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The prospects of the domestic water equity indicators in Indonesia: a review

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Abstract. Despite the major progress achieved by the domestic water supply sector since the commencement of the Millennium Development Goals (MDGs), there is still a concern that access towards water does not distribute evenly among citizens in different geographical areas or diverse economic groups. The Sustainable Development Goals (SDGs) strive for a universal water target that highlights the sustainable access to safe and affordable water supply for all. Hence, the ensuing challenge is how to comprehensively report the progress of achieving water equity in relation to the SDGs target. This paper reviews the current research and policy papers on equity metrics in the water supply sector. This study has identified that water inequity may manifest in the variations of the level of access, the dimensions of access, and the impacts of poor water supply—spatially, socially, economically, or the combination thereof. This paper also presents challenges related to the application of equity measurements in the context of Indonesia. The results will be useful in designing appropriate tool to inform decision making in water sector policy.
Keywords*:* domestic water supply, equity, indicator, metrics, SDGs

1. Introduction

Despite the major progress achieved by the domestic water supply sector since the commencement of the Millennium Development Goals (MDGs), the WHO/UNICEF's Joint Monitoring Programme (JMP) has recognized that the emphasis on macro-level progress masks the problems of inequity [1]. The JMP further reported that access to improved drinking water sources is lower in rural areas compared to that in urban areas in almost all countries, and is doubled among the richest of the population than among the poorest quintile group [1, 2]. This statement is particularly true in Asian regions that still suffer from the incomplete water service delivery. For example, urban Southeast Asian have 50% coverage of piped water; much higher than the coverage of piped water service in the rural Southeast Asian of only 13% of the total rural population [3]. Sustainable Development Goals (SDGs), the replacement development framework for MDGs, set an ambitious goal: "By 2030, achieve universal and equitable access to safe and affordable drinking water for all". 'Universal' means access to water in all settings, including households, schools, healthcare facilities, and workplaces. This paper will only discuss the water supply in households setting. 'Equitable' indicates a progressive reduction and elimination of inequity between population subgroups, not only in term of physical access to water but also service levels. The normative interpretation of 'for all' in Target 6.1 of SDGs is that the water

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provided should be suitable for use by all citizens without discrimination—men, women, girls and boys of all ages, including people with disabilities. It is clear that equity is a significant issue in the SDGs water target. Moreover, Goal 17 (Target 17.18) of the SDGs also emphasizes to increase, by 2020, the high-quality, timely, and reliable data disaggregated by various geographic and socio-economic characteristics. This point can serve as a potential lead-in to start integrating the concept of equity in reporting the development progress. Hence, the ensuing questions are: Does equity refer to merely an even distribution of access to water? How can we be sure whether water equity is achieved? This paper aims to provide an overview of the current research and practices regarding domestic water equity. Research findings and policy papers have been reviewed to gain a better understanding of water equity. Afterwards, the Indonesian survey instruments were scrutinized to seek for potential indicators for equity and equality. Lastly, the discussion contains the prospective application of such indicators in representing the concept of water equity. Like inequality, inequity can be measured as well [4], but there should be a sense of fairness issue in the measurements. For example, Gini coefficient is a measure of equality, not equity [4] since it measures the degree of variation represented in a set of values without an elaboration of how these values vary among different groups of income, gender, or ethnicity in an instance. Similarly, Researchers [5] use the term 'inequality' in their paper that talks about the geographic heterogeneity of the use of improved drinking water sources within countries. In the domestic water supply sector, however, the issue of fairness is inherent, primarily because water is a prerequisite for not only life but also domestic and economic activities. Equity is related to Amartya Sen's freedom and capability metrics [6]. Different access levels and circumstances of water can elevate people out of poverty or condemn them to it [7]. It often works perpetually; in his book, Development as Freedom, Sen points out that the economic poverty robs people of the freedom to satisfy their needs of clean water [8]. Poverty influences the technology of household water supply, which in turn affects the quantity of water used by households for consumption, basic hygiene, other domestic purposes, and other potential income earning activities [9]. The lack of access to water can hinder a various range of individual abilities, not only to survive but also to thrive of their full potentials.

