks involved in investments. Indeed, the quality and the price of the water served by a SSPWP are directly tied to its potential for level of investment (Conan, 2003, pp.34). However, the uncertainties of an illegal environment as well as the difficulties in accessing credit render investments risky and expensive. A business without legal identity or one operating at the margin of formal laws cannot access to formal banking (Matsinhe et. al. 2008; Kjellén and McGranahan, 2006; Conan 2003). Consequently, an entrepreneur has to borrow at high rates which decreases the incentive for investment. this in turn forces short term thinking as long term investments are much more uncertainty prone because a business which can be taken down by authorities at any time. To

illustrate a similar position, Conan used a real-life comparison in table 1:

Table 1: Legal environment and small networks

Delhi	***Ho Chi Minh City***
Illegal environment	Legal environment
Service: 1-1.5 hrs/day	Service: 24hrs a day
No meter	Meter
No treatment of water	Treatment of water
Investment: $10/household connected	Investment: $80-100/households connected
Tariff: $0.28/$m^3$	Tariff: $0.22/$m^3$

Source: Conan 2003, pp. 33

It should be highlighted that, this parallel is just illustrative since the regulatory framework and the wider business context of these case studies are so different that is makes comparison difficult. A closer look at the mechanisms in place and how they interrelate can provide a better picture of the potential and limits of regularisation.

Cost constraints

Water entrepreneurs face high financial costs as explained above. They also have to pay for high water tariffs when they are not granted an agreement with water utilities. The short payback equipments have higher maintenance costs in the long run and bribes and petty corruption can also increase the costs for a company (Conan, 2003, pp.34). Notwithstanding structural issues dependant on the context like the costs associated with getting water from source and transporting it (Kjellén and McGranahan 2006, pp.22).

Lack of communication and cooperation

Introduction of effective mechanisms for representation and exchange of information between key actors of the system would unlock a tremendous potential for collaboration. Utility, entrepreneurs, consumers, authorities, civil society and regulators all have a stake at improving information about, exchange in and communication on water supply. With the existence of truely inclusive fora for urban water supply, innovative policies could be designed to limit illegal activities, to fill service gaps and to better allocate funds for water supply (Kjellén and McGranahan 2006, Conan 2003). By truely inclusive, the author means that stakeholders would have a means of representation (such as associations) and that key actors (like regulators) would take part in the discussions (for more details, see Kjellén and McGranahan 2006, pp.22). Last but not least, cooperation between small networks and utility could make their technology compatible. This would have great potential to expedite piped network expansion by buying out infrastructures already in place (Conan 2003).

Lack of safeguards against profiteering

Even though vendors usually have prices which reflect their costs, one should not only trust competition to handle water supply. For Kjellén and McGranahan, water added value is too low to be carried long distances by vendors. Hence, geographical oligopolies or monopolies tend to form and the risk for collusion is high. If such is the case, groups might artificially raise prices or withhold water supplies (Kjellén and McGranahan, 2006, pp.21). If SSPWP and particularly small water networks were to take a significant role in the formal water system, legal safeguards should consequently ensure that no profiteering take place. Small water networks would be particularly sensitive on this issue since, as Conan (2003) explains, they are the most likely to deal with disadvantaged populations and thus they are granted a position of micro-monopoly. Surprisingly however, McIntosh is confident that competition is fierce enough between vendors that they do not need regulation, but rather official recognition (McIntosh 2003, pp.51). Despite that the ADB survey made in 2002 found that such entrepreneurs spoke highly of their social role and counted relatives among their customers base, Conan argues that networks should have minimum service levels decided by local authorities, with appropriate customer monitoring and feedback mechanisms (Conan, 2003, pp.31-32, 37).

Vested interests

For McIntosh, the dire situation of the poor is maintained by vested interests that many in government, utility staff and private sector are not willing to let go (McIntosh, 2003, pp.39). This might be a major barrier to necessary change.

Hypotheses formulation

Before considering the case study, the author will reformulate the lessons drawn so far in the form of a set of hypotheses:

- Water vendors take diverse forms and answer to a range of preferences from a variety of customers.
- They are a response to, and not a cause of, the failure of cheaper alternatives to provide water with reliability.
- Most SSPWP operate at the fringe of the legal system because authorities fail to recognize the role they play in water supply.
- It is the water supply system that primarily suffers from the lack of integration of water vendors. Water vendors strive as long as there is profit to be made.
- Profit could be made indifferently through good or bad practice as long as investments can be recovered. It is the business environment which defines the spectrum of opportunities for water vendors.
- With willingness, the government could take legal steps so that water entrepreneurs would have opportunities to operate with good practice.

The next generation will increasingly have to deal with water vendors.

Chapter IV Contextualizing SSPWP: findings from Kathmandu

The findings are structured in three main points; firstly, there is a water vending market blossoming in Kathmandu and private enterprises operate at the fringe of the legal system; secondly, SSPWP cannot strive for performance in Kathmandu's business environment; finally, experts doubt about the possibility of formalizing water vending in Kathmandu, not only because of the nature of private participation, but also, because the state does not have the capacity to enforce an adequate legal framework to prevent abuses.

Kathmandu's market is opening up for SSPWP

The two owners of SSPWP interviewed have both witnessed an explosion of private initiatives to provide water in the last four years[6]. That is three years after the latest baseline survey on SSPWP was conducted by ADB which was giving tankers companies as unique kind of SSPWP which delivered to 7% of the population (Conan, 2003). For Mr Kumar Lama, owner of the bottling company “Lake Quench”, the main reasons explaining the boom in new entrants is an increased water demand and the non-existence of enforcement of regulations. For Mr Rajan Dahal, owner of Ganga Khane Paani tanker company, the increase is the result of the failure of the utility to provide quality water in enough quantity, an increased awareness of water issues from consumers and entrepreneurs, and to the demand pull generated by population growth (Lama, 2010; Dahal, 2010). No quantitative estimation could be made but the growth was significant enough for both interviewees to spontaneously realize that such growth in new entrants was short term.

The author looked at three pilot projects of community organized water supply in Lalitpur. Lalitpur is a municipality in the vicinity of Kathmandu and the two cities share the same water supply system. One of the projects is a community owned self-sufficient piped network which was praised for delivering water to the 180 low-income households at an affordable price. The second is a community owned water sanitation plant, which sells purified water to the Chyasal neighbourhood at fixed times and at affordable price. The project is supported by UN Habitat and two NGOs. The third, Baneshwor is a failed attempt to imitate Alok Hiti's project. Despite the proximity of the two projects (less than 1km) and the help of the Alok Hity founder and technical expertise from NGOs; ground water proved to be unreachable. Even if those actors are neither private nor independent (as in the case of Chyasal) their experience can help us draw valuable lessons. Firstly, it confirms the willingness to pay study made in Cebu, that the poor are ready to pay and may value water

[6] The question was not directive, they were asked if they witnessed significant changes in their line of business in the last years.

accessibility and quality over its affordability (Conan, 2003). In fact, the president of the Chyasal project explained that customers were mainly poor and were coming to fetch water from 2 km radius (even people from slums). Secondly, it seems the situation of supply of water to poor people is not covered neither by cheap alternative nor by water vendors. Thirdly, it shows that community led projects could be a third alternative to water supply to the urban poor.

