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# COMPARISON OF URBAN SUSTAINABILITY USING INDICATORS APPROACH IN THE CITIES OF BAHIR DAR AND HAWASSA (ETHIOPIA)

**ABSTRACT.** Measuring urban sustainability remains an arena of dispute for long time. The promotion and development of urban sustainability are important to maximize the benefits of urbanization and minimize the negative externalities in urban environment and livelihoods. Each city has its strength and weakness towards sustainable urban development from different perspectives of various indicators. It is understood that assessment of sustainable city is related to identification and selection of sustainable development indicators. Therefore, in this research, we tried to develop a set of indicators, and indices for sustainability assessment in Bahir Dar and Hawassa cities in Ethiopia. The study focuses on the principal indicators, and an indicator framework has developed. The main purposes of sustainability indicators are to understand sustainability, supporting decisions, directing, involving stakeholders and empowerment. Twenty-six indicators with four main dimensions (economic, socio-cultural, environmental and institutional) have been identified. The computation of urban sustainability has to take into account all four dimensions equally. In the calculation of indicators, this study chooses a standard method [0, 1] using the minimum and maximum values for each indicator as an objective indicator. The sustainability indices calculated are 0.53 and 0.52 for Bahir Dar and Hawassa respectively, indicating that both cities have a moderate performance towards the development of a sustainable city. Aggregated data demonstrates that environmental indicators are moving towards sustainability, while economic, socio-cultural and institutional dimensions are performing relatively low in both cities, suggesting that sustainability studies need to work on all of sustainability dimensions that tend to better inform concerned bodies for policy intervention.

**KEY WORDS:** Equal weighting; Indicator approach; Normalization; Urban Sustainability

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## INTRODUCTION

With 70% of the global GDP coming from urban areas, urbanization is a powerful force to bring economic growth and poverty reduction through agglomeration economies and productivity gains (World Bank 2018). On the other hand, urbanization if not properly managed, can lead to more informal settlement, poverty and greenhouse gas emissions (UN-Habitat 2016; UNDP 2016). Urbanization thus has to be sustainable in order to reap its benefits. The UN agenda 2030 of SDG number 11 clearly stated the new stand to make cities safe, inclusive, resilient, and sustainable (UN 2015). The new urban agenda (conference of Habitat III held in Quito, Ecuador) also aims at shaping cities to be sustainable and liveable (Caprotti et al. 2017; UN 2017). These goals of urban sustainability aim at improving the socio-cultural and economic conditions of an increasingly urbanized population by preserving life systems and maintaining the quality of the environment (Alberti and Suskind 1996; National Science Foundation 2000; Shen et al. 2011).

Baker (2006) pointed out that sustainable urbanization occurs when there is harmony between urbanization process and sustainable development principles. Sustainability should be understood in an integrated and holistic view (Sisay 2005; Huang et al. 2009). Its central element is the nexus among economic, social, environmental and institutional objectives (Ali-Toudert and Ji 2017). These are multi-dimensional perspectives of sustainability (Mayer 2008) and sustainability studies are mindful of these components (Van de Kerk and Manuel 2008).

Urban sustainability also involves the association of a particular kind of locality and urbanization processes (Mori and Christodoulou 2012). It focuses on urban localities and opportunities for achieving sustainable livelihoods. Urban sustainability entails examining urbanization within the context of dynamic and complex factors producing urban growth in sustainable ways (Arcadis 2015, 2016). The

sustainability of urban environments is thus likely to be a major policy challenge of the near future (Mohammedameen et al. 2015).

Ethiopia is one of the least urbanized countries not only by the world's standard but also by African standard. Currently, about 20 % of its population lives in urban areas as compared to the African average of 36 % (MoUDHCo<sup>1</sup> and ECSU<sup>2</sup> 2015). However, because of high natural population growth rate (2.73 % per annum), high rate of in-migration to towns and cities, and increase in the number of urban centers, the rate of urbanization is increasing at an average rate of 5.6 % (Shlomo et al. 2013; MoUDH 2015). Furthermore, the country's urban population in future is expected to grow on average by 3.98 % and in 2050 about 42.1% of the total population is expected to live in urban areas (UN-Habitat 2007). It is evident that, in addition to the national capital Addis Ababa, regional capitals such as Bahir Dar, Hawassa, Mekele and Adama have experienced high population growth in the past two decades. While rapid urbanization is evident, Ethiopian cities are experiencing high levels of poverty, unemployment and environmental problems compromising their sustainability. For instance, according to the recent information, urban poverty stood at 14.8% in 2015/16 (NPC<sup>3</sup> 2017) and unemployment stood at 16.5% in 2013 (CSA 2013)

There is therefore, a need to assess the sustainability of Ethiopian cities using sound and applied technique. We believe that the approach presented in this study, focusing on urban sustainability in Ethiopian context has important implication for other African countries in a similar situation. Therefore, the main objective of this study was to assess the sustainability levels of the two fast growing cities in Ethiopia, using a set of environmental, economic, socio-cultural and institutional sustainability indicators. Specifically, the study has three distinct yet interrelated specific objectives. First, we briefly review the main components of urban sustainability in urban landscape of developing countries like Ethio-

<sup>1</sup> MoUDHCo- Ministry of Urban Development Housing and Construction

<sup>2</sup> ECSU- Ethiopian Civil Service University

<sup>3</sup> NPC- National Planning Commission

pia. Our second objective is to list down the major components and sub-components of sets of sustainability indicators. Based on this, our third objective is to analyze the sustainability indices of the two fast growing cities.

