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Sustainable Environmental Sanitation from a multi-layered approach: the case of Costa Rica (2005-2015)

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Sustainable Environmental Sanitation from a multi-layered approach: the case of Costa Rica (2005-2015)

El Saneamiento Ambiental desde un enfoque múltiple: el caso de Costa Rica (2005-2015)

Cindy Calvo Salazar [1]

RESUMEN: Se analizan recientes esfuerzos en Costa Rica por alcanzar un saneamiento ambiental sostenible. Principalmente, se parte de un referente que integra la noción de prácticas de saneamiento ambiental en múltiples niveles: tanto a nivel macro (políticas ambientales y sociales) como a nivel micro (acciones comunitarias y prácticas cotidianas individuales), utilizando la perspectiva teórica de la resiliencia social. Para la realización del estudio se empleó una metodología mixta, los datos cualitativos se obtuvieron de entrevistas en profundidad a autoridades nacionales, locales, líderes comunales, y jefaturas de hogar. Los datos cuantitativos se obtuvieron de la aplicación de una encuesta a tres comunidades distintas con características rurales, urbanas, y semi-urbanas. A nivel nacional, como principal resultado, se resalta un cambio de paradigma en cuanto a la concepción de salud, donde lo primordial debe ser la producción conjunta de ambientes saludables, en el marco del derecho a vivir en un ambiente sostenible. A nivel comunal, se resaltan los esfuerzos locales por proteger sus recursos naturales con fines turísticos o productivos; y, a nivel individual, se resalta una mixtura entre prácticas cotidianas reactivas y proactivas.

Palabras Clave: Agua, Saneamiento, Saneamiento Ambiental, Desarrollo Sostenible, Resiliencia Social, Costa Rica.

ABSTRACT: Analyzes Costa Rica's recent efforts to achieve a sustainable environmental sanitation. Mainly, it is based on a reference that integrates the notion of environmental sanitation practices at multiple levels: both at the macro level (environmental and social policies) and at the micro level (community actions and individual daily practices), using the theoretical perspective of the social resilience. To carry out the study, a mixed methodology was used, the qualitative data were obtained from in-depth interviews with national authorities, local, community leaders, and head of households. The quantitative data were obtained from the application of a survey to three different communities with rural, urban, and semi-urban characteristics. At the national level, the main result is a paradigm shift in the conception of health, where the joint production of healthy environments should be paramount, within the framework of the right to live in a healthy and sustainable environment. At the community level, local efforts to protect their natural resources for tourism or productive purposes are highlighted; at the individual level, a mixture of reactive and proactive daily practices have been identified.

Keywords: Drinking Water, Sanitation, Environmental Sanitation, Sustainable Development, Social Resilience, Costa Rica.

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1. Introduction[2]

Environmental sanitation mainly refers to specific characteristics of drinking water supply, storm water drainage, wastewater management, and solid waste collection and disposal. This term also calls attention to the issues of waste generation, collection, and transportation, as well as waste reuse and recycling. The focus is not only on access to improved sanitation systems, but also on the management processes of the whole sanitation chain and their impacts on the environment (SuSanA, 2008).

In the discussion of social development, environmental sanitation is recognized as an important foundation for healthy communities that results in significant social, economic, and environmental gains (Montgomery, Bartram, & Elimelech, 2009). Thus, improved environmental sanitation conditions are catalytic entry points for achieving countries' sustainable development. The framework for action represented at the World Summit of Sustainable Development (WSSD) deserves special attention because countries compromised to cut in half the proportion of people in the world without sustainable access to safe drinking water (target 10) and expanded it to include basic sanitation as a crucial factor for meeting the Millennium Development Goals (MDGs) (UN-Millennium Project, 2005). Also, as a historical landmark, the year 2008 was declared the International Year of Sanitation and helped bring to light this issue through collaborative efforts promoting regional activities to raise awareness and to discuss governmental policies, including social media and encouraging community efforts to improve environmental sanitation practices globally.

Despite efforts, the process of improving environmental sanitation conditions is a complex task that requires political will, commitment and integration of different actors and resources. A set of historical barriers are shared by most of the countries in the world in terms of inadequate investment in infrastructure and technology, lack of political will to tackle these problems, lack of clarity about what motivates people to change habits and perceptions, the tendency to apply conventional interventions, and failure to conduct evaluations of these interventions to assess whether they are successful and sustainable (Moe & Rheingans, 2006). These barriers need to be overcome if real progress on environmental sanitation is to be achieved. Overall, environmental sanitation has not been an "attractive" issue, and even worse, the core responsibility has been diluted. This weak political will can put into jeopardy the social development of many countries, including Costa Rica.

Costa Rica represents an interesting case for study, because its developmental strategy has been relying heavily on its natural resource base; nevertheless, these resources are facing important pressures and vulnerability due to economic activities and popular practices that undermine its protection (Ministerio de Vivienda y

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Asentamientos Humanos [MIVAH], 2006). Thus, significant problems in terms of drinking water quality, deficiencies on wastewater treatment, and critical management of solid waste have been identified. Particularly, this papers addresses some of the country's recent efforts to achieve sustainable environmental sanitation in different levels of action: national, communal, and individual; from 2005-2015 as a period of study. At the national level, there have been some efforts on targeting the environmental sanitation policy, as a result the legal environmental agenda has improved and the country has taken a more proactive and innovative stand. At the community level, people has recognized that environmental awareness leads to a sustainable development path, for example, in terms of ecological tourism. Finally, at the individual level, it is necessary to introduce friendly environmental behaviors that can lead to a larger cultural change.

1.1. Study Problem

Costa Rica is located in the Central America region and is classified as a middle-income developing country with a Human Development Index of 0.773 (0.937 in the United States) among 187 countries measured, and raked seventh among the Latin American countries (United Nations Development Program [UNDP], 2012). Historically, Costa Rica has been recognized by its social and economic investments, that make the country stand out from other Latin American countries. Moreover, the country has privileged geographical and ecological characteristics widely recognized internationally, especially in terms of water sources. Costa Rica has an extensive river network (34 watersheds), which is distributed in three areas, naturally bounded by a mountain system and water mouths in the North, Caribbean, and Pacific areas. Forests comprise a total of 46.8% of the country's total land area, and about 25% of the territory is protected by a national park network (Rojas, 2011). Despite this natural resource base, the country faces important environmental problems in the following areas: a) drinking water coverage and water quality, b) human excreta disposal and wastewater management, c) solid waste management, and d) rainwater drainage management.

In terms of **drinking water**, Costa Rica has increased coverage in recent years. Ninety-eight percent of the population was served with piped water, and 89.5% of this water was classified as safe (Mora, Mata, & Portuguez, 2010). The latter is a historical value and positioned Costa Rica as the number one country in Latin America (Programa Estado de la Nación [PEN], 2010). Although this is an important achievement, the country is facing critical threats in terms of planning and utilizing existing water resources, as well as contamination risks of water sources (Instituto Costarricense de Acueductos y Alcantarillados & Organización Panamericana de la Salud [AyA & OPS], 2002; PEN, 2010). The main threat is pollution by human activity causing damage to surface and groundwater sources of strategic importance (PEN, 2009); the pollution of water sources is frequently due to agricultural activity (e.g. use of agrochemicals), construction of settlements in rechargeable aquifer areas, illegal disposal of domiciliary and industrial wastewater, deficiency of sanitary sewer

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systems, among others (Contraloría General de la República [CGR], 2013; Segura et al., 2004). Although government bodies are responsible for taking action against allegations of contamination of water sources (e.g., the Environmental Technical Secretariat, SETENA), measures taken are often post-pollution and penalties are not strong enough to stop these practices (Segura et al., 2004). In fact, the Costa Rican government, in its National Development Plan (2011-2014) has recognized that the lack of land use planning and the proper consideration of the environmental variable in economic activities have generated an over-exploitation of water resources, decrease of water quality, and pollution of aquatic ecosystems.

