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Environmental quality and equity in the Human Development Index: an integrated index for the Local Agenda 21 case study

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Abstract

Although the Human Development Index (HDI) allows for a more accurate measurement of the real achievements of growth than the gross domestic product, it does not include other necessary variables for human development, such as economic inequality and growth environmental costs. An integrated HDI was developed which included environmental quality and equity as variables, along with income, life expectancy and education. The integrated HDI was applied in the 169 coastal municipalities of Mexico and the results were always lower than the official HDI calculated for the same year. We compared the relationship between the HDI and the integrated HDI with the distribution models of Local Agenda 21 (LA21), which was different for most of the municipalities. Lastly, the components of the integrated HDI for building scenarios were reviewed, prevailing subjects regarding education, health, environmental quality and equity, in order to propose strategies for the development of public policies for the LA21.
Keywords: HDI, sustainability, Gini coefficient, coastal municipalities, Mexico, public policy

1. Introduction

1.1 The Human Development Index (HDI) and its controversies

The measurement of human development through the HDI was introduced in 1992 as an alternative to conventional economic theories (UNDP, 1992), which for decades considered economic growth as measured by gross domestic product (GDP), and entailed more welfare and increasing opportunities for progress. However, growth is often accompanied by an increase in inequality, poverty, environmental degradation and resource depletion (Sanahuja, 2009).

The United Nations Development Program (UNDP) divulges and works with the paradigm of human development since 1990. It defines this concept as a process which seeks the expansion of opportunities for people, increasing their rights and capabilities. Among these opportunities are a long and healthy life, access to education, and enjoyment of a decent standard of living. Other opportunities include political freedom, guaranteed human rights and self-respect (UNDP, 1990). Therefore, this approach changed the economic vision for a holistic one, focused on wellness and human capacities, where the role of institutions is decisive (Nussbaum and Sen, 1993).

Human development has six key components: equity, where everyone can have equal opportunities; empowerment; people's freedom to influence decisions that affect their lives; productivity, where people are fully involved in the process of generating income; security, where opportunities can be exercised freely and safely without disappearing in the future; sustainability, ensuring access to opportunities for future generations; and cooperation, as a means of mutual enrichment between communities (UNDP,1994; UNDP, 2012).

The HDI allows for a more accurate measurement of the real achievements of growth by providing a more realistic view, albeit limited, since the concept of human development is broader than what this or any other more complex indicator can reflect (Sanahuja, 2009). The income variable is partial and insufficient because it does not reflect the actual access to productive resources such as land and credit, which in many countries are the key to inequality and poverty (Sutcliffe, 1993).

Besides the absence of other aspects that make human development, the HDI itself is unbalanced, since the income variable gives greater weight to the final value of the HDI than do other variables. In a study where procedures of classifications of Latin America countries and the Caribbean were compared using statistical procedures based on their HDI and GDP per capita (Dominguez et al. 2010), it was observed that the resulting ordinations were very similar and that this similarity has accentuated since 1990 to the present. Therefore,

according to the authors, the weight of the variable income in building the HDI is so great that this index has become increasingly redundant. Another similar study for 130 countries (McGillivray 1991) states that the HDI is imperfect in its composition and that, for most countries, it provides very little information other than that provided by the GDP.

Furthermore, the accumulation of a subpopulation can improve the overall average income, even if the conditions have not improved for most. This is one of the fundamental problems with the use of national income as a measure of welfare (Palazzi and Lauri 1998, 199). The inequity of different dimensions can be caused by different factors. According to Jensen and Nielsen (1997), income distribution varies depending on the structure of employment, minimum wages and social security provision; and schooling depends on the provision of public schools, the regulation of child labor, and labor markets. An example of this inequality in dimensions is observed in two of Latin America's countries with greater inequality, Brazil and Colombia, who have in turn high values in their HDI (Salazar 2009).

1.2 Environmental quality, equity and human development

According to Sagar (1998), the HDI presents a distorted picture of the world, by ignoring the performance of countries before the dimensions of the environment and the development. For example, distribution of the environmental performance of countries varies considerably, countries like Brazil and Indonesia have improved their performance in the HDI in part by the conversion of natural capital into income, but whether these improvements are sustainable is unknown. The income variable, by not incorporating environmental costs of growth, does not allow inferring whether a society is sustainable or not.

To address this shortcoming, several authors demand the development of a green HDI (Sanahuja, 2009), indicating the degree of human development achieved next to its sustainability. This will incorporate the environmental costs of growth to the national accounts, so that GDP per capita reflects the actual depreciation suffered by the planet when its resources are consumed. This is the goal that Laso and Urrutia (2001) pursued when they set-up their sensitive to pollution HDI; Neumayer (2001) with his adjusted for depreciation of natural capital HDI, and Tarabussi and Palazzi (2004) with their Sustainable Development Index, to name a few, although they have not surpassed the academic proposal stage (Dom nguez et al., 2010).

