

Monitoring human right to water in rural areas: A Nicaraguan case study

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Abstract

Much effort has gone into the recognition of the human right to water. Without doubt, this milestone influences governance and decision making processes at different scales. Now it is essential to shift discussion from legal and conceptual framework to practice. Taking this idea into account, the article proposes a methodology for monitoring the implementation of the right. The work takes the legal and conceptual framework of the right, agreed by international consensus, as a starting point. Moreover, lessons learnt from other indicators and indexes construction are considered. It is based on a water & sanitation rural services case study carried out in Nicaragua and particularly in Jinotega and Matagalpa -rural departments from the north-central region-. The different categories of the right to water were included in surveys and structured interviews design that were conducted in rural households and water comities, respectively. Ingeniería sin Fronteras-ApD, an Spanish NGDO, promoted the study in cooperation with local organizations -La Cuculmeca and Coalición de Organizaciones por el Derecho al Agua (CODA)-. Results show how the inclusion of right to water dimensions gives pertinent insights both as regards knowledge about the real situation of rural communities as for improving governance in rural water supply.

Keywords: Right to water, aggregates, Nicaragua.

Introduction

Even though hundreds of millions of people do not have access to clean drinking water and adequate sanitation, these issues only entered the global political agenda around mid-1970s (Biswas 2007), during United Nations Conference on Human Settlements held in Vancouver in June 1976 and picked up later by the United Nations Water Conference (Mar del Plata, Argentina) in March 1977. In response to the crisis, a number of policies have emerged, which can be termed the 'Commodity Approach', the 'Public Approach', the 'Community or Local Approach' and the 'Social/Human Rights Approach' (Langford 2005). Right-based Approach is thought by some to be 'old wine in a new bottle' (Cornwall and Nyamu-Musembi 2004; Laban 2007) but authors highlights that the new idea is that those people to whom rights to water are granted should have a meaningful role in decision making (Brooks 2007), it is valuable because it puts people first (Langford, 2005), the advantage of utilizing the human right approach is that water needs are transformed into water rights (Cahill 2005) and it adds a focus on 'rights' that has had too little attention until now (Laban 2007).

On 28 July 2010, the General Assembly formally recognized *the right to safe and clean drinking water and sanitation as an individual human right that is essential for the full enjoyment of life and all human rights* (United Nations 2010a) ending the discussion of whether drinking water and other household water is a human right. Until that moment it was not enshrined in any international convention, but there was quorum about the fact that it was recognized implicitly in a wide range of international human rights documents, including treaties, declarations and other standards (Gleick 1998; Cahill 2005; Pamukcu 2005; Biswas 2007; Irujo 2007; Khadka 2010). The juridical basis of the right to water in international law derives from articles 11 and 12 of the International Covenant on Economic, Social and Cultural Rights (ICESCR) of 19 December 1966 (Irujo 2007). Almost 4 decades later, the committee's General Observation No. 15, entitled "The Right to water" and based on the ICESCR, supposed a giant step in legal interpretation of the right. However, as Cahill (2005) notes, the scope and core content of the right remain ill defined in GC15. Researchers, NGDOs and international agencies have been working during last years -operating as if right existed- in order to clarify its impreciseness. The Committee settled on a relative narrow definition -water for personal and domestic uses: consumption, cooking, hygiene and personal sanitation. However, two issues -the right to food and therefore the water to grow food and the right to live in a viable environment and therefore the water to support the ecosystem- related to other economic and social rights, seem particularly important and are discussed in different articles (Cahill 2005; Langford 2005; Brooks 2007). Cahill (2005) suggests that it is imperative to clarify these relationships between the right to water and related rights, avoiding right to water recognition as an independent right but only establishing it as a right deriving from others; only then will goals be clear and monitoring will have a chance to identify cause and effect (Brooks 2007). Afterwards the Office of the United Nations High Commissioner for Human Rights (OHCHR) responded to these controversies through the report on the scope and content of relevant human rights obligations related to equitable access to safe drinking water and sanitation under international human rights instruments, advocating that water for survival and basic needs constitutes the core elements of the right to water. It is

explicitly mentioned that access to other purposes, notably for agriculture or industry (...) water for livelihood or as a natural resource falls outside the remit of the study (United Nations 2007). OHCHR also declared that “States should prioritize these personal and domestic uses over the other water uses”. Even more, it is up to each country to determine what this sufficient amount is, relying on guidance provided by WHO and others.

The theme is taken up again in the commencement of the independent expert mandate on the issue of human rights obligations related to access to safe drinking water and sanitation. Among others, the activities of Catarina de Albuquerque during her first mandate have been focused on the further clarification of the content of human rights obligations. She points out the scope and the content mentioned by OHCHR in her 25 February 2009 report (United Nations 2009a). As Irujo (2007) states, what exists is a right to the supply of water (...) rather than a ‘real’ right to the object in question, what is proposed is the development of an activity of the state (or by the competent authorities) that aims to provide a service of this very object. Thus to promote its full realization, the supply of water should meet all aspects of the right. The mandate-holder proposes to talk about five normative criteria (availability, quality, physical accessibility, affordability & acceptability) and three cross-cutting criteria (non-discrimination, participation & accountability) (United Nations 2010b). From the concept note of the first consultation on developing post-2015 indicators for monitoring drinking-water and sanitation (WHO/UNICEF 2011) it may be deduced that these criteria are beginning to be assumed by WASH sector. Two of this criteria, acceptability and accountability criteria have not appeared as specific ones in several publications (COHRE 2005; COHRE AAAS SDC and UN-HABITAT 2007). Acceptability criteria has risen lately and basically in the sanitation context (United Nations 2011b). Related to right to water, acceptability mainly refers to organoleptic characteristics of the drinking water, issue that is linked to water quality criteria. In relation with accountability criteria it has to be said that usually is more focused on legal and juridical aspects of the right. Moreover, local accountability is a much complex and broader issue that is intrinsically linked to the right to accessible and transparent information to consumers (Laban 2007), a cross-cutting criteria for all human rights.