In terms of human excreta disposal and wastewater management, in Costa Rica, 73% of the population uses septic tanks as the main sanitary technology to treat and dispose human waste. Sewage systems are used by 24% of the population, and 3% of the population uses latrines as a mean for excreta disposal; less than 1% of the population uses other types of sanitary systems (PEN, 2009). Despite the fact that Costa Rica has resolved the issue of adequate excreta disposal, wastewater treatment is an urgent issue for the country's environmental sustainability. Several decades of lack of investment in sanitary infrastructure (e.g. urban sewage service and water treatment plants) has generated an alarming pollution of water sources. Overall, sewage service is poor (only 24% of the population is served by sewer systems) and the number of water treatment plants in operation is also low. The most worrying fact is that the metropolitan area of Costa Rica —which includes the provinces of San José, Cartago, Heredia, and Alajuela— does not have a wastewater treatment system, which means that 96.5% of raw urban wastewater flows into the rivers without any treatment (PEN, 2009).

Coupled with this low sewage coverage, the excessive use of septic tanks, by 73% of the population, is problematic for Costa Rica (CGR, 2013). Septic tanks are household wastewater treatment systems which usually have serious structural and operational problems. Frequently, the importance of adhering to existing regulations about construction, operation, and maintenance is unknown both by the professionals in the construction field as well as by users. It is worth noting that in Costa Rica the construction of these septic tanks is an exclusive responsibility of households: government support and monitoring of technical design and proper maintenance are practically absent.

Relating to **solid waste management**, municipalities are responsible for providing solid waste collection services to 82% of households in Costa Rica (Instituto Nacional de Estadísticas y Censos [INEC], 2010). The remaining percentage is served by private services or treated by people using other practices, such as trash burning, burying, or dumping. Thus, important problems in terms of collection and disposal are found. For instance, the absence of waste collection in various points of rural and urban areas motivates the widespread practice of using banks of rivers as waste dumps. Castro & Jiménez (2000) suggested that at least two-thirds of the waste generated monthly comes from communities where there is no formal collection service. Even when communities have municipal collection service, people often seek to pass their waste to another location. This is especially true with non-traditional solid

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waste such as appliances, furniture, etc., due to limited options for transportation, disposal, or recycling sites (Loaiza, 2013).
Municipalities have been primarily responsible for solid waste collection and disposal. However, these local bodies face an important number of limitations in service delivery. Overall, municipalities require large amounts of financing and technical training to improve the way they handle solid waste; however, most of the solid waste operation is funded by internal municipal budgets, and the system operation requires a high percentage of such budgets. Service tariffs are low and they are frequently subsidized by the municipality. Therefore, municipalities do not have the necessary means to provide full-service collection coverage, and waste disposal trucks suffer constant damage without contingency plans for addressing the damage (Chinchilla, Poltera, Rudín, Ruíz & Spies, 2007).

Rainwater drainage is another area of interest, and municipalities are the primarily responsible for providing rainwater drainage infrastructure (Castro, 2007). Infrastructure for rainwater drainage is important to properly channel rainwater. In cases of heavy rainfall, deficiencies in rainwater drainage may cause significant damages on private and public infrastructure. Although in Costa Rica there is not much written on rainwater drainage, it is common to experience floods during heavy rainfalls because of the accumulation of solid waste and poor quality and maintenance of municipal rainwater drainage infrastructure. In the absence of appropriate national networks for the management of rainwater, Costa Rica faces unintended consequences such as floods, landslides, and other disasters associated with extreme hydro-meteorological events. Moreover, at the household level, if proper systems (e.g. gutters) are not installed or well maintained, when there is heavy rainfall, water clogging and roof leaking may appear. Stagnant rainwater may also produce the formation of mosquito breeding, which may cause important health problems.

Finally, the environmental sanitation sector in Costa Rica is comprised by different regulatory institutions and service providers at the national and local levels. Among these institutions, the Ministry of Health (MINSA) oversees the sector and assumes a guiding role, and the Ministry of the Environment and Energy (MINAE) is responsible for natural resource management in compliance with the Environmental Law. The Water and Sewer Institute (AyA) is a centralized public institution reporting to the Ministry of Health. At the local level, sanitation services are structured by municipalities throughout the country, and a public service utility company (ESPH) that provides services to some Heredian population. Furthermore, at the community level, there are two types of community-based organizations in charge of water provisioning: Rural Aqueduct Administration Committees (CAARs), considered as informal organizations, and Administrative Associations of Aqueducts and Sanitation Systems (ASADAS), under supervision of the AyA. However, it is possible to say that more than ten institutions can also relate to the environmental sanitation sector in Costa Rica.

In terms of policy, in Costa Rica there are more than one hundred and fifteen laws or executive decrees related to some extent to environmental sanitation management (Segura et al., 2004). However, such legislation is scattered and it takes time for laws and regulations to go into effect (Red Interamericana de Recursos Hídricos [RIRH],

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2007). In fact, weak controls result into little or no monitoring of standards and regulations (Segura *et al.,* 2004). Segura and colleagues believe that there is no a comprehensive national policy to address environmental sanitation in interaction with existing national programs (Segura *et al.,* 2004; RIRH, 2007). The lack of a comprehensive policy on environmental sanitation prevents the definition of government priorities, and roles and responsibilities between institutions and organizations tend to overlap (RIRH, 2007).

2. Methodology

This study employed a multi-level design with three different communities as study sites. Data collection followed a mixed-methods approach. Quantitative data were collected through the implementation of a household survey to a total of 181 householders in order to identify environmental sanitation conditions and main challenges in the selected study sites. Qualitative data consisted in 61 in-depth individual interviews to national authorities, local authorities, community leaders, and householders in the three study sites, who are related to the environmental sanitation field or directly affected by environmental sanitation policy. Additionally, 5 focus-group interviews were performed with community leaders and householders in each site, with a total of 42 participants.

The choice of a mixed-methods design employing a multi-site and multi-stakeholder approach responds to the desire of obtaining a more comprehensive analysis of the Costa Rican environmental sanitation context; also, in order to identify the different transactions across layers of society that can contribute to resilience-building processes in national, communal and individual levels. The study findings are organized by these three levels, where different data collection techniques were developed. For instance, the national and communal findings are mainly based on the qualitative data collected by in-depth individual interviews and focus-groups. The individual level of analysis is complemented by the household survey applied in the three study sites.

2.1. Selection of the study sites

The study was carried out in the following cantons: Upala, Santo Domingo de Heredia and Curridabat. The selection of the study sites was mainly based on three criteria. The first criterion was to obtain different geographic characteristics (e.g. urban, rural, and semi-urban); the second criterion was to obtain representation of different water and sanitation service providers in the country; finally, the third one was based on the outcomes of an index developed by Mora (2006) categorizing the 81 cantons of the

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country (Costa Rican administrative territorial division) according to low, medium, and high levels of inequity on water access and service quality[3].

Site 1, Upala, presents rural characteristics and it is located in the North Region of the country, along the northernmost boarder of Costa Rica. Its sanitation providers are the Municipality and Administrative Associations of Aqueducts and Sanitation Systems (ASADAS). This community is classified as having high levels of inequality in terms of access of water and service quality according to Mora (2006). Upala is a rural site dominated by open countryside, extensive land uses, and low population densities: there are small towns and sparsely inhabited villages throughout the area. The site has a total population of less than 45,000 inhabitants, with a land surface of around 1,600 square kilometers. Nearly 45% of the population is engaged in activities in the primary sector (farming and livestock), according to the last census data in 2011. Site 1 is a community privileged by its great diversity of natural resources; it contains important rivers and springs, which supply drinking water to more than 20 localities. Forest landscapes, volcanoes, and flora and fauna make biodiversity its main attraction and resource.