Regarding equity, studies show an interest in incorporating income inequality using the Gini coefficient (Hicks, 1997; Sagar, 1998; UNDP, 2010; 2011; Mancero, 2001) or inequality range tables (Le n, 1999). In its twentieth anniversary edition, the *2010 Human Development Report* held the concept of human development with an emphasis on equity, sustainability and empowerment as a means to expand people's choices (UNDP, 2011). In the last two reports of UNDP's HDI (2010, 2011) efforts have been made to average the HDI with values of inequality, sustainability, gender and poverty to national values. By 2011, the HDI value for Mexico was 0.77, and averaging it to sustainability (measured by the number of deaths as a result of natural disasters and CO2 emissions per capita) and inequality, the HDI result decreases to 0.35.

1.3 The Local Agenda 21 and the HDI: the case of Mexico

The Local Agenda 21 (LA21) is the action program promoted by United Nations to carry out the objectives of Agenda 21 of establishing policies which integrate the environment and development (UN, 1992). Poncela et al. (2011) examined the relationship between types of LA21 and HDI, based on the differences in the implementation of environmental plans based on a country's development. The results showed that those of very high HDI (ranked as developed countries by UNDP), are mostly operating under the LA21 process. In general, for those with a high, medium and low HDI (classified as developing countries), the processes are in expansion phase (high and medium HDI) and newly developed (low and medium HDI).

The last classification for inland conducted by UNDP in 2005 shows how 20 Mexican states reached a high human development level. The rest of the states were placed in the medium human development category (UNDP, 2009). However, wide disparities persist in the country. Municipalities with higher levels of HDI were located in the center and northern part of the country, while those with lower levels of HDI continued being located mostly in the southeastern region (UNDP, 2009). There are few records of the initiatives and results about the LA21 in Mexico, and there is currently no national program or campaign. Despite initial efforts of a commitment for sustainability through the establishment of LA21, these are not sufficient for Mexico. If transferring the models of the international study to the Mexican municipalities, the LA21 would widely vary among municipalities.

As mentioned, a human development index that includes sustainability would be an important contribution to alternative conceptions of development that prioritize the eradication of poverty, the satisfaction of human needs, and sustainability in the development process (Sutcliffe, 1995). Mexico presents a broad prospect of inequality and environmental threats. With approximately 104 million inhabitants in 2005, an increase of 16% of

the population is expected by 2030 (Partida Bush, 2008). The country's coastal areas have high biodiversity but many threatened or endangered species, and highly productive but fragile ecosystems. The population of the coastal municipalities represents almost 15% of the country's total area and is the area with the largest annual population growth rate at 2.8% (about twice that of the rest of the country). It accounts for almost half of all tourist activity in the country, and has a strong oil industry, fisheries, mining, other industries, and port activities (SEMARNAT, 2006).

The objective of this work is to integrate environmental quality and equity in an integrated HDI for coastal municipalities of Mexico. It analyzes and compares the relationship between LA21 models with the distribution of UNDP's HDI and integrated HDI into the case study. Finally, the integrated HDI variables are weighted to build scenarios to establish public policies for LA21, prevailing themes of education, health, environmental quality and equity.

2. Method

2. 1 The integrated HDI

To meet the objective of integrating environmental quality and equity in the HDI to enhance the measure of human development, the integrated HDI structure was defined as shown in Figure 1.

Figure 1. Structure of the integrated HDI

Life expectancy is measured by the rate of infant mortality (health index); education through literacy rates and school attendance (education index); the annual income per capita (income index); environmental quality through status and territory pressure (environmental quality index); and equity through the difference provided by income inequality (Gini coefficient). Integrated in the final sum up as follows:

Integrated HDI = [health index + education index + income index + environmental quality index + (1- Gini coefficient]/5

As a case study for the application of the proposed integrated HDI, the 169 coastal municipalities of Mexico were included. The health, education and income indices were taken from the report on human development and gender in Mexico published by UNDP in 2007; data corresponding to Mexican coastal municipalities for 2000 were taken from this database.

The environmental quality index was based on the proposal of a sustainable capacity index for Mexican coastal municipalities (Seignier et al. 2011), which defined sustainability as a combination of three aspects: the status of the environment, quality of life of human population, and the pressure applied by human activities. From this, an environmental quality index is redefined taking the pressure of human activities and the state of the environment. Quality of life was removed; measured through marginality, by being indirectly included in the HDI. The values for the sub-indices shown in Table 1 to calculate the index of environmental quality were taken from Seignier's (op cit) work database.

Table 1. Components of the environmental quality index.

Indices	Indicators/Action	Description	Source
State	Natural coverage/ Increases the state	Km^2 of natural vegetation within the municipality, divided by the municipality's total area.	Official national census
	Perforation per location/Decreases the state	Number of locations in relation to the municipal area.	Official national census
Pressure	Population density/Increases pressure	Municipal population density.	SEMARNAT (2000), INEGI (2000)
	Land usage/ Increases pressure	Sum of municipal urban area plus municipal agricultural area with weigh-up 2/1 respectively.	SEMARNAT (2000), INEGI (2000)

Source. Redefined from Seingier et al. 2011.