Taken into account right to water and sanitation, there are some evidences that suggest the necessity to monitor its implementation. The obligations of governments, at the domestic level, to realize the right to water can be broken into three simple duties: respect, protect and fulfill (United Nations 2002). The duty to fulfill means that governments should take steps in the direction of ensuring universal access which is known as the concept of progressive realization. Appropriate policy frameworks are thus required. To talk about effective policy making in the context of a RBA, implies two main issues: on the one hand, to target the most needed (marginalized groups) when money is allocated (Khadka 2010) and on the other, to measure progress. An essential prerequisite to comply with both aspects is to access consistent information through accurate monitoring backed up by rigorous interdisciplinary science, which is mainly dependent on a set of reliable and objective indicators (Molle and Mollinga 2003; Giné and Pérez-Foguet 2010). Feitelson and Chenoweth (2002) consider that effective water indicators need to focus on the structural impediments to the sustainable supply of water, so as to facilitate policy responses. In that way, we think that monitoring water supply taking into account the right to water framework, contribute to achieve the aim. Moreover, Langford (2005) suggests that there is an urgent need for effective monitoring of public and private provision of water, particularly as it affects marginalized and vulnerable groups. On 24 March 2011, the Human Rights Council decides to extend the independent expert mandate and encourages her to monitor the way in which the human right to safe drinking water and sanitation is being realized throughout the world (United Nations 2011a); a new task comparing with her first mandate (United Nations 2008). In the above mentioned concept note of the first Consultation on post-2015 monitoring of water and sanitation held in Berlin at the beginning of May 2011, it is declared that if the recognition of the human right to safe and clean drinking water and sanitation is to have any meaning, future targets and monitoring systems must endeavour to take these various aspects into account. There are many initiatives regarding to the creation of appropriate, objective and reliable indicators and composite indices for monitoring the access to water (Joint Monitoring Programme 2000; Sullivan 2002; Jiménez and Pérez-Foguet 2008; Giné and Pérez-Foguet 2010) but just a few specifically focused on right to water and sanitation (COHRE 2005).

The purpose of this paper is to propose a methodology to assess right to water, focusing on those whose human right should be guaranteed. Indicators, indexes, techniques to build and ways to present and visualized them are presented.

Case study

A lot of global indicators and statistics can be used to describe Nicaraguan human development: high proportion of rural population, scarcity of basic services, poverty and extreme poverty, important disparities, low GDP and HDI among others. According to access to water, the last Joint and Monitoring Programme report (WHO/UNICEF 2010), considers that 15% of total population lacks access to improved sources of drinking water and this percentage increases to 32% in the rural context. Our study is situated in communities from several municipalities within Jinotega and Matagalpa departments in the north central region of the country. This is essentially a rural context and then one third of its habitants should use unimproved sources of drinking water according to JMP statistics. However if JMP was based on right to water criteria, probably these numbers would be higher.

In recent years, Ingeniería Sin Fronteras-Asociación para el Desarrollo (ISF-ApD) have been working in Nicaragua, -specially in Jinotega- supporting water supply and management interventions, using a right-based approach (RBA). Between 2007 and 2008, this NGDO accompanied by the Asociación de Educación y Comunicación La Cuculmeca (a local NGDO) carried out a study about right to water in Nicaragua, using existing data, official statistics and interviews with local decision makers (ISF-ApD y Prosalus 2008). The study was focused on the access to water in Jinotega department. Years later, ISF-ApD promoted a new study in cooperation with local organizations –Coalición de Organizaciones por el Derecho al Agua (CODA)-. This case study, based on rural water & sanitation, was more ambitious. A set of research questions was proposed within a right to water framework. The different categories of the right to water were considered in the design of a) surveys; that were conducted in 1350 rural households (91 communities of 32 municipalities) and b) structured interviews aimed at 61 drinking water and sanitation comities (66 communities of 26 municipalities). CAPS (Spanish abbreviation) relevance in the provision of drinking water in Nicaraguan rural context is considerable. It is estimated that around 1,200,000 persons are supplied by this community based organizations in the whole country. In Nicaragua, the State has committed itself to formally delegate service provision in rural areas through its national Water Law (Government of Nicaragua 2007) complemented with a special law that regulates CAPS organization, constitution, legalization and performance (Government of Nicaragua 2010)

On one hand, results from the study were used for a recommendation about monitoring right to water, accepted by the Nicaraguan government after the United Nations Universal Periodic Review (UPR). On the other, the experience was considered as a good practice by the Special Rapporteur on the issue of human rights obligations related to access to safe drinking water and sanitation. Furthermore, a report was elaborated with the aim of showing a wider vision of the sector situation in the country (CODA 2011).

