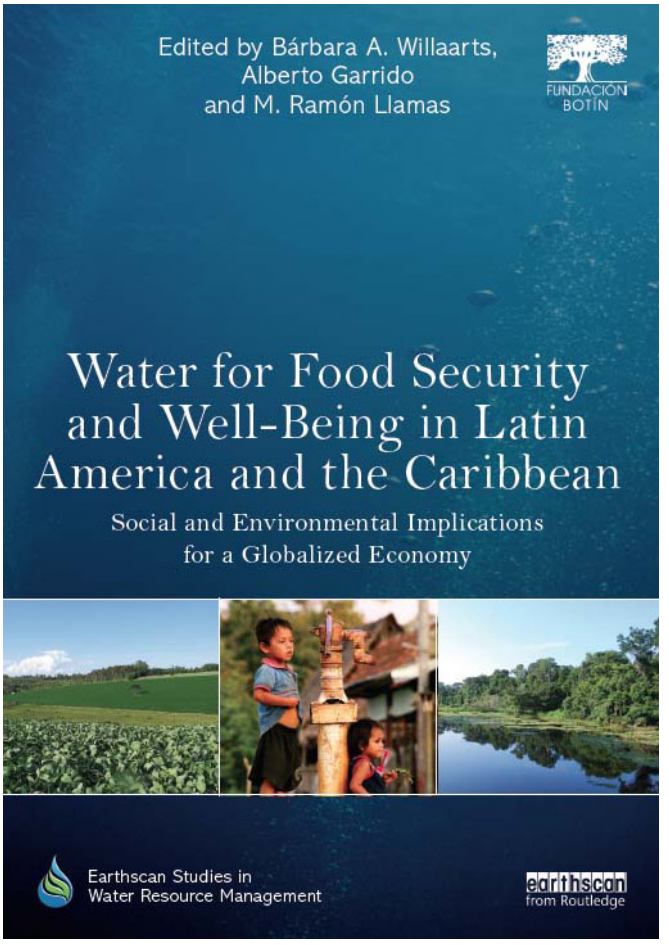

Chapter 6

Tracking progress and links between water and food security in Latin America and the Caribbean

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6

TRACKING PROGRESS AND LINKS BETWEEN WATER AND FOOD SECURITY IN LATIN AMERICA AND THE CARIBBEAN

Authors:
Bárbara Willaarts, Water Observatory – Botín Foundation, and CEIGRAM, Technical University of Madrid, Spain
Alberto Garrido, Water Observatory – Botín Foundation, and CEIGRAM, Technical University of Madrid, Spain
Bárbara Soriano, CEIGRAM, Technical University of Madrid, Spain
Marcela Molano, CEIGRAM, Technical University of Madrid, Spain
Olga Fedorova, CEIGRAM, Technical University of Madrid, Spain

Highlights

- The concepts of water security (WS) and Food Nutritional Security (FNS) have evolved from narrow and well-defined goals of guaranteeing citizens' access to sufficient water and food resources into much broader concepts, embracing health, sustainability, efficiency and social equity aspects. Such wide visions go beyond the physical availability or productive value of water and food, and testify to its importance as key elements to human well-being.

- During the last decade, significant progress has been achieved across many Latin American and Caribbean (LAC) countries on essential WS fronts, such as improving access to drinking water and sanitation, reducing social vulnerability to water hazards and water use efficiency. These achievements have contributed to improving health, physical protection and material needs, but important challenges remain. Water pollution is now one of the most important water security threats to LAC and requires greater attention at all levels.

- Efforts to improve basic WS goals are still needed in most countries, particularly in the low income countries of the Caribbean, Mesoamerica and Andean regions. Wealthier countries such as Mexico, Chile, Argentina, Brazil or Uruguay have higher WS standards, although physical water scarcity is becoming a growing problem, particularly in som of these countries.

- As with WS, most countries in LAC have improved basic food security indicators, predominantly in terms of food availability and access. However, the food crisis of 2007–2009 slowed down progress or even worsened some indicators for a few countries like Haiti, Paraguay and Guyana. Others like Bolivia, Ecuador, Peru, Honduras, Guatemala, Nicaragua and El Salvador have made significant progress, but still have a considerable gap to bridge.

- The most important challenge in LAC regarding food and nutritional security (FNS) is to overcome malnutrition rather than a physical lack of food. Currently, there are still 49 million people undernourished (8% of LAC population), but obesity now affects 20% of the LAC population (> 110 million people) and overweight up to 35% (> 200 million people).

- Between 2000 and 2010 WS and FNS indicators have progressed more rapidly and consistently in the wealthiest half of LAC countries. Progress among the poorest countries has been more erratic, inconsistent and inadequate. Per capita income is a good predictor of the levels of WS and FNS standards but there is considerable variation of performance amongst countries with similar incomes. This suggests that setting the right priorities and implementing the right policies can make a difference.

6.1 Introduction

The concept of security has long been understood as a country's safety faced with external aggression (e.g. wars or conflicts) and the defence of national interests in foreign policies (UNDP, 1994). Yet, human security has a much wider interpretation as it is focused on improving human well-being within countries, beyond defending strategic interests between nations. As the 1994 Human Development Report states 'Human security is concerned with how people live in societies, how freely they exercise their many choices, what access do they have to material well-being, and whether they live in a climate of political stability and peace' (*ibid.*). Because of the many dimensions included in the notion of human well-being, different security branches have emerged since the early 1990s, including food and nutritional security (FNS), water security (WS) and/or environmental security (ES).

WS and FNS are particularly concerned with those issues surrounding water and food, e.g. access, availability, quality and stability, which are critical to human well-being. Both *securities* imply that people have sufficient and stable access to food, enjoy a healthy diet, have access to drinking water and improved sanitation facilities and are physically protected from water hazards, among many other aspects. Not being deprived of these conditions is also a necessary condition for living a dignified life and being morally resilient. The future prospects of a foetus, a new-born or a child are to a great extent conditioned on the mother's and the household's material well-being. A child with adequate access to drinking water, sanitation and food security will have a better chance of surviving and progressing to a mature age. Further, being physically protected against natural disasters and diseases are fundamental conditions for human security and societal resilience.

The extent to which a country is water and food secure depends on the physical environment but predominantly it is the level of poverty and the constrained socio-economic context that really dictates their degree (Grey and Sadoff, 2007). As Allan (2013) states '(...) poverty determines water poverty: water poverty does not determine poverty' (p. 2) When both these circumstances are aligned, harsh natural conditions and widespread poverty, options to improve water and food gaps are rather complex. In Latin America and the Caribbean (LAC), water and land resources are for the most part abundant, and what lies behind existing water and food insecurities is the prevailing poverty (OECD, 2013a). While LAC is on good track to meet many of the Millennium Development Goals (MDGs) ahead of 2015, poverty and inequality are still widespread in the region, and basic indicators of human material well-being remain below minimum standards. Currently, LAC still has 49 million undernourished people, 33 million lacking access to an improved clean water source and 20 million still practice open defecation (FAO, 2012a; WHO-UNICEF, 2013). In addition to this, the region also faces serious nutritional problems, with 20% of the population being obese (equivalent to over 110 million people) and 13.5% of pre-school children with stunted growth (FAO, 2012b; Finucane et al., 2011; Onis et al., 2011).

Improving WS and FNS within countries requires a wide range of different policies, as well as a clear definition of priorities based on their socio-political and economic statuses. However, in spite of these differences, there are also numerous interrelated aspects of water and food within countries that call for a joint analysis, since both securities are inextricably linked. Currently, 95% of the water consumed in LAC is used for producing food (Mekonnen and Hoekstra, 2011); therefore improving FNS inevitably requires having secure access to sufficient and stable water resources. Also, other important components of FNS in LAC like food safety, acceptable cooking conditions and personal hygiene require a minimum set of water quality standards to be in place. The importance of water for food production is what led Allan (2013) to distinguish between 'food-water', i.e. 90% to 95% of total water consumption which is invested in agricultural production, and 'non-food water', i.e. the remaining 5% to 10% of water resources needed to sustain all the other economic activities beyond agriculture.

The aim of this chapter is to explore the progress achieved in WS and FNS in LAC countries during the last decade, outline the main challenges ahead and assess the relevance of the food-water security link in this region. Accordingly, this chapter is organized as follows: Section 6.2 provides a conceptual discussion of the concepts of WS and FNS, reviewing how these two concepts have been defined and refined over time by different authors and institutions; Section 6.3 quantitatively synthesizes the trends and progress of both securities over the last decade; Section 6.4 assesses the links between both securities outlining the different synergies found in the LAC context; and lastly, Section 6.5 includes some final remarks.

6.2 Evolving concepts of water and food security

6.2.1 Water security: concept and metrics

The concept of WS was introduced in the early 1990s and it has evolved significantly ever since (Cook and Bakker, 2012; López-Gunn et al., 2012). Originally WS was approached from a physical perspective, linked to the idea of national security, and the threat that physical water scarcity and conflicts-over-water could represent for neighbouring countries (Starr, 1992). Under this framework, WS was closely linked to the goal of ensuring sufficient water resources and guaranteeing access in order to maintain political stability within and outside national borders.

Over time, the concept has further evolved to include other economic, social and environmental aspects of water important to human well-being beyond its physical availability. These include protection against water hazards, safeguarding human health, maintenance of healthy aquatic ecosystems as well as cultural and spiritual values linked to water (see Table 6.1). One of the most recent definitions proposed by UN-Water (2013) defines WS as *'the capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-*

being, and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability' (p.2).

The increasing use of this concept raises fundamental questions for water policy, including whether or not it overlaps or aligns with IWRM (see Chapter 15). As Cook and Bakker (2012) argue, both approaches are complementary since water security is focused on the end goal (being water secure) whereas IWRM is process-orientated (the path and steps required to become water secure).

