

Perception of Climate Change Information Dissemination Mediums in Ethiopia

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In most developing countries, the dissemination of information about climate change has largely been done by government agencies through mass media. This study examined the sources of climate change information and their reliability in selected cities in Ethiopia. Adopting a survey research design, data on sources and the trustworthiness of climate change information were randomly collected in five Ethiopian cities. The analysis revealed that mass media were the major source of information on climate change. However, with a computed reliability index of 3.08 for all sources of information, the mass media had a low-reliability index of 2.66, compared to faith-based organisations with a 3.50 reliability index. There was apathy towards information from the mass media and government agencies. A high level of trust was ascribed to sources from family and local communities, while religious institutions were perceived to be the most reliable. Therefore, an all-inclusive climate change information dissemination mechanism should be adopted, with the active participation of religious institutions, which have hitherto been left out in climate change discourse in the country.

Keywords: Climate change, information dissemination, information reliability, faith-based organisations, Ethiopia

Introduction

Climate change poses an exceptionally complex challenge to humanity. It represents one of the greatest environmental, social, economic and political threats facing human existence (Intergovernmental Panel on Climate Change (IPCC), 2022). The fourth Assessment Report of the IPCC (2007) dispels many uncertainties about climate change. Warming of the global climate system is explicit and according to IPCC (2007), the observed increase in global temperature since the mid-20th century is triggered by human activities such as increasing rates of fossil fuel burning and land use and land cover changes. As human activities continue unabated, especially in the developing countries' quest for development, climate change impacts will uninterruptedly undermine the achievement of sustainable development (Anukwonke *et al.*, 2022). The outcome of climate change includes droughts, floods and other disasters (United Nations Environment Programme [UNEP], 2008). This may likely deepen the poverty horizon (UN-Habitat,

2011; Odufuwa *et al.*, 2012; Kasim, 2018). For example, in developing countries, the impacts of climate change that have implications on poverty outcomes are manifold. These range from severely longer periods of drought, heavier and increased rainfall variability, flooding and sea level rise to water scarcity among others (Agbola, 2011; Kasim *et al.*, 2020). Climate change has emerged as one of the issues at the forefront of international discourse and dictates how people plan, manage and live in towns and cities.

Climate change impacts everyone regardless of national borders and the impact does not respect developing or developed countries (Ki-moon, 2007). It is important to note that regardless of the anticipated outcomes of climate change, it is the poorer developing nations that are often hit hardest (Prakash, 2008). As observed by Vidal and Radford (2005), one in about six countries globally faces food shortages owing to severe drought that could become more intense under climate change influence. Africa is the greatest concern since many countries within the continent are already stressed

and are in difficulties. Thus, areas prone to drought, such as Ethiopia, will become drier under the effect of climate change. In 2009, the Food and Agriculture Organization (FAO) and the United States government monitored global food challenges and agreed that 34 nations in the continent are experiencing drought and food insecurity. Based on existing indices, more countries could be vulnerable to food shortages in the coming decade (FAO, 2009).

The climate change challenges in Africa provide a compelling need to develop climate-resilient strategies to minimize vulnerability and protect the existing infrastructure in the environment for sustainable development (UNEP, 2008; African Union, 2022). To this end, a multilateral framework termed the Paris Agreement to manage climate change drivers was adopted at the UN Climate Conference in December 2015. Almost all countries have developed national achievable climate change mitigation targets. The targets can only be achieved if there are transparent monitoring mechanisms and appropriate information dissemination strategies are adopted to ensure that the adopted developmental projections are in sync with the universally agreed pathway of reducing global warming to less than 2°C. At present, climate change is real and its impact does not differentiate individuals based on race, socio-economic status, cultural, political and religious leaning. Therefore, effective climate change-related planning actions and strategies should be driven and depend on the community's capacity to mitigate and adapt to climate change. This will only be possible by reorganizing community structure in line with evolving challenges as reported by information communication agencies. Information about innovation, especially on climate change issues, in Africa has been conventionally originating and associated with formal organisations (Heeks *et al.*, 2013; African Development Bank Group, 2023). This is necessary but not sufficient because the capacity and desire to accommodate and adopt innovational change depend on the reliability of the information sources. Therefore, this study was designed to provide insights into the effectiveness of climate change communication strategies and to identify potential areas for improvement to increase public engagement and understanding of the issue.

