

Degradation Of The Ethical (Social) Sustainability Of Public Drinking Water Services In The Municipality Of Dassa-Zoume In Benin

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Abstract – In the municipality of Dassa-Zoume, there is a real problem of unequal access to public drinking water services. This paper studies the ethical sustainability of public drinking water services in the municipality of Dassa-Zoume.

The 3E method was used for this research. It made it possible to assess the weight of the cost of water in monthly household income and to analyze the rate of complaints and unpaid bills. Data was collected through documentary research and field surveys carried out among 100 households and 20 stakeholders in the management of public drinking water services. Data processing and analysis was made possible by Sphinx 4.5 software.

The results show that 32.9% of households surveyed have a monthly salary of less than 15,000 FCFA, 26% of households have their salary between 15,000 and 30,000 FCFA and only 12.1% of households have a salary greater than 60,000 FCFA. The chi2 test carried out shows a dependence is very significant at the threshold $\alpha = 0.05$ ($\chi^2 = 124.77$, $\text{dof} = 12$, $1-p \Rightarrow 0.0001\%$) between the monthly income of the monthly and the quantity of daily water consumed. Low-income households consume less water than households with incomes above 60,000 F. Monthly, the minimum cost of access to water per person is 673 F and the maximum is 8,481 F. This cost represents at least 22.8% of the income of poor households and 7.07% of the income of households that earn at least 60,000 F monthly. These rates greatly exceed the threshold of 3% accepted for the service to be ethically sustainable.

Keywords – Dassa-Zoumé; Public Drinking Water Service, Performance indicators; 3 Es method, Sustainability.

I. INTRODUCTION

Long considered abundant, water now appears in certain situations as a good limited to the threatened quality.

Public water and sanitation services must respond to increased environmental, economic and social challenges both in terms of the quality and quantity of the water used [1]. Consumption patterns are evolving towards greater water savings and regulations are being tightened, particularly in terms of the protection of water resources. The quality of the service to the user, the evaluation of the performance of the services as well as the implementation of the right of access to water are central issues today [2].

In the field of water management where the natural resource status of the well studied induces institutional and organized consideration of the dimension, the ecological question is a priority (see the objectives of the Grenelle Environment Forum) and its importance is irrelevant. has stopped increasing with the strengthening of environmental regulatory requirements [3]. This centrality

given to the environmental aspect of urban water management has fostered the development of what some analysts qualify as "nature's neoliberalism" [4].or "green capitalism".

Other authors [5] argue that there is an environmental incentive for the privatization of water services reinforced by the increased “green” character of water sector regulation. In this context of conquering environmental sustainability, the repercussion of environmental expenditure on the price paid by the user to preserve the resource leads to a paradox: that of endangering the social sustainability of the service and, by ricochet effect, the economic sustainability. The underlying pay-polluter principle has lapsed and transfers an undue burden to water consumers, which leads to an inflation in the price of water which increases the difficulties of access to the service of socio-economically vulnerable populations [6].

This strain on access to water increases the risk of unpaid debts and consequently reduces financial revenues [7]. It is therefore faced with the observation of the impact of social dynamics on the overall sustainability of systems that we come to question the social in the water sector in Benin in general and in the municipality of Dassa-Zoumé in particular.

The town of Dassa-Zoumé, capital of the department of hills. It lies between 7 ° 29 'and 7 ° 57' North latitude and between 2 ° 9 'and 2 ° 13 "East longitude (Figure 2). It covers an area of 1,711 km² and has 112,122 inhabitants [8]. It is bounded to the north by the commune of Glazoué, to the south by the commune of Djidja, to the east by the communes of Savè and Kétou, and to the west by the commune of Savalou (figure 13). It is surrounded by hills to the east and receives less rainfall than the municipality of Savè. Thus, the average annual rainfall is around 1,100 mm [9].

