

Towards a water balanced utilization through circular economy

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Abstract

Purpose – The purpose of this study is to describe and explain the relative water scarcity condition as one of the main problems encountered in Indonesia. It is caused by fierce competition between water users, water over consumption and high water price. The water conflict and increasing phenomena of relative water scarcity result in unequal access to water between the rich and the poor. This research is intended to contribute to a balanced water governance system that secures equal and fair access to water resources for all users.

Design/methodology/approach – A mixed method approach was used involving interviews with the owners of the established bottled water companies, the community leaders, guard for sluice gate, local NGOs and several government agencies.

Findings – Research results indicate that water policies and implementation are lacking coherency. It is also shown that the complex government structure with responsibilities divided over multiple agencies is responsible for this. The circular economy for water governance system used to find alternative solutions for reducing social conflicts so that the water will be made available to those who have no water access.

Research limitations/implications – This research used only one location with a representative number of interviewees; hence, the findings are not possibly generalizable.

Originality/value – The combination of water legal framework and circular economy concept was used to reduce water scarcity

Keywords Circular economy, Other management related topics, Relative water scarcity, Unequal access, Water governance, Water legal framework, Water policies

Paper type Research paper

Introduction

Water is an essential commodity and cannot be substituted by other products. Water has strong ties to social, economic and political life (Swyngedouw, 2009). With regard to ownership water can be owned by the state or the community or no one (Ostrom *et al.*, 1994). In this paper, the focus is upon springs, which have been transformed over time from a common pool property to a private property commodity. Springs are considered to be a part of the groundwater system (Harter, 2003), so this paper can be considered as a spring-groundwater withdrawal case. Such withdrawals can cause rivalry, but also are non-excludable (Ostrom *et al.*, 1994). Rivalry will occur when one user in an area that depends on a specific groundwater aquifer takes the water in such a large amount that the other users



get less than they need. This might, for instance, as in the case of the study area, happen when companies in the private sector use a large amount of water therefore many households get less, even though in principle, there is abundant supply of water. Such a situation is referred to as relative water scarcity and it frequently is found in developing countries. Research into this phenomenon clarifies that relative water scarcity is related to inequality of access to water between rich and poor households in a region (Yang *et al.*, 2013).

Water policies in the past two decades have focused more on the expansion of water supply and physical availability of water without regard to sustainability. This approach has led to poor management of institutional structures and water resources. Current practices in water management may not be enough to meet the water challenges of the next century. About a billion people have insufficient access to water of good quality today, and also in developed countries, scenarios indicate a substantial scarcity that will occur in the future. There is a need to reexamine the institutional structures. Water use is influenced by water rights, which are closely linked to property rights on land. The problem is partly analyzed by contextual interaction theory (CIT) for explaining the why and how of the implementation of the existing policy. The other analysis is with a social ecological systems approach that is used to understand the process of use, maintenance, regeneration and destruction of natural resources and how the policy maker can help to organize diagnostic, analytical and prescriptive capabilities. The paper attempts to highlight the key features in the existing legal framework where gaps and weaknesses in the existing legal system have contributed to the present situations, which is inconsistent with sustainability principles.

Methods

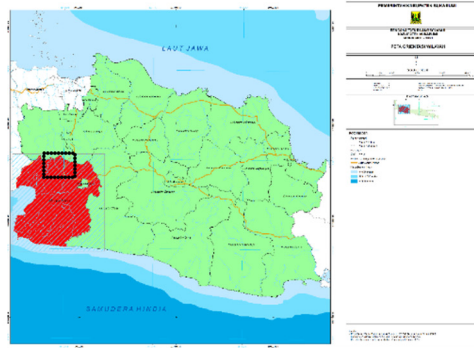
This research uses a mixed methods approach focusing on the collection and analysis of qualitative and quantitative data during the same time (Creswell, 2003). A concurrent transformative design is used to reach out information by identifying the inequalities and empowering individual strengths. The collected data were structured and analyzed by the social-ecological systems and the CIT frameworks. The aim of this study was to gain insights into the inequality of access to water, the many interests of stakeholders, the urgency of water conflict and stepping-stones toward improvement.