Equity in income distribution was measured by the difference in the Gini coefficient. The Gini coefficient measures the degree of income distribution in a population with a value between zero and one. The closer the value is to one, the more concentrated the distribution will be, and therefore greater income inequality. While the closer the coefficient is to zero, the more equitable the distribution is, and the lower the population's income inequality will be. It is calculated as the area between the Lorenz curve (income distribution relative to a given population) and the line of equal distribution (Demarco 1997).

Among the proposals of indicators to measure the study of inequality, the Gini coefficient has had greater acceptance in empirical studies (Medina 2001). Data for the case study were taken from the National Institute for the Evaluation of Education (INEE by its Spanish acronym), for the 169 coastal municipalities corresponding to 2000. The cohort chosen was between 25 and 64 years old.

2.2 The HDI and the Local Agenda 21

The study of the types of instrumentation of the LA21 in different countries showed the existence of a relationship between LA21 models and the countries' HDI, which is summarized in Table 2. A relationship was established between the LA21 models proposed, with the classification of the results of the municipal values of the HDI and integrated HDI and a comparison was made between the two.

Table 1. LA21 models per their HDI.

LA21 Model	**Actions**	**Promoters**	**Methods**	**Economic supports**	**HDI**
1	Environment (green agenda)	Government	-National campaigns -LA21 Councils	Yes	Very high
2	Urban and Social Development (brown agenda)	- Government (1st place) -International associations (2nd place)	-National campaigns -Replication strategies	Yes	High
3	Environment (green agenda) and development (brown agenda)	- International associations (1st place) - Government (2nd place)	-National campaigns -Replication strategies	Yes	Medium
4	Urban development, poverty, and health (brown agenda). Specific needs.	Wide range of different types	-National campaigns -Replication strategies	Yes	Low

Source. Poncela et al. 2011.

2.3 Scenarios for the design of public policies

Different scenarios were proposed for the design of public policies for the LA21 under different orientations. Different values were given to the integrated HDI components as shown in Table 3. Since statistical studies show how income (I) has more weight in the composition of the HDI (McGillivray 1991, Dominguez et al 2010), which increases its value unequally, the scenarios were raised by giving added value to the rest of the components, alternating them according to public policy guidelines for LA21.

Table 2. Considerations for setting-up public policy scenarios.

Scenario	**Weight of components**					**Composition of the algorithm**
	E	H	EQ	G	I	
Education (E)	5	4	3	2	1	Integrated IDH = 1/3*E + 4/15*H +1/5*EQt + 2/15*G +1/15*I
Health (H)	3	5	4	2	1	Integrated IDH = 1/5*E + 1/3*H +4/15*EQ + 2/15*G +1/15*I
Environment (EQ)	4	3	5	2	1	Integrated IDH = 4/15*E + 1/5*H +1/3*EQ + 2/15*G +1/15*I
Equity (G)	3	2	4	5	1	Integrated IDH = 1/5*E + 2/15*H +4/15*EQ + 1/3*G +1/15*I

3. Results and discussion

3.1 The integrated HDI

The calculation of integrated HDI implied a decline in values of human development for all municipalities in the case study. Figure 2 shows the decrease of integrated HDI versus HDI for coastal municipalities averaged by state. It is generally seen how the integrated HDI is around one tenth less for all states in an almost parallel manner, which is a significant variation in terms of the HDI's definition and its classification ranges. Table 4 shows the values for municipal UNDP's HDI and integrated HDI, as well as the values of the difference between the two, ranked in distribution ranges from low to very high. This change ranged between 0.03 and 0.21 points always negatively. Figure 3 shows the geographical distribution of this change.

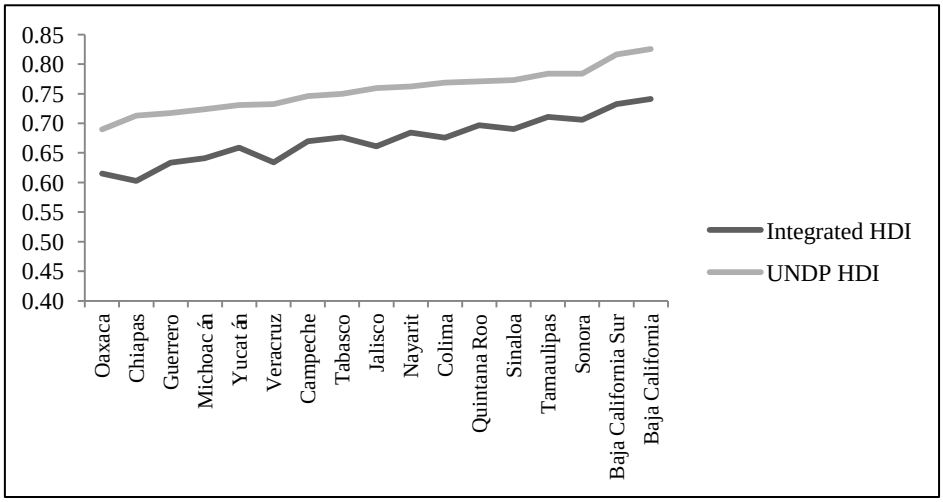

Figure 1. Values of HDI and integrated HDI for coastal municipalities averaged per state.