Literature review

The 1995 World Summit for Social Development, held in Copenhagen, established the concept of integration for inclusive society. The summit conceptualizes social inclusion as an overarching goal with a multi-dimensional process that is critical to the promotion of sustainable human development. Sustainable development and inclusiveness are conjoined and can serve as an enabler in the attainment of desired structural transformation, increased prosperity and peaceful co-existence (UN-Habitat, 2015). However, global warming, climate change and poverty have been identified as one of the major challenges to sustainable development. This is further compounded by rapid urbanization and land use and land cover change, in most developing countries. Climate change has been documented as a principal factor undermining Africa's pathways to sustainable development (Agbola, 2011; UN-Habitat, 2015; Ayinu *et al.*, 2022). There is a demand and call to develop all-inclusive strategies to mitigate and adapt to climate change impacts. The strategies should also involve sustainable use of resources and protection of environmental common properties against the negative reactions and consequences of climate change ((Hiremath *et al.*, 2013; Moreno Pires *et al.*, 2014; Science for Environment Policy, 2015; Agbola and Kasim, 2019). The inclusive strategies, including the information dissemination process, will allow all community sectors to contribute to, and participate in, the developmental process collectively and equally, regardless of individuals' position and circumstances in the community (Asia Development Bank, 2011).

Globally, information and societies are conjoined (Nwagwu, 2006). The key to successful community engagement for inclusive development is hinged on efficient information gathering, processing and dissemination. In achieving a consensus on the sustainability and uptake of research outputs, information about the research must be adequately and inclusively disseminated. Dissemination is a range of activities designed to make project outputs available to persons not directly involved in a project. Therefore, in assessing the extent to which information dissemination efforts meet the goals and objectives of a programme, the disseminators need to develop performance criteria and measures of effectiveness

for the information disseminated. Performance criteria of any information can be assessed using three different but interrelated dimensions. These are the credibility of information, market penetration and the receiver's (individual's) response to the information. Information dissemination medium will be adjudged credible if it is accepted, utilized and has an expected impact on operations. Market penetration refers to the percentage of the potential audience reached by the information disseminated. Ultimately, the purpose of providing the information is to effect some changes in behaviour that will cause an improvement in, for example, human-environment interactions at an individual scale (Wenjing, 2011; Heeks *et al.*, 2013; Foster and Heeks, 2013).

Individuals acquire or require information for different reasons. The reason may include the need to learn about certain diseases, avoid potential danger and understand emergency preparedness arrangements (Wenjing, 2011). However, the critical questions associated with information dissemination processes are: what are you disseminating and who is the target audience? What is the reason for disseminating the information and what is the medium for disseminating it? What is the procedure to be adopted in engaging with the target audience throughout the process? Are there mechanisms in place for reflection, monitoring, evaluation and re-planning? How do you measure the success of information disseminated to the target audience? (King, 2003; Southwell *et al.*, 2005). In answering these questions, King (2003) observes that information disseminated by any means is primarily designed to achieve all or any of the following: create awareness, educate individuals and increase knowledge for action in meeting individuals' needs. To achieve the objective of information dissemination as observed by King (2003) and Wenjing (2011), the required information by individuals and society can be disseminated using different channels such as public engagement, mass media, social media, policy briefs, handbills, and person-to-person among other. For capacity building and development at an individual level, sources for information can be from a plethora of channels (Kaplinsky, 2011). Information can be disseminated using different (government, private social/informal) channels. These channels of

information dissemination have shown different levels of success and limitations based on credibility, market penetration and receivers' response to the channel of propagating the information (Wenjing, 2011; Pew Research Center, 2018). Unfortunately, for most of the human population, obtaining accurate and reliable information in the correct format at the right time may be difficult (Kaplinsky, 2011).

To address the limitations associated with existing information dissemination mediums, there is a need to develop alternative mechanisms for disseminating reliable information accurately to people in a reasonable time frame. In recent times, there has been an extension in the information dissemination process, incorporating alternative mechanisms with the active involvement of the private sector and non-governmental organisations such as Faith-Based Organizations (FBO) and Community-Based Organizations (CBO) as major partners for development (Marshall and Saanen, 2007; Farquharson *et al.*, 2011; Lyons, 2015; Swart and Nell, 2016; Chowdhury *et al.*, 2019). Therefore, involvement and collaboration with trusted civil society organizations and FBOs will help to restore the trust and confidence of citizens in the formal state programme intervention and research outputs on climate change. This collaboration will also aid the process of integration between formal and informal structures in climate change discourse (Olowu, 1999; Musick *et al.*, 2000; Alex-Assensoh and Assensoh, 2001; Wallace *et al.*, 2004).