The analysis is based on primary and secondary data. The primary data were collected by interviewing key informants such as the owners of the mineral water company, community leaders and guard for sluice gate, local NGOs and several government departments. The research is located in Babakan Pari of the Cidahu sub-district and Mekarsari of the Cicurug sub-district within Sukabumi Regency-West Java, Indonesia (Figure 1). The location is chosen because this area has an abundance of water resources, while at the same time it is known for significant issues with regard to relative water scarcity. The research area is characterized by water springs which attracted investors for water-based production.

The key informant of government is taken from Sukabumi district, West Java Province, and also from ministry. They are consist of Babakan Pari village, Mekarsari village, Cidahu sub-district, Cicurug sub district, three agency from Sukabumi district and West Java Province (mining and mineral resource agency, planner agency, and environment agency), integrated capital investment and permit agency of Sukabumi District, agriculture agency of Sukabumi District, Ministry Public Works and Ministry Mining and Energy. It is followed by questionnaires distributed to local community members on-site and focus group members within the community. The secondary data were mainly collected from



(a)



(b)

Figure 1.
The research area

Sources: (a) National online program; (b) Planner Agency of Sukabumi District

government reports and other relevant materials. The data analysis is based on the triangulation method (Creswell, 2003), where analysis of qualitative and quantitative data is carried out during the same time.

Water management in the research area

Spring water has the best quality of water because of the natural filtration by geological processes. The springs are categorized by their origin. In this research area, the springs are depression springs. This means that the spring can be found when the water table reaches the surface (Fetter, 2001; Harter, 2003). Spring water is easy to find on the slope of the mountain like in the research area. The research area has an abundant quantity of water and also has the best quality thinkable. Before 1990, this was an area of rice fields and any crop could be cultivated here because the water is adequate for watering the field (Figure 2). After 1990, many industries build in this area such as a mineral water bottle company, garment and other industries. The area changed when a lot of rice fields were sold to the settlers. From the early 2000s onwards, there are many conversions of rice field areas into housing or other buildings. The volume of the rainfall is high, the conversion of fields to housing and industries had substantial impact on the available spring water volume in the lowland area, even with regard to the number of springs (Figure 3). Even when the amount of spring water decreased, this area still has an abundance of water. This is proved by the fact that the private sector is still able to fulfill its water needs in terms of both quantity and quality. On the other side, the inhabitants cannot get the water as much as before because the property rights of some of the springs have changed. They changed from common property to private property and create unequal access to spring water so that the area gets a relative water scarcity. This

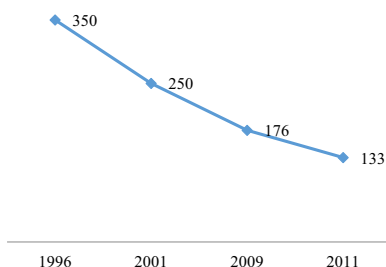


Figure 2.
Number of water
springs

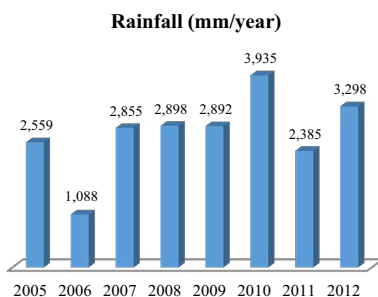


Figure 3.
Volume of rainfall

condition results not only from lack of water conservation but more from the regional planning, which is in turn related to the political, social and economic systems.