In the last six month, Mr Prakash Amatya executive Director of NGOFUWS has witnessed new forms of water vending in Kathmandu. In some areas of the city where public tankers deliver water for free, Maoists have taken over the "management" of queuing consumers, at a charge. In other areas, where workers rent their houses, individuals buy bulk quantities of water and resell it to their neighbours who do not have the time to queue for free public water nor the capacity to pay for a full tanker. (Amatya, 2010)

A last element to highlight about this opening market is that the survey conducted by ADB confirmed these findings in similar contexts; Delhi in northern India had the most active emergence of new SSPWP initiatives, many of which have been reported to serve the poor (Conan, 2003, pp.18). If their expansion in south Asia was marginal, it seems that it is only a matter of time beofre widespread emergence occurs. As Conan puts it:

> Despite an ostensibly dire public water supply situation, SSPWP operations in Delhi serve only about 5% of households. Why? DJB's [Delhi's utility company] fleet of 1,000 public water tankers is one reason; also groundwater is generally accessible, though diminishing rapidly; and although service levels are poor within service areas, they are expansive and they are cheap. It seems that city dwellers in South Asia will tolerate more than their Southeast Asian counterparts before they turn to SSPWP for their water supply. (Conan, 2003, pp.18).

To conclude this subsection, there is empirical evidence that market potential exist for SSPWP, particularly for the poor whose demand for water was not previously addressed. There is also evidence that SSPWP's activity has sharply intensified in recent years and that binding physical pressures have further forced communities to self-organize to fetch water. The recent emergence of reselling activities, for example, can be taken as a sign that water stress has passed a threshold and that responses are being witnessed in various forms. If private vending is bound to become increasingly important, then deliberating whether to consider which pathways could legally channel these entrepreneurial forces might not be an option any more: rather, such deliberation might be critical to a performing water system.

Kathmandu's business context is not conducive to best practice[7]

In business studies, the most commonly used analytical tool to understand external influences over a company is the PESTEL matrix. The PESTEL was developed by management science leading expert Michael Porter to present the six types of drivers (or trends) that could be opportunities or threats to a company or a sector of activity (Porter, 1980). Politic, Economic, Social, Technological, Environmental and Legal drivers constitute the business context within which businesses strive, therefore, by scrutinizing the external drivers of change for an industry, we can better understand which trends change an industry over time.

Typical PESTEL factors to consider include:

Factor	Could include:
Political	e.g. EU enlargement, the euro, international trade, taxation policy
Economic	e.g. interest rates, exchange rates, national income, inflation, unemployment, Stock Market
Social	e.g. ageing population, attitudes to work, income distribution
Technological	e.g. innovation, new product development, rate of technological obsolescence
Environmental	e.g. global warming, environmental issues
Legal	e.g. competition law, health and safety, employment law

An example ot the PESTEL matrix by Oxford University Press, 2007

This knowledge will answer question 2 of this research regarding the prerequisite for SSPWP to provide adequate and affordable water services. An analysis of external drivers is of particular interest since it focuses on barriers over which a business has no control, only public intervention can advert some of these trends. This paper is going to map out the six external drivers aforementioned for the water vending industry. It will present what an entrepreneur would identify as threats and opportunities to pass from a situation "a" of an underperforming SSPWP to a situation "A" of an efficient and equitable SSPWP.

Political: Politically unstable and just out of ten years of conflicts, Nepal is currently a transitory state heading towards liberal democracy (UNDP 2010). This process is laborious and many observers fear that Nepal might become a failed state (Inter Press Services, 2005). The researcher observed an unanimous political delusion and distrust; entrepreneurs, students, researchers and families of various casts and social class would speak of their leaders as pursuing their own agenda rather than the people's best interests. Corruption is widespread at all levels of governance[8] and the water sector is particularly tied to money[9]. For some of the experts interviewed, water tends to be used as a political tool which make change or reform difficult (Shah, 2010; Lal Joshi, 2010;

[7] For this section, interviews will be extensively used, please refer to the list of interviewees available in appendix XX.
[8] Transparency International, ranked Nepal 143th/180 in their corruption scale in 2009.
[9] For example, ADB gave €170 000 000 for community based water supply and sanitation projects for the period 2004-2009. Water diaries, pp. 14.) P. 2008.

Amatya, 2010). However the urgent challenges facing Kathmandu Valley seems to have sped up the discussion process between the actors in the field (Amatya, 2010). Various level of governance share responsibilities for water supply. Under the self local government act, municipalities are responsible for Stone spout management, regulation and law enforcement is a government mandate, however, as yet, there is no clear-cut responsibilities on groundwater and watershed management (Lal Joshi, 2010; Amatya, 2010).

Economic: In Kathmandu, the water business is a lucrative industry; the 30 employees and company owners interviewed had obvious markers of wealth (brand new pick up, real estate, iphone) even if the observer felt that divulging salaries was not part of the company culture in either case and so did not collect precise salary figures. "The market is good with us" was the expected answer to questions regarding financial issues. Talking with workers gave the researcher a hint about "how good" the market was becoming. One of the tanker drivers, Roshan (2010) explained that in the highest drought peak in 2009, prices went up to 5000 NRS per 12000 liters[10]. Each time prices go sky high, it attracts new entrant competitors (Dahal, 2010). Three years ago, tankers used to sell 12000 litres for 900 NRS, compared to 1700-2000 litres at the present time (Nephop, 2010)[11]. If these figures reflect real trends, they represent an 88% to 122 % increase in three years.

On the other hand, businesses are structurally condemned to underperform. Kathmandu is a poor city, with a national income per capita of 573$/c/y (ADB, 2001). The basic services that sustain economic life are currently ´failing. Intermittent water and electricity, high levels of pollution, no solid waste management and a transport system that would be considered as failing on transport and sustainability criteria (Jeon, 2007) are among the factors which hamper the city's economic efficiency. These factors directly limit water vendors activities. For example, Mr Lama roughly estimated that his water prices could go down by 10% if he had a reliable access to electricity. He currently has to use a generator, that can last up to 14 hours a day, to cope with load shedding. The limited reliability of his generator, means that his company cannot work at full capacity (Lama, 2010). Mr Dahal (2010) has also seen his costs increase because of increasing traffic jams. At a higher level, funds allocated to water are tremendous, however, they depend on international aid and it seems that a threshold has been reached in the case of the Melamchi project where, since 2002, many donors have withdrawn or are threatening to do so (Water diaries, 1971-2008). As far as credit is concerned, interest rates rocketed from 13% to 16-18% after a government transparency

[10] This converts to 44.82 SEK per m³ (conversion rate taken from xe.com on 16/05/2010)
[11] This converts to 8.06 SEK per m³ as compared to 15.23- 17.92 SEK per m³.

law which made many individuals withdraw their money from banks (Lama, 2010). In other words, entrepreneurs face high costs for credit and the return on investment they can expect is uncertain. This forces them to invest small amounts or they would have to bear high on long periods. Mr Dahal has been in business for 15 years, but he cannot project his business beyond 2-3 years ahead (Dahal 2010).