After studying surveys, interviews and their data, it can be realized that this “new” structure offers “new” data not visible in official statistics. Questions allow create indicators that represent the severity of problems from the household perspective. This was the motivation for exploiting the database developed by CODA’s study.

During last years experts have paid attention into right to sanitation (United Nations 2007; COHRE WaterAid and UN-HABITAT 2008; United Nations 2009b). As mandate-holder states (2009b), there is an ongoing discussion on whether sanitation should be recognized as a distinct right. Although right to water and sanitation criteria are, in essence, the same, each of them has its own special characteristics. Moreover, surveys and interviews design was focused on right to water and little emphasis was placed on sanitation issue. Consequently, this paper is only focused on right to water monitoring.

The study was carried out across the whole country. However, analyzed data were selected from Jinotega and Matagalpa departments on the central-north region. There are some reasons for selecting these departments within twelve departments involved in the study. The first is because their relative importance for the rural Nicaraguan context. Second, a third part of the information was captured on this region. Finally, these two transboundary departments are relatively similar in terms of feeder technology, geographical, climatological and socio-economical characteristics. This strategy reduces the number of confounding variables that might affect right to water criteria. Thus, this research utilizes data from 417 households and 28 community based organizations (CAPS), which involves 2 departments, 8 municipalities and 28 communities. These two different sources of information are used, complementing one to each other. Table 1 summarizes territorial and sample information.

Table 1. Territorial and sample information.

Department	Municipality	Community			
		Name	Polled households	Total households	
Jinotega	La Concordia	Valle Valerio	11	87	
		Santiago Coyolito N° 1	12	186	
		Chichiguas	10	143	
		Los Capules	10	64	
		Colón Abajo	10	28	
		Las Quebradas	10	63	
	SRN	San Marcos	22	300	
		La Canasta	10	43	
		La Estación/Cerro Grande	9	41	
		Suni	10	90	
	SSY	Pavona Arriba	11	87	
		Las Delicias	10	82	
		La Rica	19	105	
		El volcán	12	99	
	Jinotega	La virgen N°1	15	143	
		El sardinal	29	262	
		Paso Real	16	145	
		La Reforma	12	111	
	Muy Muy	Santa Fe	19	40	
	Matagalpa	Tuma la Dalia	La Mora	15	296
			Naranjo	10	90
			Wasaka sureste	13	171
		Matagalpa	Aranjuez el porvenir	29	121
			Jucuapa centro	20	68
			Quebrachal	7	87
		San Dionisio	El Zarzal	23	96
			El zapote	25	237
	El carrizal		18	168	
2	8	28	417	3453	

Methodology

First of all, a validation of available data from surveys and interviews was conducted. Then, we defined and proposed a first set of indicators, gathering different complementary questions from the two sources above mentioned. Indicators were sorted into six criteria based on the conceptual framework pointed before. Table 2 included below, summarizes indicators within each criteria sub-index, levels and scores of all indicators and the weighting system considered to aggregate them.

Table 2. Variables used, levels, scores and weighting system (subindex level)

Criteria	Indicator	Levels & scores					Weighting system
Availability	A1: Sufficient quantity ⁱ	< =5 lpd (0)	5-20 (0-0,2)	20-50 (0,2-0,8)	50-100 (0,8-1)	> 100 (1)	Additive & Geometric ((A1+A2)/2*A3) ^{0,5}
	A2: Sufficient quantity (user perception) ⁱ	No (0)				Yes (1)	
	A3: Reliability / continuity ⁱ	not daily (0)				daily (1)	
Physical Accessibility	PA1: Proximity (spent time) ⁱ	> 30 minutes (0)		5-30 minutes (0,2)		< 5 minutes (1)	Geometric (PA1*PA2) ^{0,5}
	PA2: Security ⁱ	No (0)				Yes (1)	
Affordability	AF1: Monthly tariff (water tariff/family income) ⁱ	0 ó > 5% (0)		0-1% (0-1)		1-5% (1)	Additive (AFF1+AFF2)/2
	AF2: Affordability (user perception) ⁱ	No tariff/opinion (0)	High (0,2)	Medium (0,5)		Low (1)	
Quality & safety	Q1: Quality(user perception) ⁱ	Bad (0)				Good (1)	Additive (Q1+Q2+Q3+Q4)/4
	Q2: Quality (CAPS perception) ⁱⁱ	Bad (0)				Good (1)	
	Q3: Chlorination ⁱⁱ	No (0)				Yes (1)	
	Q4: Organoleptics ⁱ	Bad(0)				Good (1)	
Non-discrimination	ND1: Families without service (user perception) ⁱ	Yes (0)				No (1)	Additive (ND1+ND2+ND3)/3
	ND2: Families without service (CAPS perception) ⁱⁱ	Yes (0)				No (1)	
	ND3: Targeting the poor (economic advantages) ⁱⁱ	No (0)				Yes (1)	
Participation / access to information	P1: Meetings participation ⁱ	No (0)				Yes (1)	Additive & Geometric ((P1+P2)/2*(P3+P4)/2) ^{0,5}
	P2: Information about meetings ⁱ	Never (0)	Sometimes(0,2)			Always (1)	
	P3: Water law (knowledge) ⁱ	No (0)				Yes (1)	
	P4: Users participation (CAPS perception) ⁱⁱ	Very bad (0)	Bad (0,1)	Regular (0,3)	Good (0,6)	Very Good (1)	