Result and discussion

History of water management in Indonesia

The history of water management in ancient Indonesia starts by club property. This implies that a small group of people take control over water resources for their needs. This was the situation before the period of colonialism started in 1600 (Pasandaran, 2004). At that time, every region and club had different names, for example, Dharma Tirta in East Java and Subak in Bali. They worked at local level and followed the principles of the natural system. The system is more using the natural conditions without special treatment techniques, such as irrigation making following the river curve with some local regulation. This system worked very well from generation to generation and depended on the natural water system. Each of the members of a club had a task to make the system function. The water system was capable to support the water needs of people and agriculture, especially with regard to the paddy fields. There was no real water related rivalry and no absolute or relative water scarcity. The situation changed significantly since colonialism. The colonial exploitation changed agriculture and needed more water for irrigating crops (Pasandaran, 2004). To safeguard their interest, the colonialists changed the local system turning it into a centralistic system (state property). Gradually, modern irrigation systems were installed in many places, especially in Java to support the crops and local paddy fields, also in locations where the natural system would not support agriculture at substantial scale. The transition toward water being a state property and managed by the state concerned Java and Bali. In other areas of Indonesia, the traditional system remained unchanged. After Indonesia declared its independence in 1945, colonial rules for water management were still used to manage water utilization including irrigation.

Undang-undang Dasar 1945, the 1945 Constitution, defined all kinds of natural resources as common pool good, to be used for extending welfare. Almost all natural resources that are common pool resources get into the classical conflict of overuse. The governments have the authority to manage the water and to give permits for commercial water utilization. There are however many actors who get involved when issuing permits. The influence of a certain actor usually gives a nuance to the working of the system. On the other hand, the system influences the behavior of the actors (McGinnis and Ostrom, 2014). The failed connections to secure the concept of water property alike the 1945 Constitution intended relate to the multiple levels involved, the different elements of hierarchy and market involved, as showed in Table I. There are mismatches in the systems because every regime has perspective to

Table I.
Systems connected to
the water property
concepts

Concept of the water property	Hierarchy UUD 1945	Market Other regulation	Systems Centralization
Orde Lama (1st president regime)	UU No. 5 Tahun 1960		Centralization
Orde Baru (2nd President regime)		UU No. 11 Tahun 1974	Centralization
Orde Reformation (5th President regime)		UU No. 7 Tahun 2004	Decentralization
Orde Reformation (7th President regime)		Back to UU No. 11 Tahun 1974	Decentralization

choose a paradigm so that they never evaluate the overall consequences properly. Clear and strong rules are needed for managing the water as a commons goods, also depending on the social, economic and political setting. It should be clear who is controlling it, when and what way.

Since 1945, the regulation of water in Indonesia has changed by the subsequent regimes that held the power. These subsequent regimes issued different regulations even when they had the same main aim. As dominant aim, the law prescribes since 1945 that the regime should manage the natural resources for the welfare of all citizens and do so by following the Constitution Law 1945 that gives a statement that water is owned by the state. The first substantial water law dealing with water utilization starts in 1960 by Law No. 5/1960, which was issued by the first president's regime. This regime recognized that water is relevant for social and even cultural life. The change of the regime to the second president gives another nuance starting the commoditization of water. This second presidential regime has changed the perspective and emphasized the economic value of water. The regime then issued Law No. 11/1974 which seeks benefits from water by allowing private companies to manage the water supply. The privatization of water resources starts thus from this regime onwards. The situation does not address the management regarding volumes of water that the private sector can take from water resources nor is it clear about the conditions that should be met. As a common pool resource, this situation might have negative consequences for other users. Multiple sectors of industry that use substantial amounts of water benefited and increased production. Some counter forces in society and academia advocated for a more balanced arrangement to manage it differently as a sustainable resource. This resulted in issuing rules for water springs conservation in 1990 by Presidential Decree No. 32. Among others, it forbids to dig a deep well within 200 m from water springs. However, this piece of legislation is of subordinate importance. There is a categorization of the rules, a hierarchy of regulations which divides it into six levels. The first level is the Basic Constitution Law 1945 and then Common/Standard Law, Government Regulation, Presidential Decree, Presidential Regulation and Regional/Local Regulation. In this case, the rule of water utilization is higher in hierarchy than the rule of water conservation. In most cases, government simply ignores the latter and gives a permit for exploiting the resources.