In contemporary African societies, as applicable to many developing countries, religion is one of the most potent and rapidly growing institutions (Erlich, 2010; Abbink, 2011; Vaughan, 2016; Girma, 2018; Pew Research Center, 2018; Paul-Choudhury, 2019). Established Christian denominations and the Pentecostal movement are growing and have been substantially indigenized (Meyer, 1998). Religion plays an important role in spiritual and social development in Africa (Erlich, 2010; Abbink, 2011; Girma, 2018). However, in most countries, there is no formal and sustained engagement between these organisations and national governments on shared roles for community governance and policy implementation (Gifford, 1994; Erlich, 2010; Tilson, 2011; Karbo, 2013; Girma, 2018). It is important to note that

religious non-governmental organisations possess resources that can be tapped. One of the resources that religious organisations can bring to local-level development is trust and greater accountability for information credibility, market penetration and the receiver’s acceptability of information for action and implementation.

the quadrats selected, the number of residential buildings was counted and validated by ground-truthing.

Methodology

A survey research design was adopted for the study. Five major cities, Addis Ababa, Dire Dawa, Hawassa, Makelle and Bahir Dar, representing the regional primate and charter cities in the central, eastern, southern, northern and western parts of the country, respectively, were purposively selected as shown in Figure 1. The last National Population and Housing Census for Ethiopia was conducted in 2007. The data is outdated and may not account for key groups or areas (United Nations Population Fund (UNFPA), 2019; Qader *et al.*, 2021). Therefore, Google Earth™ imageries of the cities were obtained to aid in the delineation of the sample area for the study. Owing to the aerial expansion of Addis Ababa, four out of the existing 10 sub-cities were selected randomly to represent the city, as shown in Table 1. A 3x3 grid lines were imposed on the settlements’ Google Earth imageries to delineate them into quadrats. All the quadrats were numbered and a random sampling technique was used to select the required quadrats. From each of

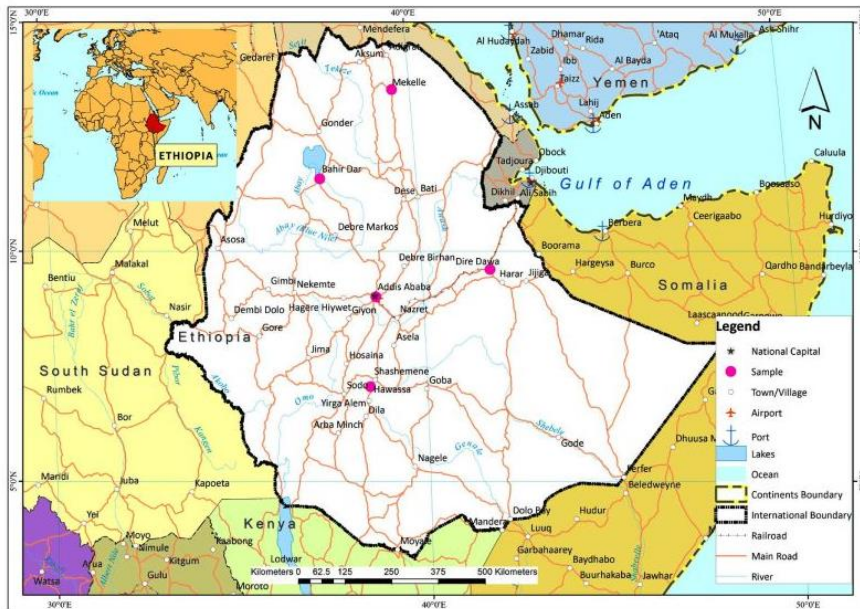


Figure 1: Study locations (Cities) in political map of Ethiopia context

Table 1: Sample frame and size for the selected cities in Ethiopia

Selected Cities	Residential Buildings in Selected Quadrats	Sample Size @ 10%
Addis Ababa Sub City		
Gullele Sub City	1367	136
Kolfe Keranio Sub City	2185	218
Arada Sub City	1088	108
Kality Akaki Sub City	928	92
Addis Ababa Sub City Total		554
Dire Dawa Administrative City	1789	179
Bahir Dar Special Zone	918	92
Mekelle	1104	110
Hawassa City Zone	1319	132
Grand Total	10698	1,067