Social: Kathmandu experiences a high population density with many poor areas, organized in wards or squats. The country is currently going through an intense phase or rural exodus, so this is likely to deteriorate even further. Total urban populations grew from 4% of national population in 1971 to 13.9% in 2001 and are expected to reach 26.7% by 2021 (MPPW, 2009). High population growth induced by rural-urban migrations and high fertility rates generate booming needs for space, food, energy and water. Urban water demand is increasing rapidly at between 6% and 9% per annum: around three times the national population growth rate (MPPW, 2009). In Kathmandu, there has been a long standing view that water should not be paid for, but this view is slowly changing (Shah, 2010; Amatya, 2010; Gurung, 2010). When it comes to quality, a clear lack of awareness prevents consumers from recognizing water quality by themselves (Lama, 2010; Shah, 2010; Lal Joshi, 2010; Amatya, 2010; Manandhar, 2010). Competition drives entrepreneurs to lower their prices with compromises on quality since only low prices attract customers (Lama, 2010). Indeed, unless quality provides a competitive advantage, there is no reason for an entrepreneur to strive for quality.

The traditional stonespouts where pressure is low in dry season. Due to falling water tables, the situation deteriorates year on year.

Technological:

Access to technologies does exist and allows for leapfrog progresses in solutions for harvest, treatment and supply of water (Lama, 2010). However, a flagrant lack of skills and training[12] as well as loose regulatory and political frameworks make any investment in technology costly and risky (Lama, 2010; NGOFUWS, 2005; Conan 2003). Another issue is that many entrepreneurs lack the formal training to even consider the right technologies for water harvest, sanitation and commercialisation (Lama, 2010; Shah, 2010; Lal Joshi, 2010).

The current utility water system is obsolete and degraded. It requires refurbishment, upgrading and extension (NGOFUWS, 2005). The pipe network development works pose overarching challenges to an extent that given its current financial (Sharma, 2010) and governance difficulties (Manandhar, 2010; Kumar Gurung, 2010; Lal Joshi, 2010) seems beyond reach of the utility in the near future. The big technological hope to address water supply issues is the Melamchi water supply project. A 26km long tunnel, deriving water from the Melamchi river, would provide significant quantities of supplemental water to Kathmandu Valley. Poor governance, political and technical issues have delayed the project which was approved in 1988 and yet was only 18% completed in 2006 (Water diaries 1971-2008, pp. 16). In 2002, Melamchi and its extension were calculated to cover demand until 2024 (McIntosh, 2003). This is seen as an opportunity by Mr Dahal since more water availability would sustain population growth (Dahal, 2010).

The main response to Kathmandu's growing water issues is the rapid development of shallow or deep private water points (wells or standpipes). This trend is strengthening with water stress increasing and remaining unchecked (Lal Joshi 2010; Prasad Dhakal 2010; Kumar Gurung, 2010).

[12] Both technical and financial training. Lama insisted that most of his fellow entrepreneurs had difficulties in assessing risks in the investing process.

Environmental: The extreme pressure on water reserves created by the combined drivers mentioned above can sometimes have a synergistic impact on the environment; for instance, population growth creates higher needs for water. Additionally, it induces a higher demand for electricity or for food which indirectly impacts much more than mere drinking water needs on the water stress of the area. The state of water levels is now alarming, water tables are heavily suctioned and the population already suffers from those unexpected changes. Water tables levels are falling by 2 to 2.5 meters per year and private uptake for agriculture, industry or private use takes a significant toll on ground water (Lal Joshi, 2010; Sharma, 2010; Prasad Dhakal, 2010). This will increase the competition over water sources and already tensions have risen and with communities forbidding entrepreneurs to exploit their source (Lal Joshi, 2010). Mr Lal Joshi explained that Kathmandu's high water stress may well occur as soon as 2016 (Lal Joshi, 2010). As yet in Kathmandu, no clear correlation has been established between informal drilling and increased ground water contamination, however, the author suspects that there might be a link between changes in microbiological composition of deep water observed in the laboratory by Mr Kumar Gurung and the fact that poorly maintained vertical water ways are open doors for ground water contamination from runoff waters(Philipon, 2008, p.65). The author observed that these changes are happening extremely rapidly. The man on the left in the picture below must be eighty years old and he is fetching his water from a community well to wash his dishes. The string he is using spoke for him; it was lengthened with laces to cope with falling water levels. In this picture, once again, his arm was too short to reach the water. Falling water levels have direct impact on SSPWP as it will increase the cost of fetching water in various ways; some people have to go further to fetch water(Shah, 2010) and they will probably have to pay for water extraction (Prasad Dhakal, 2010; Lal Joshi, 2010). One barrier to change is that the data necessary to scientifically inform decision-making has yet to be collected. Kathmandu authorities have neither quantified the state of groundwater reserve nor the uptake (Sharma, 2010; Prasad Dhakal, 2010) and they rely on gross estimation when it comes to water consumption and water supply (Amatya, 2010).

The string was, again too short to fetch water from the dwell. © M. Mana Da Costa

Legal: Regulation on water does exist. It is present in the constitution, where there is a special commission for water tariff fixation, a water tariff act and a water regulation act (water aid, 2005). If they include water vendors, lack of enforcement prevents the rule on paper consituting a rule in use (NGOFUWS 2005, MPPW, 2009). Water vendors have the opportunity to register their activity and to submit their production to a quality test. No enforcement of licenses, registry or quality standards is done by the authorities (Lama, 2010). Registered and non registered companies are treated in the same way by authorities and all have to expect abuses such as having to give free water to police agents (Dahal, 2010; Kumar, 2010; Nephop, 2010). Currently no regulation exists on underground water , however, the first groundwater act should be drafted before 2011 (Amatya, 2010).

Concerning the poorest people, lack of legal identity or of legal land tenure often makes investment difficult or illegal for the utility. Indeed, in shanty areas, connecting squatter households would legitimize squatting which is politically unacceptable for a central authority (NGOFUWS, 2005).

The PESTEL matrix

From the findings above, we can synthesize in one matrix the threats and opportunities that condition water businesses capabilities to deliver to the poor:

	Opportunities	Threats
Politic	Common urgent challenge	Corruption, vested interests, slow and divided bureaucracy, uncertainty about political stability, unclear water governance roles and responsibilities.
Economic	International aid money. Water is a very lucrative business.	Failing transports, electricity supply and water supply. Lack of access to credit, high interest rates. Low transparency of the market, difficult communication between actors.
Social	High population growth. Variegated needs calling for tailored services and for more flexibility than the utility can offer.	Low awareness and reactivity of the population about water quality. Low awareness on water use. Cultural reticence to pay for water. Water vendors seen as inherently dangerous by authorities.
Technological	Conventional utility unlikely to provide adequate water services to all within 5-10 years. Technologies available.	Lack or training and competence for many entrepreneurs. Investment in technologies incompatible with the need for short payback periods.
Environmental	Water is becoming a valuable good.	High competition for sources. Water is becoming harder to fetch. Water is becoming more polluted. The government lacks basic data for sound regulation.
Legal		No legal barrier of entry, anybody can compete on the water vending market. No enforcement of quality standards regulations. Little legal protection and rights. No protection from abuse from authorities. Land tenure rights make it illegal to connect some customers. No legal protection of sources.