This situation became even worse when decentralization took place in 1998. The local or regional government grants the permits for water utilization even more easily. This has happened after the political system changed in Indonesia by the reformation of 1998. Economic conditions and pressure by international political and economic institutions played a role in this. The IMF and the World Bank gave a loan to Indonesia on the condition of political reforms including liberalization of political and also economic systems (Abrahamsen, 2004). In fact, in some countries, including Indonesia, national socio-political systems proved not to be capable of balancing such a system (Soto, 2000). This era resulted in a new regime and in 2004 the rules on water management changed again when Law No. 5/2004 was issued. This law created another problem. It is about categorization of spring-waters that in the hydro geological system in practice cannot be separated. The spring-water cannot flow when the water table intersects the land surface in a small depression (common on hill-sides) (Harter, 2003). The tasks in managing water were by this law divided among three ministries and local and regional governments. Two of the ministries hold the authorization of water utilization and one ministry holds water conservation. They are following the Law No. 5/2004 and get the tasks as mentioned in Government Regulations No. 42/2008 and 43/2008. Both of the laws separate the water springs into below and above ground level. The responsible authorities are the Ministry of Public Work for water springs above ground level and the Ministry of Energy and Mineral Resources for water springs

below ground level. The Ministry of Environmental affairs and Forestry is responsible for conserving the water springs. However, all of these regulations and related permits are implemented through local or regional governments. This overlapping system of legitimacy plays an important role in the resulting ambiguity.

Institutional responsibilities and authorities of involved actors

To underpin the analysis of the stakeholder process we succeed by analyzing the responsibilities toward water resources. It starts by mentioning the authorities in water management as included in Table II. Next, the responsibilities of each institution related to water management is described in Table III. This is about the responsibility for parts of the implementation of relevant policies and how legal authorities are allocated over involved actors (Bressers *et al.*, 2013). It is used to underpin the analysis of the process that led to inequality between the private company and the inhabitants, especially the poor people. That analysis starts by depicting legal authorities and roles of actors within the political system at multiple scales.

Table II.
The institutional authorities in Indonesian water management

Local	Regional	National
Headperson of village	Environment agency	Public works
Headperson of sub district	Mining and mineral resource agency	Mining and energy
Mining and mineral resource agency	Publics work agency	
Planning agency		
Integrated capital investment and permit agency		
Agricultural agency		
Public works agency		

Table III.
The responsibility of government institutions for spring water management

No.	Institution	Task related to spring water management
1	Headperson of villages	Recommendations for exploitation
2	Headperson of sub district	Recommendations for exploitation
3	Local mining and mineral resource agency	Recording data
4	Regional mining and mineral resource agency	Technical permits for exploration and exploitation
5	Local planner agency	Recommendations on suitability of land
6	Ministry of public works	Piping water for society and irrigation
7	Ministry of mining and energy	Data base on ground water availability
8	Local environment agency	Environmental recommendations on distribution of benefits from water
9	Regional environment agency	Data base on environment condition
10	Local integrated capital investment and permit	Giving permissions
11	Local agricultural agency	Irrigation
12	Local public works agency	Piping water for inhabitants
13	Regional public work agency	Data base on surface water availability and technical permits for exploitation

Table III shows that institutions from various levels and sectors are involved in the management of water resources. Involvement of higher level institutions can influence power relations on the local and regional level. At the local level, for instance, the agriculture agency needs water for irrigating the crops and rice fields; rival ambitions have to be aligned. At the same time, the public works agency carries out a project with aid from the ministry of public work establishing a piped water infrastructure in another area. That the piped water infrastructure is not built in the research area based on integral analysis at the appropriate scale is because actors think that the water in the area is sufficient for all users and the process of allocation can be handled by the private sector. The involvement of the planning agency, responsible for planning of investment in infrastructure, in general focusses more on the cities rather than on the villages. All of such separated tasks indicate that there are no signs of substantial efforts on coordination. In the often horizontal relations, the connection with the long term integral perspectives is lacking. The strategic goal setting for a sustainable water resource management and sustainable water supply, avoiding social conflict, is thus missing.