Site 2, Curridabat, presents urban characteristics. Its water and sanitation provider is the Costa Rican Water and Sewer Institute (AyA) only. This community is classified as having low levels of inequality in terms of access of water and service quality according to Mora (2006). Site 2 is located in the metropolitan area of San José, and it has a total population of less than 70,000 inhabitants, with a land surface area of around 16 square kilometers. Nearly 85% of the population engages in activities in the tertiary sector (public and private sector) (INEC, 2011). Between 1987 and the 1990s, an intense urbanization process took place on this site. Particularly, land was invaded during that period of time, and informal human settlements were established. Some improvements, in terms of public infrastructure have been made in those settlements, but many families still do not have title deeds.

Finally, site 3, Santo Domingo de Heredia, presents a mixture of urban and rural characteristics and it is located in the Province of Heredia, also pertaining to the metropolitan area of the country. The major water and sanitation provider is the municipality. This community is classified as having medium levels of inequality in terms of access of water and service quality according to Mora (2006). Site 3 has a total population of less than 45,000 inhabitants, with a land surface of around 25 square kilometers with some coffee plantations in this area. Nearly 80% of the population engages in activities in the tertiary sector (public and private services). Most of its residents commute to other neighboring municipalities or San José. Site 3

[3] The inequalities were defined by means of an index elaborated with the percentages of coverage of households with domestic water of potable quality and subjected to disinfection, in addition to the uniformity in service fees. They are classified in total, very high, high, medium, little and very little inequality, which is equivalent to 0,1,2,3,4 or 5 points, respectively. Pearson's linear correlations were applied with the indicators of development, social welfare and health by canton. Then, a frequency analysis was carried out with each indicator in the different groups of cantons, according to the classification of the inequalities. Then averages, minimums and maximums of the 11 indicators of each group were calculated, and graphs were made to visualize the trends of each indicator, with respect to the classification of inequality in access to drinking water (Mora & Portuguez, 2008).

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is located in an important aquifer area in the country, but increasing urbanization in recent years threatens the amount and the quality of the water supply.

2.2. Study conceptual approach

This study is mainly concerned with recent efforts to promote and achieve more sustainable environmental sanitation practices. Generally speaking, sustainable environmental sanitation is understood as quality of life, capabilities, assets, attitudes, and activities supporting the creation of healthy environments (McConville, 2008). This implies the need for integrating the different elements of the sanitation sector (e.g. health promotion, financing, technology, socio-cultural appropriateness, and environmental sustainability), as well as involving all sanitation stakeholders for large scale sustainable changes (Lüthi, McConville, & Kvarnström, 2009). Therefore, this study tries to recognize national and local capacities and motivations for change in order to understand the relationships between stakeholders in the pursuit of a more sustainable path of development.

Particularly, this study is based on the assumption that in order to achieve environmental sanitation sustainability, resilience-building processes might play an important role in understanding policies and behaviors promoting positive change. The construct of resilience can be understood from many different perspectives (Luthar & Cicchetti, 2000). These perspectives greatly depend on the aspects researchers want to emphasize, for instance:

- The ability to recover from the negative consequences of an event.
- The ability to prevent negative consequences from occurring.
- The ability to prevent negative consequences from worsening over time.
- The ability to innovate, to learn, and positively change (Seville, 2008).

These two last emphases were of significant attention during the development of this work. Specifically, this study borrows from the multi-layered social resilience approach, which has been developed within the discussion of sustainable development (Obrist, Pfeiffer, & Henley, 2010). Recently, this developmental discussion has shifted consideration to the promotion of resilient management approaches towards diversity, innovation, and mutual learning; by envisioning alternative actions to influence sustainable policies and social practices. Two main conceptual aspects of this approach are worth of attention. One aspect relates to the social actor capacities not only to cope with harmful conditions (reactive capacities), but also to search for creative options (proactive capacities) to increase the desired outcomes. At this point, what really matters are people's capacities, assets, motivations, and activities leading to social change. The second aspect is its multi-layered nature, which ranges from the individual, to the communal, national, and global levels (Obrist *et al.,* 2010).

The different transactions across layers of society are of special importance since all of them affect and influence to each other. For instance, organizations at the national

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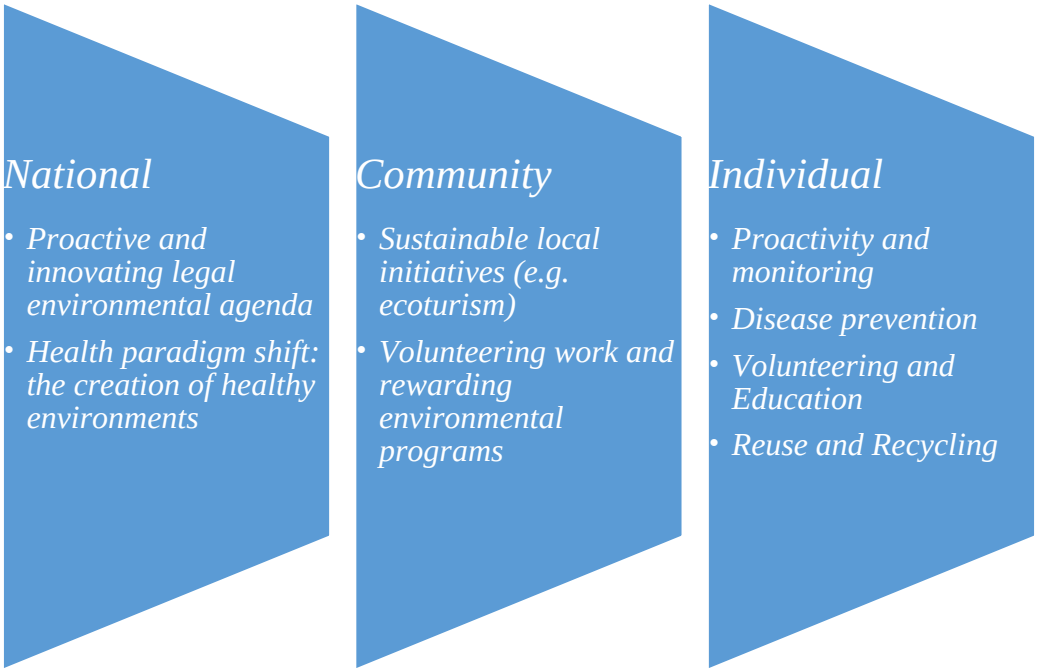
level can contribute to resilience-building processes in lower levels, and be a powerful enable factor for intermediate level organizations, community, and household levels. This also brings the idea that these transactions enable people to access resources, learn from experience and develop constructing ways in dealing with common problems (Obrist *et al.,* 2010).

3. Study Findings

The findings presented here correspond to a summary of a larger doctoral dissertation project. This section is organized through three layers of analysis: national, communal, and individual levels. The analysis pretends to identify where the government, communities, and individuals are focusing their efforts towards more sustainable environmental sanitation behavior (see Figure 1).