It is imperative also to understand that the definition of equity depends on the history or social values and the conditions of a country or region as well, and such definition often stems from, as Karan and Wilkinson mention, "generally accepted human values of fair play and justice at that time" [10]. In an instance, a recent study in a peri-urban area of Bandung City, Indonesia, focusing on how local water entrepreneurs, together with citizens, work towards cultivating equity in providing access to spring water network [11]. Although not everyone can get a similar type of access to the spring water network, conflicts related to the unfairness are mostly avoided through a shared consciousness that 'not all can get water from the communal tank' and 'the water will not be enough' [11]. Therefore, assessing the real water equity is not always straightforward.

2. Water Equity Metrics

There are many ways to measure the state of water inequity in the domestic setting. In scholarly works, the metrics of inequity mainly talks about the uneven distribution of access to improved water sources across social groups or geographical regions. For example, Dungumaro measured the inequity of access to water supply based on income, dwelling unit, household size, and economic status index [12]. Dungumaro assessed what in this paper is called **social inequity**. Social inequity represents an uneven distribution of access to control over and use the water among different social groups and their members (e.g., income level, ethnicity, gender) [13]. Figure 1 shows an example of the type of social inequity where access to improved water sources is more prominent in Indonesian rich households than in poor ones, both in urban and rural areas.

A study by [5] assessed the distribution of the proportion of population reporting use of improved water sources protected from outside contamination, based on administrative areas, countries, and urban/rural types [5]. It reveals another category of water inequity: spatial inequity, that refers to an unequal distribution of access to control over and use the water among people living in different regions. Figure 2 illustrates an example of the spatial inequity of access to water in the Southeast Asian region. Some spatial inequity may also have some socioeconomic, even political backgrounds.

For example, the problem of underserved peri-urban communities in many postcolonial cities in the developing world, such as Bandung and Jakarta, roots from the colonial segregation in the past. Piped water connections were built to serve those resided in the city centres: local elites and expatriates who were considered as first-class citizens [14]. In an instance, access to piped water in Bandung City mostly higher in the central urban districts, although the overall coverage is still considered low [17]. However, there are cases, like in Jakarta, in which several population subgroups currently residing in the slum pockets of the city centres, who supposedly have good connections due to the colonial legacy, still do not have access to piped water network [15].

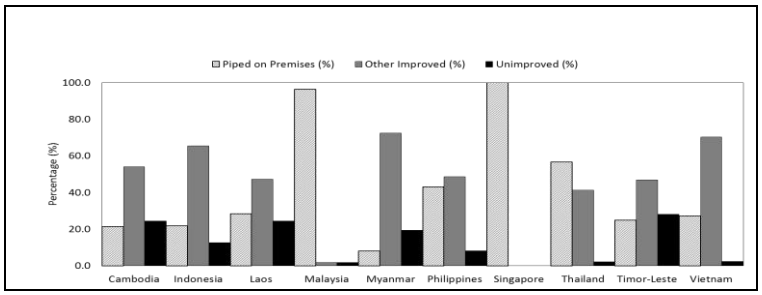


Figure 1. Trends in drinking water coverage by Indonesian rural and urban wealth quintile in 2012. The coverage of piped water and improved water sources increases along with the increase of wealth. Graph modified from data of the JMP [2].

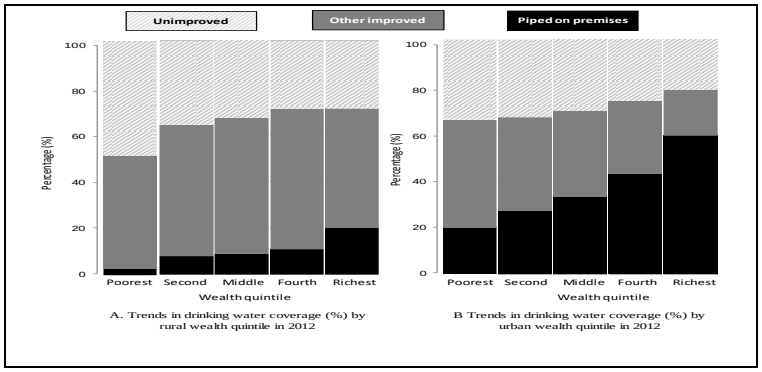


Figure 2. Drinking water coverage (%) in Southeast Asian countries. Access to piped water on premises in Singapore and Malaysia is much higher than that of other countries (data extracted from the JMP [16]).