i: data from households surveys; ii: data from CAPS interviews

The availability component is composed by three different variables: i) sufficient quantity (real water consumption –litres per person per day-) ii) users perception of water amount availability and iii) reliability of supply (continuity). Physical accessibility criteria agglutinate two different issues of the right: i) proximity to the water point, measure as total collection time in minutes and ii) access security users' assessment. The kind of information used for affordability was the same than for water consumption: i) a continuous quantitative indicator –monthly tariff in this case- and ii) users perception of it. Quality is composed by four indicators: i) users and ii) CAPS water quality perception, iii) whether a chlorination treatment is being practised and iv) acceptability of water, according to its organoleptics properties. The later responds to the necessity to consider acceptable aspects in right to water monitoring. According to cross-cutting criteria, non-discrimination compiles three variables: i) users and ii) CAPS appraisal of water discrimination in their communities and iii) existence of measures within the community for targeting the poor. Finally, participation and access to information, were considered as two different issues. Two variables nurture each one: i) user participation in meetings and ii) CAPS assessment of it on one hand and iii) users information about meetings held in their communities and iv) users information about the existence of national water law, on the other. Indicator iii) is specially linked to accountability processes at community level.

A score between 0 and 1 was assigned to each parameter, where a value of 0 indicates the poorest level and 1 the optimum conditions. Continuous variables were normalized, dummy variables and other categorical data were divided into scale scores. International standards, experts, and local stakeholders supported the assignment. Finally indicators were aggregated into each right criteria. Levels and scores of all indicators are also presented in table 2.

To tackle the step for aggregating indicators into right to water criteria subindex, different approaches were considered depending on variables characteristics. At this level, we considered two situations; when variables can compensate each other's performance and the opponent. For the former we used additive aggregation and multiplicative for the later. Taking this idea into account, affordability, quality and non-discrimination criteria were combined using an additive function and physical accessibility utilizing a geometric one. Availability and participation indicators were aggregated using a combined function (arithmetic & geometric).

Six subindex level criteria feed a composite indicator. A major issue for this tarea is the choice of weighting and aggregation model (Giné and Pérez-Foguet 2010). The assignment of weights is crucial because they should reflect the relative importance of each right to water criteria. Several possibilities were considered: weights based on expert opinion, not to assign explicit weights, and statistical weights (based on multivariate techniques). The former was ruled out due to it is often pointed for its subjectivity and arbitrariness (Booyesen 2002). Second and third options were considered. Main argument for no weighting is based on the premise that no objective mechanism exists to assess the relative importance of the different aspects included in the index (Giné and Pérez-Foguet 2010). Some researches highlight that multivariate techniques present an empirical and more objective option for weight assignment. A principal component analysis has been used due to the advantage of determining that set of weights which explain the largest variation in the original variables (Slottje 1991), where those are built on the relative importance of the subindices for the principal components. Weights were computed from PCA of logarithm of the variables as a geometric aggregation repercussion. The factors were retained based on the variances explained criteria, id est., to keep enough factors to account for 80% of the variation (Nardo, Saisana et al. 2005) and a varimax orthogonal rotation was applied to the analysis.

According to the aggregating technique for constructing the index, we have opted to use a multiplicative function. The weighted arithmetic mean (the most commonly used method) was rejected, mainly due to two reasons: (i) this function should only be applied if indicators are mutually independent (Munda and Nardo 2005) and it is obvious that this assumption can not be admitted in this study as criteria are clearly interrelated. For example, quality depends on continuity and domestic water used on physical access (Howard and Bartram 2003). (ii) An implicit compensability among the criteria indexes of the function (Nardo, Saisana et al. 2005). A *sine qua non* requirement for right to water compliance is that all criteria should be met. Therefore a non-compensatory method is necessary. In the geometric method, poor performance in some attributes is penalized more heavily.

Findings and discussion

Table 3 shows i) averages of each subindex criteria and composite index –depending on the two weights alternatives- and ii) exponent values for the geometric function. According to data recorded for the sample studied, affordability, non discrimination and participation are the most critical issues of the right to water and availability, physical accessibility, availability and quality seem to be less problematic. Comparing composite index average, it is evident that no important differences exist between alternatives. The two weighting alternatives mentioned above have been compared.. It can be noted that introduction of multivariate analysis does not involve vast differences. An important amount of zeros in criteria indexes can partially explain these similar results. It can be seen that “affordability” and “participation/access to information” weights are the lower ones in PCA alternative. As in this method weights are built on the relative subindices importance for the principal components, it can be inferred that affordability criteria has been “penalized” due to its high correlation. Non discrimination is the subindex which appears to be less correlated.

To enhance comparability of the two proposed functions, both histograms were depicted and are shown in figure 1. The most outstanding result is the big amount of zeros *i.e.* a lot of people whose human right to water is not guaranteed. As it was mentioned above, a geometric function has been used to aggregate criteria in order to avoid compensability among them. This representation allows us to stress the relevance to guarantee every single right criteria if the objective must be met.