Figure 1.
Diagrama de flujo del proceso de identificación e inclusión de estudios para la revisión



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3.1. Findings at the national level: Environmental sanitation policy efforts and a paradigm shift

Since 2005, Costa Rica has kept improving its legal environmental agenda taking a more proactive and innovative stand. Two outstanding examples are the 2007 Regulation of Dumping and Reuse of Wastewater and the 2010 Law on Integrated Waste Management (GIR Law). The 2007 Regulation of Dumping and Reuse of Wastewater enforces the liability of all public and private entities to protect the quality of water resources. This law serves as a financial instrument to the government, in order to regulate the pollution of water sources. All tenants and potential users, including the sewer service providers, are obliged to pay a fee against the aquatic transportation and disposal of wastewater originated from a specific pollution point. Collected funds should be used and invested in sewer systems, wastewater treatment plants, monitoring of pollution sources, and environmental education in order to compensate the damage caused (Hernández, 2010). The GIR law promotes a shared responsibility among all community stakeholders depending on the role they play in society. This law emphasizes social participation throughout all the stages in solid waste management; the main focus is based on reducing the amount of generated waste and change of consumption patterns and behavioral practices regarding collection, transportation, disposal, and reuse or recycling (Programa Competitividad y Medio Ambiente [PCMA], 2012).

Throughout the process of formulation of this law, a close integration between public and private sectors took place. Furthermore, it has enabled the capacity to frame and define clear competencies and responsibilities according to the nature of each social actor (Chinchilla et al., 2007). Among the positive consequences of enacting this law stands out the enhancement of the relationships between the different private and public stakeholders. The public entities hold the responsibility to assure all type of resources (e.g. human, technical, financial) and implement the required actions defined within the law. This is accomplished through municipal bodies by drafting and applying the plans for solid waste management. On the other hand, private entities have taken an important role in providing alternatives for the management of solid waste. The main interest is primarily economical, but at the same time these players set the path for developing corporate social responsibility, which in turn expands the spectrum for new business. Finally, within this new orientation, it is expected that the National Policy on Waste Management 2010-2021 can unify existing legislation, including the Law on Integrated Waste Management and the national and municipal plans for the management and disposal of waste.

However, the capacities of the different actors involved, as well as the resources and responsibilities vary considerably and make difficult to translate into practice such requirements. A particular vulnerable actor in the execution of this law is the local government (municipalities), which have been the historical providers of solid waste service. The first intention of this law was to expand municipal leadership regarding waste management; however, there is a contradiction: municipalities are considered weak performers mainly due to the lack of financial resources and/or political will to

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enable the expected changes. In fact, only 26 of the 81 country municipalities have developed a plan for solid waste management (Ministerio de Salud de Costa Rica [MINSA], 2012). The rest of municipalities without plans might violate the requirements of offering recycling programs, separate treatment of electronic waste, and better systems of waste collection (Loaiza, 2013).

Other individual initiatives from different communities across the country have developed recycling waste collection centers, with a certain good performance and community support. For instance, in Site 3, there is a recycling collection center, which was a neighbor's initiative, particularly motivated to obtain some economic profit from recycling. This initiative has gained significant support from the community. Although initiatives of this kind have a monetary interest primarily, they are also actions which intend to promote recycling behaviors among the population. According to study participants, it is not the government which has participated the most in solid waste management; conversely, it is the private sector which stand out the most. A recycling program continuously mentioned by study participants is called "AmbientaDOS," which is the result of an alliance between the Kimberly-Clark Company and a private broadcast channel (Channel 7) in Costa Rica.

However, both the 2007 Regulation of Dumping and Reuse of Wastewater and the 2010 Law on Integrated Waste Management (GIR Law) are very recent laws and their effectiveness is still ongoing. According to study participants, part of the success of the GIR law is attributed to the General Comptroller of the Republic, who sets the terms of compliance and who conducts audits. This law is a huge effort that demonstrates how much the country can achieve if clear priorities are set. In this regard, national and local authorities agree that, although changing practices is a low process, at least, there is an institutional platform interested in promoting changes to solid waste management, which is an important starting point.

Moreover, Costa Rica has succeeded with some other environmental sanitation initiatives which have been consolidated throughout the years. For instance, two community-oriented programs can be considered as outstanding efforts to promote hygiene, improved sanitation, water quality, and natural resources protection. These two programs are the Ecological Blue Flag (PBAE) and the Sanitation Quality Stamp Program (PSCS). The PBAE started in 1995 with the aim of promoting civil organization in the protection of the environment. The program administration of PBAE is shared by different national institutions considered as an important strength for its success[4]. The PBAE's trajectory began with the protection of water resources, specifically, the program started working with beach communities at environmental risk. Then, the program expanded to communities where contamination of rivers was a prominent characteristic. Later, the program created a working category with educational centers serving the purpose of increase the viewpoint of improved sanitation and hygiene in primary schools, secondary schools, and universities. In fact, the aim of this category is to incorporate the program into the functioning of the

[4] The national institutions participating are: the Costa Rican Water and Sewer Institute (AyA), the Costa Rican Institute of Tourism (ICT), the Ministry of the Environment and Energy (MINAE), the National Chamber of Tourism (CANATUR), and the Ministry of Health (MINSA).

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educational system itself. Recently, the PBAE has been expanded to other categories such as: the protection of watersheds, sustainable households, and the final category -that is the integration of all other categories- called Neutral Climate Communities (Mora & Chávez, n.d).

Another important finding at the national level is related to the social production of health. The government of Costa Rica, through its institutions, has made significant improvements in terms of changing the focus on its health policy: “from disease to the social promotion of health.” In the country, this paradigm shift started mainly with the Charter of Health Promotion commonly known as the Ottawa’s Charter in 1986. Basically, this instrument encourages a new strategy that seeks the adoption of healthy lifestyles, and thus, the promotion of healthier communities (OPS, 2003). In order to understand the complexity of this paradigm shift, it is necessary to situate the construct of health as a dynamic one. Both health and disease are the consequences of a number of factors and elements of the individuals and the environment within specific community contexts (OPS, 2003). Thus, the social production of health is made of the interrelation of socio-economic, cultural, environmental, health, legal, and institutional determinants.

Even though, this conceptual framework has many years of enactment, it has been difficult for the country to permeate these health principles in its programs, plans, and actions. In fact, the adoption of new ideas takes a significant amount of time and such process can encounter important resistance. According to previous studies in Costa Rica and people interviewed in the field, in order to adopt appropriate actions within this framework, a cultural change is required, especially for health personnel and national and local authorities. Unsurprisingly, the manifested resistance to adopt more complex frameworks such as the social production of health might cause that many environmental sanitation problems keep unresolved (Artavia & López, 2007; Chamizo, 2009).

Necessarily, government actions must integrate environmental sanitation into this alternative health framework. Even the term environmental sanitation itself has to be seriously revised and reconsidered within these efforts. If we take a close examination of this term, it refers to a reactive emphasis: “to sanitize what is already polluted.” However, authorities, personnel, educators and the general public should talk about the creation of healthy environments because the emphasis necessarily shifts to proactive conditions such as pollution and disease prevention, usage of clean technologies, environmental-friendly behaviors, and individual and social engagement. Basically, the underlying idea to consider is that repairing is not the same as preventing.

3.2. Findings at the community level: Environmental awareness lead to a sustainable development path

Beyond the merely idea of being compliant to environmental standards, there is the path of recognizing the embedded opportunities of developing a holistic awareness.

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Some communities start to visualize their own way to reach the desired goals, a determined place in a development path, and several business opportunities behind the idea of environmental sustainability. A good example of these types of communities is site 1, which faces the challenge of developing its own local initiatives in order to overcome the idea of immediate urgency by visualizing a road map for future sustainable developing programs.