Uneven distributions of water often manifest, not only in the access level but also in service level or the variations in the dimensions of access, such as collection time, water quality, water quantity or consumption, water reliability, and water affordability or expenditure (for instance, see [12], [18], [19], [20]). The examination towards the concept of equity is getting complex with a question that Goff and Crow posed: "Is equity connected to improved water sources access, or to the quantity of potable water that households can collect?" [10]. Later, the authors suggested that the two ideas of equity not be sufficient to measure equity since, as the authors conclude, "…the most vulnerable people in the world have not benefited from progress." Access to water is only an intermediate target [9]. Results should be focused on expanding actual water use in order to achieve the intended development outcome. For example, the increasing quantities of potable water used by households for hygienic purposes may help reduce the rates of under-five mortality related to diarrheal diseases. Therefore, there is also a possibility that water inequity is measured in the context of uneven distributions of various impacts due to poor water supply. In an instance, opportunity costs for collecting water and diarrheal diseases are associated with poor drinking water quality. Even so, reliable and continuous data related to such matters are difficult to be found in the nation-wide survey. Thus, firm causal-effect relationships may be challenging to accomplish. Based on the previous discussion, an illustration of different types of water inequity and potential water equity indicators was then devised (Figure 3). Meanwhile, Table 1 shows water inequity studies and what types of water inequity these studies have focused on.

Table 1. Studies on water inequity.

Study	Operational definition on equity	Focus	
Dungumaro, 2007, South Africa [12]	Distribution of household source of water supply (by income; by dwelling unit; by household size; by economic status index)	SOC	A
	Distribution of time spent to water source (by income)	SOC	DoA
Pullan et al., 2014, Sub-Saharan Africa [5]	Distribution of the proportion of population reporting use of improved water source, that is protected from outside contamination (by administrative areas; by countries; by urban/rural type)	SPAT	A
	Distribution of the proportion of population reporting use of improved water source, that is protected from outside contamination (by quintile within countries)	SOC	A
	Distribution of the proportion of population reporting use of accessible, improved water source, that is can be accessed within 1 km or 15 minutes of the household (by administrative areas; by countries)	SPAT	DoA
	Distribution of the proportion of population reporting use of accessible, improved water source, that is can be accessed within 1 km or 15 minutes of the household (by quintile within countries)	SOC	DoA
Sebri, 2015, Tunisia [18]	Distribution of basic/minimum water consumption per household AND average residential water consumption per household (by governorate; by income).	SOC	DoA
	Affordability Index (AI) for BOTH basic and average water consumption. AI is calculated as basic OR average household water charges or bill divided by the average household income.	SOC	DoA
Sun et al., 2015, China [19]	Distribution of water expenditure (by income; by city scale (small-, medium-, and large-cities))	SPAT	DoA
Yang et al., 2012,	Distribution of household using improved water sources (by socio-economic status)	SOC	DoA
Bangladesh,	Distribution of tubewell with <50 ppb of arsenic (by socio-economic status)	SOC	DoA
Peru, Ethiopia, Jordan,	Distribution of piped water with >0.1 mg/l free residual chlorine (by socio-economic status)	SOC	DoA
Nicaragua, Nigeria, Tajikistan [20]	Distribution of compliant improved water source, in term of water quality (by socio-economic status)	SOC	DoA

Note: SOC = social inequity, SPAT=spatial inequity, A= inequity in access, DoA=inequity of the dimensions of access.

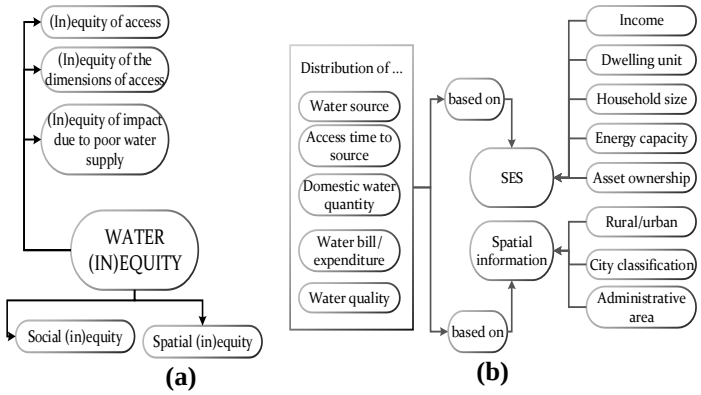


Figure 3. (a) Different types of water inequity. Inequity can be assessed by looking at the variations of the level of access, dimensions of access, and impacts due to poor water supply. These variations can also be based on the socio-economic characteristics and geographic location; **(b)** Potential indicators for water equity metrics (SES = socioeconomic status).