### Theoretical framework of urban sustainability: Indicator Approach

In the contemporary debate, the concept of urban sustainability implies the vitality of urban areas as a complex system in terms of the quality of life of its citizens and the natural capacity to support activities (Basiago 1999; Ferris et al. 2001; Lafferty and Eckerberg 2013).

UN and EU have broadly endorsed an overarching goal of sustainable development to achieve greater environmental effectiveness through cost-effective policy integration that can be realized by employing different combinations of policy elements (Lafferty 2004). The OECD has also formulated the institutional challenges of sustainable development in order to achieve a better balance between the environmental, social and economic aspects of welfare provision (OECD 2002; Lafferty 2004). The general goals and the more specific objectives formulated by international and regional organizations (UN, EU, and OECD etc.) can be seen as a set of minimal external standards for adapting government practice to sustainable development (Lafferty 2004).

Urban sustainability rests on four conceptual dimensions: economic, socio-cultural, environmental and institutional (UNDPDSD 1996a and b; Spangenberg 2002). Economic dimension of sustainability is a concern with economic activities to consider natural, social and human capital (Labuschagne et al. 2005; Finkbeiner et al. 2010). It seeks to preserve the environment through economic growth and the alleviation of poverty (Shen et al. 2011). The economic component consists of the key elements of different modes of economic development and sustainable production through improved eco-efficiency and sustainable consumption lifestyles (Lafferty 2004).

The socio-cultural dimension of sustainability shows a less clear-cut definition (Martin 2001) because of the diversity of economic, social and cultural conditions in individual

countries (Moldan et al. 2012). It is however characterized from a social perspective. For instance, Black (2004) defined socio-cultural sustainability as the extent to which social values, social identities, social relationships and social institutions of individual countries can continue into the future. Gilbert et al. (1996) perceived that the socio-cultural pillar of sustainability requires the cohesion of society and its ability to work towards common goals of health and well-being, nutrition, shelter, education and cultural expression. Lafferty (2004) also mentioned that the socio-cultural component of sustainable development to include equitable distributions of individual life chances to satisfy objectively defined basic needs such as national social equity, national generational equity, global social equity and global generational equity.

The environmental dimension of sustainable development is a concept based on the notion of ecosystem services of both renewable and non-renewable resources and waste absorptive capacity that provide benefits to humans and improve their welfare (Moldan et al. 2012). The OECD strategy for the 21<sup>st</sup> century (OECD 2001) defined four specific criteria for environmental sustainability: regeneration (renewable resources shall be used efficiently and their use shall not be permitted to exceed their long-term rates of natural regeneration), substitutability (non-renewable resources shall be used efficiently and their use should be limited to levels which can be offset by substitution with renewable resources or other forms of capital), assimilation (releases of hazardous or polluting substances into the environment shall not exceed their assimilative capacity) and avoiding irreversibility. Environmental sustainability involves ecosystem integrity, carrying capacity and biodiversity (Munda 2005). It requires that natural capital be maintained as a source of economic inputs and as a sink for wastes (Moldan et al. 2012). Lehtonen (2004) noted that on one hand, resources must be harvested no faster than they can be regenerated, on the other hand, wastes must be emitted no faster than they can be assimilated by the environment.

Environmental sustainability, unlike the economic or social spheres, seems to be open

for developing and using targets that are firmly rooted in the bio-physical properties of the system (Moldan et al. 2012). Lafferty (2004) stated that environmental dimension of sustainability consists of nature conservation, environmental protection and ecological balance. The integration of environmental concerns into other policy areas has been diversely referred to as environmental policy integration (Lafferty 2004). An equally plausible and highly relevant case can however be made, that there are numerous very real conflicts of interests with respect to many environmental issues and non-environmental objectives. Any conflicts of interest between policy objectives of environmental issues and non-environmental objectives can be resolved by balanced means which has to be addressed to the satisfaction of all affected interests (Lafferty 2004). This implies that there will be at least some environmental objectives that should be balanced with either political or economic goals for life support systems. When environmental planners speak of urban sustainability; they mean the pursuit of urban form that synthesizes land development and nature preservation (Lozano and Huisingh 2011).

Institutional dimension of sustainability has stronger roots within the broader development literature (Bell and Morse 2008). Some studies (Keman and Pennings 1995; Spangenberg et al. 2002a) stated that institutions are broadly defined and analyzed by political science as the structure of rules for political decision-making and implementation. However, Spangenberg et al. (2002b) noted that social entities see it as actors as well as systems of rules shaping social behavior, including the mechanisms for rule enforcement. Political organizations perceive it as involving a combination of definitions given by political science and social entities: appearing as actors in political process and systems of rules structuring political behavior and facilitating societal views (UNDPSCD 1996a,b; Spangenberg et al. 2002b). Measuring institutional growth toward sustainability is vital in order to manage and improve its effectiveness. For these purposes institutional sustainability is taken as, the effectiveness of institutions through the implementation of their purposes for sustainable urban development.

In the analysis of urban sustainability measurement, the foregoing discussion implies these four dimensions of sustainability must be integrated and interlinked (Sikdar et al. 2017) in coordinated and comprehensive manner (Höjer et al. 2011).