Site 1 is a rural community privileged by its great diversity of natural resources; it has countless rivers and springs that supply drinking water to more than 20 localities, forest landscapes, volcanoes, and flora and fauna that make biodiversity its main capital and resource for a developmental perspective. Although, this community does not hold the status of a national park area, it does belong to a protected area officially called Arenal Tempisque, specifically located in the Corredor Biológico Tenorio Miravalles (CBTM). The CBTM was a local initiative with the aim of identifying home-grown socio-economic activities and practices more aligned with the conservation and protection of the environment, which in turn can lead to a more sustainable path. One of the main interests for conservation is to protect water sources for human consumption. Specifically, nine water sources are being protected; these sources supply around 15,000 families, mostly low-income families, in the community (Calvo, 2014).

The second main interest of this local initiative was to visualize feasible options for eco-tourism. In this matter, a particular locality is ahead of this process and hosts an important number of tourism companies, which have understood that by exercising ecological practices a proportional sustainable benefit can be achieved. One example is the emergence of agro-tourism type of lodge: the tourist not only goes there for a leisure purpose, but also to get involved in the daily practices of running a productive farm. Because the business run is based within the protected ecological area, the farmer (owner) is committed to respect and protect the environment.

Moreover, it is possible to say that, by adopting this ecological development path, a general recognition of environmental sanitation improvement has been unfolded within the population. Among the most adopted practices, the following have been found: solid waste collection campaigns, improvement of aqueduct infrastructure, and educational school campaigns. Notably, one ASADA of this locality has opted for a significant improvement of its water supply and water protection activities, mainly related to the upgrading of physical infrastructure and by applying education efforts. Recently, the ASADA has applied for a water quality certification through the Sanitation Quality Stamp Program (PSCS), as an important step to acquire social recognition of its efforts on supporting such sustainable practices.

Nonetheless, some significant limitations have also been found within this local process, the most salient is about friction between community leaders, non-participatory leadership styles, and general lack of understanding on future steps to follow. Likewise, some challenges remain regarding inadequate wastewater management from local businesses and households, as well as low coverage of solid

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waste collection services. Such challenges need to be addressed if a real environmental sustainable path is to be acquired.

Another important study finding relates to the idea that volunteering work can achieve sanitation improvements. For instance, the other two communities which were also surveyed in this study have shown some efforts into improving their current conditions. However, their approach leans towards a rather more reactive responds than the proactive behavior found in site 1. For example, site 2 faces a significant threat regarding water quality and availability, especially, in the eastern localities of the city. This is due to pollution of their surface water sources, which has been generated by poor urban planning. Since 2006, one of the most affected localities decided to start the volunteering program called Ecological Blue Flag in order to exert pressure to local and national government and look for solutions. Neighbors worried by the future of water supply in the area have opted for educational campaigns as a key instrument to behavioral change. Apart from supporting cleaning campaigns, leaders have taken also the role of intermediaries in order to make local authorities aware of the severity of the issue. They advocate the spread of the deficiencies through the social media, making all stakeholders aware of the problematic issue.

Other informal cleaning campaigns and reforestation activities have been promoted through some groups of neighbors who spontaneously have organized by using social media, such as facebook, with a good level of success. These are mainly young people who want to make changes about the current characteristics of their communities by introducing more environmental-friendly behaviors.

Finally, site 2, presents particular problems related to the handling of solid waste, which is openly thrown in illegal landfills or at the edge of the streets. This situation is primarily visible in areas of low income with high proportion of immigrant population. Moreover, in these low-income areas serious problems regarding wastewater are also found. Most of the time, households direct this water to the storm drainage system causing health problems and generating a bad reputation for the community. A similar experience with site 3 has happened in some localities of site 2. For example, recently, in two public schools, a group of students concerns about the sanitation conditions of their community; they have raised the proposal towards the school chairmen to become part of the Ecological Blue Flag Program as well. These young people have also spontaneously organized waste collection campaigns using internet social networks; and, according to the experiences, the organizational calls have resulted successful.

3.3. Findings at the individual level: Householders reactive and proactive responses to environmental sanitation

One of the purposes in the field study was to identify a set of environmental friendly sanitation practices and the frequency individuals implement them in daily life in order to assess their enrollment and own responsibility towards a more sustainable behavior. With this goal, a survey, which consisted on a list of 30 questions, was

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handed out. The question measurement is divided into a four-point scale ranging from 0-4 (0, Not Applicable; 1, never; 2, seldom; 3, sometimes; 4, often) representing the frequency in which a particular practice is carried out. Based on this output an index was built using the factorial analysis as the underlying method in order to compile the data set and reduce it to four significant items, so called factors (see Table 1).

Table 1.

Index factors according to the results of the household survey applied to the study sites (Upala, Curridabat and Santo Domingo de Heredia), from January to March, 2012.

Factor 1: Proactivity and Monitoring	Factor 2: Disease Prevention
Water storing in case of service interruption.	Hand washing.
Water boiling or use of chlorine.	Washing floors and cooking utensils.
Water leaks monitoring and repairing.	Saving water.
Gutter repairing.	Avoiding of accumulated garbage in drainage, river, and water bodies.
Toilet repairing.	Elimination of mosquito breeding grounds.
Possibility of buying a new toilet that uses less amount of water.	
Septic tank monitoring.	
Budgeting for septic tank cleaning.	
Claiming in case of environmental pollution.	
Purchase of water bottles.	
Pick the garbage out of the streets or green zones.	
Usage of cloth bags or reusable packaging when shopping.	
Possibility of earning money through the management of solid waste.	
Possibility of earning money through the reuse of fecal sludge.	

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Monetary support to educational/ cleaning campaigns.	
Factor 3: Volunteering and Education	**Factor 4: Reuse and Recycling**
Volunteering work in protection of the environment. Participation in community organizations. Instilling family members about importance of protecting environment. Practice what is preached about importance of protecting environment	Usage of garbage trash. Household garbage separation and recycling Reuse of organic material for the production of fertilizers, biogas, etc. Reuse of waste material such as plastic, paper, aluminum, etc.

Source: Own elaboration

Factor No. 1 (Proactivity and Monitoring) is considered as one of the main indicators in this analysis as it measures the incorporation of sustainable practices in daily life habits. The main emphasis lies on monitoring, budgeting and repairing of current sanitation systems to prevent future failures. This is translated into the capacity of the individuals to foresee or plan in advanced specific measures to prevent or improve adverse sanitation conditions.

Factor No. 2 (Disease prevention) comprises all those practices related to the hygiene habits. The main trait of these practices is to identify individual capacity to recognize that improvement in hygienic conditions will lead to reduce disease spread out.

Factor No. 3 (Volunteering and Education) focuses on the motivation and engagement within community organizations oriented to environmental protection. This factor is important since establishes a direct connection among the stakeholders based on the efforts to contribute to the sustainability and development of local contexts.

Factor No. 4 (Reuse and Recycling) gathers all those practices related to the regain of material and components through the implementation of recycling activities. Recently, these practices have been strongly promoted since they represent an important economic impact and contribute to change consumer's preferences.