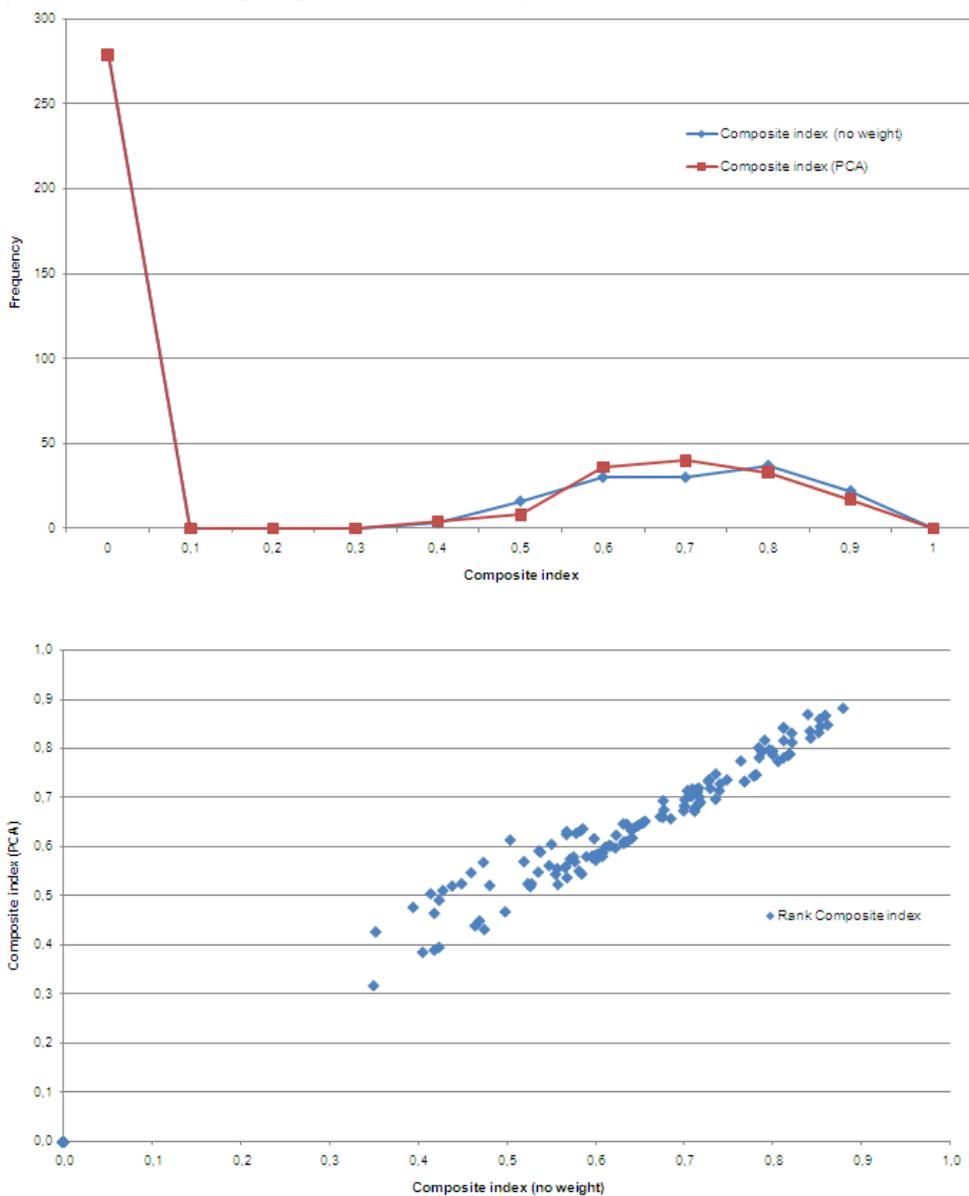


Figure 1. Histograms of composite index (top). No weighted vs. PCA weighted geometric function (bottom).

Results across different weighting techniques do not differ significantly. There are just subtle differences in the rank between 0,4 and 0,9. The figure confirms that the use of PCA does not produce significantly different results as mean values of table 3. When plotting index without weights vs. the PCA weighted one (figure 1_bottom), it can be observed that both groups of data are very similar and thus it can be inferred similarity between histograms (figure 1_top). It is interesting to mention a particular characteristic of this figure. It can be appreciated that most part of the cases are situated within the diagonal but there is a small group –but considerable- displaced above the straight line. These points have a common characteristic: the lower affordability values (no considering zero scores) which provoke a deviation as a consequence of PCA geometric weighting technique explained above. Despite just subtle differences exists, this special feature justifies to opt for PCA weights due to it produces the least eclipsed results, an idea that has been considered in similar studies (Giné and Pérez-Foguet 2010).

Due to criteria relevance just mentioned, a major focused is placed on them. Index and subindex average values are relevant but histograms and territorial analysis are essential for the assessment of differences. Both are analyzed below.

Figure 2 and table 4 represent frequencies for the six criteria and the composite index (PCA) calculated from them. This type of information is useful due to it provide evidence of the main problems within a concrete situation. According to data recorded for the sample studied, this graph produces on the one hand clear ideas that were mentioned before: i) there is a big amount of zeros in the composite index distribution. ii) Affordability, non discrimination and participation are the most critical criteria of the right to water while availability, physical accessibility, availability and quality seem to be less problematic. On the other it is interesting to stress differences between criteria and composite index distributions. As table 3 shows, averages are significantly different. Furthermore, distribution disparities are equally important. If we pay attention to availability or physical accessibility histogram, it can be realized that small amounts of data are compiled in the first decile (14% and 8% respectively) and large ones in the last decile (27 and 69%). Comparing to composite index distribution (67% -first decile- and 0 % -last one-) it can be concluded that a detailed analysis is needed in order to identify different tendencies.