Table 6.1 Human well-being dimensions considered under different approaches to water security

DIMENSIONS	Starr (1992)	GLOBAL WATER PARTNERSHIP (2000)	Grey and Sadoff (2007)	UNESCO IHE (2010)	UN WATER (2013)
Access to drinking water and sanitation	■	■	■	■	■
Protection from water hazards		■	■	■	■
Ecosystem protection (water quality and quantity)		■	■	■	■
Adequate livelihoods (e.g. health, material goods, education)		■	■		■
Preserve non-material aspects of water (e.g. cultural and ethical values)		■			■
Maintain peace and political stability (e.g. transboundary water cooperation, public participation, etc.)	■				■

Source: own elaboration

Improving WS of LAC citizens will require a pool of measures, including hard-path solutions, i.e. technological responses based on infrastructure development, as well as soft-path solutions, i.e. an institutional response including legal framework development and enforcement, greater transparency or economic instruments to improve water management. The type of measures as well as the implementation sequence will largely depend on the socio-economic context and the degree of development within countries, above any favourable hydrological condition. Foremost because improving WS and reducing people's vulnerability to water risks largely relies on the capacity of nations to make investments and develop infrastructures and policy tools (Grey and Sadoff, 2007; Allan, 2013).

Nevertheless, having a favourable hydrological situation is an advantageous factor to become more water secure. As described in Chapter 2, LAC is extremely well endowed in terms of water resources; however, it also has a high hydro-climatic variability (e.g. floods and droughts linked to the El Niño and La Niña phenomena). Such inherent variability often affects the most vulnerable and poorest, but also LAC's richest countries, such as Chile or Mexico. In fact, droughts in Chile represent a major water risk since they are

highly frequent in the centre-north part of the country, where the majority of the population lives and most agriculture takes place (UNESCO, 2010).

An inherent characteristic of countries' WS is that it is a scale-dependent goal (Cook and Bakker, 2012). In fact, national WS assessments can mask significant variations compared to those performed at the more regional or local scale (Vörösmarty et al., 2010). Moreover, WS goals are likely to change over time, depending on the priorities countries have at a given time or stage of development. For instance, in Europe conventional approaches to water management have for a long time prioritized the need for building infrastructures and attending to the increasing demands of competing users. However, the goal of the current European water policy i.e. the Water Framework Directive (WFD 2000/60/EC) represents a radical shift with respect to this previous approach since it considers environmental sustainability of aquatic ecosystems as a priority to ensure WS in Europe.

The benefits gained by LAC countries when improving their WS and reducing their water risk to tolerable levels entail inevitable *trade-offs,* e.g. guaranteeing water access to big urban areas requires the constructions of dams, and even large inter-transfer schemes, which often have large social and environmental implications. However, some of these *trade-offs* are avoidable, such as reducing water pollution, and these will depend to a larger extent on the priorities defined by governments. The path followed by developed regions such as Europe to achieve WS has brought about serious environmental degradation, and yet there is no full understanding of the costs and the actions needed to reverse this problem despite ongoing efforts. Hence, developing countries striving for WS would need to make large investments in water management and infrastructure at all levels, but they can benefit from the experience gained in regions like Europe of the need to pay greater attention to institutional development, environment sustainability and social inclusion to avoid unintended and avoidable costs.

In order to keep track of regional progress in WS, a number of operational frameworks have been developed over the last few years (see Figure 6.1). The overall purpose of these frameworks is to determine whether countries or regions are on the right path to increase resilience to water risks and what are the main challenges. As Figure 6.1 shows, the majority of existing operational frameworks propose a different set of indicators to measure the hydrological status within countries (resource physical availability and environmental status), as well as the use and access of water from a socio-economic perspective (access, sanitation and economic water efficiency). The existence of water institutions to ensure WS stability is barely considered under these frameworks, partly because of the lack of robust metrics to measure institutional progress, and also because of the difficulty of quantifying what is good governance. Neither the risks related to water hazards, nor those associated with natural disasters, are explicitly considered in most of the cases despite the importance they have in regions like LAC.

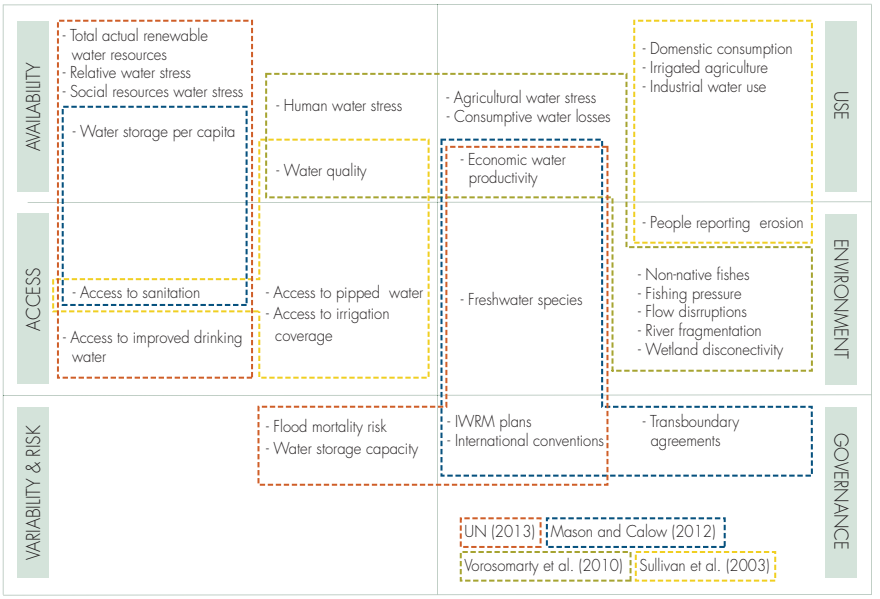

Figure 6.1 Indicators and operational frameworks for measuring water security. *Source: Own elaboration based on UN (2013), Mason and Calow (2012), Sullivan et al. (2003) and Vörösmarty et al. (2010)*

6.2.2 Food and nutritional security: concepts and dimensions

Similarly to the WS concept, the notions of FNS have evolved significantly in the last sixty years. Table 6.2 synthesizes the major milestones of the concept since the 1940s.

The notion of food security has generated tremendous attention in the last years, and it is now a well-established concept. According to FAO (1998) food security (FS) exists when (a) all people at (b) all times have (c) both physical and (d) economic access to sufficient food to (e) meet their dietary needs for (f) a productive and healthy life. Often, FS is framed in four dimensions: availability, access, stability and utilization.

According to FAO (1998):

> Food insecurity exists when people are undernourished due to the physical unavailability of food, their lack of social or economic access, and/or inadequate food utilization. Food insecure people are those individuals whose food intake falls below their minimum calorie (energy) requirements, as well as those who exhibit physical symptoms caused by energy and nutrient deficiencies resulting from an inadequate or unbalanced diet, or from the inability of the body to use food effectively because of infection or disease. An alternative view would define the concept of food insecurity as referring only to the consequence of inadequate consumption of nutritional food, considering the physiological utilization of food by the body as being within the domain of nutrition and health. Vulnerability refers to the full range of factors that place

Table 6.2 Evolving definition and scope of the food security concept

FOOD AND NUTRITIONAL SECURITY	
1940–1980	Food security and nutrition security (WW II), 43 countries met in Hot Springs, Virginia, 1943 'Freedom from want' meaning a secure, adequate and suitable supply of food for every man, woman and child, where 'secure' referred to the accessibility, 'adequate' referred to the quantitative sufficiently of the food supply and 'suitable' referred to nutrient content.
1980–1990	'Concept of entitlement' Sen (1982). Food problems associated to agricultural production and food supply, but also with the governing economies and societies.
1940–1980	1996 World Food Summit 'All people at all times have physical and economic access to sufficient, safe and nutritional food to meet …' 'A person is considered nutritionally secure when he/she has a nutritional diet and the food consumed is biologically utilized… resisting or recovering from disease, pregnancy, lactation and physical work' Frankenberger et al. (1997) Joint use of FS and NS concepts IFPRI, UNICEF and FAO (mid-1990s)
2000–PRESENT	Road Map for Scaling-Up Nutrition 'NS is achieved when secure access to an appropriately nutritious diet is coupled with a sanitary environment, adequate health services and care, to ensure a healthy and active life for all household members' 2010 Weingärter (2010), Food and Nutritional Security is a condition under which adequate food (quantity, quality, safety, socio-cultural acceptability) is available and accessible for and satisfactorily utilized by all individuals at all times to live a healthy and happy life. FAOs 'FNS is a condition when all people at all times consume food of sufficient quantity and quality in terms of variety, diversity, nutrient content and safety to meet their dietary needs and food preferences for an active and healthy life, coupled with a sanitary environment adequate health and care' (CFS, 2009)

Source and quotes from: Pangaribowo et al. (2013)

people at risk of becoming food insecure. The degree of vulnerability for an individual, household or group of persons is determined by their exposure to the risk factors and their ability to cope with or withstand stressful situations.

Hoddinott (1999) claims that there are 200 definitions and 450 indicators of food security. As we will review in section 6.3.2 below, dozens of indicators are identified as having a direct and indirect influence on food security assessments. Less straightforward and evident are the drivers of food insecurity. Consider one of the factors that have been mentioned as having a crucial impact on the number of people suffering from hunger or being vulnerable to food insecurity: agricultural prices levels and volatility. Swinnen and Squicciarini (2012) found contradictory statements from two leading institutions, FAO and OXFAM, in relation to the role of agricultural prices in explaining rural poverty and food insecurity. The difficulty of ascertaining the impact of food prices on food security is due to the fact that people in poor rural areas are often producers and consumers, a factor whose complexity escalates as some households could be net buyers under some price situations and net sellers under others.

Recently, the notion of FS has also been expanded to include nutritional security, the two now being commonly addressed as 'Food and Nutritional Security' (FNS). The G8 supported the New Alliance for Food Security and Nutrition, which included the endorsement of the 'Scaling Up Nutrition movement' and 'welcome the commitment

of African partners to improve the nutritional well-being of their populations, especially during the critical 1,000 days window from pregnancy to a child's second birthday'. This attests to the fact that, while calorie intake may be sufficient to cover body-energy demands, many other dietary elements are also required, especially for pregnant women and children, to ensure a healthy life and growth.