Table 4. Results of integrated HDI per municipality, and representation of changes with regard to the HDI.

State	Municipality	UNDP HDI	Integrated HDI	HDI Change	Ranges
Baja California	Playas de Rosarito	0.82	0.73	-0.09	Medium
	Ensenada	0.81	0.73	-0.08	Medium
	Mexicali	0.84	0.75	-0.09	Medium
	Tijuana	0.84	0.76	-0.08	Medium
Baja California Sur	Mulegé	0.80	0.72	-0.08	Medium
	Comondú	0.79	0.71	-0.09	Medium
	Loreto	0.82	0.73	-0.08	Medium
	Los Cabos	0.83	0.75	-0.08	Medium
	La Paz	0.84	0.76	-0.08	Medium
Campeche	Palizada	0.72	0.64	-0.08	Medium
	Tenabo	0.71	0.64	-0.07	Low
	Champotón	0.72	0.64	-0.08	Low
	Calkiní	0.73	0.66	-0.07	Low
	Hecelchakán	0.73	0.66	-0.06	Low
	Carmen	0.81	0.71	-0.10	Medium
	Campeche	0.80	0.73	-0.08	Low
Chiapas	Suchiate	0.70	0.57	-0.13	High
	Pijijiapan	0.70	0.58	-0.12	Medium
	Acapetahua	0.70	0.58	-0.11	Medium
	Mapastepec	0.69	0.57	-0.12	Medium
	Mazatán	0.69	0.60	-0.09	Medium
	Villa Comaltitlán	0.68	0.59	-0.09	Medium
	Tonalá	0.73	0.62	-0.11	Medium
	Huixtla	0.73	0.62	-0.11	Medium
	Arriaga	0.74	0.63	-0.11	Medium

	Tapachula	0.77	0.65	-0.12	Medium
Colima	Tecomán	0.76	0.64	-0.12	Medium
	Armería	0.74	0.66	-0.08	Medium
	Manzanillo	0.81	0.73	-0.08	Medium
Guerrero	Cuajinicuilapa	0.66	0.57	-0.09	Medium
	San Marcos	0.67	0.60	-0.07	Low
	Florencio Villarreal	0.70	0.61	-0.09	Medium
	Azoyú	0.68	0.59	-0.08	Medium
	Copala	0.69	0.61	-0.08	Medium
	La Unión de Isidoro Montes de Oca	0.69	0.62	-0.08	Medium
	Técpan de Galeana	0.73	0.64	-0.09	Medium
	Petatlán	0.74	0.65	-0.09	Medium
	Coyuca de Benítez	0.70	0.63	-0.07	Low
	Benito Juárez	0.76	0.67	-0.09	Medium
	José Azueta	0.79	0.70	-0.09	Medium
	Acapulco de Juárez	0.79	0.72	-0.07	Low
Jalisco	Cabo Corrientes	0.72	0.66	-0.06	Low
	Tomatlán	0.74	0.66	-0.08	Low
	La Huerta	0.75	0.53	-0.21	Very high
	Cihuatlán	0.78	0.70	-0.08	Medium
	Puerto Vallarta	0.81	0.75	-0.07	Low
Michoacán	Aquila	0.63	0.57	-0.07	Low
	Coahuayana	0.75	0.65	-0.10	Medium
	Lázaro Cárdenas	0.79	0.71	-0.08	Medium
Nayarit	Rosamorada	0.75	0.67	-0.08	Low
	San Blas	0.74	0.67	-0.07	Low
	Santiago Ixcuintla	0.77	0.69	-0.08	Low
	Tecuala	0.77	0.69	-0.08	Medium
	Acaponeta	0.75	0.68	-0.07	Low
	Compostela	0.76	0.68	-0.08	Medium
	Tuxpan	0.78	0.70	-0.08	Medium
	Bahía de Banderas	0.77	0.70	-0.08	Low
Oaxaca	Santa María Tonameca	0.61	0.45	-0.16	High
	Santo Domingo Armenta	0.64	0.57	-0.07	Low
	Santiago Tapextla	0.58	0.54	-0.05	Low
	San Mateo del Mar	0.62	0.55	-0.06	Low
	San Miguel del Puerto	0.61	0.56	-0.05	Low
	San Francisco del Mar	0.69	0.62	-0.07	Low
	Santa María Huazolotitlán	0.65	0.59	-0.06	Low
	San Dionisio del Mar	0.63	0.58	-0.06	Low
	Santa María Xadani	0.65	0.56	-0.09	Medium
	Villa de Tututepec de Melchor O.	0.80	0.68	-0.12	High
	San Pedro Pochutla	0.69	0.61	-0.08	Medium
	San Pedro Tapanatepec	0.72	0.62	-0.09	Medium
	San Pedro Huamelula	0.67	0.63	-0.05	Low
	Santa María Colotepec	0.72	0.64	-0.08	Medium
	Santiago Jamiltepec	0.67	0.61	-0.06	Low
	San Francisco Ixhuatán	0.71	0.63	-0.09	Medium
	Santiago Pinotepa Nacional	0.69	0.62	-0.08	Low
	Santiago Astata	0.71	0.67	-0.04	Low
	Santo Domingo Zanatepec	0.71	0.63	-0.08	Low
	San Pedro Mixtepec - Distr. 26	0.62	0.58	-0.04	Low
	San Pedro Huilotepec	0.72	0.66	-0.07	Low
	Juchitán de Zaragoza	0.74	0.65	-0.09	Medium