A random sampling technique was used to select the sample size from the residential buildings in the selected quadrats. A structured questionnaire was administered to a household head per residential building. The designed questionnaire was revised by subject experts and validated by a pilot survey before administration. To determine if the questionnaire is capturing the information it is intended to measure in line with the goals and objectives of the study as noted by de Jong (2018) and Aithal and Aithal (2020), the pre-test of the data collection tools and questionnaire administration should be undertaken. This was done in the major settlements around the selected locations. The pilot studies were carried out on 15 persons each at Adama (Addis Ababa), Gondar (Bahir Dar), Adigrat (Mekelle), Shashemene (Hawassa) and Harar (Dire Dawa). This enabled the testing of the instruments and the level of acceptance by the respondents. The incorporation of the response from the pilot studies improved the feasibility of the study procedure and data collection process. Owing to the language barrier, the questionnaire was converted from the English language to Amharic, the official language of Ethiopia and Tygrigna, the local language in Mekelle, the northern part of the country. The questionnaire was administered in Addis Ababa, Hawassa, Dire Dawa and Bahir Dar using the Amharic language while the questionnaire for Makelle was administered using the Tygrigna language. A set of 1,067 copies of the questionnaire (10.0% of the sample frame) were administered to respondents. From the 1067 copies of the questionnaire administered, 1033, representing 96.8%, were duly completed for analysis that are presented in the form of frequency counts, percentages and table summaries.

To assess the extent to which information dissemination channels could be reliable and effectively inclusive, a set of performance criteria and measures of reliability about these efforts were developed. The reliability of the information sources on climate change in Ethiopia was determined using a 3-point Likert scale. The aggregated weighted mean index was used in analysing data using the 3-point Likert scale to evolve the residents' Reliability Index (RI). The Reliability Index was determined using the ratings "Very Reliable", "Reliable", and "Not Reliable" with assigned weights of 3, 2 and 1, respectively. The Reliability Weighted Value (RWV) for each item in the scales was obtained as the product of the number of responses for each rating to a variable and the respective weight of the value. The RI is obtained by dividing the reliability-weighted value of each score by the total number of respondents. This is expressed as follows:

where: RWV = Reliability Weighted Value,
 MRI = Mean Reliability Index,
 RI = Reliability Index
 N = Respondents

The total of the Reliability Weighted Value (RWV) for each variable was obtained by summing the product of the number of responses of each rating for a variable and the respective weight of the value. The total of the Reliability Weighted Value (RWV) for each variable was divided by the number of respondents to compute the reliability index as follows:

$$\text{Reliability Weighted Value} = 1n_1 + 2n_2 + 3n_3$$

Where n_1 , n_2 and n_3 = number of respondents for not reliable, reliable and very reliable, respectively

$$\text{Reliability Index (RI)} = \frac{\text{Reliability Weighted Value}}{\text{Total Number of Respondents (N)}}$$

The Mean Reliability Index (MRI) is computed as the average of the Reliability Index (RI) for a given dataset. This is determined by the summation of the Reliability Index for each item in the set and then dividing by the total number of items (N_i) as follows:

$$\text{Mean Reliable Index (MRI)} = \frac{\sum RI}{N_i}$$

The Mean Reliability Deviation (MRD) is calculated by subtracting the individual RI from the MRI. Any value higher than the average obtained is considered to be reliable. This is obtained as follows:

$$\text{Mean Reliability Deviation (MRD)} = \text{MRI} - \text{RI}$$

Results

Socio-economic indices (profiles) of the respondents considered were age, gender, educational qualification, occupation and income. Table 2 reveals that 52.4% of the respondents were females. The age classifications show that 15.4% of the respondents were less than 30 years old and 33.6% were aged 50 and above. Ethiopia is a religious country dominated by Orthodox Christians. From the analysis, the majority of the respondents (65.8%) in the cities were Orthodox Christians, 15.0% were Protestant Christians, 14.43% were Muslim, 4.3% were Catholic Christians and 0.5% belonged to other categories (mainly traditional religions and atheist). The Ethiopian Orthodox Church, having served as the official religion of the ruling elite until the end of the monarchy in 1974, has played a dominant role in the culture and politics of the country. Ethiopian political structure is influenced by ecclesiastic traditions (Girma, 2018). For centuries, religion has been central to everyday life in the country. Priests, wearing colourful robes and carrying ornate crosses, are frequently kissed by the people and the Christian faithful genuflect at the sighting of churches' domes. References to God abound in Ethiopian languages and the public

holidays in the country are largely determined by religion. The core area of Christianity is in the highlands of northern Ethiopia but its influence is felt in the entire country. Over 40 per cent of Ethiopians abide by the teachings of the Ethiopian Orthodox Church. About 20% of the citizens adhere to other Christian faiths, specifically, evangelical Christians. Islam is practised by about one-third of Ethiopians.