From the above matrix, we can clearly see that the main driver for vendors is profit which is itself driven by an exponentially increase in demand for water. Some factors seem to be out of the hands of authorities for the time being; for instance, it is reasonable to say that fixing poverty, corruption, transport, electricity and water issues cannot be solved with political will alone. However, some issues appear to be fairly manageable within relatively short term provided that there is political will behind it (Conan, 2003; McIntosh, 2003). It is interesting to note that authorities can influence many of those factors through changes in the legal framework. PESTEL does not explicitly make these bridges but it helps firms to map out and navigate the threats and opportunities.

Gaz bottles and bottled water are both signs of an increase in revenue and of backlogs in supply.

Experts have doubts about regularizing SSPWP

Among the experts interviewed, few believed that water vendors could be formalized any time soon. The arguments and counter arguments balancing this judgement are presented below. In essence, private vendors are seen as potentially useful to the system, but as inherently incapable of delivering to the poor. Regulation could not offer safeguards since it is unlikely that laws could be enforced in the current governance context.

Water vendors have been acknowledged as potentially useful for the system. There is an important financial need for water collection and distribution in the city that a private entrepreneur could partly cover (Shah, 2010; Kumar Gurung, 2010). The utility KUKL could also take advantage of the opportunity to delegate to private vendors some of its responsibilities (Manandhar, 2010). A multiplicity of private actors could decrease water stress and improve the resilience of the water supply system (Amatya, 2010). Finally, some projects of piped water supplied have emerged, often sponsored by NGOs and always owned by communities (Lumanti, 2010; all experts interviewed). Most interviewees think that they are a better alternative than private operators to deliver to the poor (Shah, 2010; Lal Joshi, 2010 ; Sharma, 2010 ; Amatya, 2010), however, Mr Manandhar mentioned that in the long run, SSPWP might deliver better than non profit operations. He suggested a transition from a community to private network in order to ensure continued commitment and incentive to improve and expand (Manandhar, 2010).

SSPWP are in the pursuit of profit. For many, this is viewed as incompatible with the distribution of a good which should be seen as a right (Amatya, 2010; Lal Joshi, 2010). Indeed, there is little reason to trust water vendors because (due to the lack of consideration of their consumers) they have no good reason to deliver on time or at the right price (Shah, 2010; Sharma, 2010). Furthermore, the ongoing depletion of shallow aquifer could be further aggravated if water vendors were protected by law (Manandhar, 2010; Lal Joshi, 2010). Last but not least, a question of ownership arises about water source points, equipment, infrastructure and water itself (Prasad Dhakal, 2010; Lal Joshi, 2010). This question already led to tripartite conflicts between private users, authorities and end consumers and tensions with water vendors could increase without an appropriate and enforceable legal framework (Lal Joshi, 2010).

Even if some regulations could preserve the interest of the poor, Nepal regulatory system cannot be trusted (Kumar Gurung, 2010; Lal Joshi 2010, Amatya, 2010). At the bottom level, arrangement with authorities are often a matter of bribe (Kumar Gurung 2010, Lama, 2010 ; Kumar, 2010; Nephop, 2010) and contracts are often weak (Manandhar, 2010). Governance wise, high levels of corruption (Lal Joshi, 2010) as well as the use of water issues as a political tool (Amatya, 2010) make legislation and enforcement unlikely (Lal Joshi, 2010 ; Amatya, 2010). In this context, even the private water networks solution recommended by Conan (2003) seems risky since it provides structural monopoly without strong laws for safeguard (Manandhar, 2010; Amatya, 2010).

Answer to hypotheses

From the hypotheses formulated in the last chapter, we can make the following changes:

- Kathmandu water vending industry is likely to boom in the next decade.
- Entrepreneurs already have the opportunity to register, however, they choose to not do so because being registered does not give a sensitive advantage.
- The business environment does not drive quality since most consumers are unable to assess quality and to value it.
- Under the current environment, it is not profitable to deliver to the poor despite high demand. The investment needed for piped system is illegal. Only community led project manage to provide water at low charge, with the help of subsidies or volunteer workers.
- Regulation would be unlikely to protect consumers against water vending opportunism. In Nepal, corruption and governance issues prevent many rules on paper to be in use. SSPWP regulation does not make exception.

Chapter V A discussion on SSPWP regularization

Discussion

The insight gained from Kathmandu's case study propels the author to the following discussion: if regulation cannot be enforced, and if the market currently rewards price over quality; how can SSPWP be made to lean towards best practice? This section addresses this question in four points. First, it states that a law on paper will be used only by entrepreneurs who can get an appreciable advantage from it. Second, it further argues that such advantage cannot be given to all entrepreneurs because it does not prevent abuses. It is not profit that drives best practice, but competitive advantage. Third it shows how to use market based instrument to shape the water industry in a systemic way. Finally it explains that monitoring is crucial to enforce any agreement and that changes in governance are key to protect vendors, consumers and the resources that sustain them.

As a wholesaler, Mr Lama wants to make this SSPWP slogan trustworthy.

Only attractive opportunities will be grabbed

We have seen earlier that water vendors are difficult to regulate because of their high number and mobility (Kjellén and McGranahan, 2006, p.12). With Kathmandu's case study it became clear that not regulating water vending activities was not only a matter of political will (entrepreneurs can actually register) but also that the authorities were not capable of enforcing such regulation. Informal entrepreneurs are numerous; often mobile and putting one out of business makes no difference. Indeed, barriers of entry are so low that an expelled entrepreneur would soon be replaced by two new informal SSPWP. If coercion is likely to become too costly or ineffective, one must either consider solution to reduce enforcement costs or solutions to encourage voluntary compliance.

From a business perspective, it is self-evident that formalization of SSPWP will comply with regulations only if it presents an advantage for them. In the case of Kathmandu, registration of a business might confer slightly more security and access to associations but overall there was little rationale to do so. When asked why he was registered at all, Mr Lama (2010) answered that it was more by principle than anything else. Registered companies are subject to quality controls and can be blacklisted in the media. Others can operate without registration without any control or coercion. It is the same level of tolerance in either case, both formal and informal companies have to give free water to policemen (Dahal, 2010; Kumar, 2010; Nephop, 2010). From a business perspective, formalisation or legal duties appear only as a burden, therefore the challenge for authorities is to give sufficient advantages to complying businesses to avoid undermining or nullifying complying businesses' competitiveness with their policies. For example, a policy that force companies to maintain prices at low level in times of scarcity would make the illegal environment comparatively more attractive for entrepreneurs. Water scarcity is a physically binding limitation and the price of water must reflect the amount of water in the system; with capped prices, formalized SSPWP might be forced to make less money than their illegal counterparts.