The two common approaches used to measure urban sustainability are direct measurement and indicators approach (McCool and Stankey 2004). Direct measurement of urban sustainability is difficult in developing countries because of a paucity of comprehensive data set and technology. Hence, the most commonly used measurement approach of urban sustainability is indicator approach (Maclaren 1996; Turcu 2013). The core motivation behind the indicator based approach for measuring urban sustainable development lies in the ability of indicators to give a comprehensive, reliable, and easy-to-understand picture of the environmental, socio-cultural, economic and institutional trends in a concise form (Eurostat 2009; Mori and Yamashita 2015).

The first set of indicators was launched by the United Nations Commission on Sustainable Development in 1995 (UNESC 1995), followed by a number of countries adopting their own national sustainable development indicators. Since then, numerous global, national, and local scale indicator initiatives have been carried out in order to measure sustainable development. Sustainable development indicators have been produced for various purposes and by a wide spectrum of institutions (Munier 2011; Rametsteiner et al. 2011; Dahl 2012; Rinne et al. 2013; UN-Habitat 2016). Zilans and Abolina (2009) claimed that, it is crucial that cities are focusing on indicators to measure sustainability. The sustainability indicators implied the tight interconnectedness of economic, social and environmental components (Sustainable Cities International 2012). They can be either quantitative or qualitative measures (Camilla and Marc 2009; Sustainable Cities International 2012).

The main criticisms against them have to do with the subjectivity of the choice of variables and the weighting of the indicators (Mori and Christodoulou 2012). Bell and Morse (2008)

also indicated although indicators are logical devices used to gauge progress towards attainment to sustainable development, there are a number of key questions related to their development and application including what indicators should be selected? who selects them? why are they selected? how are the indicators to be measured? how are the indicators to be interpreted, and by whom? how are the results to be communicated, to whom and for what purpose? how are the indicators to be used?. Therefore, with the limitations stated above, this study adopted indicator method to assess the cities sustainability in the study areas.

### Selection of indicators

The framework of indicator approach is considered as the first step in the implementation and interpretation process of sustainability (Mascarenhas et al. 2010; Estoque and Murayama 2017). Indicators for each dimension of sustainability are distilled from the literature (see Annex 1 (available at <https://ges.rgo.ru>) for source, explanation and measurement of indicators). In total 26 indicators of which six for economic dimension, eight for

socio-cultural dimension, six for environmental dimension and six for institutional dimension were chosen.

## MATERIALS AND METHODS

### Study areas

This study was conducted in the two fast growing cities of Ethiopia: Bahir Dar and Hawassa (Fig. 1). Bahir Dar is the capital of Amhara National Regional State. Its astronomical location is 11° 36' North and 37° 23' East and 565 km north of Addis Ababa. According to the municipality of Bahir Dar city (2015), the historical foundation of the city is associated with the establishment of KidaneMiheret Church in the present site of St. Giorgis church around the 14th century. Haregeweyn et al. (2012) elaborated that Bahir Dar was fast developed and transformed into a modern city during the Italian occupation period of 1928-1933. Haregeweyn et al. (2012) also mentioned that the name Bahir Dar which means the periphery of a water body is related to the city's proximity to two water bodies: Lake Tana and River Abay.

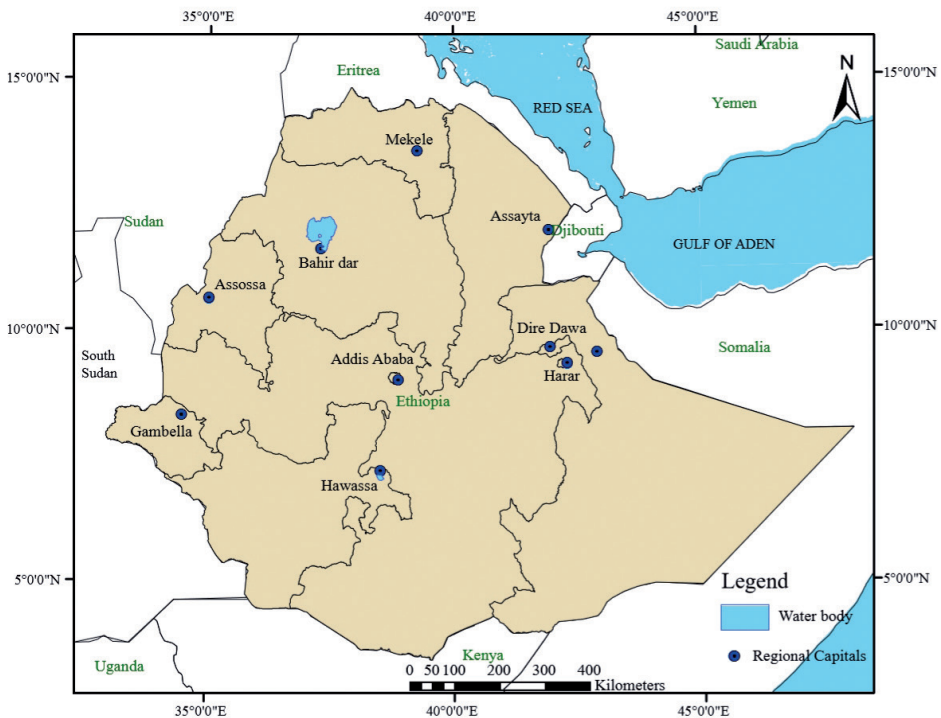


Fig. 1. Location map of study areas

The other study site, Hawassa city, is found in Southern Nations, Nationalities and Peoples National Regional State, at a distance of 275 km south of Addis Ababa. It is the regional capital and is bounded by Lake Hawassa on the west and north-west, Chelelaka swampy area to the east and south-east, TikurWuha river on the north and Alamura mountain on the south. Its astronomical location is at 07° 03' North and 38° 28' East.