	Santa María Huatulco	0.77	0.69	-0.09	Medium
	Santo Domingo Tehuantepec	0.76	0.69	-0.07	Low
	Salina Cruz	0.83	0.75	-0.08	Low
Quintana Roo	Felipe Carrillo Puerto	0.70	0.64	-0.07	Low
	Lázaro Cárdenas	0.71	0.64	-0.07	Low
	Solidaridad	0.77	0.70	-0.07	Low
	Othón P. Blanco	0.80	0.71	-0.09	Medium
	Isla Mujeres	0.78	0.71	-0.07	Low
	Cozumel	0.80	0.72	-0.08	Medium
	Benito Juárez	0.83	0.76	-0.08	Low
Sinaloa	Elota	0.69	0.62	-0.07	Low
	San Ignacio	0.73	0.66	-0.07	Low
	Navolato	0.74	0.66	-0.08	Medium
	Guasave	0.78	0.68	-0.10	Medium
	Angostura	0.77	0.69	-0.09	Medium
	Rosario	0.76	0.69	-0.07	Low
	Escuinapa	0.78	0.70	-0.08	Low
	Culiacán	0.83	0.73	-0.10	Medium
	Ahome	0.82	0.74	-0.09	Medium
	Mazatlán	0.84	0.75	-0.09	Medium
Sonora	Etchojoa	0.75	0.66	-0.09	Medium
	Benito Juárez	0.76	0.66	-0.10	Medium
	San Ignacio Río Muerto	0.74	0.67	-0.07	Low
	Bácum	0.75	0.68	-0.07	Low
	Huatabampo	0.75	0.68	-0.07	Low
	Pitiquito	0.77	0.70	-0.07	Low
	Empalme	0.79	0.72	-0.07	Low
	Caborca	0.80	0.71	-0.08	Medium
	Cajeme	0.81	0.73	-0.08	Medium
	Guaymas	0.81	0.74	-0.07	Low
	Puerto Peñasco	0.81	0.73	-0.08	Low
	San Luis Río Colorado	0.81	0.73	-0.08	Low
	Hermosillo	0.84	0.76	-0.08	Medium
Tabasco	Huimanguillo	0.71	0.63	-0.07	Low
	Comalcalco	0.76	0.68	-0.08	Medium
	Centla	0.73	0.67	-0.06	Low
	Cárdenas	0.75	0.68	-0.07	Low
	Paraíso	0.80	0.72	-0.08	Medium
Tamaulipas	Aldama	0.74	0.64	-0.10	Medium
	Soto la Marina	0.73	0.65	-0.08	Medium
	San Fernando	0.75	0.67	-0.08	Medium
	Altamira	0.78	0.69	-0.09	Medium
	Matamoros	0.82	0.73	-0.09	Medium
	Tampico	0.82	0.79	-0.03	Low
	Ciudad Madero	0.85	0.81	-0.04	Low
Veracruz	Mecayapan	0.61	0.50	-0.10	Medium
	Ozuluama de Mascareño	0.70	0.60	-0.10	Medium
	Tecolutla	0.71	0.60	-0.11	Medium
	Pajapan	0.60	0.51	-0.09	Medium
	Cazones	0.68	0.60	-0.09	Medium
	Tantima	0.68	0.59	-0.09	Medium
	Tatahuicapan de Juárez	0.63	0.54	-0.08	Medium
	Ángel R. Cabada	0.70	0.58	-0.12	Medium
	Tamiahua	0.70	0.63	-0.08	Medium
	Nautla	0.73	0.63	-0.10	Medium
	Tamalín	0.70	0.62	-0.08	Medium