Thus, if consumers cannot tell the difference between legal and illegal companies, or if businesses are not aware that formalization would grant sensitive advantages in terms of cost reduction, cooperation opportunities or access to cheaper bank loans and securities, policies might remain pipe dreams.

Entrepreneurs should not all be regulated:

A question arises from the previous point: is it desirable to give advantages to **all** water vendors in order that they are formalized? Indeed, providing the opportunity to access to credit does not guaranty that SSPWP would make longer term investment or that they would not simply increase their operations and become even more resistant to change. There is no evidence that facilitating private participation would increase quality in the absence of enforceable regulations. On the contrary, this case study shows that ,for now, Kathmandu's competition is about low prices only. It means that success is determined by a capacity to provide water at low price, not adequate services at adequate prices. More generally, it seems from this case study that if regularization of water vendors cannot be backed up by monitoring and coercive mechanisms, it is unlikely that it would increase the accountability, and the equity of the whole water supply system.

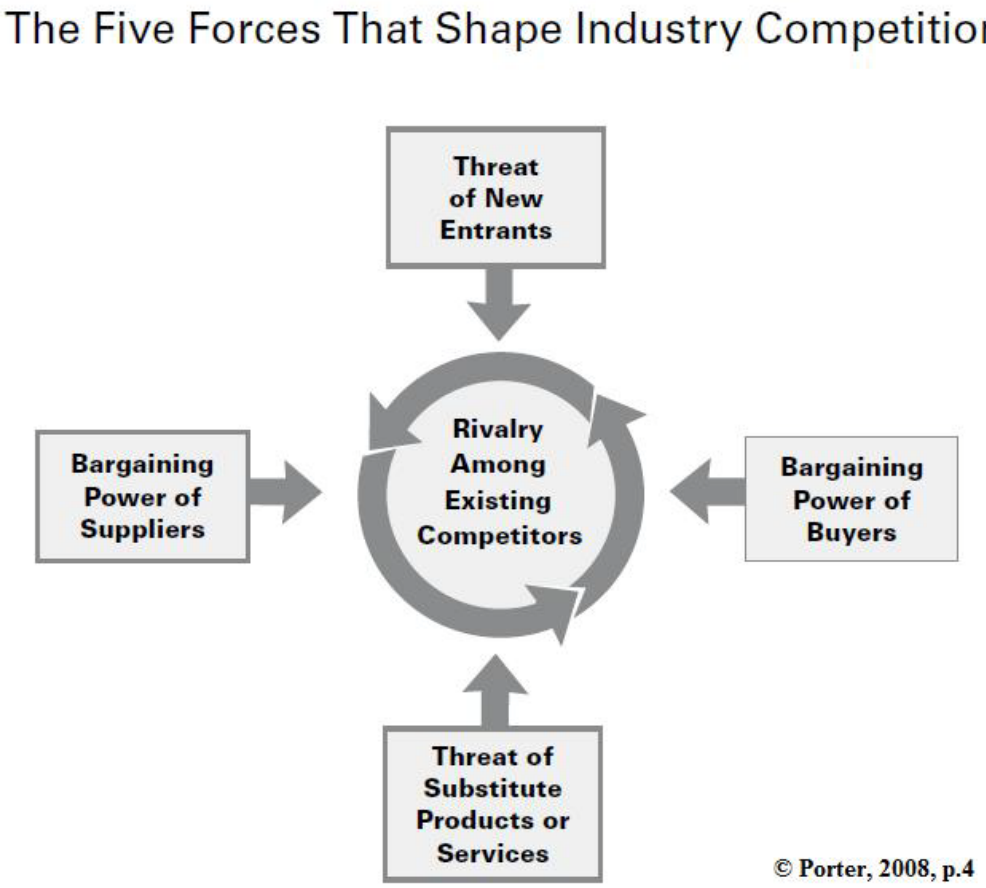
Referring again to Kjellén and McGranahan's false dilemma:

> If governments take a negative attitude towards water vending, and enforce strict regulations, they are likely to reduce the amount of water available on the market, driving high prices up still further. But if they take a positive attitude towards water vending, this may be seen as condoning a situation in which the poorest segment of the population has to pay the highest prices for water and sanitation. It is hardly surprising that many governments just ignore vendors altogether. (Kjellén and McGranahan 2006, pp.19)

This dilemma contains two false premises rather than one, as previously stated by the authors. The first of which frames the problem as whether or not we should regularize water vendors is unanimously answered by many authors: not “yes”, not “no” but “how” (Collignon and Vézina, 2000; Conan, 2003; Conan and Paniagua, 2003; McIntosh, 2003 ; Kjellén and McGranahan 2006; Angueletou, 2007e.t.c.). Looking closer at how water vending could be regulated in Kathmandu, this study frames the question differently. “How” to regularize water vendors implies to regulate them all. If authorities are to decide their future path then they need to decide which water vendors to regularize. This is an eminently political choice. The author argues only by giving best practice a competitive advantage, the water vending industry will develop in the desired direction. The next section will show how, by understanding better the dynamics of competition, one could use regulation as a carrot to drive the water industry where it can serve best.

It is possible to drive water vendors towards good practice

Whether policy makers or business managers, strategist tend to understand competition in its narrowest sense. Competition is not only about competitive rivalry between actors of the same industry within one market; it includes five competitive forces : rivalry between existent competitors, threat of new entrants, bargaining power of suppliers, bargaining power of buyers, threat of substitute products or services (Porter, 2008).



A strategist equipped with this framework can understand the underlying competitive structure of an industry. It provides the analytical insight to anticipate and influence competition and profitability over time (Porter, 2008, p.3). Realizing a thorough diagnosis of the water vending industry would fall behind the scope of this stud, however, the author will use examples from this case study to illustrate the logic behind this model and to show how it could be used by authorities to leverage good practice among water vendors[13].

[13] For more details on the terms used in Italic, the reader is invited to read the full article available freely on internet. The link is provided in bibliography.

Rivalry between existent competitors

The rivalry (also called competitive intensity) between direct competitors could be fierce. There are a number of SSPWP, of roughly the same size, which compete on comparable products and answer to similar needs. However, the demand grows so quickly that water vendors cannot keep up to it hence, competition is not as fierce as many would like to think. The water vending business is currently very profitable without needing to put too much effort in competitiveness. It seems that such "easy money" has attracted many *new entrants* to obtain a share of an ever growing cake.

Threat of substitute products or services

In Kathmandu, the substitutes for SSPWP services are: free public standpipes, tap water, private wells or stonespouts. There is no substitute for water itself. This case study has shown that all of these substitutes are losing ground with falling water tables in the total share of water provision[14]. This means that two alternatives exist: vended water or reduced water consumption. Falling water tables and population growth are at the root of this increased demand for SSPWP services. The market will continue to increase as long as this "threat" continues to decrease.