According to the municipality of Hawassa city (2015) and as explained by elders, Hawassa was founded in 1968 by Ras Mangesha Seyoum under the permission of Emperor Haile Selassie. It was initially settled by pensioned soldiers and this was reckoned to have given an impetus to the growth and development of the city. Hawassa municipality was founded in 1970. The city got its name from Lake Hawassa. Most people choose it as a place of residence because of its relative nearness to the capital Addis Ababa and due to its suitable weather condition, natural attractions, business and job opportunity, investment potentials and friendly community.

## DATA AND SAMPLING

This study used both qualitative and quantitative data collected from primary and secondary sources. Qualitative data were collected from two focus group discussion (one from each city) composed of six experts/practitioners (civil engineer, architecture, urban planner, surveyor, land administration and environmentalist) and face-to-face interviews with two focal persons (one from each city). The two focal persons for face-to-face interview were selected from the office responsible for the green infrastructure development, implementation, maintenance, preparation and status monitoring in each city. This helps for scrutinizing indicators at the local level. The quantitative data were collected from a cross sectional survey. Structured questionnaire was used to collect each of the economic, socio-cultural, environmental and institutional dimensions of indicators.

A 5-point Likert scale was used to measure the level of each sub-indicator with scores of 0 (very low), 1 (low), 2 (average), 3 (good) and 4 (very good). A full description of each indicator was provided in the questionnaire and each respondent was asked to rate the different dimensions of sustainability indicators in the city. All of the economic, socio-cultural, environmental, and institutional indicators were measured in nominal scale.

The survey was implemented in a two stage sampling. In the first stage, five sub-cities were purposively selected in each city on the basis of better availability of green infrastructure. The sub-cities selected in Bahir Dar were Facilo (with population number 26,349), Hidar-11 (with population number 33,950), Shume-abo (with population number 31,221), Gesh-abay (with population number 19,938) and Sefene-Selam (with population number 20,236). The sub-cities selected in Hawassa were Misrak (with population number 30,350), Menahe-ria (with population number 29,120), Tabor (with population number 25,125), Mehalke-tem (with population number 24,135) and Haik Dar (with population number 21,201).

In the second stage, a total of 430 respondents (215 from each city) were selected from sub-city sampling frame for survey questionnaire using a formula by Israel (1992) and substantiated by CRS<sup>4</sup> (2012). In each sub-city a proportional number of respondents were selected using the proportional sampling size method.

## Data analysis

Descriptive statistics was used to summarize the socio-demographic data and the indicator method approach was used to compute the environmental, economic, socio-cultural and institutional dimensions of sustainability. The qualitative data were transcribed and analyzed using theme analysis techniques. Quantitative data were analyzed using normalization to make the decision whether or not urban sustainability in the study areas.

<sup>4</sup> Creative Research Systems

**Mathematical calculation**

In the calculation of indicators, this study chooses a standard method [0, 1] using the minimum and maximum values for each indicator as an objective indicator (Choon et al. 2011; Yang et al. 2017; Tanquay et al. 2010).

The value of indices fall between 0 and 1, where a value closer to 1 denotes better sustainability of urban development while a value closer to zero indicates poor sustainability of urban development. The actual ratings of individuals or actual values are transformed into values between 0 and 1 using the following equation 1:

$$Y_i = \frac{Z_i - a}{e - a} \tag{1}$$

Where,  $Y_i$ : lies between 0 and 1,  $Z_i$ : actual value;  $a$ : denotes minimum value of an indicator and  $e$ : denotes maximum value of an indicator.

The above indicators are normalized in order to allow comparisons between different dimensions of sustainability using the following equation 2:

$$Z = \frac{Y_i(Avg) - \mu}{\sigma} \tag{2}$$

Where:  $Z$ : denotes the normalized value of each indicator in a given sustainability dimension,  $Y_i$  (avg): the average value of each indicator for all respondents,  $\mu$ : is the aggregated average value for each sustainability dimension,  $\delta$ : denotes the standard deviation of each sustainability dimension

In order to examine each sustainability dimension index and overall sustainability index for Bahir Dar and Hawassa inde-

pendently, we used an equal weighting method (Roldan and Valdes 2002; YCELP and CIESIN 2005, 2006). For the calculation of each sustainability dimension, standardized sub-indicators can be combined using the following formula (Wilson and Wu 2017).

$$INDEX_{norm} = \frac{(Sub\_index1_{norm} + \dots + Sub\_index2_{norm} + \dots + Sub\_indexn_{norm})}{N} \tag{3}$$

Where:  $Sub\_index_{norm}, \dots, sub\_index_n$  norm is normalized values of each sub-indicator  $1_{to} n$ ;  $N$  is the total number of sub-indices.