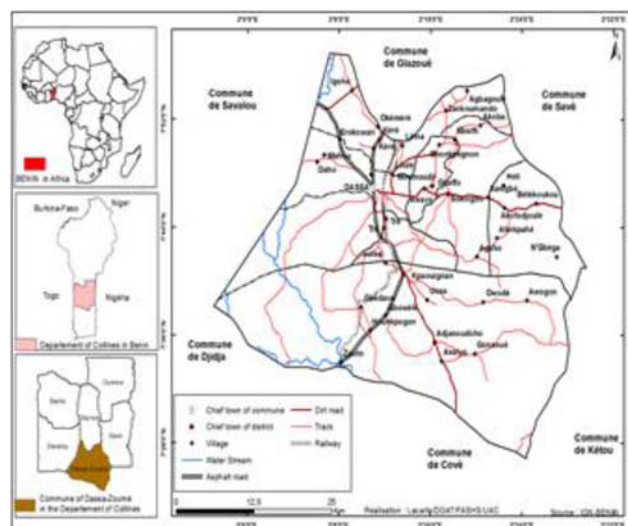


Figure 1: Geographical and administrative location of the municipality of Dassa-Zoume [9].

To conduct this research well, a methodological approach is adopted

II. METHOD FOR EVALUATING THE ETHICAL SUSTAINABILITY OF PECS

The social aspect is very important in this assessment because it includes the quality of the service provided to the user and the acceptability of the bill. A first assessment consists of measuring the quality of service through the rates of complaints and unpaid bills. Secondly, the weight of the water bill is estimated in the budget of poor households and is compared to the unpaid rate to determine whether the tariff appears acceptable. By considering the acceptability of the tariff and the quality of the service, it is determined whether the tariff is actually accepted.

However, a comparison of the social support given to poor households with the acceptability of the tariff is made to determine whether this support is consistent.

Finally, we consider together the acceptance of the tariff and the consistency of social support to determine the social sustainability of the drinking water service (figure 2).

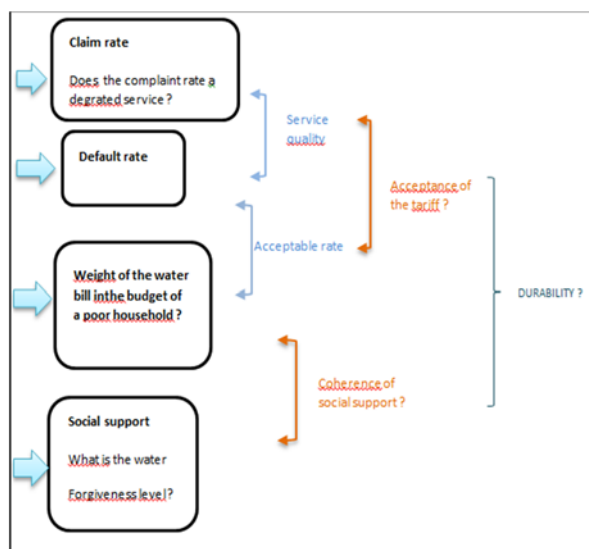


Figure 2: Principles for evaluating the Ethics (social) component of sustainability [10].

A first step is to assess the quality of service through the rates of complaints and unpaid bills. Second, we estimate the weight of the water bill in the budget of poor households and compare it to the unpaid rate to determine whether the tariff appears acceptable. By considering the acceptability of the tariff and the quality of the service together, it is determined whether the tariff is actually accepted.

III. RESULTS AND DISCUSSION

3.1-Ethical sustainability of SPEP in the municipality of Dassa-Zoumé

Most social sustainability analysts agree on the precarious status of the concept from a theoretical and empirical point of view. It is only very recently that he has taken an interest in social and human science reflections on sustainability [6], [11], [12] et [13]. This observation is even more true in the case of water, where there is hardly any work that deals with this question. It is therefore important to give content to this notion of social sustainability.

3.1.1-Income of households surveyed

The incomes of the households surveyed vary from less than 22 USA to more than 87 USA. Figure 3 shows the income of the households surveyed.