Main goals of involved actors

It is the province that should provide the vertical coordination with regard to the management of the extraction of substantial resources, connecting the process on the local level and the policies at national level. In practice, the mining and mineral resource agency at the provincial level has the authority to decide about a permit. A decision is to be made based on the technical conditions for the exploration and exploitation. Unfortunately, this agency issues in practice the permit to use the groundwater with only one dominant goal in mind: finding investors to develop the region and receive tax revenues. Whether there are sound arguments for this in terms of necessity remains vague. There is no attempt to include an integral assessment also covering sustainability of water resources and water supply. A comprehensive evaluation of the socio-environmental conditions and impacts is missing in this case.

Another unfortunate thing is that the province also supports the companies aiming for increasing their production. With regard to the effects and consequences, the government also does not have sufficient data and science-based information, which weakens their positions. Research documents on the carrying capacity of this area are absent. Instead, the government relies on research documents supplied by the companies, whose main concerns are to continue and expand their water production or use. Of course, in theory, there might be benefits for the companies that help the government gaining a better database of the natural resource for management. And this would in stronger developed countries make sense, as an element of corporate social responsibility (CSR) of private companies. This then could lead to modern forms of co-creation and co-production. In this case, private companies do not aim for this purpose and governments are not capable and competent to evaluate the reports of the companies.

At the national level institutions have the task to prepare appropriate plans and regulations and support the local and regional level governments. The ministry of public work attempts to develop and expand the piped water system by cost sharing with local government. They work on the surface water and the springs under the river. The most important hindrance for this is also the lack of appropriate knowledge, information and exchange. At the local level there is no appropriate information on the piped water system and its functioning in relation to the occurring relative water scarcity. Actually, the local government is as depicted above, depending upon research and reporting of the big water companies. The result is also that the local government does not give relevant information to actors on the national level with regard to water scarcity.

Permitting process

Indonesia operates water law and water policy on the basis that *de jure*, the water is owned by the state. People and organizations that wish to take a benefit from the water should get a permit or permits for access. In fact, there are many institutions, some of the important ones were already depicted in Table III, that play a role in the permitting of water allocation and utilization (Table IV). They all operate within the context of an organizational setting and all of these organizations bring in their own goals and ambitions, starting from national level up to local level. Thus, the subsequent steps will be to describe the permitting process for taking spring water and the role of the actors with the administrative system. The key issue is of course whether they team up into a competent multi-level system that facilitates sound decision making on the local level. Therefore, from the perspective of understanding the role of governments within the administrative system, it is necessary to analyze their roles and interactions as well as network relationships (Bressers *et al.*, 2013).

The West Java government prepared an agreement with the private sector to solve the relative water scarcity condition. This agreement is about a water service program for inhabitants with private capital involved. The private sector, driven by their CSR program, initiated and prepared a plan to create a piped water system. Given the already growing demand for water from the companies and resulting raising water prices, the local community has to face the inevitable social conflict. The government-initiated water piping project seems to give little benefit to the poor people in practice, considering that most of the local community is using shallow groundwater (Figure 4). Figure 4 indicates that only 37 per cent of the inhabitants could gain from the company by this CSR-based initiative. The local people that have access to the piped water have this for less than 24 h a day. Moreover, the secondary piping lines are in most cases constructed with poor quality pipe systems, resulting in inequality of water distribution among local people. In short, the majority of the local people cannot fulfill their water needs at a reasonable standard. Roughly, 63 per cent of the people

Table IV.
Multi-level
institutions on water
permitting

Procedure	Operational level	Collective level	Constitutional level
Location permit	FGD with society NGOs	Sub-district permit	
Environment permit		Coordination with planning agency, environmental agency, and technical agency	AMDAL or UKL/UPL document
Operational permit	Coordination with investment agency	Business license	District rule for water tax
Monitoring and evaluation	Preparation for auditor		