Distribution in terms of educational attainment revealed that 10.7% were illiterates, 17.1% could read and write, 18.9% obtained primary/adult education certificates, 25.3% had secondary/high school certificates and 28.0% had obtained post-secondary school education certificates. This structure of educational attainment shows that the literacy level of the respondents is high and the majority of those interviewed had adequate knowledge to comprehend the focus of the study. Employment/occupation structure, to a larger extent, is a function of educational attainments. Therefore, the education profile presupposed that the majority of the respondents would be employed. However, from Table 2, 25.18% of the respondents were unemployed and 28.9% were engaged in trading and business activities; 10.7% were artisans, 5.8% were urban farmers, 27.4% were civil servants and 2.0 were professionals. The monthly income of the respondents revealed that the majority (54.2%) earned less than Ethiopian Birr (ETB)3,000, 33.4% earned between ETB3,000 and ETB6,000 per month and 12.4% earned above ETB6,000 monthly (Table 2).

Household Data		Addis		Hawassa		Bahir Dar		Dire Dawa		Mekelle		All Cities	
		NR	%	NR	%	NR	%	NR	%	NR	%	NR	%
Gender	Male	201	37.2	99	79.8	55	57.3	72	43.9	65	60.2	492	47.6
	Female	340	62.8	25	20.2	41	42.7	92	56.1	43	39.8	541	52.4
	Total	541	100	124	100	96	100	164	100	108	100	1033	100
Age of Respondent	< 30 years old	72	13.3	8	6.5	27	28.1	33	20.1	19	17.6	159	15.4
	30 - 39 years old	101	18.7	51	41.1	25	26.0	47	28.7	28	25.9	252	24.4
	40 - 49 years old	139	25.7	37	29.8	22	22.9	51	31.1	26	24.1	275	26.6
	50 - 59 years old	98	18.1	16	12.9	10	10.4	23	14.0	21	19.4	168	16.3
	>=60 years old	131	24.2	12	9.7	12	12.5	10	6.1	14	13.0	179	17.3
	Total	541	100	124	100	96	100	164	100	108	100	1033	100
Religion	Orthodox	407	75.2	25	20.2	86	89.6	79	48.2	83	76.9	680	65.8
	Catholic	22	4.1	9	7.3	2	2.1	6	3.7	5	4.6	44	4.3
	Protestant	47	8.7	80	64.5	4	4.2	21	12.8	3	2.8	155	15.0
	Islam	64	11.8	8	6.5	4	4.2	56	34.1	17	15.7	149	14.4
	Traditional	0.0	0.0	1	0.8	0.0	0.0	0.0	0.0	0.0	0.0	1	0.1
	Atheist	1	0.9	1	0.8	0.0	0.0	2	1.2	0.0	0.0	4	0.4
	Total	541	100	124	100	96	100	164	100	108	100	1033	100
Highest Level of Education	Illiterate	64	11.8	1	0.8	9	9.3	19	11.6	18	16.7	111	10.7
	Read and write	98	18.1	16	12.9	14	14.6	20	12.2	29	26.9	177	17.1
	Primary/Adult	124	22.9	20	16.1	10	10.4	24	14.6	17	15.7	195	18.9
	Secondary Educ.	129	23.8	48	38.7	16	16.7	57	34.8	11	10.1	261	25.3
	Post-Secondary	126	23.3	39	31.5	47	49.0	44	26.8	33	30.6	289	28.0
	Total	541	100	124	100	96	100	164	100	108	100	1033	100
Occupation	Unemployed	190	35.1	2	1.6	13	13.5	41	25.0	13	12.0	259	25.1
	Trading/business	132	24.4	49	39.5	28	29.2	55	33.5	35	32.4	299	28.9
	Artisan	69	12.7	5	4.0	5	5.2	16	9.8	16	14.8	111	10.7
	Farming	9	1.7	16	12.9	0	0.0	19	11.6	14	13.0	60	5.8
	Civil Servant	125	23.1	52	41.9	50	52.1	33	20.1	23	21.3	283	27.4
	Professional	14	2.6	0.0	0.0	0.0	0.0	0.0	0.0	7	6.5	21	2.0
	Retired	2	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Other	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total	541	100	124	100	96	100	164	100	108	100	1033	100
Monthly Income	< 1500 Birr	211	39.0	6	4.8	23	24.0	35	21.3	26	24.1	301	29.2
	1500 - 2999 Birr	118	21.8	41	33.1	32	33.3	37	22.6	30	27.8	258	25.0
	3000 - 4499 Birr	69	12.8	44	35.5	25	26.0	55	33.5	18	16.7	211	20.3
	4500 - 5999 Birr	83	15.3	16	12.9	12	12.5	9	5.6	15	13.9	135	13.1
	>= 6000 Birr	60	11.1	17	13.7	4	4.2	28	17.1	19	17.6	128	12.4
	Total	541	100	124	100	96	100	164	100	108	100	1033	100

Note: NR is the number of respondents

The perception of the respondents on the major environmental issues in Ethiopia is presented in Table 3. From the responses, the most prominent environmental issue identified by the respondents was pollution (air and water) (25.5%). Minor environmental issues identified in descending order are: increasing temperature (18.0%), population increase and urban expansion (14.7%), waste disposal and management (12.8%), transportation issues (12.1%), flooding (8.3%), deforestation (5.3%) and resources depletion (3.3%). Perceptions of the respondents on drivers of climate change in Ethiopian cities in descending order are deforestation (29.6%), air pollution (19.5%), transportation activities (15.5%), industrial

activities (14.1%), increasing population and urban expansion (10.4%), urban concretization (land use and land cover change) (7.3%) and agricultural activities (3.6%).