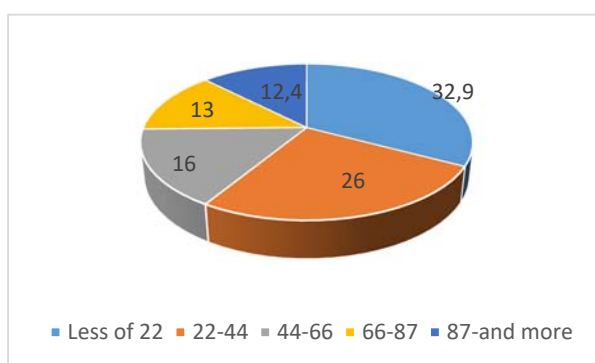


Figure 3: Monthly income of surveyed households

Source: Field survey, July 2019

Figure 3 shows the monthly household survey. Its analysis shows that 32.9% of the households surveyed have a monthly salary of less than 22 USA. These are households that do not have a fixed income. They all practice agro-pastoral activities, resellers. In addition, 26% of households have their salary between 22 USA and 44 USA. Only 12.1% of households earn more than 87 USA. In these households, 95% of intellectuals have at least a secondary level and are recipients of the state.

The analysis of water consumption shows that they consume water according to their income (Figure 4).

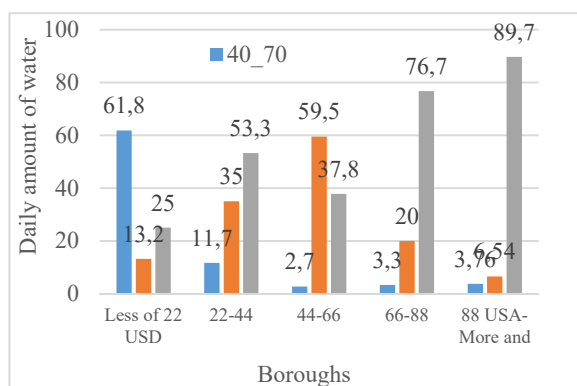


Figure 4 : Income and volume of daily water consumed
Source: Field survey, July 2019

The figure 4 shows the daily volume of water consumed according to the income of the households surveyed. His analysis shows that household consumption varies between at least 40 L to 100 L and more per day. Low-income households (less than 15,000 F) consume less amount of water (40 to 70 liters per day) than high-income households that consume more amount of water (at least 100 Liters and more per day) . The chi2 test performed shows an expenditure is very significant at the threshold $\alpha = 0.05$ ($\chi^2 = 124.77$, dof = 12, 1-p => 0.0001%) between the monthly income of the monthly and the quantity of daily water consumed. Low-income households consume less water than households with incomes above 60,000 F. Water consumption varies according to household income.

3.1.2-Sale price per cubic meter of drinking water

Access to drinking water involves production, distribution and treatment costs. Therefore, not only the choice of the water source but also the quantity and quality sufficient to meet the needs of the household are significantly influenced by the financial accessibility of water can lead the populations to use sources not recommended [14].

In the municipality of Dassa-Zoumé, the BF, SONEB and well water are engaged in a financial sale of drinking water in the various districts.

Table I: Seasonal price variation of 25 L of water.

Water sources	Seasons	
	Rainy season	Dry season
Drilling (FPMH)	10 F	10 F
BF	20 F à 25F	25 F à 35 F
SONEB (Commercial Distributors)	35 F	35 F à 50F

Source: Survey results, September 2019

Table I shows the seasonal variation in the price of water depending on the water sources used. His analysis shows that the price of water with a capacity of 25 L varies from 10 F to 50 F depending on the source used. In fact, during the rainy season, the price of water from BF varies from 20 F to 35 F and can reach 35 F during the dry season. At SONEB water vendors, this price is 35 F

for 25 L containers and can reach 50 F during the dry season. These price variations are not often observed at the FPMH level. At this level, the price of water remains constant whatever the season and is equal to 10 F.

On the other hand, the price of water transfer set by SONEB in the municipality of Dassa-Zoumé is 198 Francs for the first tranche (5m3) generally considered as a social tranche for all households. The estimate of the volume of water consumed per person per day in the town makes it possible to define the theoretical annual budget for water consumption per person.

Table II shows the cost of water per person and district.