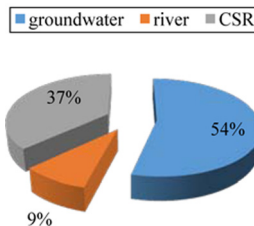


Figure 4.
Water access in
Babakan Pari

still depend on traditional wells and very often have to use water from the polluted river adjacent to the village. The remaining traditional wells produce water of inferior quality because of the fact that the water is polluted by domestic waste and by the effects of unregulated and unplanned settlements. The river is also used for taking a bath in the communal bathroom, even though the river is polluted by fertilizers and pesticides from the rice fields nearby. Unfortunately, the local government did not take any action for this because as long as some water is available, it is not regarded as a problem that needs urgent attention.

Multilevel stakeholder process

How public actors prepare and position themselves with regard to permits for companies at the local level that require spring water seems to vary by agency. The environmental agency focuses on water conservation and gives the environment permit for private sectors that wish to take any benefit from water. The mining and mineral resource agency, on the other hand, has an authority over the technical permits, but they do not have an overview of and a strategy for the carrying capacity for exploitation of the water resource. This leads to a situation in which neither institution feels they have the sole responsible or the sole competence with regard to permitting and certainly not with regard to the avoidance of overexploitation. The reason for this is that they feel that the province is responsible for competent guidance on this. Coherence of permitting is therefore low and this is thus caused by substantial fragmentation, relevant aspects of responsibility are shattered over multiple agencies, roles and responsibilities.

Lack of information about the real situation also inhibits the Ministry of Public Works to give aid to an adequate development of the piped water sector. In the dry season the situation gets considerable worse in our research area. The volume of water in the rainy season is then much larger compared to the dry season (Figure 5). In the rainy season, the quantity of water is abundant however the quality is low. In the dry season, the quantity of water is low and the majority of people are depending on water from the polluted river, at a substantial distance. During the dry season, water quality is really below reasonable level. Therefore, the choice is either to use this water or wait for the kindness of the private sector to allow taking some of their water. The private sector has water at their disposal, even during the dry period. The water companies are able to reach the water as much as they want to because of the fact that they have permits to do so and the financial and technical means to dig deep. They use the springs that contain a stable volume in each season, not the traditional shallow wells, nor the river. The company is actually obliged to share these sources with the inhabitants of the community. The rule is that this should be at least 10 per cent of the production. However, this is by far not enough to fulfill the societal water needs.

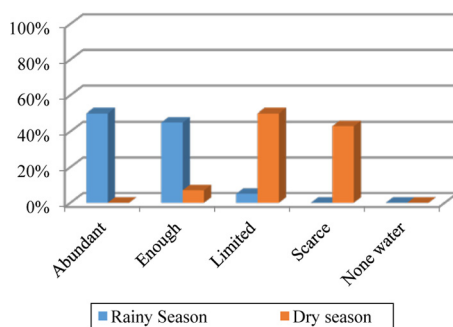


Figure 5.
Survey of availability
of water

There is another factor that has no positive impacts: when companies get the needed permit from the institution under the Ministry of Public Works at the provincial level, they have to pay a tax (NPA) of 10 per cent. On the other hand, when they get the permit from the institution under the Ministry of Energy and Mineral Resources at the provincial level, they should pay a tax (NPA) of 20 per cent. This led to a competition between the District level of the Ministry of Public Works and the District level of the Ministry of Energy and Mineral Resources in getting the water consumers into their schemes. The problem is that the two only have responsibility to give technical permits for water utilization. The water conservation is the institutional responsibility under the Ministry of Environment and Forestry at the local level. This local office also makes environmental assessments and issues environmental permits for the company to start their activity. The ambiguity allows the state much discretion in the allocation of access (compare Ribot, 1995). The described incentive system leads to rivalry and low efforts on co-operation and hence enables powerful companies to choose the forum at which to claim their rights (compare Lund, 1994).