The results of the perception of Ethiopian residents regarding climate as shown in Table 3 revealed that 92.8% of the respondents believed that the country was experiencing climate change. Among them, 66.1% associated climate change with an increase in temperature, while 26.8% perceived it in terms of changing intensity of rainfall, pattern, and flooding. Moreover, 73.8% of the respondents confirmed that Ethiopian cities were experiencing an increase in temperature, and 77.2% believed that the level and intensity of

rainfall and flooding were also increasing due to the climate change phenomenon. However, the respondents appeared to give little attention to the problem of deforestation and agricultural practices, although Ethiopia is an agrarian nation, and about 85% of the population depends on agriculture. It is worth noting that the largest carbon emission of the country is from the agricultural sector, particularly

the livestock sector (Gebremichael *et al.*, 2014). The study, also, revealed that urban expansion and concentration could lead to urban pollution and encroachment to peri-urban areas and urban land use/cover changes. This issue is particularly relevant in the cities of Dire Dawa and Bahir Dar, which are relatively warm compared to other locations in the country.

Environmental Issues	Addis Ababa		Hawassa		Cities Bahir Dar		Dire Dawa		Mekelle		Total		
	NR	%	NR	%	NR	%	NR	%	NR	%	NR	%	
Observed problems of													
Deforestation	31	2.4	12	4.5	31	10.8	10	2.8	49	18.7	133	5.3	
Pollution (air and water)	358	26.9	103	39.0	37	12.9	51	14.2	90	34.2	639	25.5	
Flooding/drought	68	5.1	10	3.8	23	8.0	87	24.3	19	7.2	207	8.3	
Waste disposal and management	169	12.7	32	12.1	23	8.0	55	15.4	40	15.3	319	12.8	
Transportation issues	214	16.2	33	12.5	30	10.5	21	5.8	5	1.9	303	12.1	
Increasing Temperature	252	18.9	34	12.9	74	25.8	88	24.5	3	1.1	451	18.0	
Resources depletion	15	1.1	8	3.0	3	1.0	8	2.2	49	18.6	83	3.3	
Population increases and Urban expansion	223	16.7	32	12.2	66	23.0	39	10.8	8	3.0	368	14.7	
Total	1330	100	264	100	287	100	359	100	263	100	2503	100	
Factors responsible (drivers) of climate change													
Deforestation	206	30.4	73	39.5	24	11.4	60	28.6	77	38.1	440	29.6	
Population and urban expansion	64	9.4	15	8.1	37	17.5	19	9.1	19	9.4	154	10.4	
Air pollution	141	20.8	23	12.4	46	21.8	34	16.2	45	22.3	289	19.5	
Urban concretization	53	7.8	7	3.8	19	9.0	17	8.1	13	6.4	109	7.3	
Transportation activities	88	13.0	42	22.7	47	22.3	34	16.2	20	9.9	231	15.5	
Industrial activities	104	15.4	23	12.4	24	11.4	41	19.4	17	8.4	209	14.1	
Agricultural activities	22	3.2	2	1.1	14	6.6	5	2.4	11	5.5	54	3.6	
Total	678	100	185	100	211	100	210	100	202	100	1486	100	
Variables	Responses												
Climate change	Changing	496	91.0	118	95.2	89	92.7	153	93.3	106	98.1	962	92.8
	Not changing	49	9.0	6	4.8	7	7.3	11	6.7	2	1.8	75	7.2
	Total	545	100.0	124	100.0	96	100.0	164	100.0	108	100.0	1037	100.0
What is/are often changing	Temperature	351	64.4	69	55.7	78	81.3	88	53.7	99	91.7	685	66.1
	Rainfall intensity	135	24.8	52	41.9	18	18.7	64	39.0	9	8.3	278	26.8
	Both	59	10.8	3	2.4	0	0.0	12	7.3	0	0.0	74	7.1
Total	545	100.0	124	100.0	96	100.0	164	100.0	108	100.0	1037	100.0	
Temperature	Increasing	407	74.7	82	66.1	84	87.5	96	58.5	96	88.9	765	73.8
	Decreasing	138	25.3	42	33.9	12	12.5	68	41.5	12	11.1	272	26.2
	Total	545	100.0	124	100.0	96	100.0	164	100.0	108	100.0	1037	100.0
Rainfall/ Flooding	Increasing	476	87.3	71	57.3	94	97.9	112	68.3	48	44.4	801	77.2
	Decreasing	69	12.7	53	42.7	2	2.1	52	31.7	60	55.6	236	22.8
	Total	545	100.0	124	100.0	96	100.0	164	100.0	108	100.0	1037	100.0