3. Measuring equity in Indonesia: application and challenge

After scrutinizing various indicators that were mentioned in the previous studies, the survey instrument of SUSENAS, the Indonesian annual nationwide socioeconomic survey, was then observed to see whether potential indicators for water equity may already be available in the surveys. SUSENAS has been used as the basis for MDGs' monitoring and will continue to become the main data supplier in tracking progress towards SDGs. Table 2 shows the SUSENAS questions related to the potential water equity metrics. Since there is no nationwide water quality analysis, the type of water source available in a household and the distance to such a source to the nearest wastewater containment facility serve as a proxy to safe water. These two questions, the type of water source and the distance to wastewater containment facility, are presently used to classify whether households have access to a certain

'improved' or 'unimproved' water source. Note that SUSENAS records what kind of water source that households have for three different uses: for drinking, cooking, and bathing purpose.

Table 2. Relevant questions in SUSENAS.

Issue	Question in SUSENAS
Water source	• What is the main source of water used for drinking, cooking, and bathing? (branded bottled water, refill water, metered piped water, resale piped water, borehole, protected well, unprotected well, protected spring, unprotected spring, surface water, rainwater, others)
Water bill	• How much money does each household spend for water?
Water quality	• If the main source of water used for drinking is borehole/well/spring, how far is the source of water to the nearest waste water containment facility? (<10 m, ≥10 m) • If the main source of water used for cooking is borehole/well/spring, how far is the source of water to the nearest waste water containment facility? (<10 m, ≥10 m) • If the main source of water used for bathing/washing is borehole/well/spring, how far is the source of water to the nearest waste water containment facility? (<10 m, ≥10 m)
Water quantity	Is the water used for bathing/washing originate from the networked piped water or a public water terminal? (networked piped water, public terminal)

The behaviour of using multiple water sources for various domestic purposes are commonly found in Indonesian households. The implications of such multiple water sources use towards the water equity needs to be scrutinized. One thing to consider, the use of multiple water sources by households indicates that the primary water source they have is 'lacking' [21]. Thus, the rate of combined use of 'improved' and 'unimproved' water sources needs to be taken into account. Moreover, there is no direct question related to the domestic water quantity consumed by households.

However, data on water bill are limited to households who are subscribed to piped water companies or buy water to vendors. Water expenditure and water quantity consumed by private groundwater users will be difficult to estimate. A question in SUSENAS also focuses on whether water for bathing and washing is obtained from in-house water connection of public water terminal. It can serve as a potential proxy for water quantity as there is a limit to how much water can be collected by household members when the source of water is not located on premises. As Larson et al. have recorded, households with private water connections use water in a quantity that is six times higher than households that need to collect water from somewhere else [9].

4. Conclusion

The widely used approach of aggregating data has masked serious inequity problems that policy makers and water supply managers need to address. The main challenge in overcoming such inequity problems is to understand how unequal our water supply service among different population groups or across administrative boundaries. This study has identified that water inequity may manifest spatially, socially, economically, or the combination thereof. This paper also highlights that not only the level of access, the dimensions of access and the impact of poor water supply are also crucial in revealing the real persisting gap in water service. There are currently missing elements in the SUSENAS to properly measure the water inequity, such as water expenditure for piped and non-piped water users, water quantity consumed/used by households, and the duration of daily water availability. Consequently, the focus of future research should not stop in designing appropriate water equity metrics for Indonesian context. The perception of users and policy-makers concerning the water inequity and the production of water inequity should also be on the agenda of water equity research. Finally, the discussions in this paper serve as a base for future studies in understanding the pattern of water inequity in Indonesia and how to overcome it.

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