To accomplish over all sustainability index, we generally selected economic, socio-cultural, environmental, and institutional sub-indicator sets, which are normalized and averaged. Therefore, over all sustainability index may take the following form using the technique formulated by Wilson and Wu (2017).

$$SI = \frac{(Economic + Socio - cultural + \dots + Environmental + Institutional)}{N} \tag{4}$$

Where 'SI' represents over all sustainability indices, 'Economic' the normalized economic sub-index; 'Socio-cultural' the normalized socio-cultural sub-index; 'Environmental' the normalized environmental sub-index, 'and 'Institutional' the normalized institutional sub-index;  $N = 4$ .

In this study, we used a sustainable city classification system as presented in Table 1 adopted from OECD 2004; Choon et al. 2011; vanDijk and Mingshun 2005; Caprotti et al. 2017.

**Table 1. Sustainable city classification**

Score	Definition
$\geq 0.75$	strong sustainability
$0.50 \leq X < 0.75$	moderate sustainability
$0.25 \leq X < 0.50$	weak sustainability
$< 0.25$	unsustainable

<sup>5</sup>Yale Center for Environmental Law & Policy

<sup>6</sup>Center for International Earth Science International

## RESULTS

**Socio-demographic background of respondents**

The socio-demographic characteristics of the respondents are presented in Table 2. The average age of the respondents was almost similar in the two cities: 41 and 44 years old in Bahir Dar and Hawassa cities respectively. The educational status of the respondents in Bahir Dar shows that, just over two-third of the respondents (68.8%) have completed college or university degree and

the remaining (23.2%) and (7.9%) have completed secondary and primary education respectively. In Hawassa, over half of them (57.2%) have completed college and university degree; the rest (18.6%) and (12.6%) have completed secondary and primary education respectively. Services are by far the most important sources of employment for respondents in both cities.

More than half of the respondents or 57.2% in Bahir Dar and 54.9% in Hawassa mentioned ownership of the house they occupy (Table 2). In both Bahir Dar and Hawassa,

**Table 2. Socio-demographic characteristics of respondents (N=215 each city)**

Variables		Bahir Dar	Hawassa
Age	Average	41years	44years
	Range	18-64years	18-64years
Sex	Female	38(18)	53(24.7)
	Male	177(82)	162(75.3)
Education	Primary education	17(7.9)	27(12.6)
	Secondary education	31(23.2)	40(18.6)
	College & University graduated	167(68.8)	148(68.8)
House Tenure	Owned the house unit currently occupied	123(57.2)	118(54.9)
	Renting (Private and Public)	92(42.8)	97(45.1)
Type of employment	Urban agriculture	9(4.2)	10(4.7)
	manufacturing	26(12.1)	29(13.5)
	Services	96(44.7)	78(36.3)
	Education	42(19.5)	40(18.6)
	Trade	39(18.1)	50(23.3)
	Unspecified	3(1.4)	8(3.7)
Awareness level of sustainability	Yes	175(81.4)	190(88.4)
	No	40(18.6)	25(11.6)
Can define meaning of sustainability	Yes	166(77.2)	185(86.0)
	No	49(22.8)	30(14.0)

\*Numbers in parenthesis are percentage values, Source: Survey result



a very significant number of respondents (81.4% in Bahir Dar and 88.4% in Hawassa) are aware of the sustainability issues. Furthermore, 77% in Bahir Dar and 86% in Hawassa pointed out that they can explain the basic meaning of sustainability (Table 2).

**Sustainability index analysis**

Based on the concept presented in Table 1 and using equation 4, classification of urban sustainability at aggregate level, Bahir Dar and Hawassa scored 0.53 and 0.52 respectively which is almost equal to the mean index point of 0.52. However, neither of the two cities attained sustainability level of greater than or equal to 0.75, hence they are classified as moderately sustainable.

**Economic dimension of sustainability index**

The economic dimension is one of the main pillars of urban sustainability. The sub-indicators of economic dimension: transport infrastructure, economic growth, tourism and employment have shown a tendency towards sustainability, while this is not true for ease of doing business in both cities.

Fig. 2 shows the economic dimension of the sustainability index in Bahir Dar and Hawassa. Within this dimension, the trans-

port indicator has the highest value with an average score of more than 0.6 and the smallest is ease of doing business with an average score of less than 0.5 in both cities. Transport, connectivity and employment achieved a higher score in Bahir Dar than Hawassa while economic growth, tourism and ease of doing business have a higher score in Hawassa. The overall economic sustainability indices using equation 3 are 0.52 and 0.53 in Bahir Dar and Hawassa respectively which according to the classification in Table 1 puts them at the moderate level of sustainability

**Socio-cultural dimension of sustainability index**

The sub-indicators of socio-cultural dimension: demographics, education, income inequality, housing, social and cultural network have values closer to one and hence reflect progress towards sustainability. Other indicators, however such as crime, should be standardized via adjustment

( $Z^* = 1 - Z$ ), so that a value trending towards one indicates improved sustainability.