Next to the Ministry of Public Works also the Ministry of Mining and Mineral Resources could make a substantial contribution. This ministry gathers data and runs a database on the potential of water resources. They work on ground water and spring water. For the case of our research, the ministry only receives information expressing that the volume of water resources is abundant, so that this area is very open for investments in water related products. The commercial promotion of the water resources of this area is successful. This is, for instance, illustrated by the substantial increase in foreign investment in large mineral water bottle company. The stock held by foreign investors indicates the increasing privatization in Indonesia.

The bottom line of the private sector concerns profits, responding to public concerns or to the environment is not their main goal (Figure 6). The change from perceiving water as a common property to a commodity creates conflicts in the area as described. Especially, people who already are living for a long time in this area think this is unfair. Lawlessness is not so much about crime but often a coalition between rule-making at the grass roots level and rule-making at the top (Soto, 2000). This situation is also called mismanagement by the government. There is however also the option to price the commodity water in a way that also enables government to secure both the water resource and the supply of water of good quality, in that case regulations should price misuse of water such as inefficient use and pollution of water (Bressers and Lulofs, 2004).

The problem in this case happened because discretionary decisions or transfers establish insecure arrangements or privileges that decision-making agents can influence themselves rather than establishing user's rights in an inclusive and coherent manner and connecting misuse to consequences (compare Ribot, 1998). Local and regional agents just follow the technical permits from District level of Ministry of Public Work or District level of Ministry

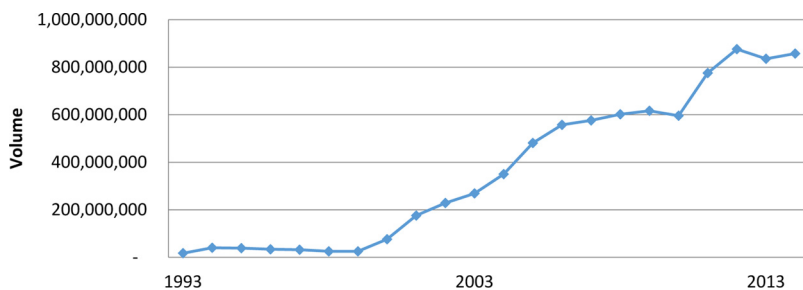


Figure 6.
The rising volume of
water yields

of Energy and Mineral Resource. They lack databases on water supply, they lack appropriate models and they lack knowledge with regard to conservation efforts required for sustainable management. It results in a weak position for all local or regional governments who give the permit. There is no master plan for resource utilization, instead they are usually depending on the private sector reports.

Analysis of the resource use processes

The national government gives the responsibility about this local case to local government. But the local government gives no priority to resource protection in this case because they need the tax from the private sector to build the region, and with regard to some aspects there is, as described, even competition among governments to receive tax money from companies. The lack of evaluation of water use by the private sector makes the government in the end almost always giving them a permit to increase their production. This has happened since 1990, when the protests of the citizens in the small number were easy to ignore. Many places in the world specially in development country, the demand for water usually exceed viable resource yields including. It is including in the research area as a part of Indonesia. It is caused by dysfunctional political or economic systems and ill-defined markets. They push the water production and use more and more into linear systems. The linear system has changed the valuable resource into a worthless trickle. In other words, the linear model provides economically and environmentally unsustainable development.