And yet, well-known experts still puzzle at the low adoption rates of a number of crucial habits for health improvement and income generation among the world's poorest, e.g. application of fertilizers, use of anti-malaria nets, application of chlorine to drinking water, vaccinations and routine medical checks to name but a few (Banerjee and Duflo, 2011). Another unresolved query is the increasing prevalence of obesity among the poorest households in some developed and developing countries alike. Ultimately, having a healthy diet requires not only sufficient access to food under all FNS dimensions, but also the willingness to adhere to it and minimum knowledge of its components and sources.

What the above comments may suggest is the following. First, whilst an increase in agricultural production is fundamental in order to increase FNS, it may not guarantee it. This is one of the blurring elements of the linkages between water and food security, in the sense that more water (or land) available for agriculture does not necessarily improve FNS indices, although increasing agricultural production among the poorest rural households improves their nutritional outlook. Second, the new approach of FNS places more emphasis on nutritional aspects than FS, but in order to monitor them there is a need for data which is much harder to obtain and of which we do not have historical records. Furthermore, the consequences of reduced FNS could have delayed effects which may only become evident as children become adolescents and young adults. Third, as this book shows, virtually all the variables directly related to FNS in the LAC region have been changing rapidly in the last decade, in the course of which commodities prices have become very volatile and followed an upward trend (see Chapters 4 and 5). Thus, FNS performance indicators co-vary with other major drivers; with which it has only an indirect relationship, meaning causality is almost impossible to establish (see Table 6.5).

As Barrett (2010) mentions, the FNS concept is elusive because a single indicator cannot summarize its complexity. It is thus necessary to analyse a set of indicators in order to capture all its relevant dimensions. Some of the existing composite food security indicators that focus on macro levels are: the FAO Indicator of Undernourishment (FAOIU); the Global Hunger Index (GHI); the Global Food Security Index (GFSI); the Poverty and Hunger Index (PHI); the Hunger Reduction Commitment Index (HRCI)). Some indicators that focus on micro level are the anthropometric indicators (measure nutritional outcomes) and the medical and biomarkers indicators (measure micronutrient deficiencies) (Pangaribowo et al., 2013). Many of the different FNS frameworks or compound indicators developed complement each other because they refer to different critical dimensions of food security (see Figure 6.2). Dimensions such as access, use and utilization are well represented by most composite indicators, only stability is clearly under-represented. Pangaribowo et al. (2013) recommend including two outcome indicators to capture the short-term FNS stability: per capita food supply variability and food price variability.

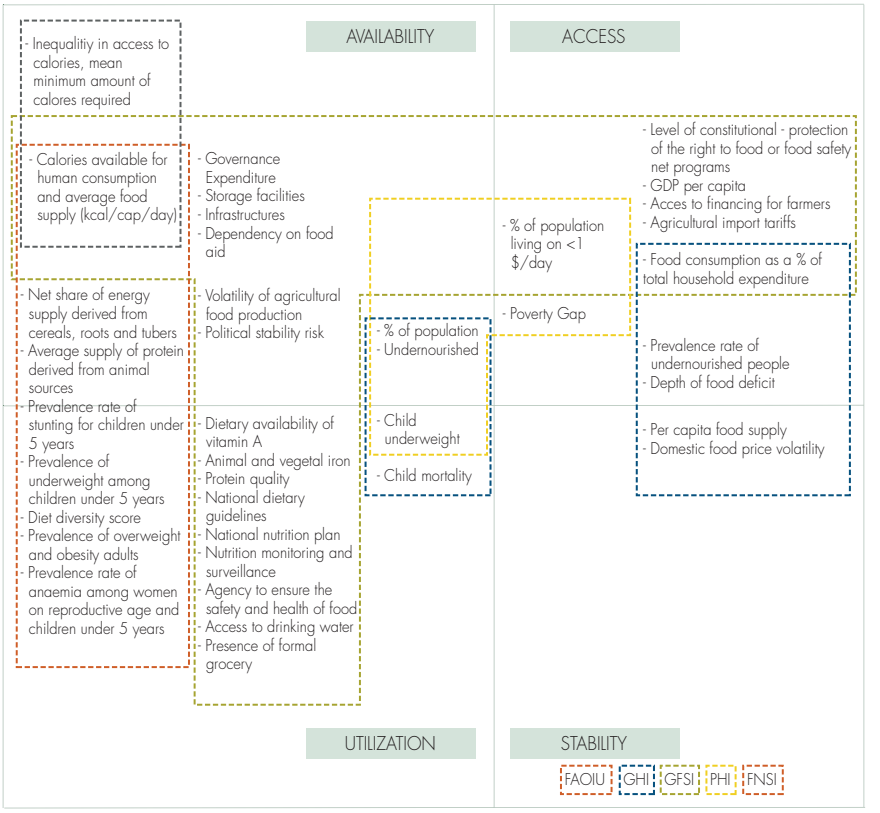

Figure 6.2 Existing food and nutrition indicators. *Source: own elaboration based on Pangaribowo et al. (2013).* Note: the FAO Indicator of Undernourishment (FAOIU); the Global Hunger Index (GHI); the Global Food Security Index (GFSI); the Poverty and Hunger Index (PHI); Food and Nutrition Security Indicators proposed by EU project 'Food Secure' (FNSI).[1]

6.3 Water and food security status and trends in LAC

6.3.1 Water security performance

Table 6.3 summarizes the WS status of LAC countries in 2010 and the progress achieved since 2000. The framework used in this assessment to measure WS is a mixture of the ones presented in Figure 6.1. An imposed pre-requisite was to choose only those indicators for which it was possible to track changes over time, as well as selecting a pool of indicators capable of reflecting the different dimensions involving WS.

In terms of blue water availability (runoff), LAC countries have a privileged status, only the Caribbean islands of Dominican Republic and Haiti show a total actual renewable water resources (TARWR) below 3000 m^3/cap/yr (Table 6.1). Despite this overall water

1 www.foodsecure.eu/

richness, physical blue water scarcity exists due to the spatial mismatch between where water is naturally available and where it is demanded. For instance, more than 75% of Mexicans live in basins where water consumption is at least twice the volume of water renewed naturally every year (blue water scarcity index ≥ 2) (see Figure 6.3 and Table 6.3). The northern part of Chile also faces serious blue water stress, with current demand being three times more than the natural available flow. In the northern part of Argentina and northeast Brazil, blue water scarcity problems are currently affecting 14% and 13% of their national populations respectively, and this trend has grown since the year 2000. Along the Peruvian coast, blue water scarcity is approaching a critical threshold, which poses an important risk for Peru's development since the majority of the population and agricultural activity is concentrated along the coastal basin.

Green water (soil moisture) plays a fundamental role in LAC's agriculture (see Chapter 7) and it is a key asset for achieving regional and global food-water security. Green water availability (measured in terms of arable land per capita) in LAC is high (0.26 ha per capita per year in 2010), and only the Caribbean islands, Costa Rica and Colombia have lower ratios. These punctual green water shortages are mostly compensated through regional agricultural trade and do not represent a major water risk for the above mentioned countries. The most important risk from a food-water security perspective in LAC is related

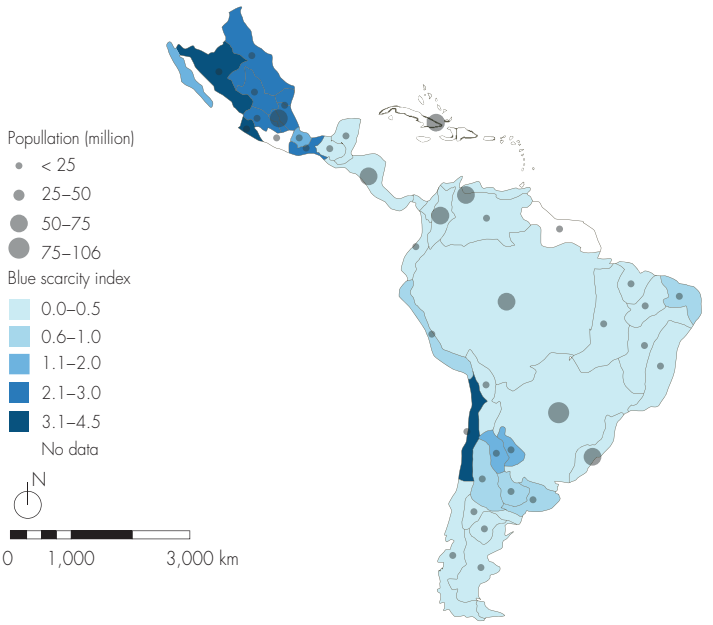

Figure 6.3 Blue water scarcity and population distribution estimates for 2010 in Latin America. *Source: own elaboration with data from Hoekstra and Mekonnen (2011) and CIESIN-FAO-CIAT (2005).* Note: The blue water scarcity index as defined by Hoekstra and Mekonnen (2011) is the ratio between the annual blue water consumption and the naturally available runoff minus the environmental flow requirements.

to the intra- and inter-annual variability of green water, i.e. the high frequency of droughts and floods linked to El Niño and La Niña, and the impacts these phenomenon have on rain-fed agriculture and food security. Alongside this, the high reliance on green water for food production has associated large environmental trade-offs, since the expansion of arable land calls for the extension of the agricultural frontier over natural ecosystems (see Chapter 3).

With regard to access to water, significant improvements have been achieved across most LAC countries. Approximately 90% of the households in LAC have access to an improved water source and 76% to sanitation facilities (see Table 6.3). Only Bolivia and Haiti remain below these rates, particularly regarding sanitation facilities. This positive trend nevertheless masks an important gap between urban and rural access, particularly in the Andean region, Brazil and some Mesoamerican countries such as Nicaragua (see Figure 6.4). According to the latest figures of the Joint Monitoring Program on water (WHO-UNICEF, 2013) in 2011, 32.7 million people in LAC still have no access to an improved drinking water source and 21 million still practice open defecation, the majority of these in rural areas.