	Tampico Alto	0.72	0.63	-0.08	Medium
	Catemaco	0.70	0.59	-0.11	Medium
	Papantla	0.72	0.63	-0.09	Medium
	Vega de Alatorre	0.75	0.63	-0.13	High
	San Andrés Tuxtla	0.69	0.60	-0.09	Medium
	Tlacotalpan	0.73	0.62	-0.11	Medium
	Medellín	0.75	0.64	-0.11	Medium
	Martínez de la Torre	0.76	0.65	-0.11	Medium
	Alto Lucero de Gutiérrez Barrios	0.70	0.61	-0.09	Medium
	Pánuco	0.77	0.67	-0.10	Medium
	Actopan	0.72	0.62	-0.10	Medium
	Túxpam	0.79	0.67	-0.11	Medium
	Alvarado	0.77	0.66	-0.11	Medium
	Lerdo de Tejada	0.78	0.67	-0.11	Medium
	Pueblo Viejo	0.79	0.70	-0.09	Medium
	Agua Dulce	0.78	0.69	-0.09	Medium
	Úrsulo Galván	0.79	0.69	-0.10	Medium
	La Antigua	0.79	0.69	-0.10	Medium
	Veracruz	0.84	0.74	-0.10	Medium
	Coatzacoalcos	0.82	0.74	-0.08	Low
	Boca del Río	0.85	0.77	-0.08	Medium
Yucatán	San Felipe	0.74	0.64	-0.09	Medium
	Tizimín	0.70	0.61	-0.09	Medium
	Yobaín	0.73	0.66	-0.08	Low
	Dzemul	0.70	0.63	-0.07	Low
	Sinanché	0.73	0.65	-0.08	Medium
	Río Lagartos	0.74	0.66	-0.08	Medium
	Ixil	0.70	0.65	-0.05	Low
	Dzilam de Bravo	0.74	0.67	-0.07	Low
	Hunucmá	0.70	0.64	-0.06	Low
	Telchac Puerto	0.75	0.67	-0.07	Low
	Celestún	0.71	0.66	-0.06	Low
	Dzidzantún	0.77	0.69	-0.08	Medium
	Progreso	0.79	0.73	-0.06	Low

Values for integrated HDI for coastal municipalities were between 0.45 and 0.81, while the values for the UNDP's HDI were between 0.58 and 0.85. Some cases of municipalities with the greatest difference between the two measures were, La Huerta (Jalisco) with a difference of 0.21 points, and Santa Maria Tonameca (Oaxaca) with 0.16 points, resulting La Huerta with one of the lowest values in the case study with 0.53 in the integrated HDI, and Santa Maria Tonameca as the lowest in the case study with 0.45.

The municipality of La Huerta (figure 3) shows a trend of population growth, as a result of migration from rural to urban areas. It has a total of 7509 inhabitants (INEGI, 2005) distributed in 119 localities. This locations dispersion and low population density make difficult construction, and public services supply. Some of the problems related to human development that are registered in the municipality and defined in the Municipal Development Plan (Gobierno Municipal La Huerta, 2010) are: deficiencies in water and waste management, medical and electricity services; lag in education, lack of promotion of culture, poor regulations, low employment and public investment; lack of strategies for sustainability, damage to natural resources, and lack of security.

The municipality of Santa Maria Tonameca (figure 3) has a total of 21,223 inhabitants (INEGI, 2005) distributed in 103 localities. The small number of productive activities and rural development in the municipality brings unemployment and subsequent migration. Some of the problems identified in the Municipal Plan for Sustainable Rural Development (SAGARPA, Gobierno de Oaxaca, 2008) are: lack of implementation of new production systems and lack of legal organization of agriculture, tourism, fishing and aquaculture; water shortages, environmental pollution resulting from poor management of water and waste, and lack of social infrastructure.