Threat of new entrants

New entrants could be a potential threat to the profitability of the industry in the future. Each new actor takes his share of profit and inevitably there will come a day when the water vending market will face limits to its expansion. This limitation could take various forms: such as reaching Kathmandu's population carrying capacity (Lal Joshi, 2010), the exhaustion of new profitable water sources (Lal Joshi, 2010; Shah, 2010) or a limit in willingness to pay for some of the population who might decide to emigrate (Sharma, 2010; Manandhar, 2010). When the market stops growing, water vendors survival will depend on their competitiveness. Porter explains (2008, p.10):

> When all or many competitors aim to meet the same needs or compete on the same attributes, the result is a zero sum competition. Here, one firm's gain is often another's loss, driving down profitability."

Bargaining power of suppliers

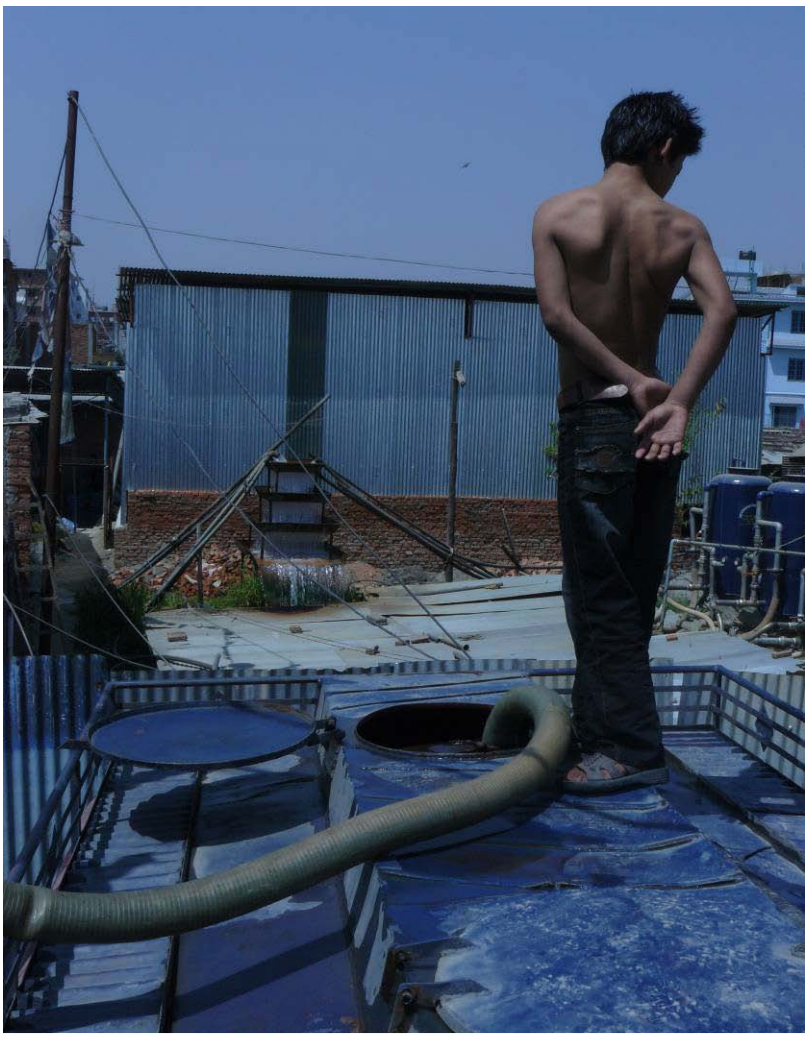
For water vendors, the industry suppliers are water sources in the form of water sold by the water utility, ground water fetched with electric pumps and river water owned by upper riparian communities in Kathmandu Valley or even other rivers outside Kathmandu Valley. Water has a low added value which makes it costly to transport long distances. Local sources are thus competitive

[14] The Melamchi poses question for tap water on the medium term , at least in quantitative terms.

and coordinated owners could make water vendors compete for access to them. However, sources are unregulated which has two consequences; it reduces the power of suppliers because vendors move to the best almost-free sources and it reduces the threat of substitutes because the rightful owners of the groundwater experience water resources loss and falling water tables..

Bargaining power of buyers

Logically, the increasing *rivalry* can push prices down. Indeed, consumers have potentially a powerful influence on SSPWP because they can shift provider at virtually no cost (many do actually use a number of alternative SSPWP). In times of scarcity, the latter argument becomes irrelevant, however, the market does not drive quality at the moment. Indeed, end products are *undifferentiated* for customers who have little awareness and little means to know the quality of the water they buy. For example, tt is impossible to know where a tanker has taken his water from since he himself chooses his wholesaler for each deal (Nephop, 2010). For an average consumer, only price differentiates a provider from another and there is no way to test the quality of the water while receiving it. With the absence of transparency and accountability, consumers cannot exert their power on quality because they can only control price. If authorities and consumers cannot control the quality of the water, who can?



Distributors are independent from wholesalers. After each delivery, they can shift providers to avoid traffic jams.

Examples on how to use market based mechanisms with a systemic outlook

By publishing a list of tested good quality bottled water brands, institutions have already taken one step closer to giving competitive advantage to some companies over others. It is an advantage that companies surely consider when they registered their activities and have their water tested. Unfortunately, few people know about these lists and from observation, it appears that these were only privileged people.

When it comes to poor people who have less access to information, some other similar levers could be considered. For example, piped systems argued for in this paper can be maintained at capped prices by consumer themselves. The operator is more accountable because he knows his customers and because he cannot move his equipment easily. In business terms, his exit costs are high. Why would an entrepreneur accept such deal? Because it confers *an unequal access to distribution channels* (Porter, 2008, p.5). It is not really a monopoly since other actors are present and could sell, but the piped water is cheaper and it is a secured profit on the medium to long term with a secured return on investment. Indeed a pipe water operator has little incentive to risk his operation license unless the informal market proves that it makes him more money, with certainty, on a longer term. For such a comfortable competitive advantage and the associated profit, an entrepreneur is likely to make compromises. In the same way, licensing public standpipes management operations could be negotiated under regulations that were known to end users.

Financial guaranties on selected projects as well as preferential interest rates would reduce *barriers of entries* to project bearers who could set an agreement with a community. SSPWP which show good practice and accountability[15] could have a license to get water from the utility at preferential rates. If bids for a limited number of temporary licenses are renewed every year, competition would happen to obtain the licenses and rivals would have to compete on aspects determined by the license givers.

For water bottlers, Mr Lama (2010) proposed that each retailer should have a list of tested bottled water brands visible to customers. This would allow the product *differentiation* necessary to drive quality more systematically as a competitive advantage. If consumers are were aware that these list should be present, the government would not have to monitor each retailer.

[15] See the decentralization argument in next discussion section.

These examples of market mechanisms would give competitive advantage to formalized entrepreneurs over informal ones with four main prospects:

- It would make regularization strategically sound for entrepreneurs.
- It would force entrepreneurs to compete in the direction wanted by the authorities since they could control the pockets of opportunity they offer.
- It would reduce market opportunities for informal SSPWP.
- It could potentially clarify agreements in a way that the utility could actually buyout infrastructures previously built by a private operator without resistance or compatibility issues (provided it was made clear that the license was temporary).