Assessing the productive use of water determines nations' dependency on water resources for its economic development. Table 6.3 summarizes the trends in green water productivity. Overall, the majority of countries show a positive increase in the efficiency of green water use (measured in terms of improvements in rain-fed agricultural yields), particularly the most important agricultural producers like Chile, Argentina, Brazil and Paraguay. In Mesoamerica, green water productivity has increased, but to a lesser extent. Only the countries Dominican Republic and Cuba, together with Belize, have experienced a reduction in their agricultural yields. These results evidence a progressive decoupling of agricultural growth from agricultural area expansion, which is a positive sign to increase food-water security. Regarding blue water efficiency use in agriculture, no data exists to track progress over time, which prevents a detailed analysis. However, as discussed in Chapter 10 and detailed in Figure 6.5, irrigation efficiency in LAC remains low compared to the global average (39% of LAC average compared to a global efficiency of 56%). Mesoamerican countries and the Caribbean islands show the lowest rates of irrigation efficiency.

Concerning the environmental status of aquatic ecosystems, the indicator on freshwater diversity status shows a clear trend of environmental degradation across the entire region (see Table 6.3). Countries whose rivers are most degraded include Brazil, Colombia, Peru and Mexico. Overall, and despite the lack of robustness of this indicator, it seems clear that averting environmental degradation and reduced water quality is probably the next most important challenge LAC needs to face in order to avoid unintended environmental but also social and economic side effects. Figure 6.6 shows the trends in public investments in LAC countries on water resources management. Since 2000 a large fraction of the public investments in LAC (either as Official Development Aid (ODA) or as Other Official Flows (OOF)) have been directed to mixed projects of water supply and sanitation. Wastewater treatment investments still represent less than 1% of total public investments.

Table 6.3 Water security progress between 2000 and 2010 in LAC

		AVAILABILITY						ACCESS				UTILIZATION		STATUS		RISK		GOVERNANCE			
		Total Actual Renewable water resources (TARWR, m^3/cap./yr) [1]		% Pop. living in water scarce basin		Green water availability (ha of arable land /cap/yr) [1]		% Pop with access to an improved water source		% Pop with access to sanitation		(Green water) Arable productivity (ton/ha/yr) [1]		Freshwater biodiversity (number of threaten species) [2]		Flood risk Index (% population affected by water floods, storms and landslides)		State recognition on the human right to water and sanitation [3]		Water Laws (national laws) [4]	
	COUNTRY	2000	2010	2000	2010	2000	2010	2000	2011	2000	2011	2000	2010	2000	2008	2000	2010	2000	2010	2000	2010
AMAZONIAN	Brazil	45,920	41.886	12	12	0.33	0.31	93	98	75	79	2.6	3.6	70	737	< 1	<1	no	yes	1	3
	Guyana	326,558	318.783	<1	<1	0.61	0.56	89	94	79	84	2.6	2.8	3	23	2	14	yes	yes	no data	no data
	Suriname	254,167	230.624	<1	<1	0.12	0.11	89	92	81	83	2.5	2.8	2	16	<1	3	no data	no data	no data	no data
ANDEAN	Bolivia	71,990	61.707	<1	<1	0.36	0.38	79	88	37	27	1.5	2.0	23	57	<1	<1	no	yes	1	1
	Ecuador	33,242	28.938	<1	<1	0.11	0.11	84	94	81	92	1.6	2.4	no data	no data	<1	<1	yes	yes	1	2
	Peru	71,974	65.068	<1	<1	0.14	0.13	80	85	63	71	2.6	3.1	45	118	<1	<1	yes	yes	1	1
	Colombia	51,901	45.432	<1	<1	0.07	0.04	91	92	73	78	2.7	3.3	148	229	<1	<1	no	yes	1	2
	Venezuela	48,787	41.886	<1	<1	0.11	0.10	92	no data	89	no data	3.0	3.1	43	101	<1	<1	no	yes	0	2
MESOAMERICA	Belize	70,532	58.333	<1	<1	0.26	0.20	85	98	83	90	2.6	2.5	9	25	14	6	no data	no data	no data	no data
	Costa Rica	27,529	45.432	<1	<1	0.05	0.04	95	97	91	95	2.5	2.6	31	69	3	<1	no	yes	no data	no data
	El Salvador	4,213	4.052	<1	<1	0.11	0.11	83	88	61	87	2.1	2.7	4	19	<1	<1	yes	yes	1	1
	Guatemala	9,432	7.542	<1	<1	0.12	0.10	87	92	71	78	1.8	2.1	34	73	<1	<1	no	yes	0	1
	Honduras	14,809	12.370	<1	<1	0.17	0.13	81	87	65	77	1.3	1.5	27	56	4	<1	no	yes	0	2
	Mexico	4,455	3.983	77	78	0.25	0.22	89	96	75	85	2.8	3.5	205	335	<1	<1	yes	yes	1	2
	Nicaragua	37,663	33.492	<1	<1	0,38	0.33	80	85	48	52	1.5	1.7	6	26	3	<1	yes	yes	2	3
	Panama	48,224	41.445	<1	<1	0.19	0.16	90	94	65	69	1.5	1.7	no data	no data	<1	<1	yes	yes	1	2
SOUTH CONE	Argentina	21,616	19.968	13	14	0.76	0.77	96	99	92	90	3.3	4.2	40	86	<1	<1	yes	yes	1	1
	Chile	58,414	84.483	62	63	0.11	0.07	95	96	92	96	4.4	6.0	7	57	<1	<1	yes	yes	6	6
	Paraguay	60,337	51.157	<1	<1	0.57	0.59	74	86	58	71	2.0	2.8	9	27	1	<1	no	yes	1	2
	Uruguay	41,805	41.124	<1	<1	0.42	0.56	98	100	97	100	2.9	3.6	10	27	<1	<1	yes	yes	no data	no data
CARIBBEAN	Cuba	3,411	3.387	no data	no data	0.32	0.32	91	94	87	91	2.1	1.8	16	35	<1	4	no	no	no data	no data
	Dom. Republic	2,370	2.088	no data	no data	0.07	0.09	86	82	78	83	2.8	2.3	no data	no data	2	<1	no	no	1	1
	Haiti	1,580	1.386	no data	no data	0.10	0.11	62	69	23	17	0.8	0.9	no data	no data	2	<1	no	yes	1	1
LAC weighted average		34,917	32.465	22	23	0.28	0.26	90	90	75	76	2.6	3.3	34	65	3	3	no	yes	1	2

Improvement above the regional average growth | Improvement below the regional average growth | Deterioration or no improvement | No risky change

Source: own elaboration using data from EM-DAT (2013), FAO (2013b; 2013c; 2013d), Hoekstra and Mekonnen (2011), IUCN (2013), World Bank (2013) and WHO-UNICEF (2013)

1 Data for 2000 represent an average for the values of 1999-2001, whereas data for 2010 represent also an average for values of 2008–2010.
2 The inventory of freshwater threatened species was for the first time conducted in 2004 and updated in 2008.
3 State recognition of the human right to water and sanitation acknowledged in national constitutions, laws or policies.
4 Includes national or regional water legislation, laws on natural resources with a specific section on water, domestic supply legislation and specific groundwater law in selected LAC countries.

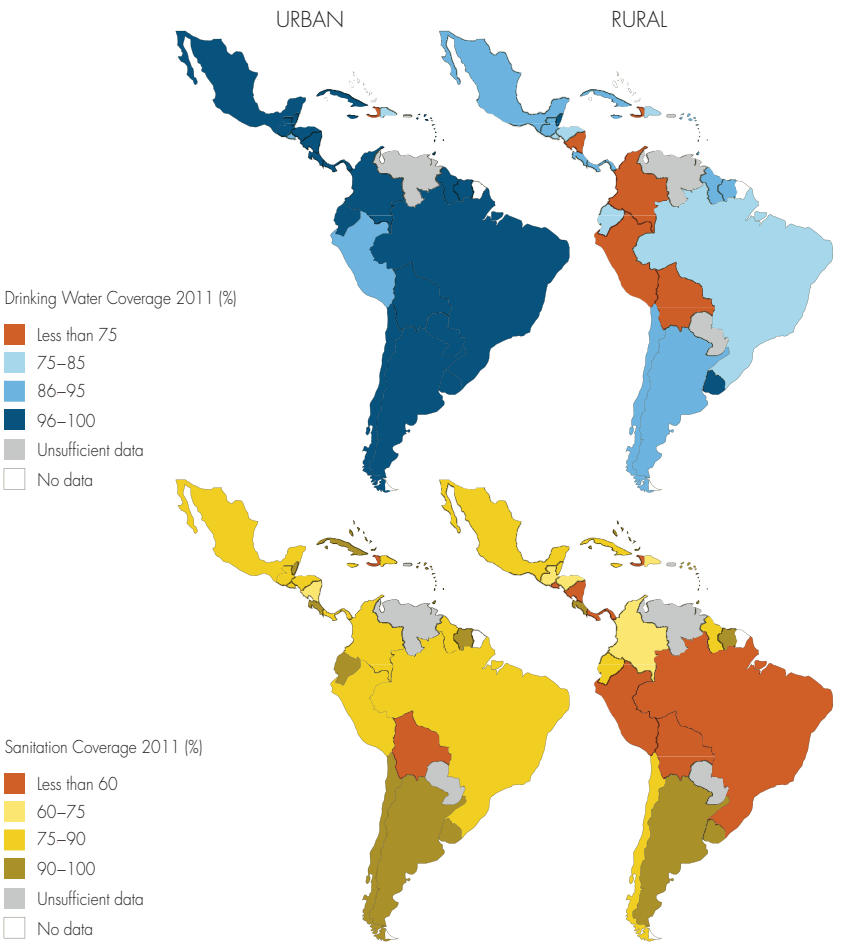

Figure 6.4. Percentage of population with access to drinking water and sanitation coverage in urnban (left) and rural (right) areas in LAC. *Source: own elaboration based on data from WHO-UNICEF (2013).*