All three figures (see figure 2, figure 3 & figure 4) show no important differences regarding the practices performed among the three communities. Overall, all of them follow a similar pattern based on the grouped practices. There is a lower engagement into proactive and monitoring activities rated closely to "seldom." The greater general concern lies into the disease prevention with a rate close to "often." This may be the

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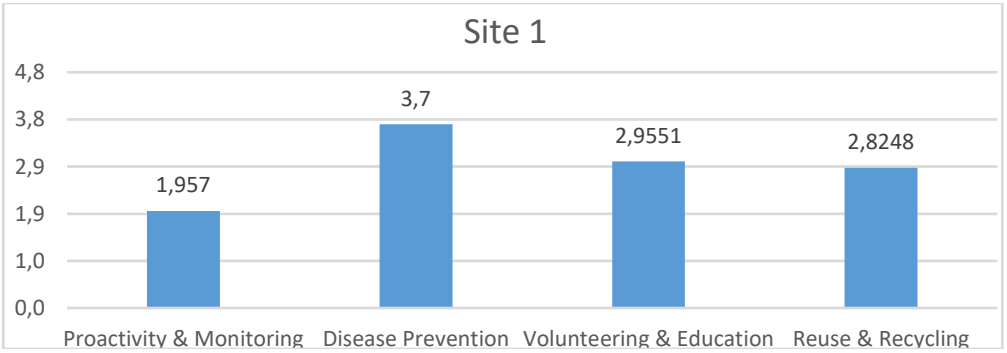
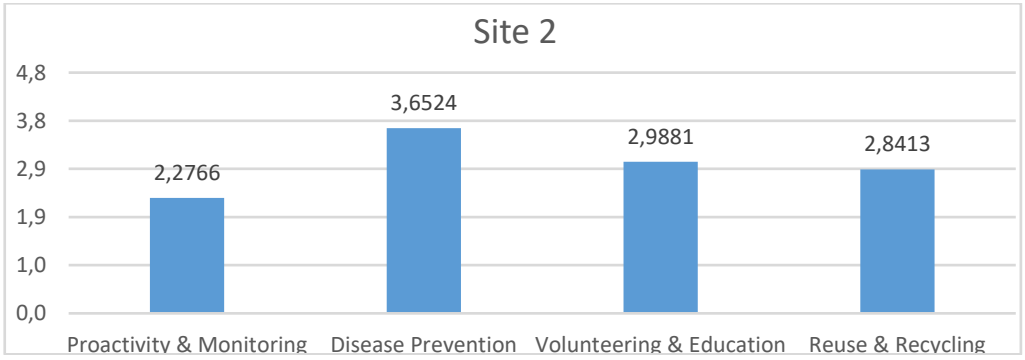
result of the driven hygiene and health campaigns carried throughout the country, which have been intensively conducted in the last 30 years. Volunteering and education practices as well as reuse and recycling perform somewhat similar within communities, although the bigger difference occurs in site 3. In general, volunteering and education work practices are performed as “seldom” and the factor of reuse & recycling also within the category of “seldom” a little closer to “sometimes.”

Figure 2.
Environmental sanitation practices index according to the household survey applied in Site 1, Upala, Costa Rica, January 2012.



Source: Own elaboration

Figure 3.
Environmental sanitation practices index according to the household survey applied in Site 2, Curridabat, Costa Rica, February 2012.



Source: Own elaboration

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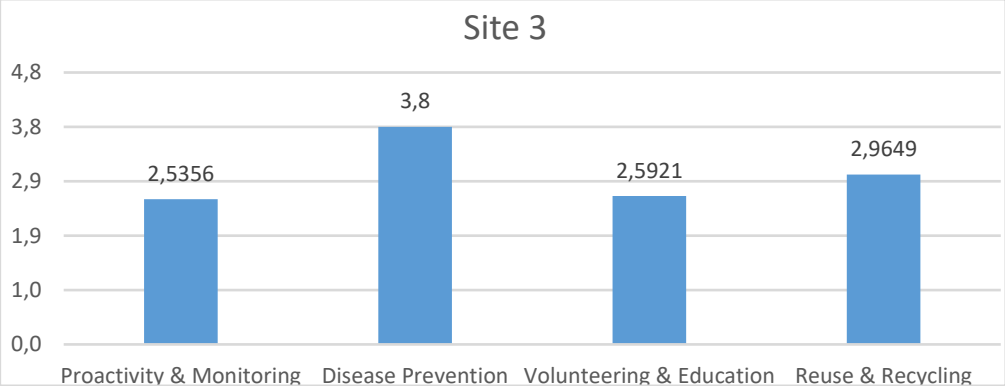
Figure 4.
Environmental sanitation practices index according to the household survey applied in Site 3, Santo Domingo de Heredia, Costa Rica, March 2012.



Source: Own elaboration

Therefore, it is possible to say that communities that shared more urban characteristics (site 2 and site 3) perform better in terms of monitoring and proactive practices. Regarding recycling habits and reuse of materials can be considered as a weak practice in general, with a potential for improvements. The lack of well-defined policies and the availability of recycling centers make this practice somewhat cumbersome.

Figure 5 depicts the opinion of householders on who should take ownership and responsibility in improving sanitation conditions. Site 1 is aware that main contribution for the improvement of sanitary conditions has to be carried out by the individuals and very low participation from the school level. Site 2 gives a heavy weight to the involvement of all stakeholders in order to reach the desired level of improvement. Nevertheless, a significant percentage of the population thinks that the individuals need to take action in order to achieve a change. Finally, site 3 leans towards the idea that householders should be the category to have the highest responsibility in driving the change.

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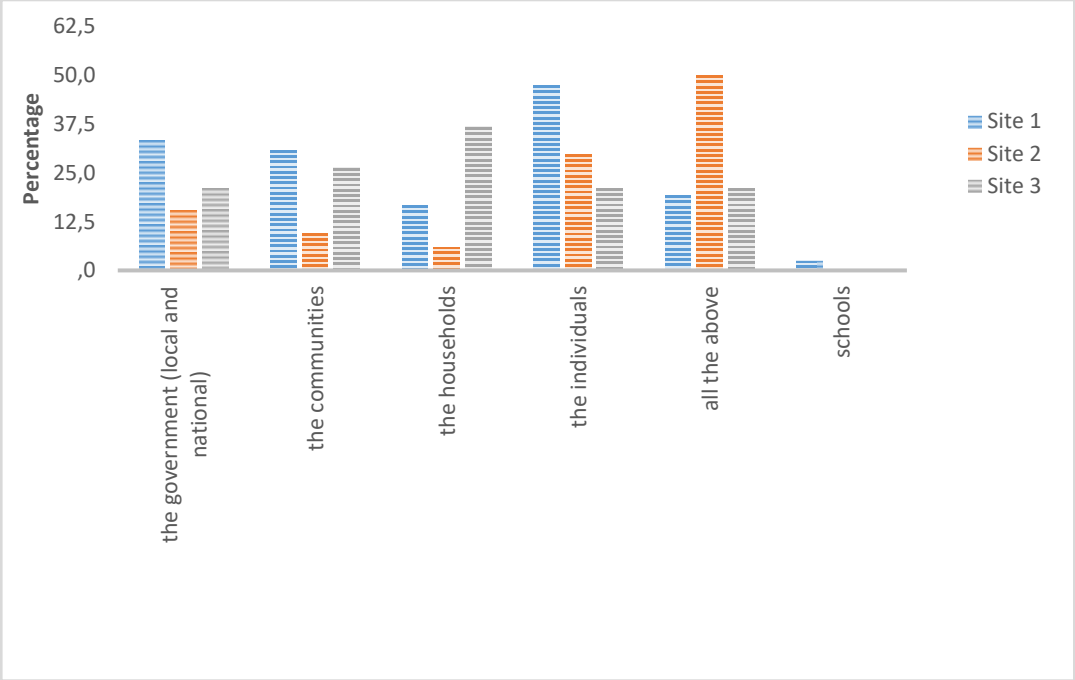
Figure 5.
People's opinion about the main responsible for environmental sanitation according to the household survey applied to the study sites (Upala, Curridabat and Santo Domingo de Heredia), from January to March 2012.



Source: Own elaboration

No general trend can be found for all three communities in a common decision to weight a particular stakeholder as the main driver for sanitation improvements. This contradicts to certain extent the findings from the qualitative data collected in which the liability relies in the householders by means of spreading family values and education.