Circular economy and the legal framework

Under the concept of “circular economy” one should be trying to reduce the water use by recycling it or use water injection with some filtration and apply regulation that punish people who overuse or pollute the water. The circular economy approach tries to prevent the contamination of water that circulates in closed loops, allowing repeated use. In China, circular economy practice is used to serve as demonstration projects, first beginning at the level of enterprises, then industrial parks, and then expanding to cities and regions (Zhiyun and Nailing, 2007). Promoting a circular economy preserves the environment, establishes a resource saving and environmentally friendly society, and achieves a harmonious balance of economic growth, population, resources and environment. According to a green growth economy report in 2014, Indonesia’s performance is quite poor in this, ranking near the bottom of most dimensions, except some among which leadership and climate change. Especially, sectors like building and transport are poor performers from a green perspective in Indonesia. Also, with regard to the distribution, companies that produce mineral water use massively trucks to deliver water to all consumers, from countries that operate efficient piped drinking water systems it is demonstrated that this can be done otherwise. This situation automatically also increases the price of water for some consumers. On the other hand, Indonesian has a chance to change the situation by their leadership so that a change of regulation becomes a first step to enable equal and sustainable water use. The regulation effectively will be important to help achieve a circular economy. The existing regulatory framework that is relevant to the circular economy is complex. It includes both environmental and non-environmental legislation and has evolved with other aims and priorities in mind, and rightly so there are many issues to be balanced. The needed change of regulations comes with the opportunity to include circular economy in the legislation. Some instruments should be added in government regulation, such as increasing the value-added to water and its appropriate management, using new irrigation technology to reduce water use and water pollution, applying filtration systems in every house and making every citizen support the conservation of water resources.

The change of regulation has to start by a new and revolutionary way of thinking, leaving the old linear thinking about resource use. The stakeholders need to understand how to make a circular system of water utilization. The stakeholders should rise their knowledge and follow an evolutionary process. The circular economy approach could create equal conditions of water use such as in Dalian municipality China has attempted to pursue by both supply and demand-driven approaches to water management (Geng *et al.*, 2009). They try to find new water sources and at the same time reduce water consumption. The regulatory context should change step by step. River can be used as new source by filtrating the water to increase the water production. Of course, this also makes clear that a policy for conservation action is needed. The conservation should follow the water table conditions. If the water user has a land with a high water table, they should for instance plant trees or make a small forest in the catchment area. But, if their water table is low, they should make infiltration wells to fill the water resource with the natural filtration. The society should reduce the consumption of mineral water in bottles and use clean local filtrated water instead. Another problem is agricultural pollution. Farmers can reduce their pollution under the influence of incentive and disincentive systems. This requires the participation by all of the society because of the need of change the way of farming, for instance by transforming the use of the chemical fertilizers into bio fertilizers.

Unless these lessons are taken seriously, the Millennium Development Goals (MDGs) for a developing country that targets to reduce the number of people without access to water sanitation by 50 per cent in 2015 will fail by far because this goal is not within reach by business as usual or by small changes. Until the early year of 2015, the research area still had a huge implementation gap regarding water access so that the MDGs target is unlikely to be achieved in this area. In the described circular economy strategy, the driving forces of the market mechanism and hierarchy are in principle combined and work together. Circular economy principles enable making better, more efficient use of resources. This reduces the total volume needed, and also the costs of production decrease by this strategy. All of this facilitates the delivery of water to the poor at lower prices as well as it enables making sustainable business from water management. Of course, there is still a lot of fine-tuning to do; however, if our analysis comes with a clear observation, it is that this new pathway has to be chosen, changing nothing will lead to more steps to the bottom in the linear system of overuse.

Conclusions

Mismanagement of water has created relative water scarcity. It is caused by short-term target policy and commodification of water without control from government. An unbalance between hierarchy and market exists. There should be a revolutionary change of orientation on taking the benefits from the water resources. The circular economy approach gives an alternative solution for relative water scarcity by a revolutionary change in way of thinking on internal and external water management. Elements of this consists of increasing added value of water, creating incentives and disincentives to reduce water pollution and water use, rising the knowledge to create an evolutionary process from linear to circular (in external action) and also an top down-bottom up approach used in making decisions on developing the city. The revolutionary change of thinking should include a change of the social and cultural habits so that rain water can be an alternative water source for domestic use instead of the springs. Also, the government and the private sector can take the benefit from rainwater as a source when it is used wisely by sustainable water management underpinned by co-production.

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