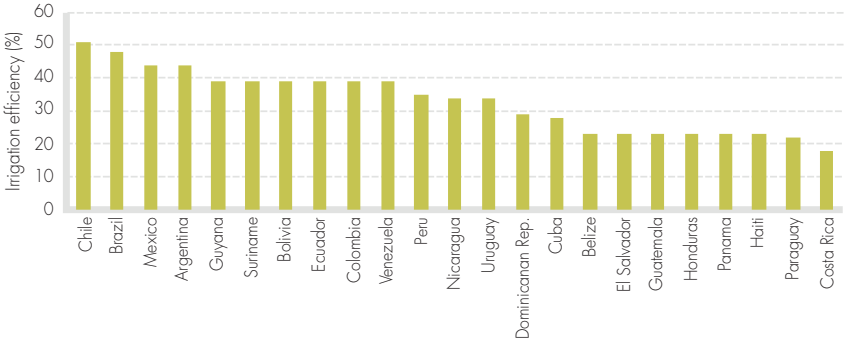

Figure 6.5 Irrigation efficiency (measured in terms of water requirement ratios) for Latin American countries, average for the period 1990–2012. *Source: FAO (2013a)*

The high hydro-climatic variability across many LAC countries represents an important water risk. Floods and droughts have large impacts on WS and FNS as they have large social and economic implications. As Table 6.3 shows, the social impacts of floods (measured in terms of the percentage of the population affected) are relatively low (<3%) for the entire LAC, but in countries like Belize, Guyana or Cuba they have larger impacts. Figure 6.7 summarizes the economic impacts attributed to natural hazards in LAC since 1980. Even though variability is a constant over time, economic impacts related to water hazards are still high, for instance in 2010 they peaked to almost 2 % of LAC's GDP. These trends shows that the region's vulnerability to water hazards is still high, and may not subside, in relative terms, as more growth is seen in terms of infrastructures, the economy, population density and the concentration of said population, thus increasing exposure to these risks (Berz, 1999; Mills, 2009).

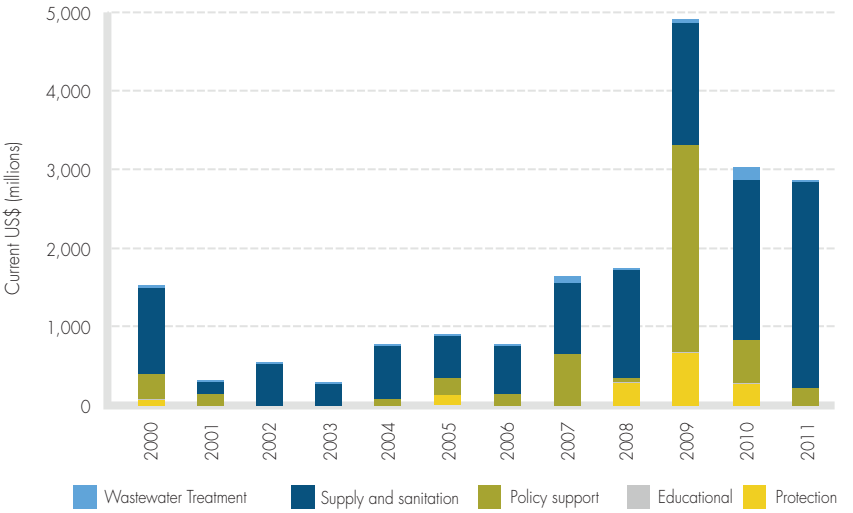

Figure 6.6 Allocation of public investments in water supply and sanitation in LAC, 2000–2010. *Source: based on data from OECD (2013b).*

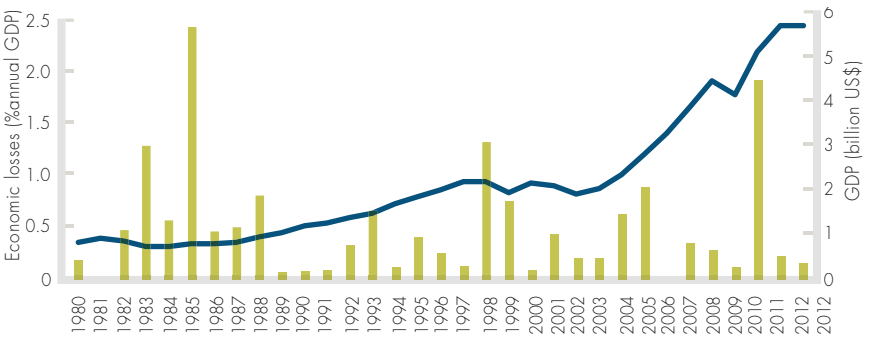

Figure 6.7 Economic losses (expressed in % of annual GDP, bars) attributed to water-related hazards (storms, floods and droughts) and GDP evolution (in USD, line) in Latin America and the Caribbean, 1980–2012. *Source: EM-DAT (2013) and World Bank (2013)*

Good governance and the development of a basic legal framework is a pre-requisite for ensuring countries' WS in the long run (Cook and Bakker, 2012). Several countries such as Costa Rica have made significant progress towards WS despite lacking a national water act. Nevertheless, the existence of a basic legal framework should facilitate the road to improve WS within countries. The recognition of water as a human right, either in their constitutions or under different legislations, and the number of existing water laws (national or regional water acts, groundwater, urban water supply) were used here as a proxy-indicator to ascertain the extent to which legal baseline conditions are in place in LAC countries to reach WS goals and minimize water risks (see Chapter 11). As Table 6.3 shows, water governance overall seems to have progressed substantially more than some WS goals. There is a close correlation between progress achieved in water access and sanitation and the development of legal frameworks. However, these legal frameworks have not been effective at reducing other important water risks associated with increased water pollution and vulnerability to hydro-meteorological events, probably because policy goals were mostly oriented towards securing access to citizens.

The above results can be summarized into two major trends. First, government priorities to improve WS (mostly those concerned with securing access and sanitation) have been effective and remarkable progress has been accomplished. Still, greater efforts are required among the low- and middle-income countries of Mesoamerica and Andean region (see Figure 6.8). The second trend is that upcoming water challenges will most likely require addressing the growing water pollution problem, particularly in megacities, because of the high threat such a trend could represent for LAC's development.

Figure 6.8 Water security performance in LAC countries. *Source: own elaboration based on the data from Table 6.3.*

6.3.2 Food security indicators in LAC

In this section we review a selection of food and nutritional indicators across LAC countries in order to track progress in FNS during the period 2000–2010. As with WS indicators, only those available for the majority of LAC countries and for which it was possible to track temporal changes were considered in this analysis. The selected indicators are shown in Table 6.4.

Table 6.4 Food and nutritional security indicators selected to assess Food and Nutritional Security (FNS) performance in Latin America and the Caribbean (LAC)

DIMENSION	INDICATOR	UNITS
AVAILABILITY	Per capita total amount of net calories available in a given country	kcal/person/day
	Average supply of protein derived from animal resources	g/cap/day
ACCESSIBILITY	Prevalence rate of undernourished people	% of population
	Depth of food deficit (how many calories would be needed to lift the undernourished from their status)	kcal/person/day
UTILIZATION	Prevalence rate of stunting for children under five years old (height-for-age < two standard deviations of the WHO Child Growth Standards Median)	%
	Body Mass Index [BMI < 18.5 Low BMI (chronic energy deficiency)/ BMI > 25 Overweight]	kg/m²
STABILITY	Per capita food supply variability (Variability of the net food production value between 2004 and 2006 in constant $ divided by the population from UN 2010 estimates.)	%
	Cereal import dependency (Cereal imports/(cereal production+cereal import-cereal export)	%

Source: FAO (2012c)

Table 6.5 reports the progress of the indicators between 2000 and 2010. The indicators that show the best performance in LAC are those related to availability and access. 'Energy supply' improved in most countries and in those where it worsened, only slight reductions were experienced. Among these, Paraguay has the lowest levels and worsened over the specified time period. Ecuador, Guatemala and Haiti stood at fewer than 2,500 kcal/cap in 2010. Also, availability of 'energy from animal protein' improved in most countries. It ranges from 63 grams of protein per capita per day in Argentina to 9 in Haiti. It is below 30 in Belize, Bolivia, Cuba, Guatemala, Haiti, Honduras, Nicaragua, Paraguay, Peru, El Salvador and Suriname. In addition to Haiti's low score, the availability of animal protein is also particularly low in Nicaragua and Guatemala (19), although 35% higher than in 2000. It decreased in Paraguay (reaching 29), Uruguay and Argentina, but in these last two it is still above the regional average.

Overall it is interesting to note that food availability has improved the most among the Andean and Mesoamerican countries and the Caribbean. All Andean countries have improved their availability and access indicators (cells in green). Some countries have recorded increases higher than the average regional growth in these indicators. Some examples of this remarkable positive performance are: Peru and Venezuela in the Andean Region, Dominican Republic in the Caribbean and Nicaragua, Panama and

Honduras in the Mesoamerican region. Although this last region has exhibited significant growth, the case of Guatemala ought to be highlighted. In this country the prevalence of undernourishment ratio is still above 20%. Nicaragua has reduced this indicator from 37.5% to 22.7%, but still this percentage is notably high. Paraguay has seen all of its availability and access indicators go down between 2000 and 2010.

Food access indicators such as 'prevalence rate of undernourished people' and 'depth of food deficit' behaved well in the region. However, a few countries (Argentina, Costa Rica, Guatemala, Paraguay, El Salvador, and Uruguay) worsened in one or the other. Guatemala and Paraguay experienced significant worsening indicators. But Peru, Honduras, Nicaragua, Panama and Venezuela improved significantly. The depth of food deficit was still above 150 kcal in Guatemala, Haiti and Nicaragua in 2010.

Trends for food utilization vary across the LAC region. The prevalence of stunting for children under five has improved in most of the cases, except in Guyana, Dominican Republic and Haiti. Although the largest improvements were concentrated among Andean countries, these countries still have a high percentage of children likely to have stunted growth (more than 20% of children under five years old). For the year 2010, Bolivia, Ecuador and Peru also displayed this ratio above 20%. Considering the relative number of stunted children under five, in 2010 the prevalence rate was 8.2% in Argentina, 7.1% in Brazil, 12.7% in Colombia, 15.5% in Mexico, and 28.2% in Peru, to mention only the most populous countries.