It should be explicit that giving the same rights to all water vendors would allow any kind of practice to develop with the same opportunities, whereas giving sensitive advantages to controlled development may be slower, but it has the potential to control the direction taken by the transition in the water vending sector.

This means two things for Kathmandu's decision makers. The current profitability of the market makes subtle market-based policy moves easier, because new entries do not threaten the industry's growing profitability too much. Thus, new entrants can expect less retaliation from incumbents (Porter, 2008, p. 6) who cannot cope with growing demand anyway (Dahal, 2010). However, once the market matures, any move aimed at changing the water vending industry will directly threaten incumbents' profitability and will face resistance. Driving change while the market is growing is therefore easier to implement and it will set determinants of water vending survival as one firm's gain will translate into another's loss. In summary, shaping the water vending industry is an adaptive process. If authorities want to steer competition in the right direction, market mechanisms do exist but they would better be implemented before the market approaches saturation.

Limitations and options for the future

Despite their importance for sustainability, some crucial questions remain out of the scope of this paper. To address governance and environmental issues is an imperative precondition for successful water vendors integration. The author recognizes these gaps of knowledge in his analysis but a masters thesis could not afford such scope. A taste of the research agenda envisioned by the authors follows.

A level of decentralization is key to SSPWP

In the last discussion point, it was made clear that it would be feasible for the authorities to trade a certain level of quality standards and accountability against boosted competitiveness or stability in profits. However, it is still unclear how to make sure that such agreements with SSPWP will not be breached by an opportunist entrepreneur. We have seen that the enforcement of a high number of small-scale agreements is either too costly or administratively impossible for Kathmandu's central authorities. Others factors such as corruption and lack of information could explain such inability. To infer that this inability is inherent in a fully centralized water regime can be debated, but if accepted it, it is a strong premise for a decentralized authority in dealing with water vendors.

While reading about water users group, the author could see that even “community” lead projects were experiencing profiteering (Matsinhe et. al. 2008, pp. 846). For example, in Mozambique there is no clear separation of roles and responsibilities between water committees and managers, which leads to conflicts of interest. The regulators have direct interests in the rules they decide when it can help a neighbour or when to convince the taxpayer. Furthermore coercion is reduced as it is those who edict the rules who monitor their effects (Matsinhe et. al. 2008).

If there is a crisis of accountability in water governance, both private and public arrangements are unlikely to meet stakeholders’ needs and best interest. It is therefore crucial to contextualise water supply in terms of socio-hydrological systems and to understand power asymmetries in water governance systems. With further research, integrating water vendors within participatory agreements could be informed by science.

Environmental issues with local supply

It is important to remind the reader that this paper does not take account of the environmental aspect of sustainability in the water system. Water tables falling to dangerous levels are a sign that a society is not managing its water resources in a sustainable way. The Melamchi project might relieve pressure but it will definitely not solve the problem if demand keeps growing exponentially. We can ask ourselves what kind of role would SSPWP play with this perspective, or if they would even survive. A neo-liberal economist might think that this water table is the treasure chest of our entrepreneur and that they would have no incentive to deplete it. That would be partly true, and the Chyasal project does actually redirect waste water to an open pond to help refill water table and to offer an additional alternative water source to the poor for non-drinking purposes, nevertheless, underground water is a common resource and each entrepreneur might want to sell the water before the neighbour draws it for free from his well.

This issue poses complex governance questions which could quickly be related to water vendors. Indeed, there is currently a mismatch of scale between user groups, groundwater physical boundaries and resource regimes. As water is fully subtractive[16], there is high incentive to overuse the resource (Ostrom 2007) and the variety of actors make regulation hardly possible. The author wants to frame the problems in the following terms: any water source which feeds on the same groundwater basin depletes a common pool. This means that while shallow ground water belongs to all, those who can afford borings and those with privileged access to stonespout have a power advantage over the other water owners. The question is therefore not only how to preserve ground water but also to have a more even distribution of water source over the same common pool. Water vendors could help in tackling such a challenge.

[16] "All private goods, like bread, are fully subtractive. Once a loaf of bread is obtained by one individual or family, that loaf of bread is nolonger available to others." (Ostrom, 2007, pp.246).

Concluding remarks

Kathmandu and its neighbouring municipalities have always relied on abundant underground water resources to compensate for the failures of their piped water system. Until a few years ago, the existence of alternative sources hindered investment from entrepreneurs in provision of water to the poor. Free resources were available, and the water was good for any use. With declining water tables and increasing contamination of underground water, market opportunities are now opening for private operations despite lower income population. It is therefore necessary to study the role that Small-Scale Independent Private Water Providers (SSPWP) could play in delivering water to poor consumers, in order to pro-actively prepare the bases for their integration in the water system where necessary. This study attempts to contribute to this understanding.

It was found that water vendors are able to adopt any role as long as they can make a profit. In the current situation, SSPWP have no incentive to increase the quality of water and they cannot deliver to the poor. This is not due to their own lack of willingness, nor even to lack of political will; does the harsh business environment prevent them from realizing their full potential. The way to succeed for a water business is to compete for price, with short term investment.

The prerequisites for better practice are numerous; some would require radical change and some could occur much more easily. However, increasing businesses capabilities does not mean that they will adopt better practice; it means that they will have more options. As lists of prerequisites have been established, the author attempted to answer the third question by considering how to exploit these needs.

One solution is to use competitive advantage in a systemic fashion. Public policies can create controlled pockets of opportunity for a few entrepreneurs who would have structural competitive advantages over a degree of regulation of their operations. The market mechanisms presented show how such levers can be identified and it is explained that the earlier authorities will apply them, the less resistance they will face.

This paper contributes to the field of sustainability science in three ways. First, it is a problem based study which uses a variety of disciplines to tackle a complex issue from a new angle. In that sense, it adds to the research process knowledge for other similar studies in the field.

Second, it takes a holistic view at a development problem and tries to go beyond the usual divide between human society and nature society. A master thesis has a narrow scope and the environmental aspect could not be investigated in depth. Connections between market mechanisms, decentralized governance and ecosystem thresholds were explored to further incorporate this thesis in a more comprehensive research agenda about SSPWP.

Finally, this thesis has reframed traditional business management theory by using firm strategy as a policy making tool for regulation. Taking into account entrepreneur's perspective in a more systemic way is key to SSPWP related research. This insight helps science to inform the policymaking process with better potential for compliance.

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Appendices:

Appendix 1 Research database

Interview guide experts

- **SSPWP**

The Stone spouts having less pressure than before, some express concern about quantity and the quality of the water at stone spouts in the coming years. What will be the alternative sources the poor will use?

Have you witnessed any other private initiatives than water bottlers and tankers (give examples if necessary)?

Do you see private water networks emerging? Why?

- **Privatization issues**

Let's imagine that the government decides to license Private networks to operate in the city.

What are the benefits?

What are the danger? Any ways to prevent them?

Which would you trust more to provide water to low income households: private vs. community-led water networks?

- **Environment:**

Let's imagine the following scenario: we are in 2050, Melamchi has been built but the city kept growing. There is more need for water than ever but the ground water is nearly entirely depleted.