Table II: Cost of water per person and district

Borough	Water demand L / D	Water demand l / month	CD/ArC	CD/Pers	CM / House holds
AKOFO DJOULE	1565,7	46970,1	469701	54,7	1642
Dassa I	1287,9	38637,3	386373	46,4	1393
DASSA II	24208,5	726254,4	7262544	282,7	8481
GBAFFO	784	23520,8	235208	51,8	1554
KERE	4406,4	132191,1	1321911	124,4	3733
KPINGNI	4222,8	126685,3	1266853	133,2	3997
LEMA	834,3	25028,6	250286	39,8	1194
PAOUIN GNAN	27795,5	833864,1	8338641	233,2	6997
SOCLOGBO	4273,4	128202,1	1282021	97,5	2924
TRE	413,6	12406,9	124069	22,4	673
Total	69792	2093760	20937600	1249,9	32589

Source: Field survey, September 2019

Table II shows the daily and monthly variation in the cost of water according to the districts of the municipality. Its analysis shows that, the minimum cost of water per individual is 0.031 USD and the maximum cost is 0.43 USD. Monthly, each individual targeted in the research environment, spends at least a sum of 0.43 USD per day and per person. The maximum monthly cost of water is 13.29 USD.

3.1.3-Influence of the price of the water transfer on household income

Apart from the poor coverage of the SoNEB water distribution network, the low standard of living of the majority of households is a major handicap in the supply of drinking water. The majority of households surveyed have unstable and low incomes which do not allow them to meet all the current household expenses. Indeed, the monthly price of water represents at least 22.8% of the income of poor households, that is, households with low incomes. For households with at least 87 USD more and of monthly income, the monthly price of the drinking water supply represents 7.07% of their salary. These thresholds are well above the threshold of 1.5% monthly household income for the payment of water by subscribers [15]. The figure 5 shows households' perception of the weight of water in their income.

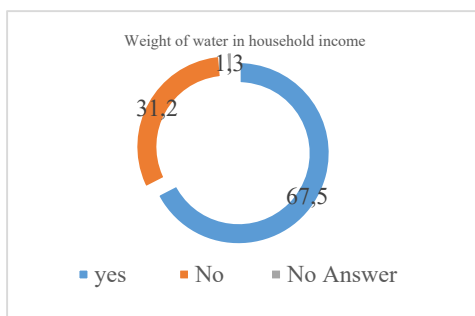


Figure 5 : Household perception of the weight of water in their income
Source: Field survey, July 2019

The analysis of the figure 5 shows that according to their respective income, 67.5% of the households surveyed think that the purchase of drinking water weighs on their income against 31.2% who are not. 'notice. To these are added 1.3% of households who have no perception of the weight of water in households.

Analysis of the information gathered in the field shows that SoNEB's water subscription is not within the reach of all households. Indeed, in Benin, 63.5% of the population spend less than one dollar (0.72 USD) per day and the average annual expenditure per capita in 2015 in the Collines department is 400 USD, for a poverty rate 59.04% monetary [8]. This level of expenditure is insignificant with regard to human needs and cannot allow the most disadvantaged to subscribe to the water distribution services of SONEB, the average promotional cost of which is 73 USD instead of 218 USD, i.e. 58, 50% of the annual average expenditure. On the other hand, the pricing of water to subscribers seems expensive in the eyes of households.

3.1.3-Analysis of the rate of unpaid and abandonment of SPEP in the municipality of Dassa-Zoume

The municipality of Dassa-Zoume has 374 FPMH of which 13.90 % are out of order and 12.03 % have been abandoned. The figure 6 shows the breakdown by district of the service failure and abandonment rates.

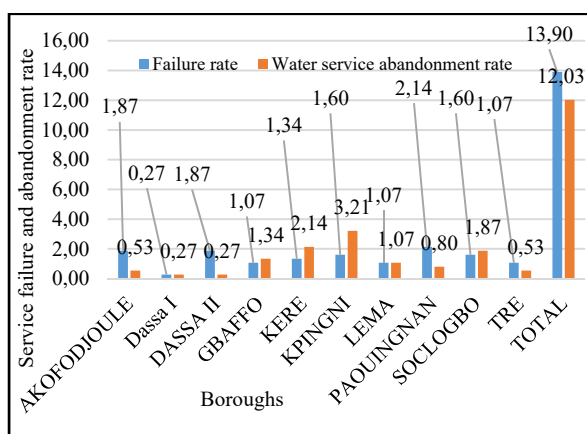


Figure 6 : Breakdown by district of FPMH failure and abandonment rates
Source: Field survey, February 2020