Regarding food, stability indicators vary across the region. In terms of stability, the indicator 'variability of food supply' exhibits a mixed performance in the region. Some countries reduced it significantly, mainly in the Mesoamerican region (Belize, Costa Rica, Nicaragua and Panama) and in the Andes (Bolivia, Ecuador and Peru). Others saw it worsened, including Chile, Paraguay, and Brazil. Most of the countries show a greater cereal imports dependency ratio in 2010 than in 2000, predominantly among Mesoamerican and Caribbean countries where it ranges from 12% in Paraguay to more than 100% in Haiti.

The role of international trade as a means of achieving improved food security has been at the centre of numerous discussions, both in the academic world and at the top international political arena because of the 2007–2009 food price crises. The G20[2] wrote:

> (1). Under the Food Security pillar of the Seoul Multi-year Action Plan on Development, the G20 request that FAO, IFAD, IMF, OECD, UNCTAD, WFP, the World Bank and the WTO work with key stakeholders to develop options for G20 consideration on how to better mitigate and manage the risks associated with the price volatility of food and other agriculture commodities, without distorting market behaviour, ultimately to protect the most vulnerable. … [This report] has been prepared

2 G20 Agricultural Ministers agreed in June 2011 on an 'Action Plan on food price volatility and agriculture', www.g20-g8.com/g8-g20/g20/english/news/news/declaration-of-the-ministers-of-agriculture.1401.html.

Table 6.5 Food security progress between 2000 and 2010 in LAC countries

		AVAILABILITY				ACCESS				UTILIZATION				STABILITY			
		ENERGY SUPPLY (kcal/cap/day)		ENERGY FROM ANIMAL PROTEIN (gr/cap/day)		PREV. UNDER-NOURISMENT (%population)		DEPTH OF FOOD DEFICIT (kcal/cap/day)		PREV. STUNTING CHILDREN UNDER FIVE YEARS (%)		BODY MASS INDEX (kg/m²)		VARIABILITY FOOD SUPPLY (kcal/cap/day)		CEREAL IMPORTS DEPENDENCY RATIO (%)	
	COUNTRY	2000	2009	2000	2009	2000	2010	2000	2010	2000[11]	2010[11]	2000	2008	2000	2010	2000	2010
ANDEAN AMAZONIAN	Brazil	2,882	3,173	40	45	13	8	83	60	14	7	25	26	18	18	19	14
	Guyana	2,814	2,718	38	31	8	6	52	37	14	18	24	26	46	29	36	34
	Suriname	2,457	2,548	24	23	18	13	121	89	15	11	25	27	30	28	34	30
	Bolivia	2,121	2,172	23	26	30	26	200	175	33	27	24	27	64	13	29	24
	Colombia	2,662	2,717	29	34	13	12	86	82	18	13	24	26	24	21	54	59
	Ecuador	2,221	2,267	26	32	20	19	126	124	33	29	25	27	46	19	37	37
	Peru	2,379	2,563	21	25	23	14	151	92	31	28	25	26	36	14	46	49
	Venezuela	2,484	3,014	34	44	15	5	102	20	17	16	27	27	47	41	54	48
MESOAMERICA	Belize	2,560	2,680	26	26	9	7	52	45		22	26	30	36	30	30	30
	Costa Rica	2,825	2,886	36	39	5	5	27	35	9	6	26	26	60	33	87	95
	Guatemala	2,096	2,244	14	19	27	30	167	192	50	48	24	27	48	16	45	49
	Honduras	2,435	2,694	22	27	17	11	100	60	43	30	25	26	8	16	46	52
	Mexico	3,158	3,146	37	42	<5	<5	21	6	22	16	27	29	23	16	35	34
	Nicaragua	2,148	2,517	14	19	38	23	265	151	31	23	25	27	43	16	31	39
	Panama	2,195	2,606	36	40	25	12	175	79	22		26	27	86	41	64	70
	El Salvador	2,561	2,574	18	25	11	12	64	74	29	21	25	28	30	20	47	54
SOUTH CONE	Argentina	3,268	2,918	67	63	<5	<5	7	25	17	8	27	28	54	35	1	0
	Chile	2,808	2,908	38	47	<5	<5	31	26	3	2	26	28	20	39	45	52
	Paraguay	2,596	2,518	42	29	13	19	85	132	18	18	25	25	12	25	15	12
	Uruguay	2,844	2,808	56	39	<5	<5	27	33		14	25	27	43	35	27	16
CARIBBEAN	Antigua & Barbuda	2,155	2,373	49	60	39	21	293	156					48	60	99	99
	Bahamas	2,785	2,750	56	57	6	7	42	50			26	29	41	64	99	99
	Barbados	2,832	3,021	48	54	<5	<5	32	24			26	28	68	16	109	112
	Cuba	3,046	3,258	23	26	<5	<5	21	6	7		25	26	88	111	72	76
	Dominica	3,081	3,147	50	54	<5	<5	24	18					35	36	97	98
	Dom. Republic	2,322	2,491	23	29	23	16	156	107	8	10	25	26	37	31	76	75
	Grenada	2,220	2,456	37	48	31	21	228	156			25	27	45	26	178	129
	Haiti	1,931	1,979	8	9	52	45	429	375	28	30	23	23	55	35	58	59
	Jamaica	2,729	2,807	36	40	7	9	49	58	7	6	23	27	14	7	101	102
	Saint Kitts&Nevis	2,513	2,546	43	43	20	17	143	121					34	54	101	100
	Saint Lucia	2,720	2,710	55	54	11	14	74	97			24	27	30	39	100	101
	S.Vincent	2,528	2,914	35	48	14	6	99	39			25	27	32	14	178	188
	Trinidad & Tobago	2,696	2,751	25	31	13	10	94	73	5		25	29	16	26	111	116

Improvement above the regional average growth | Improvement below the regional average growth | Deterioration

Source: FAO (2012c)

by the listed organisations, with the addition of IFPRI and the UN HLTF, in response to the G20 request. (2). The approach taken in this report reflects the view of the collaborating international organisations that price volatility and its effects on food security is a complex issue with many dimensions, agricultural and non-agricultural, short and long-term, with highly differentiated impacts on consumers and producers in developed and developing countries.

Timmer (2013) indicated that:

> Macro food security refers to a society-wide sense that food is reliably available in urban markets and that adequate purchasing power is a sufficient condition for accessing this food. 'Micro' food security requires that all households (urban and rural) have access to sufficient food, but that is only possible when poverty has been eliminated. 'Macro' food security is often confused (especially politically) with food self-sufficiency, but imported food often plays a key role in providing macro food security. (p.12)

Openness and increasing reliance on trade to import food staples is both a necessity and source of serious concern. Primarily, while 16% of the world's population today relies on food imports, Fader et al. (2013) conclude that 50% of the population will be dependent on imports in 2050 because of land and water constraints, even if food productivity in these countries reached its maximum potential. The OECD (2013b) reports that the net agricultural trade of all the developing countries, excluding Brazil, worsened significantly after the food crisis of 2007–2009.

It has been concluded by numerous authors that the food crisis in 2007–2009 worsened food security indicators in many countries (de Schutter, 2012; and OECD, 2013b). In Table 6.6 it is clear that the rate of improvement of food security indicators was much slower between 2007–2009 and 2010–2011 than it had been between 1990–1992 and 2007–2009. In some countries, including Colombia, Costa Rica, El Salvador, Guatemala, and Paraguay the proportion of people that suffered from hunger increased during the last comparison periods.

Table 6.6 Percentage of people suffering from hunger

				CHANGE	
	1991–92	2007–09	2010–12	BETWEEN 1990–92 AND 2007–09	BETWEEN 2007–09 AND 2010–12
LAC	14.6	8.7	8.3	-5.9	-0.4
Caribbean	28.5	18.6	17.8	-9.9	-0.8
Cuba	11.5	<5	<5		
Dominican Rep.	30.4	15.9	15.4	-14.5	-0.5
Haiti	63.5	46.8	44.5	-16.7	-2.3
Latin America	13.6	8.1	7.7	-5.5	-0.4
Argentina	<5	<5	<5		
Bolivia	34.6	27.5	24.1	-7.1	-3.4
Brasil	14.6	7.8	6.9	-6.8	-0.9
Chile	8.1	<5	<5		
Colombia	19.1	12.5	12.6	-6.6	0.1
Costa Rica	<5	5.0	6.5		1.5
Ecuador	24.5	19.6	18.3	-4.9	-1.3
El Salvador	15.6	11.3	12.3	-4.3	1.0
Guatemala	16.2	30.2	30.4	14.0	0.2
Honduras	21.4	11.6	9.6	-9.8	-2.0
Mexico	<5	<5	<5		
Nicaragua	55.1	23.9	20.1	-31.2	-3.8
Panama	22.8	13.1	10.2	-9.7	-2.9
Paraguay	19.7	16.8	25.5	-2.9	8.7
Peru	32.6	15.9	11.2	-16.7	-4.7
Uruguay	7.3	<5	<5		
Venezuela	13.5	<5	<5		

Improvement above the regional average growth Deterioration

Source: FAO (2012b)

The case of Paraguay has special relevance for our study. In 2011, it exported 48% of the soybean production (FAO, 2012b), reaching US$2.23 billion in exports revenues, 44% more than in the period 2009–2010. And yet, food security indicators worsened significantly in the period of measurement.

In Table 6.7 we report the ratio of imports over national utilization of wheat and maize in several LAC countries. Note that among the worst performing countries in terms of food security indicators, all except Paraguay had dependency rates of 99% or 100%.