Results are consistent within the case studied. Communities polled have been benefit from different water and sanitation programs during last years and a big amount of them were design in domiciliary-supply logic. The resource is not usually a problem in this context. According to quality criteria, the indicators selected and the way it was aggregated culminate in this results. There was no data about physicochemical analysis so indicators related to perception and water treatment were used. Although in this context there are important problems related to pesticides pollution, these data were not available for the study. Thus, despite water quality is expected to be a problem, data available do not show it.

It is interesting to note the big amount of households that show problems related to affordability. Many of them do not pay any tariff or do not have an opinion about it. Some of them paid for the service high amounts in relation to the family incomes. All these situations have been penalized while indicators scoring.

The two cross-cutting criteria also show revealing results. According to participation and access to information, Narayan (1995) and many other authors have stressed the importance of water users participation for last two decades. They also have pointed that it is still not enough assumed in too many interventions (Schouten 2003). Even more it has to be mentioned that the poor are frequently less able and have fewer channels to participate in community process (Agrawal and Gupta 2005; Cleaver 2005; Jiménez and Pérez-Foguet 2011) in general and community management of common-pool resources and water supplies in particular. This is consistent with rural picture as it is a usual situation to find houses or sectors within a community that are not connected to the water supply system that benefits the others. These two deficiencies just emerged in some way in figure 2.

Table 3. Weights and averages of criteria indexes. Composite index averages according to different weights

Criteria index	Average	Exponent	
		No weight	PCA geometric
Availability	0,638	0,167	0,191
Physical Accesibility	0,794	0,167	0,192
Affordability	0,418	0,167	0,068
Quality & safety	0,659	0,167	0,188
Non-discrimination	0,300	0,167	0,203
Participation / access to information	0,481	0,167	0,158
		No weight	PCA geometric
Composite index		0,2156	0,2157

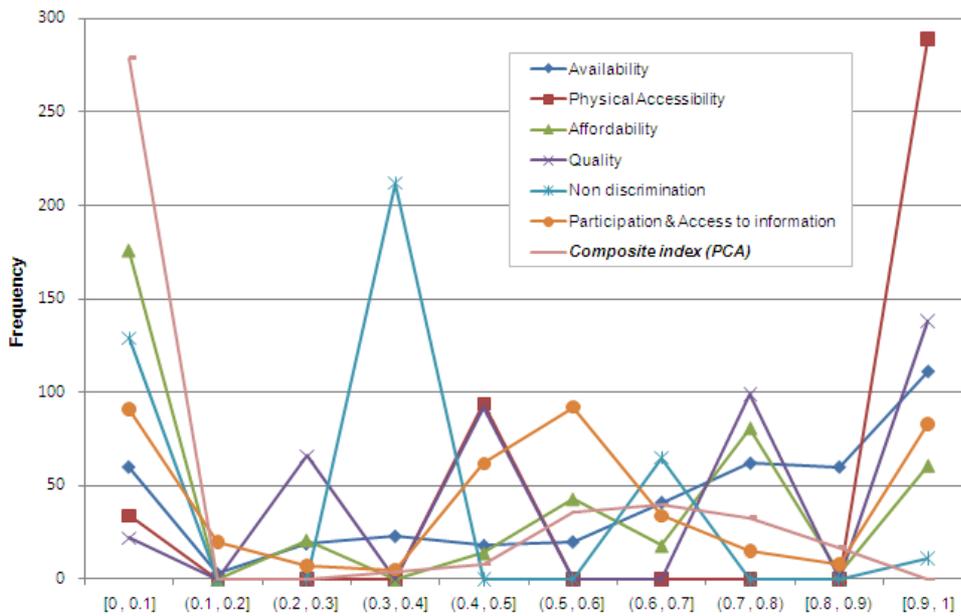


Figure 2. Histograms: subindex and index level. All data involved.

Table 4. Criteria and composite indexes frequencies. All data involved

	Availability	Physical Accessibility	Affordability	Quality	Non discrimination	Participation & information	Composite index (PCA)
[0.0-0.1]	60	34	176	22	129	91	279
(0.1-0.2]	3	0	0	0	0	20	0
(0.2-0.3]	19	0	21	66	0	7	0
(0.3-0.4]	23	0	0	0	212	5	4
(0.4-0.5]	18	94	14	92	0	62	8
(0.5-0.6]	20	0	43	0	0	92	36
(0.6-0.7]	41	0	18	0	65	34	40
(0.7-0.8]	62	0	81	99	0	15	33
[0.8-0.9]	60	0	3	0	0	8	17
[0.9-1.0]	111	289	61	138	11	83	0

Figures 3 and 4 can be used to appreciate differences within the territory. The first one aggregates results by municipalities and the second one drops down municipal level, showing differences among communities. Each level is illustrated using different types of graphs. Figure 3 is composed by two different graphs: the first one shows the situation in municipalities from Jinotega department and the second one from Matagalpa ones.