The figure 6 shows the breakdown by district of the failure and abandonment rates of SPEPs (FPMH). It emerges that regardless of the district covered, the water services based on the FPMH in the municipality of Dassa-Zoumé have experienced poor performance. Indeed, with a municipal rate of 13.90 % of service failures and 12.03 % of abandonment, the districts of Panouignan (2.14 %), Akoffodjoulé and Dassa II (1.87 %) and Kpingni (1.60 %) accumulate the strengths of failure. This notes the degradable nature of the water service level. In addition, at the municipal level, the service dropout rate is 12.03%. This rate is unevenly distributed from one arrondissement to another. The districts of Kpingni (3.21%) and Kèrè (2.14 %) stand out with a high rate of abandonment against the districts of Dassa I and II (0.27 %). This high rate of service drop-out discredits its social sustainability.

Apart from water services based on FPMH, AEVs are also called upon to supply water to populations. The figure 7 shows the rate of closed AEVs.

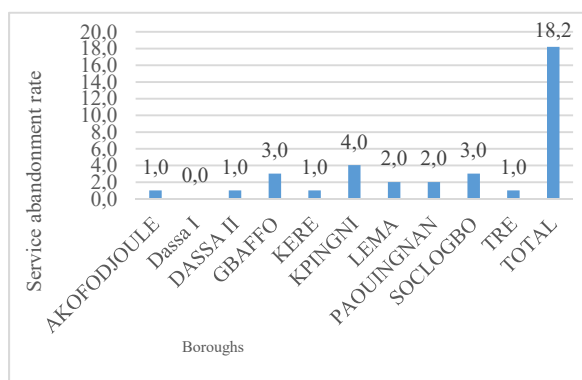


Figure 7: Rate of closed BF in Dassa-Zoumé commune
Source: Field survey, February 2020

The figure 7 shows the rate of closed BF in the municipality of Dassa-Zoumé. It emerges that the BF experienced poor performance which translates into 18.18% of closed BF. According to the delegates, the closure of its BF is due to the accumulation of unpaid invoices by subscribers. These subscribers who believe that the price of the water transfer exceeds their financial capacity. The Soneb water supply network is also used for access to water for households.

The municipality of Dassa-Zoumé has 2,216 subscribers, of which 1,794 are active in 2019. The number of non-active subscribers is 422, or 19.04% of the total number of subscribers. Interviews with the resource persons revealed that the 422 subscribers were deactivated from the network because of their inability to honor regular payment of their bill. They believe that this is a dear cost to them. This situation makes the state of the service vulnerable to subscribers. This vulnerability is illustrated by the fact that households experience accessibility difficulties.

3.1.4-Geographical and temporal accessibility

- Distances traveled from the arrondissements to the water points

According to [14], an individual has access to water if he is served by a network within 200 m of his home. In rural areas, it is rather the time spent by family members to obtain water that is an indicator. The standard adopted by [14] is a 15-minute walk in terms of the time it takes for households to get to drinking water points. However, the percentage of the population with access to drinking water is considered an indicator of the efficiency of the water supply. The distance to the water point is a first-order data since it partly determines the quantities available for domestic use, and for hygienic uses in particular, as well as the quality of the water.

In the commune of Dassa-Zoumé, 68.32 % of households travel at least 0.5 km to obtain water. Only 6 % of the households surveyed have a water source at home, which reduces the distances traveled. The figure 8 shows the distances traveled.

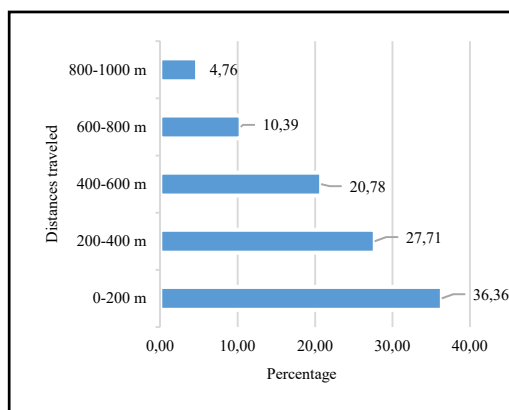


Figure 8 : Average distance traveled to access water
Source: Survey results, February 2020

The figure 8 shows the average distances traveled to access water. It appears that in all the arrondissements, the average distance traveled by women and children to obtain drinking water varies between 150 m and 900 m. Women and children in the districts of Dassa I, II and Kèrè walk 300 m before obtaining water. On the other hand, in the districts of Tré, Gbaffo, Panouignan, Kpingni, Soclogbo, households travel a distance of between (0.39-0.7) km before obtaining water. Only households in the districts of Akoffodjoulé and Lèma travel a distance of more than 700 m before obtaining water.