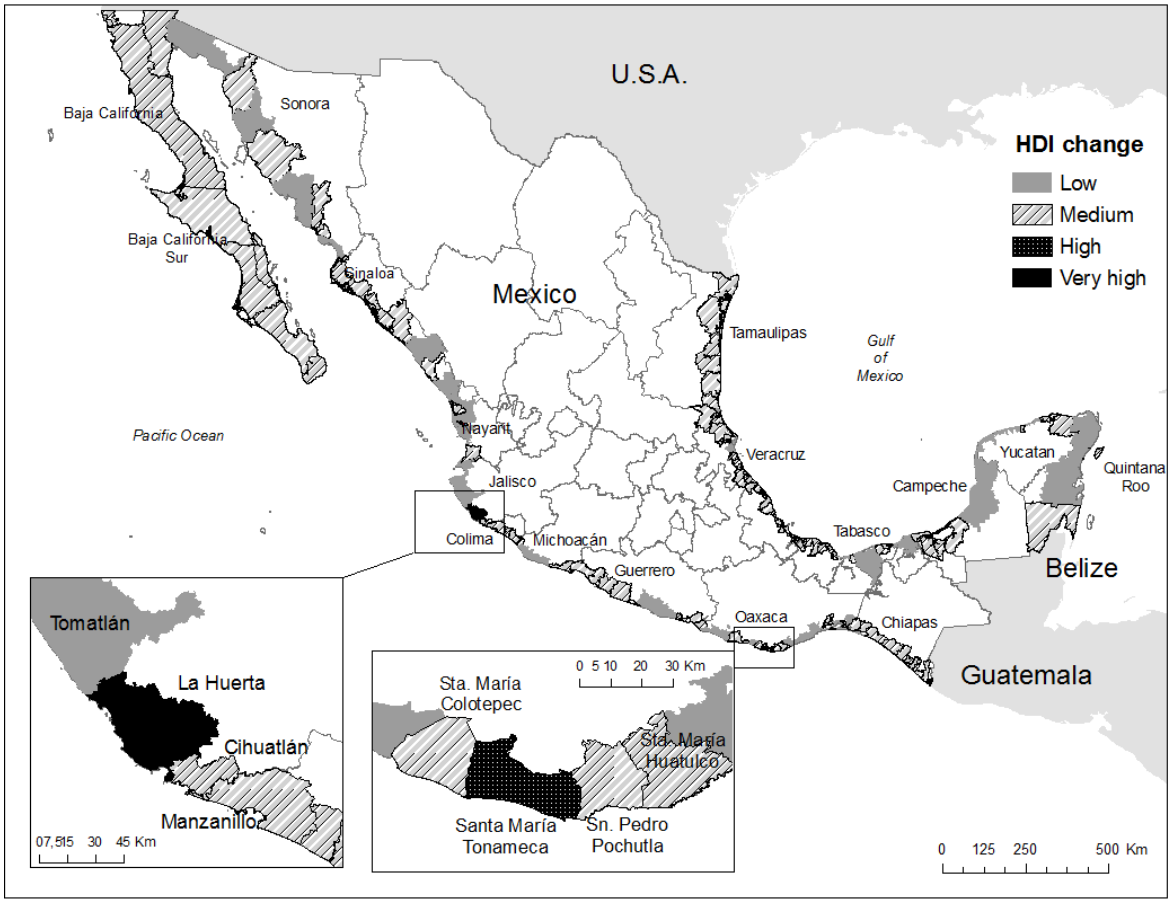

Figure 3. Change between Integrated HDI and UNDP HDI per coastal municipalities in Mexico

3.2 The integrated HDI and the Local Agenda 21

The integrated HDI values for coastal municipalities involved a variation in the classification of LA21 models. Figure 4 shows the distribution of municipal values of the HDI and integrated HDI in LA21 models. As is observed for the UNDP's HDI (2000), most of the municipalities are distributed in model 2, and a smaller part in models 1 and 3. While for the integrated HDI, most are distributed in model 3 and a lesser part in model 2.

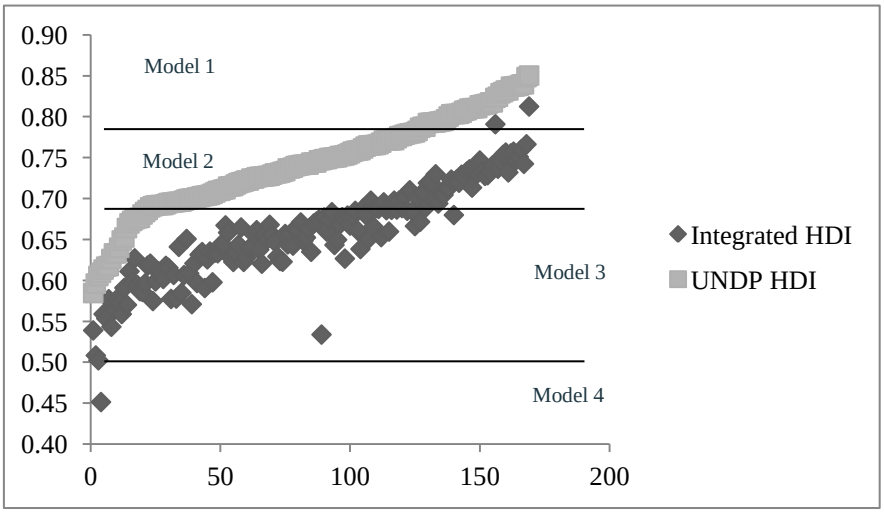

Figure 4. Distribution of *LA21* in regards to the HDI and integrated HDI for Mexico's coastal municipalities

3.3 Scenarios for public policies

Figure 5 shows the result of weighting scenarios from the integrated HDI components averaged by municipality. It is observed that all scenarios have an integrated HDI lower than the UNDP's. The health and education scenarios were very similar and 0.05 points lower. The environmental and the equity scenarios were 0.1 lower. A proposal for the design of LA21 policies was taken from the integrated HDI scenarios (Table 5).