Figure 6 illustrates the qualitative statements given by the communities' stakeholders. These statements were filtered and grouped into several categories which best represents people's belief. The interviewed participants clearly highlight the education and cultural changes as the main driver to achieve a fundamental transformation. They all point out the easy accessibility to broadcast media like, TV, and radio which in turn play an important role in reaching out to massive diffusion of ideas. Unfortunately, this resource has not been exploited in that direction and a call to the public and private sectors should be raised in order to joint efforts to conduct a program which can make use of such important asset. The second most mentioned traits were the value of protection of natural resources and the communal organization.

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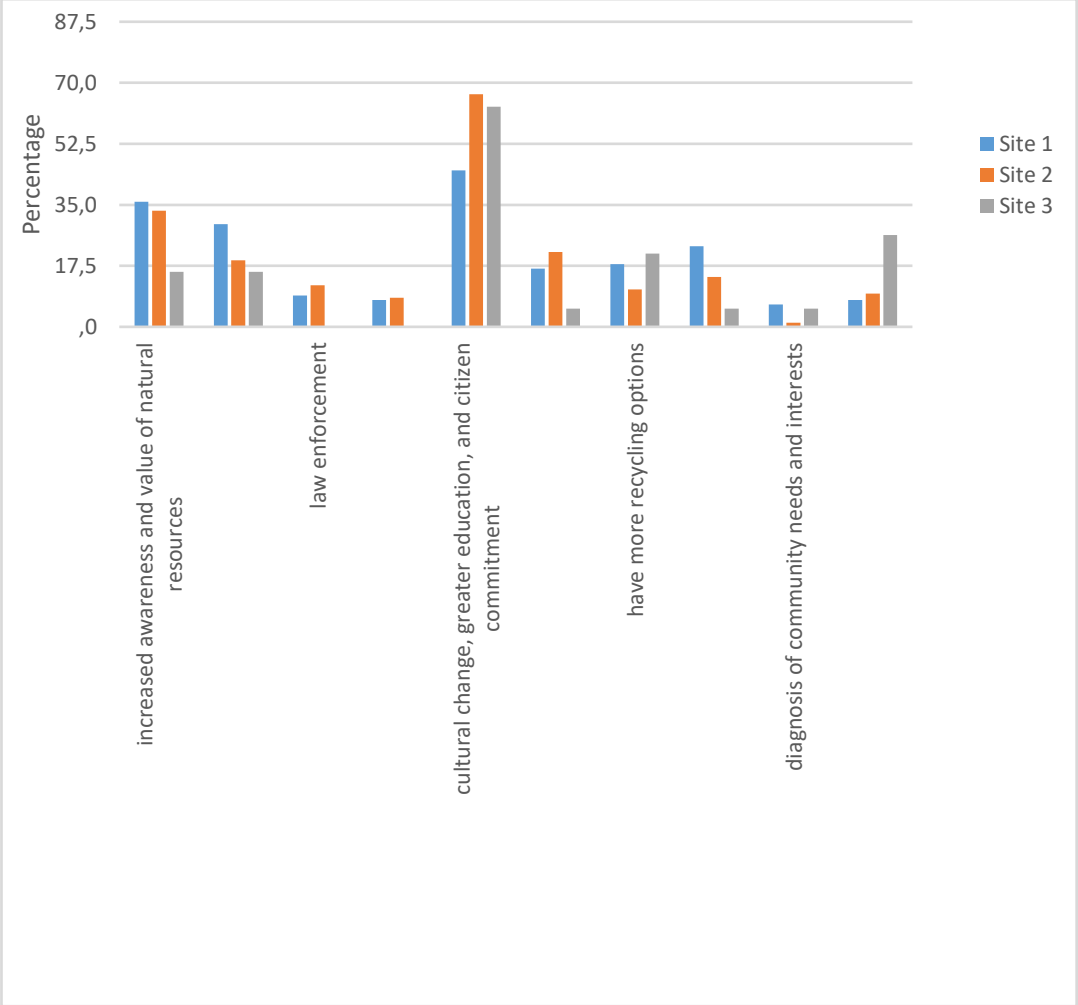
Figure 6.
People's recommendations to improve environmental sanitation conditions according to the household survey applied to the study sites (Upala, Curridabat and Santo Domingo de Heredia), from January to March 2012.



Source: Own elaboration

A baseline for all three traits is clearly the education, which can be looked from two complementary perspectives. On one side, the internal family education that should strength certain values, such as: social affiliation, group solidarity, and environmental awareness. Unfortunately, nowadays the predominant and most appreciated trends are the individual achievements supported by a culture where the material attainment sticks out, which is translated in the collective awareness as a lack of community belonging. This leads to an abrupt evasion of responsibilities and social engagement.

The other side of education is the important role played by the school system. This institution is supposed to act as a change agent for cultural transformation. However, the lack of a clear educational direction in terms of environmental awareness makes it difficult to obtain the expected results. This deficit is reflected in poor and neglected

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environmental educational programs treated as a merely appendixes and not as substantial subjects. Many shortcomings in the program hinder a real educational transformation. To sum up, the low instruction received by the young students creates a need addressed to the government for reviewing the programs and financing proper training, starting with the teaching personnel.

4. Discussion

This paper illustrates recent Costa Rican attemps towards more sustainable environmental sanitation efforts and practices across national, communal, and individual levels. The starting point of analysis is to consider that different transactions across layers of society are of special significance, since all of them affect and influence to each other. Borrowing from the social resilience theory, all three layers (country, community and individual) should shift attention to the promotion of resilient management approaches towards innovation, mutual learning, and diversity in order to generate alternative actions to influence sustainable policies and social practices.

Consequently, Costa Rica has shifted to a more comprehensive view of environmental sanitation, where some laws and programs have included a new strategy towards participatory processes that seek the adoption of healthy lifestyles, and thus, the promotion of healthier communities. In order to understand this conceptual shift, it is necessary to situate the construct of health as a dynamic and complex one. Both health and disease are the consequences of a number of factors and elements of the individuals and the environment within specific community contexts. Evidently, these statements draw on a more inclusive and holistic thinking, since they understand that the social production of health is made of the interrelation of socio-economic, cultural, environmental, heath, legal, and institutional determinants (OPS, 2003).

Unquestionably, the promotion of health is a commitment primarily assumed by the government and it requires national policies for their development. Within such policies, joint efforts among social actors are crucial. Thus, social enrollment and participation implies the need to develop capacities and the creation of stakeholders' opportunities to interact and participate in the decision-making processes. The first challenge in this task is to overcome the traditional ways Costa Rican population has participated in the past; most of the time characterized by a reactive or passive behavior. Conversely, within this framework, the population must become proactive, autonomous, and independent, aware of their rights and duties.

Thus, significant efforts are found in the sites for study; for instance, communities understand that by protecting the environment and reducing contamination, social and economic assets and capacities are also promoted. Such efforts put attention to local productive activities and voluntary environmental programs and standards, which also are considered a significant opportunity for individuals to help overcome environmental sanitation challenges in their communities. It includes programs that seek to increase

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the motivations and the sense of responsibility towards the protection of the environment by rewarding good practices. When communities participate in these programs, they often kick start virtuous cycles, generating positive results among participants and the general population. Also, individuals have started to adopt more proactive and environmental friendly behaviors in their daily life; for example, by adopting hygiene habits or by recycling or reducing the consumption of unnecessary goods.

However, findings from this study have shown that although there have been important efforts at the national, communal and individual levels, there are still some challenges that must be overcome. For instance, Costa Rica lacks an explicit and comprehensive environmental sanitation policy. Policies are fragmented and lack a comprehensive planning framework that articulates all national and local actions under clear objectives. According to some stakeholders, the lack of linkages at higher levels trickles down to local levels, and most environmental sanitation changes have been driven by individual or community efforts rather than the government.