How would the Utility react to keep providing water to the Poor?

What do you think would happen to water vendors (networks, tankers, bottlers) in such context?

What can be done now to prevent such problems (role of water vendors)?

- **Additional information:**

Side information to write down

Interview guide company owners

Characteristics:
Size of company, number of years of operation, history of leadership, how successful and prevision for the coming years. could we go in a truck with a driver for one day eventually?

Determinants of quality and price in the water they supplied.
Can you describe what exactly you are doing during: (where are the costs and what does make each cost vary?)
The purchasing phase?
The transformation phase?
The distribution phase?

In the last few years what have been the biggest changes for you as a water vendor?
Did this impact the quality of the water you sell or the costs involved in your activity?

How can other actors of the water system influence those determinants?
Do authorities have influence on your work? (Police, regulations, limitations in withdrawals)
Do you receive any help from NGOs or so?
How did you learn to become water vendor?
How do you deal with customers complaints?

Are there ways to empower entrepreneurs?
Do you think the government, or NGOs should help you and how (see examples below):
Getting better loans to invest?
Getting better technologies (better tankers, better treatment solution)?
Getting better deals with the water Utility?
Getting better information about where water is going to be cut, where water is poorly served, where they intend to develop the network?
Getting better work condition? Social protection, financial insurance, training?
Getting better representation to make sure laws are fair with your business, and to make water entrepreneurs more united?

How do clients know that you are the best?

Extra
Are you part of the water vendors association? Khanepaani prashodan tatha bikiribitaran sangh.
What is the association's role? What do they do for you as a vendor? Do you have any contact who I could interview?

Are there many not part of association (participation rate)?, Who do you dialogue with? Authorities ? NGOs? Water utility? What are the main topics of discussion?

Protocol Narrative walks

Framework of elements to be careful about

Efficiency:

- what are the main costs and the main felt wastes (how did I ask the forest?)
- where could there be economies of scale
- where could investment bring better efficiency

Resilience:

- how do they cope with yield management , with the utility expanding coverage and with water tables falling?

Accountability:

- where is there an evident lack of transparency
- how is information about quality, and price of water disseminated to consumer
- what is the state of power to consumer: buyer choice, buyers size/number, change cost/frequency, product/service importance, volumes, JIT scheduling)
- What are the feedback mechanism in place
- How can external actors monitor the performance of the business and what coercion has been used in the past?

Other questions sometimes asked during interviews

Do LICSU do a good job?

Are the people forming Water User's Groups (WUG) creating jobs to manage the public standpipes? Is there any mapping of the WUGs already in operation?

Do the poor (as defined with the LIPA criteria) get drinking water from other sources than the free, open ones? If not, do you have any report about significantly high occurrence of symptoms of bad quality water such as diarrhoea, scabies, typhoid fever, etc.

What systems are in place to make sure the poor have ok quality drinking water ? (stone spout water test and sanitation?) other purposes water? (public standpipe rehabilitation, solar pumps?)

One of the water bottlers I interviewed was doing the following treatment to his waters: aeration, multimedia filtration (sand, carbon, resin), river osmosis process, ozonification, UV exposition, multi-micron filtration. I have limited technical knowledge, but aren't there overlapping processes used there ? Couldn't he simply make aeration a bit longer to get the UV done? Does he even need UV after the rest of filtration?

What is “nagbada laké” ?

When projects of water pipes like alok hiti take place, aren't they creating more inequalities with the resale of water? I mean, even if they have a pokhari to refill water table, don't they pump the water for paying customers and hence reduce the pressure available at the stone spout ?
(or maybe they are doing at night, or the pump actually compensate for the pressure?)

Some documents I have say that the lower aquifer is under utilized. Do you have any example of how it could deliver water to the poor?

Why would private Dwells, tube wells and increase in interest for rain water harvesting, ecosan undermine the demand for the bulk water supply? Melamchi is supposed to supply so much water that it would cover more than the demand?

Who is supposed to help regulator for pro poor policy? Who is the current Regulator?

What should I know that everybody knows but is never written about water governance or water money in Kattmandu?

Amongst the stakeholders I will interview, who would have interest to lie to me?

Is it worth contacting somebody from KUKL, or KVWSMC or the national water supply regulatory commission if I have questions about water vendors? Do you have any contacts ?

Appendix 2: List of interviewees (interviews + narrative walks)

Interview N°1, Lumanti, NGO specialized in urban poverty and squatter community.

- No transcript, pilot interview, no quote used in findings.

Interview N°2, Guna Ram, member of national executive committee of the general federation of Nepalese trade unions

- No transcript, pilot interview, no quote used in findings.

Interview N°3, Prakash Chandra Jha, manager of an independent environmental research and consultancy group.

- No transcript, informal interview, no quote used for findings.

Interview N°4, Kumar Lama, executive director of Lake Quench, wholesaler of tank water and bottled water.

Interview N°5, Rajan Dahal, Director of Ganga Khanepaani, wholesale water and tankers.

Interview N°6, Moon Shrestha, Climate change adaptation officer, WWF.

- No transcript, informal interview, not structured, no quote used in findings.

Interview N°7, Rajesh Manhandhar, Water and Sanitation Coordinator, UN Habitat.

- Interviewed in the quality of technical consultant and fund agency representative.

Interview N°8, Ganesh Shah, former Minister of environment , science and technology.

Interview N°9, Dr Jaya Kumar Gurung, director of the WETC research center.

- Interviewed in the quality of researcher and technical consultant

Interview N° 10, Hari Prasad Dhakal KVWSMB executive director

- Interviewed in the quality of Utility representative

Interview N° 11, Prayag Lal Joshi former 2nd man in command for Nepal Water Supply Corporation, Consultant for the Asian Development Bank.

- Interviewed in the quality of institutional and technical consultant.

Interview N° 12, Suman Prasad Sharma, former Joint-Secretary MPPW transitioned as project manager for KUKL (the utility) 10 days before the interview.

- Interviewed in the quality of representative of the government and the utility

Interview N° 13, Prakash Amatya executive Director, NGO Forum for Urban Water and Sanitation

- Interviewed in the quality of representative of the NGO sector.

SUM UP interviews

	N°4	*N°5*	*N°6*	*N°7*	*N°8*	*N°9*	*N°10*	*N°11*	*N°12*	*N°13*
Utility							1	½	½	
Government					½				1	
Consultant				1	1	1		1		
Private sector	1	1								
NGO			1	½						1

Legend: 1= role principal, ½= past experience or expertise on the issue.

Narrative Walk N°1, Lake Quench with Kumar Lama

Narrative Walk N°2, Small Tanker (6000 L), trip from Lake Quench to private house.

Narrative Walk N°3, Large tanker (12000 L), trip from Lake Quench to Russian embassy

Narrative Walk N°4, Alok Hity

Narrative Walk N°5, Chyasal

SUM UP narrative walks

	N°1	*N°2*	*N°3*	*N°4*	*N°5*
Bottling	1				
Tanker		1	1		
Community piped network				1	1