- Temporary accessibility to drinking water

It is an indicator of the social sustainability of the rural water service. It makes it possible to assess the time lost for the supply of drinking water in rural areas. Another difficulty is the Number of Hours Lost (NHP) to obtain drinking water. Reasonable or acceptable geographic accessibility to drinking water in rural areas is defined by walking no more than fifteen (15) minutes from home to a water point to obtain water. Figure 9 shows the time lost to obtain water.

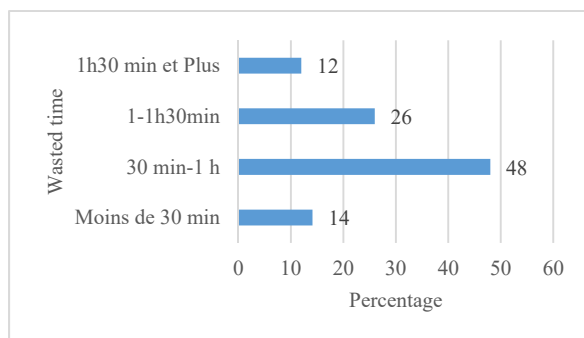


Figure 9 : Number of hours lost to obtain water in the municipality of Dassa-Zoumé
Source: Survey results, February 2020

Figure 3 shows the time taken by rural households before obtaining drinking water. Its analysis shows that 48% of targeted households in rural areas lose 30 min to 1 hour before getting water, compared to 12% who lose more than one (1h30 min). Only 14% of households surveyed lose 30 minutes before obtaining water.

3.2-Discussions

For WHO, accessibility is assessed in terms of distance, which is less than 200 meters from the concession [14] and collection time estimated at 15 minutes' walk. While traveling long distances undoubtedly impairs the quality of the water and also decreases the amount of water withdrawn as well.

It appears that in all the arrondissements, the average distance traveled by women and children to obtain drinking water varies between 150 m and 900 m. Women and children in the districts of Dassa I, II and Kèrè walk 300 m before obtaining water. On the other hand, in the districts of Tré, Gbaffo, Panouignan, Kpingni, Soclogbo, households travel a distance of between (0.39-0.7) km before obtaining water. Forty-eight percent (48 %) of targeted rural households lose 30 min to 1 hour before getting water, compared to 12 % who lose more than one (1h30 min). The distance, or collection time, and the cost have indirect effects on the quality and quantity of water available within households. For example, distance and cost influence the quantities of water available within households for basic consumption and hygiene needs in particular.

These results are also identical to those found by [16]. where he states 61 % of respondents from the Mono basin declare that they lose two (02) hours of time while 07 % believe they put four (04). This latter segment of the population is probably the one who travels the longest distances to obtain drinking water. Time and energy wasted in fetching water over long distances, a task mostly incumbent on women and girls, deprives them of time to engage in income-generating activities and go to school [14].

IV. CONCLUSION

At the end of this research on the social sustainability of water services in the municipality of Dassa-Zoumé, it emerges that taking into account the social dimension of sustainability in the water management system is not synonymous with economic deficit. Social sustainability coexists with a situation of economic surplus, which depends on the extent of the redistributive effects.

Also, taking social sustainability into account in terms of pricing is an exercise in adjusting the three dimensions of global sustainability and making the issues and universes of values equity and social justice) compatible according to the choices made. 'actors and modalities that should be made explicit. One of the concrete conditions for the social sustainability of the service could reside in the transfer of part of the management savings towards the support of the social equity objectives defined as the strategic objectives of the service. Such a prospect, however, depends on the ability of stakeholders in the water governance system to debate and collectively agree on the purposes of public water services. It also raises the question of the fair cost / fair price of water and the efficiency of urban water management systems, as well as that of social justice underpinned by the polluter-pays principle supported by the service user.

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