De Schutter (2012) highlights some of the improvements being achieved in LAC on implementing the right to food, including: (1) the increased recognition of the right to food in the constitutions of many countries – rich and poor alike – with the development of an expansive legal framework on FNS (e.g. Ley Sistema de Seguridad Alimentaria y Nutricional in Guatemala (2005), Ley de Soberanía y Seguridad Alimentaria in Ecuador (2006), Ley Orgánica de Seguridad Alimentaria y Nutricional in Brazil (2006), Ley Orgánica de Seguridad y Soberanía Agroalimentaria in Venezuela (2008), Ley de Soberanía y Seguridad Alimentaria y Nutricional in Nicaragua (2009), or Ley de Seguridad Alimentaria y Nutricional in Honduras (2011)); and (2) the development of FNS strategies and plans of action (e.g. the Plan Nacional de Seguridad Alimentaria 2009–2015 of Paraguay, the Política Nacional de Seguridad Alimentaria y Nutricional of Nicaragua, the Política de Seguridad Alimentaria y Nutricional 2006–2015 of

Table 6.7 External dependencies of wheat and maize in LAC, (average 2007–2008 and 2011/2012)

	WHEAT		MAIZE	
	Ratio Imports/ Utilization	Consumption (kg/cap/yr)	Ratio Imp/ Utilization	Consumption (kg/cap/yr)
Mesoamerica & Caribbean				
Costa Rica	100	50	-	-
Dominican Rep	99	29	-	-
El Salvador	100	31	38	116
Guatemala	99	34	28	85
Haiti	100	25	-	-
Honduras	98	32	40	79
Mexico	54	50	28	144
Nicaragua	100	21	19	57
Panama	100	43	83	24
South America				
Bolivia	70	55	-	-
Brazil	61	52	-	-
Chile	35	114	52	17
Colombia	100	27	38	41
Ecuador	99	35	37	17
Peru	91	57	54	19
Venezuela	96	56	39	49
Uruguay	-	-	26	32

Source: FAO (2012b)

Honduras, the Política Nacional de Seguridad Alimentaria y Nutricional 2008 in Colombia, the Estrategia Nacional de Reduccion de la Desnutrición Crónica 2006–2016 of Guatemala, the Política Nacional de Seguridad Alimentaria y Nutricional (2003 and 2011) of El Salvador or the Plan Nacional de Seguridad Alimentaria y Nutricional 2009–2015 of Panama). Furthermore, a series of national social programmes also aim explicitly at combating hunger and food and nutrition insecurity, such as the 'Fome Zero' in Brazil, the 'Vivir mejor' in Mexico, 'Bogotá sin Hambre' in Colombia, 'Desnutrición Cero' in Bolivia, or 'Hambre más urgente' in Argentina.

Underlying the general improvement of the LAC region in most FNS indicators, the other side of the coin of food insecurity and probably the greatest challenge this region needs to face in relation to malnutrition is obesity. As shown in Table 6.5, most countries' body mass index indicates worrying levels of overweight (i.e. are above 25 kg/m^2). LAC is the second region in the world, after the US, with the highest percentage of its population obese or overweight (Finucane et al., 2011). Obesity today affects 20% of the Latin American population (> 110 million people) and overweight up to 35% (> 200 million people) (FAO, 2012b). In countries such as Belize, Mexico, Venezuela, Argentina and Chile obesity affects almost 30% of the countries' population, whereas in Brazil and most Andean countries it affects closer to 20% of the population (*ibid.*). Yet, the highest rates of overweight and obesity are found in those countries which are at a stage of nutritional post-transition (FAO, 2010, see also Box 6.1). The underlying reasons behind this type of food insecurity are diverse and include economic, as well as cultural factors. As claimed by Cuevas et al. (2009), 'the increase of overweight and obesity [has] been

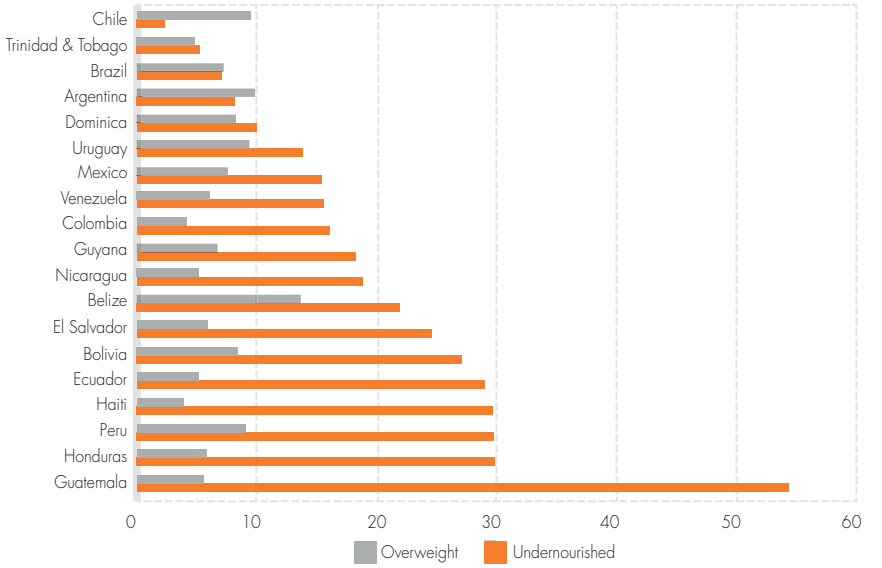

Figure 6.9 Percentage of undernourished and overweight children under five years old (2000–2009). *Source: FAO (2010) using data from Global Health Observatory-WHO 2010*

attributed to lifestyle changes occurring in recent decades related to rapid socioeconomic development, including a more Westernized diet, physical inactivity, urbanization, rural-urban migration and some maternal-fetal factors' (see Box 6.1). Obesity is a serious sign of malnourishment, stands in contrast to the hunger pandemic and has consequences for future generations. Countries that have eradicated hunger are those in a stage of nutritional post-transition and have the highest rates of child obesity. Among them, Argentina, Uruguay and Chile show obesity rates above 9 % (see Figure 6.9).

Box 6.1 The nutritional transition of emerging economies: the case of Brazil

Population growth, economic globalization, improving living standards and urbanization are causing important changes in the global food system in addition to modifying the dietary habits in many parts of the world (CAWMA, 2007; Godfray et al., 2010). As countries develop and populations become wealthier, the nutritional transition occurs. This transition implies a shift away from traditional staple foods such as roots and tuber vegetables and a rise in the consumption of meat and milk products, refined and processed foods as well as sugars, oils and fats (Ambler-Edwards et al., 2009).

In Brazil important changes have occurred to the food consumption patterns since 1987 (see Figure 6.10). In absolute terms, food consumption per capita has decreased over time from 360kg per capita in 1987 to 315kg per capita in 2009. However, most importantly the composition of the diet has experienced significant changes. In 1987 Brazilians had a balanced diet with an intake of predominantly vegetables, fruits, cereals and legumes (around 90 per capita per year of each). Rice, native tubers such as cará, potatoes, beans and tropical fruits like bananas and citruses were fundamental components of the diet prior to 1990. Animal protein consumption in the late 1980s was relatively high (> 50kg per person per year), equivalent to the average intake of richer regions like Europe (≈ 60kg per person per year in 1990) (Westhoek et al., 2011). However, since 1987 noteworthy changes have taken place in the composition of the food pyramid. Overall, the intake of vegetables, fruits and dairy products has decreased significantly (between 36 and 38%), whereas the consumption of processed food, stimulants and sugary products has experienced a dramatic increase (80%). Brazilians eat twice as much sugar as they did in 1987, 30% more processed food and almost 50% more non-alcoholic drinks and mineral water. The largest reduction in fruit and vegetable consumption is due to the lower intake of citruses and local tubers. Among the dairy products, the largest reduction is due to the lower intake of milk (from 68 litres per capita in 1987 to 40 litres in 2009). Overall, a nutritional transition in Brazil occurred in the late 1990s and early 2000s, overlapping with the economic takeoff of the country. Nevertheless, and compared to the prevailing trend in other developed regions, diet changes in Brazil have not translated into a greater consumption of animal protein, simply of food items linked to urban lifestyles.

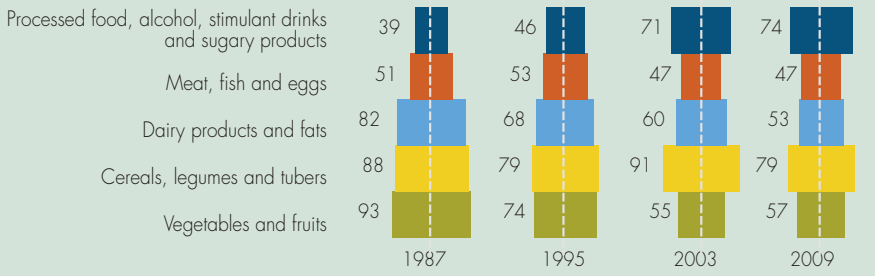

Figure 6.10 Food consumption pyramids (in consumed kg per capita per year) for Brazilians during the last two decades. *Source: own elaboration based on household survey – Pesquisa de Ornamentos Familiares: POF – for the years 1987/1988, 1995/1996, 2002/2003 and 2008/2009 (IBGE, 2013).*

6.4 Linking water and food security in Latin America

The purpose of this final section is to assess whether improvements and progress in water and food security indicators correlate across countries and to what extent they are interrelated. As shown in previous sections, economic development to a large extent explains part of the trends and current status. Therefore, in order to carry out the joint analysis of water and food security indicators we grouped the countries according to per capita income (as measured in 2010). The four figures (6.11 to 6.14) all have three panels, each with the set of countries belonging to the corresponding quartile of per capita income. Lastly, for each country and panel we present two points, corresponding to the pairs of selected WS and FS indicators measured in 2000 and 2010. Note that the scale differs across the three panels of each graph. This way data in this section shows five dimensions: time, country, per capita income, one WS indicator and one FS indicator.

The following pairs of indicators are plotted in Figures 6.11, 6.12, 6.13 and 6.14: prevalence of undernourishment (%) against access to improved sanitation (%); prevalence of stunting in children under five (%) against access to improved sanitation in rural areas (%); and finally prevalence of stunting in children under five (%) against access to drinking water (%).