Fig. 3 presents the sustainability index of sub-indicators of socio-cultural dimension in Bahir Dar and Hawassa cities. Among the sub-indicators, demographics (0.67) in Bahir

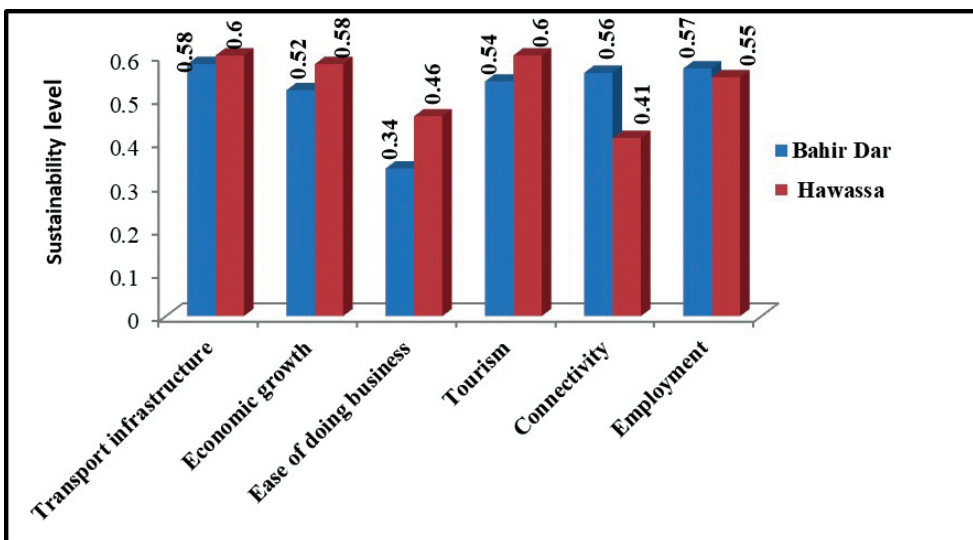


Fig. 2. Sustainability level of economic dimension indicators

Dar and education (0.67) in Hawassa have the highest values. In both cities, crime has highest values via adjustment mentioned implying that cities are safe and hence sustainable in this regard susceptibility of the cities for crime. Highly sustainable sub-indicators in Bahir Dar are demographics and education while education and housing have high sustainability in Hawassa.

scores and hence reflect higher sustainability (Fig. 4). Like crime, which is one of socio-economic indicator mentioned above, environmental risks and greenhouse gas emission should be standardized via adjustment ( $Z^* = 1 - Z$ ) so that, a value trending towards sustainability, one indicates improved sustainability. This shows, environmental risk indicator is not showing towards sustainability in both cities. Nevertheless, the score for waste management is low in both cities and this is an indication that there are no enough liquid and solid waste management practices. This leads to the disposal of waste in Lake Tana in Bahir Dar and Lake Hawassa in Hawassa.

**Environmental dimension of sustainability index**

Among the environmental sustainability sub-indicators, energy, land use/green spaces, greenhouse gas emission, and water availability are indicators with higher