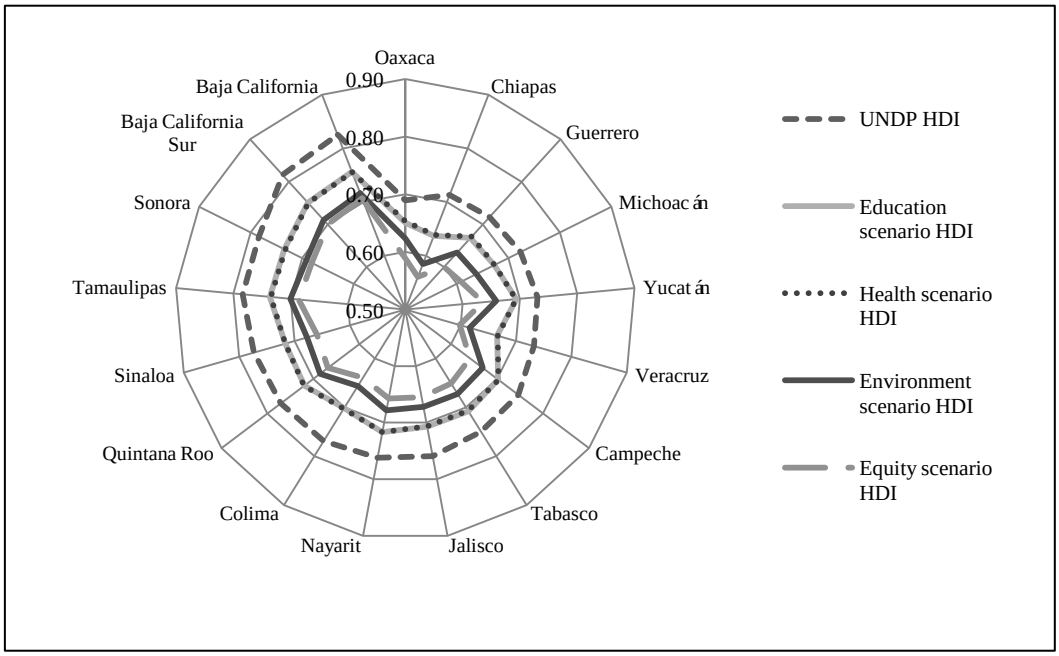

Figure 5. Scenarios of the integrated HDI based on orientation of public policies for LA21.

Table 5. Proposal for the design of strategies for public policies.

Scenario	Agenda objective	LA21 model	Orientation of policies and strategies
Education (E)	Green and brown	2	- Educational actions: to improve overall efficiency in elementary education, integrate environmental education, etc. - Local government as the main entity responsible for its instrumentation. - Collaboration among agencies. - External collaboration: links with NGOs, civil society, academia, businesses. - Magnitude of actions: medium-high. - Actions from short to long term.
Health (S)	Brown	2	- Health-related actions: to avoid child and maternal mortality, coverage of public health services. - Actions related to development: coverage of water and sanitation. - Local government as the main entity responsible for its instrumentation - Collaboration among agencies - External collaboration: links with NGOs, civil society, academia, businesses. - Magnitude of actions: medium-high. - Actions from short to long term.

Environment (A)	Green	3	- Remedial environmental type actions - Complement with sustainable development actions - Local government as the responsible entity along with foreign agencies (NGOs, civil societies, academia, businesses) - Support from national campaigns and central governments (regulatory or federal) - Obtaining of international support - Magnitude of the actions: medium - Prevalence of short term actions - Replication strategy for pilot cities
Equity (G)	Brown	3	- Actions related to economic inequality - Local government as the responsible entity along with foreign agencies (NGOs, civil societies, academia, businesses) - Support from national campaigns and central governments (regulatory or federal) - Obtaining international support - Magnitude of the actions: medium - Prevalence of short term actions - Replication strategy for pilot cities

4. Conclusions

The design of integrated HDI meets the demands of various authors on the creation of a HDI that takes into consideration environmental degradation and economic inequality as variables for a more accurate estimate of the extent of human development. The values obtained for the integrated HDI were consistently lower than those calculated for the UNDP's HDI for all coastal municipalities in the case study. It follows that equity and sustainability factors that define human development, provide a relevant and necessary change to the traditional HDI measurement. This decrease in the measure of human development with the integrated HDI, occurs almost parallel for all states, which may indicate that the measure through the HDI overestimates the true value of human development. Municipal governments for La Huerta and Santa Maria Tonameca, where the difference for the HDI and integrated HDI was higher than the rest, detected many problems and deficiencies in the municipality related to basic opportunities to achieve human development, such as lack of employment, poor public services and lack of environmental strategies. In a preliminary interpretation this would correspond with low or medium levels of human development, which is consistent with the obtained integrated HDI values. Moreover, it was mentioned that the inclusion of GDP in the HDI gives greater weight to the final value than its other components. By including more components in the final average of the integrated HDI, income decreases part of its domain.

By taking municipal values as a case study allows for a more detailed picture of human development in the country, as national HDI measures, which are the most frequently used and updated, do not include the inequalities that may arise within the country. This disparity in income distribution often occurs in developing countries, so local calculations are very important to convey more exact information about them. Similarly, the inclusion of environmental quality in the case study is relevant because of the vulnerability of coastal municipalities. Depletion and processing of natural resources resulting from human activities are a global problem, so the proposed integrated HDI can be used in other countries in order to understand the role of environmental quality in human development.

For the LA21 case study, the distribution of models in relation to the human development varies between the UNDP's HDI and integrated HDI. This indicates that the UNDP's HDI measure overestimates the rate corresponding to the LA21 models based on their HDI, which may lead to inadequate implementation strategies. While the integrated HDI approaches more realistic models for the LA21. Scenarios were weighted always giving the lowest value to income, in order to give greater prominence to other components. The proposed strategies for LA21 are targeted at capacity building in terms of human development, instead of granting a purely financial perspective as is traditionally done to meet these goals.

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