As shown in Figure 2, 82.1% of respondents obtain their information on climate change from mass media, with television being the most common source (50.7%), followed by radio (25.6%) and newspapers (5.8%). The remaining 17.9% get their information from other sources, including 6.1% from friends and family, 4.3% from local educational institutions, 2.9% from government agencies, 2.4% from social media, 1.5% from environmental groups, and 0.7% from faith-based organisations and informal discussions. Interestingly, respondents in Mekelle showed a different pattern compared to the rest of the cities, such as cosmopolitan Addis Ababa. They reported

the mass media as their primary source of information on climate change. This could be because the information is mostly disseminated in the local language, Tigrigna, which is preferred in the region. Additionally, the Tigray People’s Liberation Front (TPLF) has had a strong influence on the federal government in the region, and the people of Tigray tend to be pro-government, particularly in terms of regional government. Therefore, the government-controlled entity may be a more viable medium for disseminating information on a phenomenon in the region than other regions of the country.

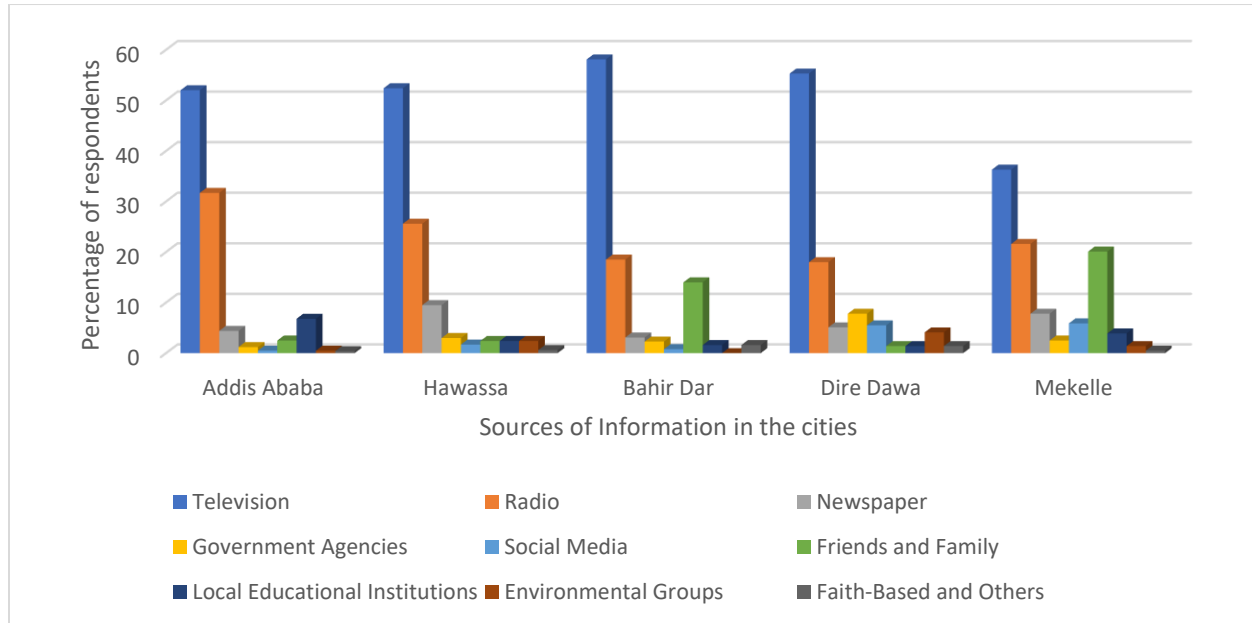


Figure 2: The sources of information about climate change

Table 4 presents the reliability of sources of information about climate change in Ethiopia. The Reliability Index (RI) was used to determine the reliability of each source, including all the sources combined. The mean RI for sources of information on climate change in Ethiopian cities is 3.076. Among all the sources, faith-based organisations (FBO) had the highest RI of 3.509. The remaining sources ranked in descending order based on their RI, with social media (3.278), local environmental groups (3.262), family and friends (3.146), and educational institutions (3.136). These rankings indicate that faith-based organisations were perceived as the most reliable sources of climate change information in Ethiopian cities. Conversely, government agencies and conventional media had lower RI values of 2.536 and 2.660, respectively, and were considered less reliable sources of information on climate change.