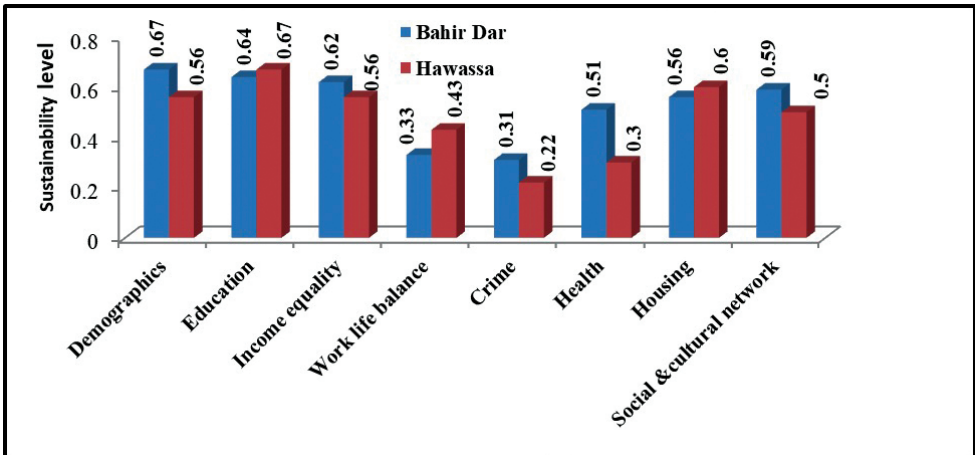


Fig. 3. Sustainability level of socio-cultural dimension indicators

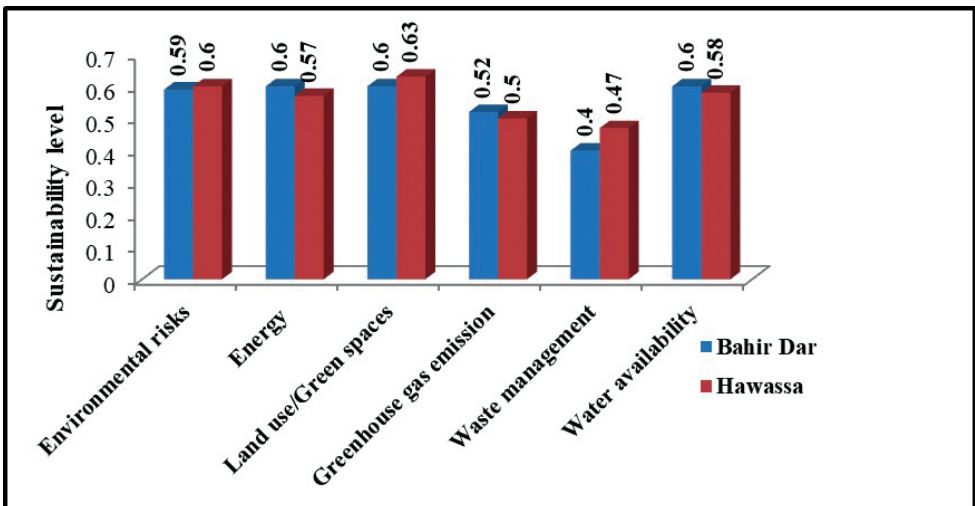


Fig. 4. Sustainability level of environmental dimension indicators

The sub-indicators with the highest sustainability score in Bahir Dar and Hawassa are energy consumption, land use/green space, and water availability (Fig. 4). The overall score for environmental sustainability in Bahir Dar is 0.55 and it is 0.56 in Hawassa. The results show that both cities are found at the moderate level of sustainability.

**Institutional dimension of sustainability index**

Fig. 5 depicts that among the institutional sustainability sub-indicators, institutional capacity, institutional framework, local community participation, and gender mainstreaming are those with higher scores in both cities. On the other hand, local authority services indicator has low score in both cities. In Hawassa, the institutional sub-indicator with the highest score is institutional capacity with an average score of 0.59 while in Bahir Dar the sub-indicator with the highest score is local community partnership with an average score of 0.57 (Fig. 5). The average rating for institutional sustainability using equation 3 is 0.52 for Bahir Dar and 0.50 for Hawassa.

**Overall urban sustainability indices**

Fig. 6 and 7 provide the results of sustainability in terms of the four dimensions. It can clearly be seen that the three dimensions of sustainability in both cities fall in the category of moderate sustainability classification ( $0.50 \leq X < 0.75$ ) except socio-cultural dimension in Hawassa. Hawassa seems to have relatively a better performance in the economic and environmental dimensions. The economic sustainability score of Hawassa (0.53) is higher than that of Bahir Dar (0.52) which could be due to the investment pooling potential of Hawassa since the city is relatively closer to the capital, Addis Ababa. Similarly the better performance of Hawassa in environmental dimension reveals that the attention the city has provided to this issue is better than Bahir Dar. Hawassa however lags behind Bahir Dar in terms of the socio-cultural and institutional dimensions of sustainability. The overall result of sustainability in Bahir Dar (0.53) is higher than that of Hawassa (0.52) reflects the values of the socio-cultural and institutional dimensions which are better for Bahir Dar city (Fig. 6 and 7).