Radar chart in figure 3 has been used to present and visualized criteria indexes and the composite index. The approach adopted result in this spider diagram shape in which each vertex represent always the same index. This picture can be applied at any level (household, community, municipality, department or country) allowing rapid comparison. Some ideas interpreted from figure 2 are confirmed at municipal sphere (physical accessibility shows the highest levels while non discrimination seems to be the most problematic issue). There are some municipalities with similar pattern within one department (for example La Concordia and Jinotega in figure 3 (top) but it is interesting to underline that these similarities reply between municipalities from different departments (see La Concordia -3 top- and San Dionisio -3 bottom-spider graphs).

Taking into account Jinotega department, some evidences are stated below. While communities polled from San Sebastián de Yalí show higher values for most of the criteria, there are several tendencies that show different right to water deficiencies in each municipality. For example, La Concordia results reflect important problems of discrimination and economic accessibility while they are among the highest in the other criteria. These outputs are important for policy making because they can be used to particularized support for problems solutions and thus augment interventions efficiency. Furthermore, they have a great potential for territorial equity objective. This is paramount for right to water as it calls for universal access in a non-discriminative perspective.

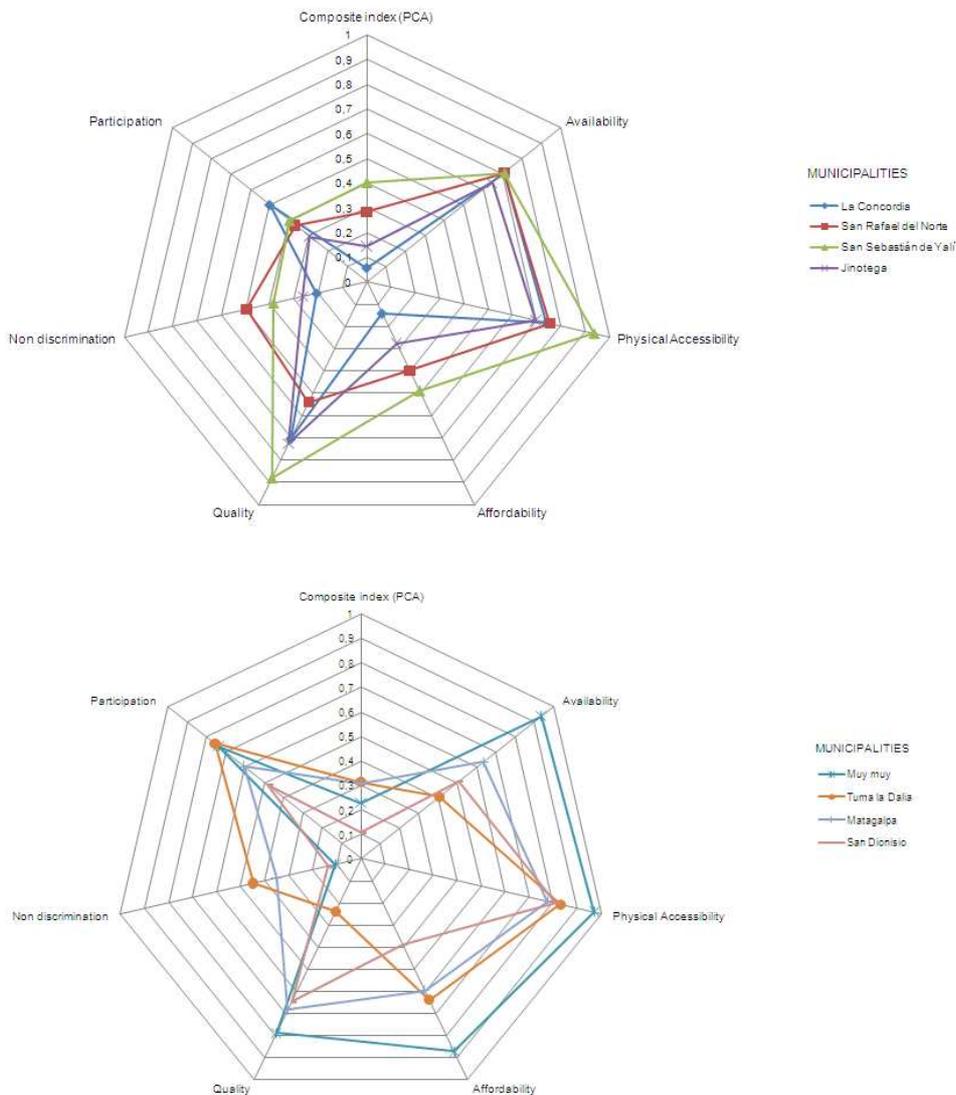


Figure 3. Radial chart. Right to water criteria for department pilot study: Jinotega (top). Matagalpa (bottom). Municipal data

Figure 4 zooms in community level. The four San Sebastián de Yalí (SSY) communities used in this study are represented in it. Criteria and the composite index are shown for each community. This figure states explicitly geometric function characteristics where poor performance in some attributes is penalized more heavily. For example, taking into account Las Delicias community, it can be observed that very low values in affordability and non-discrimination criteria lead also to poor values in composite index. The same idea is considerable for the others communities, where lower criteria values draw composite index score.

An interesting result is presented in Las Delicias case study where composite index goes down to zero although all subindexes criteria are higher than that number. Nine and eight out of ten cases show null values in affordability and non-discrimination criteria, respectively. There is just one case without zeros in both criteria but it is counted as zero due to participation and access to information one. Thus, when applying geometric aggregation to the cases, all of them results in zero values. However, criteria averages are not null in any case.