Therefore, the fact of working on bringing change turns to be very difficult if people do not recognize the positive impacts of their practices in their daily life experiences. Even the way people conceptualize environmental sanitation and put the emphasis (in reactive or proactive actions) deserves particular attention. This is especially important by local and national authorities, because they are supposed to lead the desired path of development. The important issue here is how to consolidate suitable conditions to transcend from theoretical concepts to concrete practices.

Finally, environmental sanitation must be classified with high priority in the national political agenda and should involve all different actors of society. The participation and involvement of each actor must be differentiated according to its capacities with the ultimate purpose of balancing responsibilities and promoting an equitable society. Moreover, the environmental sanitation construct must be understood from the perspective of healthy environments. In order to accomplish this challenge, stakeholders must be able to recognize the benefits obtained by introducing sustainable environmental practices. The building block for this relies on identifying the real drivers that trigger actions. These drivers should be leaning towards prevention and proactive behaviors which, in turn, increase social capacities and resilient responses; in other words, country’s environmental sanitation sustainability could be increased.

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5. References

Artavia, R. & López, M. (2007). *Análisis de la implementación de la política de salud ambiental en el territorio de Escazú*. San José, Costa Rica: Universidad de Costa Rica.

Calvo, C. (2014). *Towards sustainable environmental sanitation in Costa Rica* (doctor of philosophy dissertation). University of Kansas, Kansas, United States.

Castro, E., & Jiménez, L. (2000). *Cuencas hidrográficas y degradación del Golfo de Nicoya: Una metodología de valoración económica para la toma de decisiones* (3r Informe). Heredia, Costa Rica: UNA.

Castro, R. (2007). *Regulación ambiental y capacidades ambientales en los gobiernos locales.* Ponencia preparada para el Décimotercero Informe Estado de la Nación en Desarrollo Humano Sostenible. San José, Costa Rica: Programa Estado de la Nación.

Chamizo, H. (2009). Los nuevos desafíos de la puesta en práctica de las políticas de saneamiento ambiental. *Población y Salud en Mesoamérica, 7*(1), 1-20. Doi: https://doi.org/10.15517/psm.v7i1.1096

Chinchilla, R., Poltera, N., Rudín, V., Ruíz, P., & Spies, S. (2007). Planes municipales de gestión de residuos sólidos: Un nuevo instrumento de gestión ambiental municipal en Costa Rica. En *III Congreso Iberoamericano de Desarrollo y Ambiente CISDA*, Costa Rica.

Contraloría General de la República. (2013). *Informe acerca de la eficacia del estado para garantizar la calidad del agua en sus diferentes usos.* San José, Costa Rica: Área de Servicios Ambientales y de Energía, CGR.

Hernández, K. (2010). *Hacia un saneamiento más responsable.* Retrieved from www.uicn.pactoporlavida.ecobook

Instituto Costarricense de Acueductos y Alcantarillados & Organización Panamericana de la Salud. (2002). *Análisis sectorial de agua potable y saneamiento de Costa Rica*. San José, Costa Rica: Author.

Instituto Nacional de Estadísticas y Censos. (2010). *Censo de población: Resultados generales*. San José, Costa Rica.

Instituto Nacional de Estadísticas y Censos. (2011). *Censo de población: Resultados generales*. San José, Costa Rica.

ISSN-1659-0201 http://ccp.ucr.ac.cr/revista/

Doi: https://doi.org/10.15517/psm.v1i1.31108
Volumen 16, número 2, Artículo 1, enero-junio 2019

Loaiza, V. (2013, abril 8). Mayoría de municipios incumple Ley sobre residuos. *La Nación.* Retrieved from www.nacion.com/2010-12-10/ElPais/NotasSecundarias/ElPais2618080.aspx

Luthar, S., & Cicchetti, D. (2000). The construct of resilience: Implications for interventions and social policies. *Developmental Psychopathology, 12*(4), 857-885.

Lüthi, C., McConville, J., & Kvarnström, E. (2009). Community-based approaches for addressing the urban sanitation challenges. *International Journal of Urban Sustainable Development, 1*(1), 49-63.

McConville, J. (2008). *Assessing sustainable approaches to sanitation planning and implementation in West Africa* (Unpublished Thesis). Department of Land and Water Resource Engineering, Royal Institute of Technology, Stockholm.

Ministerio de Salud de Costa Rica. (2012). *Situación de los planes municipales de gestión integral de residuos a marzo del 2013*. San José, Costa Rica: Dirección Planificación Estratégica y Evaluación del Impacto de Acciones de Salud, MINSALUD.

Ministerio de Vivienda y Asentamientos Humanos. (2006). *GEO Gran área metropolitana del valle central de Costa Rica: Perspectivas del medio ambiente urbano*. San José, Costa Rica: MINAE.

Moe, C., & Rheingans, D. (2006). Global challenges in water, sanitation and health. *Journal of Water and Health, 4*(1), 41-57.

Montgomery, M., Bartram, J., & Elimelech, M. (2009). Increasing functional sustainability of water and sanitation supplies in rural sub-Saharan Africa. *Environmental Engineering Science, 26*(5), 1017-1023.

Mora, D. (2006). *Desigualdades por cantones en el acceso a agua para consumo humano en Costa Rica*. Cartago, Costa Rica: Laboratorio Nacional de Aguas, AyA.

Mora, D., & Chávez, A. (n.d). *Programa bandera azul ecológica: 15 aniversario 1996-2010* (7 ed.). San José, Costa Rica: Instituto Costarricense de Acueductos y Alcantarillados (AyA).

Mora, D., Mata, A., & Portuguez, L. (2010). *Acceso a agua para consumo humano y saneamiento: Evolución en el período 1990-2010 en Costa Rica*. San José, Costa Rica: Laboratorio Nacional de Aguas, AyA.

Obrist, B., Pfeiffer, C., & Henley, R. (2010). Multi-layered social resilience: A new approach in mitigation research. *Progress in Development Studies, 10*(4), 283-293.

ISSN-1659-0201 http://ccp.ucr.ac.cr/revista/

Doi: https://doi.org/10.15517/psm.v1i1.31108
Volumen 16, número 2, Artículo 1, enero-junio 2019

Organización Panamericana de la Salud. (2003*). 100 años de salud en Costa Rica: Costa Rica S. XX*. San José, Costa Rica: OPS/MS.

Programa Estado de la Nación. (2009*). Decimoquinto informe estado de la nación en desarrollo sostenible*. San José, Costa Rica: Author.

Programa Estado de la Nación. (2010). *Decimosexto informe estado de la nación en desarrollo sostenible.* San José, Costa Rica: Author.

Red Interamericana de Recursos Hídricos. (2007). *LATINOSAN Conferencia Latinoamericana en Saneamiento.* Calí, Colombia.

Rojas, N. (2011). *Atlas de cuencas hidrográficas de Costa Rica*. San José, Costa Rica: MINAET/IMN.

Segura, O., Miranda, M., Astorga, Y., Solano, J., Salas, F., Gutiérrez, M., Dierckxsens, M., & Céspedes, M. (2004). *Agenda ambiental del agua en Costa Rica*. Heredia, Costa Rica: EFUNA.

Seville, E. (2008, November). Resilience: Great concept… but what does it mean? In *Council on Competitiveness Workshop, Risk and Resilience*. Wilmintong, USA.

SuSanA (2008). *Sustainable Sanitation for Cities* (Thematic Paper Version 1.2). Eschborn, Germany: Sustainable Sanitation Alliance.

United Nations Development Program. (2012). *Human development report: The real wealth of nations: Pathways to human development*. New York, U.S: Oxford University Press.

UN-Millennium Project. (2005). *Health, dignity and development: what will it take? Task Force on Water and Sanitation*. U.K: Earthscan Publications.

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