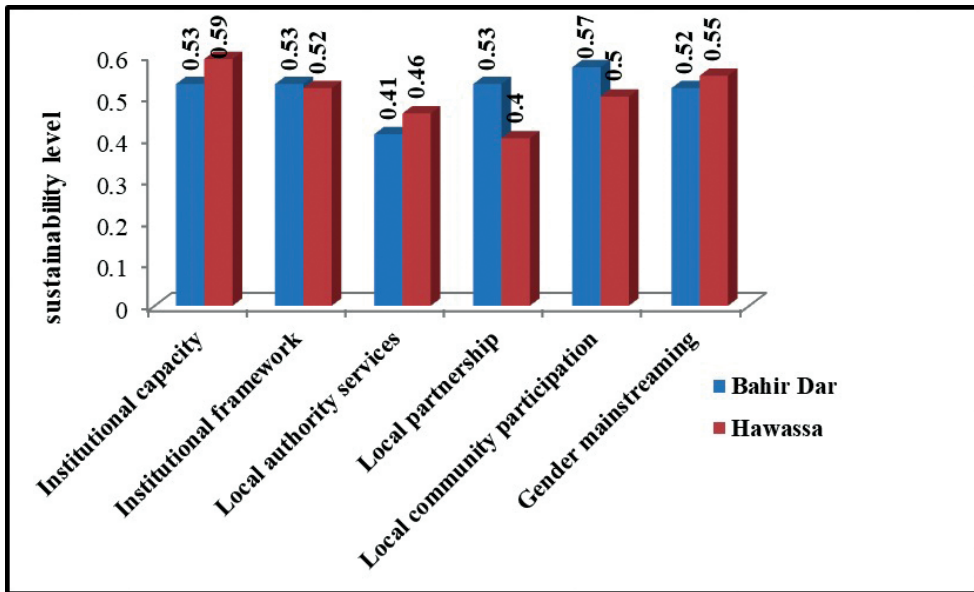


Fig. 5. Sustainability level of institutional dimension indicators

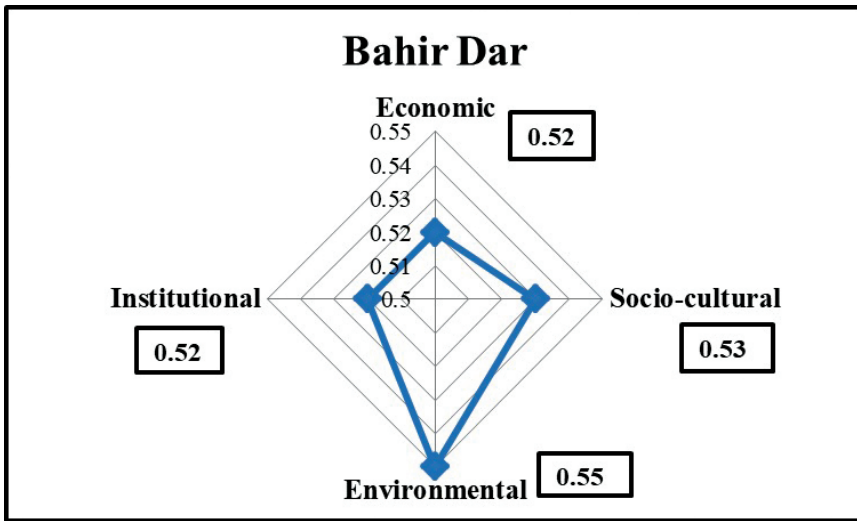


Fig. 6. Spider diagram of dimensions of sustainability for Bahir Dar

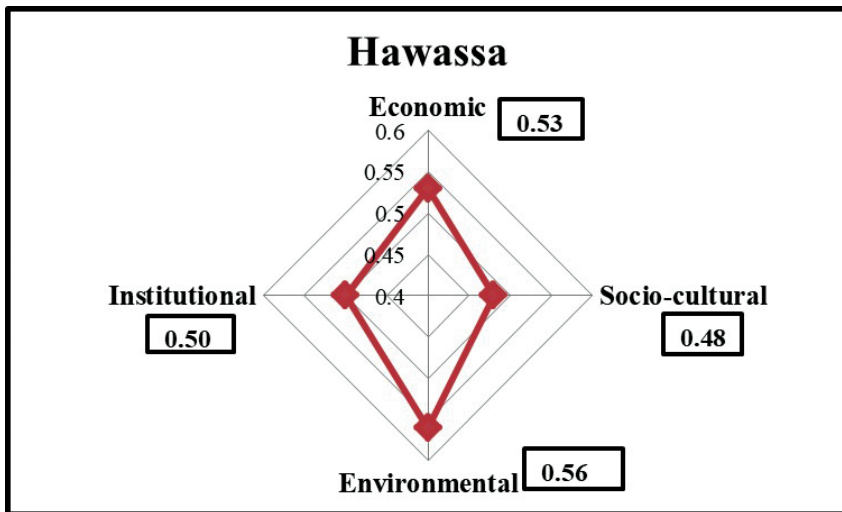


Fig. 7. Spider diagram of dimensions of sustainability for Hawassa

**DISCUSSION**

Recently, sustainability is given a high profile and it requires that decision makers should have information about the environmental, socio-cultural, economic, and institutional implications of development (Lyth and de Chastel 2007). In the same way sustainable, urban development requires major changes in managing the social, environmental and spatial effects of urban development (Roberts and Kanaley 2007). Sustainability however has to be understood correctly and this necessitates

the use of techniques of selecting and using appropriate indicators for each of the dimensions of sustainability. Our exercise in constructing the sustainability index has helped us to examine the extent to which the two cities have managed their environmental, economic, institutional and socio-cultural aspects of urban development in a comparative perspective.

The computation of urban sustainability has to take in to account the four main dimensions equally. Urban sustainability is multidimensional optimization process

by its very nature and cannot have one clear optimal solution. Therefore, sustainability assessment must be based on multi indicators analysis. The result showed that both cities have attained a moderate level of sustainability and there is little difference in the overall sustainability among the cities. The components of sustainability show slight variations between the two cities. In relation to economic dimension (Fig. 6 and 7), Hawassa has relatively higher index than Bahir Dar while Bahir Dar has relatively higher socio-cultural index than Hawassa. However, in both cities, the socio-cultural dimension of urban sustainability is at the lower range of sustainability classification. This shows that both cities have to work more in addressing housing, education, health needs, reducing crime and strengthening the social and cultural networks in their respective jurisdictions. In relation to environmental dimension, both cities show relatively higher index. This implies that most of the activities of the cities are focused on environmental issues. As a result environmental sustainability in the form of minimizing environmental risks, providing renewable energy consumption, reducing greenhouse gas emission and providing clean water has received a better attention in the cities.

The urban development policy in the country supports urban sustainability and strives to make cities the sources of the industrial value chain, centers of innovation and employment opportunity (MoUDH 2015). The findings of the result showed that priority is given to environmental dimension followed by economic dimensions. The socio-cultural and institutional dimensions have received less attention though they are equally important and incorporating them increases the possibility of broadening the coverage of sustainability.

## CONCLUSION

The indicator-based approach provides a basis for identifying different indicators to urban sustainability in a comprehensive manner. It combines indicators-based interpretation of urban sustainability with the recognition of different indicators. An assessment of sustainability using the four main dimensions is necessary to determine if cities are able to consider the economic, socio-cultural, environmental, and institutional dimensions of sustainability simultaneously.

In this study, it is implied that one index is insufficient to understand fully the sustainability of a city, and therefore utilization of composite indices is required. According to the classification of a sustainability index, neither of our case study cities has yet achieved strong sustainability. Socio-cultural and institutional dimensions of sustainability are found to be low in Hawassa and Bahir Dar respectively as compared to the other dimensions. On the other hand, both cities have attained strong sustainability level in terms of environmental dimension. Each city has its strengths and weaknesses towards sustainable urban development. The sustainability indicators of these two cities in Ethiopia can be used as a framework and a guideline for urban managers and planners towards attaining sustainable urban development in other cities and towns in the country.

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