Las Delicias case attracts attention due to poor values of non-discrimination, affordability and thus composite index due to reasons that has just been explained. As it was mentioned before, Ingeniería Sin Fronteras-Asociación para el Desarrollo (ISF-ApD) has been working supporting water supply and management interventions in Jinotega during last years. In their 2008 diagnosis, Las Delicias main problems detected were the existence of sectors within the community without access to the service and high rates of non-payment. In methodology presented, these difficulties are evidenced in non-discrimination and affordability criteria sub indexes. Thus, the way information is presented here must be able to communicate a picture to decision-makers quickly and accurately.

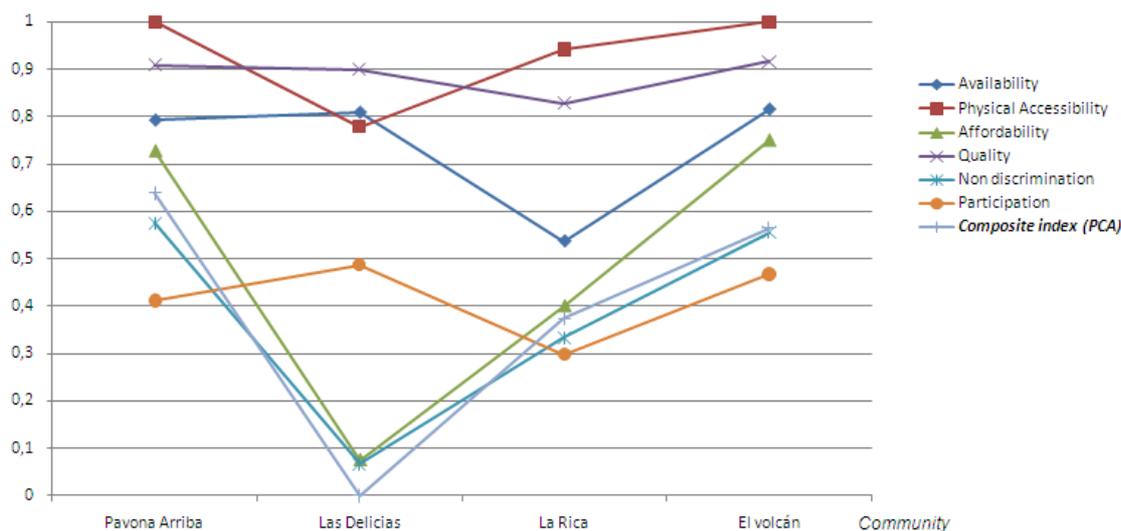


Figure 4. Right to water criteria and composite index for the pilot study at San Sebastian de Yalí municipality. Community data

Figure 4 stresses again differences among right to water criteria. Physical accessibility does not seem to be the principal problem in the cases studied. According to diagnosis, Pavona Arriba, Las Delicias y El Volcán were equipped with gravity fed systems and La Rica with a pumped one. However, all of them show signs of right to water failures where lack of participation, discrimination and affordability are especially critical.

Conclusions

The human right to water entitles everyone to sufficient, safe, acceptable, physically accessible and affordable water for personal and domestic uses, proscribing any kind of discrimination and defending participation and access to information. The universal access to this basic service goes beyond total coverage in terms of improved access to water. Some aspects demanded are well known but others call for new perspectives or at least, to compiled issues that never have been considered together. Undoubtedly tools are necessary for allocating resources targeting the most needed and to monitor progress. We think that it is paramount to work in that way, consequently, we have developed a 18 indicators battery that cover all right to water criteria. They have been aggregated into criteria index and then into a composite index. We have worked in order to avoid arbitrariness of weights and inadequate aggregation process and we have tried to use available, understandable, accurate, scalable at different administrative levels, relevant, regularly updatable and integrative data. The information in each criterion should be considered jointly with the composite index as a response for the inevitable classical loss of information in the aggregation process, as have been presented in this article. As Feitelson and Chenoweth (2002) declare, assessment of problems often requires indicators, with such indicators needing to be meaningful and point out the problems so as to galvanize decision makers into action. This work has tried to move forward methodologies to comply with those shortages.

This paper highlights that a right to water framework permits and binds to measure novel issues that usually have not been sufficiently considered before. The methodology presented works satisfactorily and can be used as a tool for resources allocation in decision making processes. It is also important to emphasize that this approach offers a more detailed vision of the access to water. It is time to veer toward a more demanding position in which infrastructure existence is necessary but not enough and more issues have to be considered. As case study results show, if all right to water criteria have to be met simultaneously, there is no doubt that official statistics would descend. However, further research and discussion is needed in order to improve human right to water monitoring as a fundamental field for policy makers, resource managers and governments.

Acknowledges

The authors would like to thank Ingeniería Sin Fronteras-ApD (ISF-ApD) and the Centre for Cooperation and Development (CCD) of the Universitat Politècnica de Catalunya (UPC) for supporting this research. The authors would like to express as well their sincere gratitude to Paloma García, Rosa Angélica Saenz, Sonia Wheelock, Xavier Fernández and Eddy Monzón (ISF-ApD), Harmhel Dalla Torre (Asociación de Educación y Comunicación La Cuculmecca) and Professor Lorenzo Romeo (Universidad Centroamericana UCA) for their advices and clarifications.

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