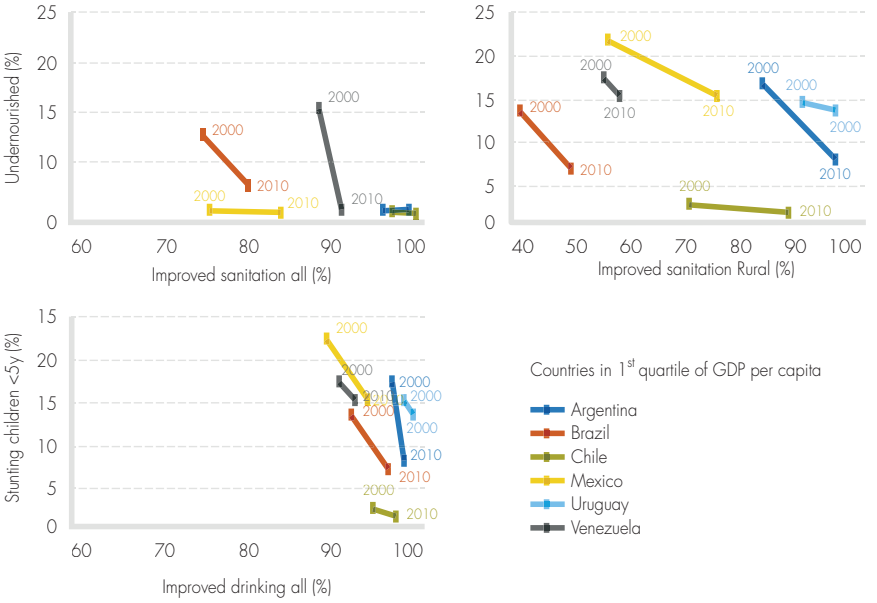

Figure 6.11 Three pairs of water and food security indicators measured in 2000 and 2010 (countries of the first quartile of per capita income in 2010). *Source: FAO (2010) using data from Global Health Observatory.*

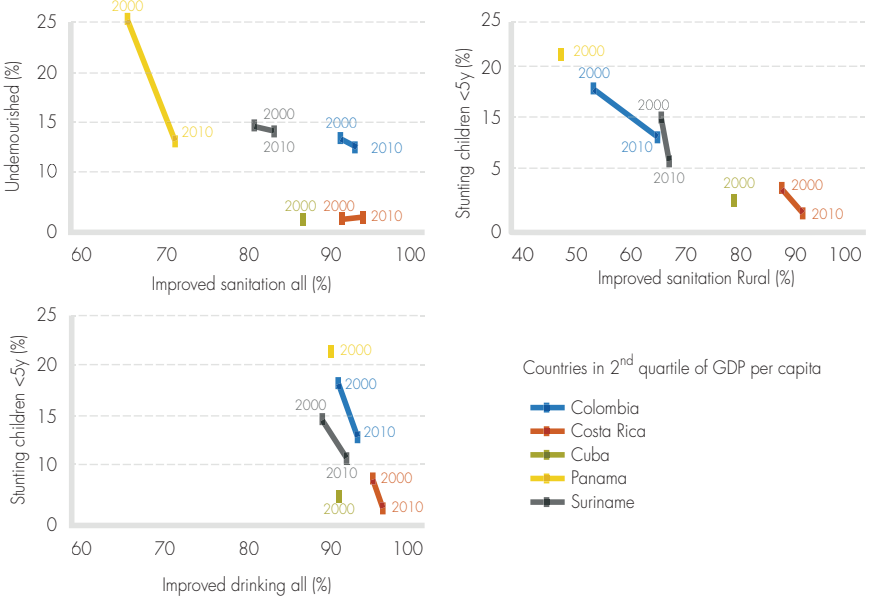

Figure 6.12 Three pairs of water and food security indicators measured in 2000 and 2010 (countries of the second quartile of per capita income in 2010). *Source: FAO (2010) using data from Global Health Observatory.*

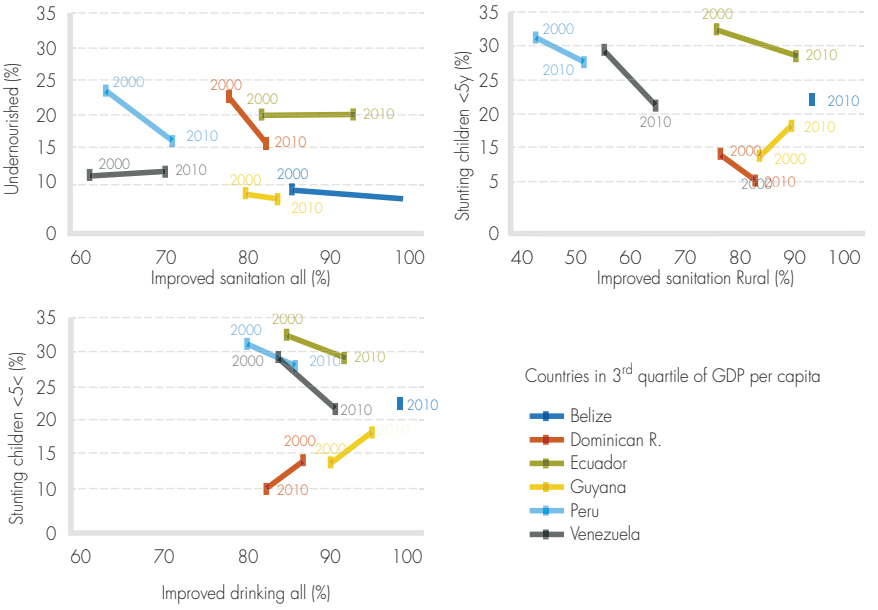

Figure 6.13 Three pairs of water and food security indicators measured in 2000 and 2010 (countries of the third quartile of per capita income in 2010). *Source: FAO (2010) using data from Global Health Observatory.*

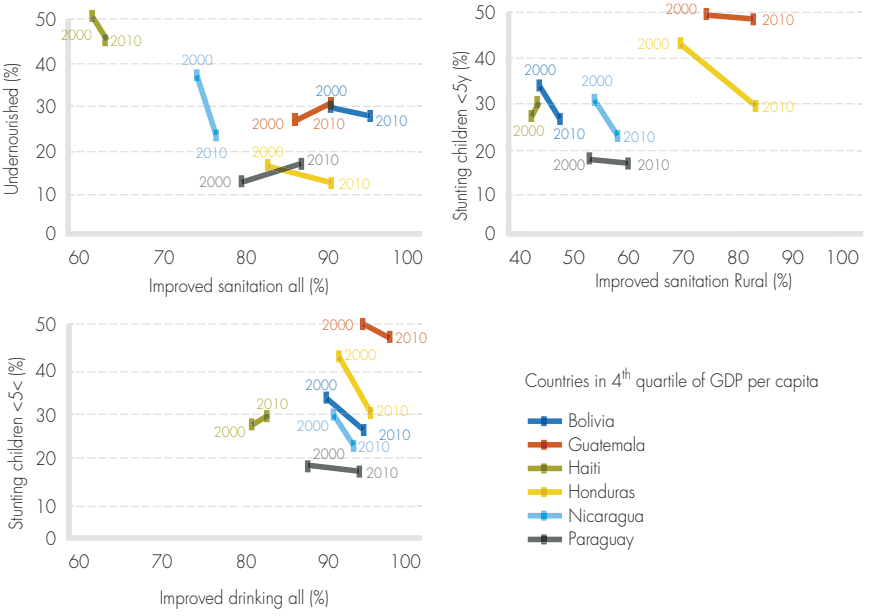

Figure 6.14 Three pairs of water and food security indicators measured in 2000 and 2010 (countries of the fourth quartile of per capita income in 2010). *Source: FAO (2010) using data from Global Health Observatory.*

By examining the Figures 6.11 to 6.14, we can draw the following conclusions. First, per capita income largely explains the pattern of improvements of the five indicators represented in these figures. From countries with the highest (Figure 6.11) to the lowest per capita income (Figure 6.14), the direction and slope of the segments overall become less homogeneous and more chaotic. In the groups of countries of the two lowest quartiles, some segments are upwardly sloped, and some hardly show any improvement between 2000 and 2010. Therefore, income growth and per capita income is fundamental for improving both WS and FS indicators.

Second, the reduction of the prevalence of stunting in children under five is closely correlated to the improvement of access to sanitation in rural areas. Except for Guyana, the remaining twenty-two countries exhibit downward sloping segments whose slopes tend to be similar within groups of countries. This would indicate that improved sanitation and the reduction of stunting in children evolve in parallel, although causation cannot be established.

Third, based on the different improvements and base levels of the percentage of undernourished people and stunted children across groups of countries, it seems clear that the reduction of undernourishment precedes the reduction of stunting in children. This would suggest that countries find it easier to reduce undernourishment rates than reducing the proportion of stunted children. We would thus conclude that ensuring nutritional security is more complex than simply reducing undernourishment, such as these concepts are defined by FAO. NS requires more specific programmes, population targets and a strong focus on pregnant women and children, especially amongst the most vulnerable.

Fourth, improving sanitation is for the most part preceded by improvements in access to drinking water, especially in rural areas. The consequences of not improving sanitation infrastructure and delaying its deployment to further stages of economic development are found in impaired water quality and ecosystems, reduced biodiversity and a greater prevalence of water-borne diseases.

Last, there is still a huge gap in terms of improving sanitation in the region, especially in rural areas. The investments required to bridge this gap are reviewed in Chapter 13, and the institutional challenge is the focus of Chapter 1.

6.5 Final remarks

The overview of a wide range of variables for most LAC countries within a span of a decade tells three overall stories. First, that the consequences in coping with the problems of insufficient sanitation have eventually materialized in increasing costs to reverse its impacts and in moving towards more sustainable economic development. It is true that the investment needs are, for some countries, overwhelming. For others with growing economies and rapid poverty alleviation, ensuring proper sanitation in rural areas and water treatment in both large cities and rural areas should be an affordable priority.

Second, it seems that common patterns of nutritional transition in the prosperous LAC countries show growing rates of overweight and obesity. This has worrying negative effects, in both impaired human health and pathologies, but also in the larger footprints of the diets that are behind this emerging pandemic. In the case of LAC, the 49 million people suffering from undernourishment coexist with 110 million obese people, and with 200 million overweight. Only by educating people at the basic level can this trend be curbed and a worse disaster averted. It is important that the nutritional transition does not follow this path, but solutions are far from clear.

Last, while the performance in LAC countries of most WS and FNS indicators can be explained by the relative level of per capita income, there are significant differences amongst countries even within the same income quartile. National policies are thus crucial to rapidly improve the situation and reach the poorest and more vulnerable members of society.

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