The perceived reliability of different sources of climate change information in different cities of Ethiopia is provided as follows. In Addis Ababa, the mean RI value for all sources of information on climate change was 3.199, which is above average. However, family and friends (3.137RI), media (2.449RI), and government agencies (2.342RI) were perceived to be less reliable than other sources. In Makelle City, the mean RI value was 3.373. Family

members (3.741RI), faith-based organisations (3.630RI), and the media (3.583RI) were considered to be the most reliable sources of information on climate change. However, sources such as educational institutions (3.296RI), government agencies (3.231RI), scientists and environmental groups (3.139RI), and local communities (2.991RI) were perceived to be less reliable. In Bahir Dar, Hawassa, and Dire Dawa, family and friends and faith-based organisations were considered to be the most reliable sources of information on climate change, except for Hawassa where a local community was deemed to be the most reliable source with a mean RI value of 3.315. The study suggests that it is important to use a range of sources to improve the perception of climate change information, as people tend to have a poor perception of mass media as a reliable source.

Table 4: Climate change information sources reliability index

Cities	Sources for climate change information	3 VR	2 R	1 NR	N	RWV	RI	MRI
All the Cities	Family and Friends	1722	1164	364	1033	3250	3.146	3.076
	Educational Institutes	1740	1080	419	1033	3239	3.136	
	Local Environmental Groups	2289	699	382	1033	3370	3.262	
	Government Agencies	738	897	985	1033	2620	2.536	
	Faith-Based Organisation	2673	753	199	1033	3625	3.509	
	Social media	2025	1023	338	1033	3386	3.278	
	Conventional media	957	834	957	1033	2748	2.660	
	<i>Total</i>					22238	21.528	
Addis Ababa	Family and Friends	780	729	188	541	1697	3.137	3.199
	Educational Institutes	969	561	204	541	1734	3.205	
	Local Environmental Groups	1434	291	139	541	1864	3.445	
	Government Agencies	228	354	685	541	1267	2.342	
	Faith-Based Organisation	1326	426	123	541	1875	3.466	
	Social media	1149	522	143	541	1814	3.353	
	Conventional media	246	432	647	541	1325	2.449	
	<i>Total</i>					12117	22.397	
Makelle	Family and Friends	342	57	5	108	404	3.741	3.373
	Educational institutes	213	108	35	108	356	3.296	
	Local Environmental Groups	210	84	45	108	339	3.139	
	Government Agencies	153	177	19	108	349	3.231	
	Faith-Based Organisation	312	69	11	108	392	3.630	
	Social media	117	165	41	108	323	2.991	
	Conventional media	297	78	12	108	387	3.583	
	<i>Total</i>					2550	23.611	
Bahir Dar	Family and Friends	153	105	33	96	291	3.031	3.089
	Educational institutes	156	69	50	96	275	2.865	
	Local Environmental Groups	177	57	45	96	279	2.906	
	Government Agencies	93	66	84	96	243	2.531	
	Faith-Based Organisation	324	33	7	96	364	3.792	
	Social media	288	60	7	96	355	3.698	
	Conventional media	114	120	36	96	269	2.802	
	<i>Total</i>					2076	21.625	
Hawassa	Family and Friends	201	90	66	124	357	2.879	3.080
	Educational institutes	252	108	38	124	398	3.210	
	Local Environmental Groups	246	99	53	124	398	3.210	
	Government Agencies	156	132	40	124	328	2.645	
	Faith-Based Organisation	333	87	18	124	438	3.532	
	Social media	261	108	42	124	411	3.315	
	Conventional media	162	87	94	124	343	2.766	
	<i>Total</i>					2673	21.556	
Dire Dawa	Family and Friends	249	183	69	164	501	3.055	2.929
	Educational institutes	153	234	89	164	476	2.902	
	Local Environmental Groups	228	168	94	164	490	2.988	
	Government Agencies	108	168	157	164	433	2.640	
	Faith-Based Organisation	381	138	37	164	556	3.390	
	Conventional Media	213	168	102	164	483	2.945	
	The media	144	117	163	164	424	2.585	
	<i>Total</i>					3363	20.506	

Discussion

The study evaluated sources of information on climate change and the reliability of the sources to aid the uptake of research on climate change in Ethiopia. Respondents for the study were selected from five cities in Ethiopia. The socio-economic indices indicated that about 90.0% of the respondents were literate and old enough to evaluate climate trends in the country. The income accruing to the respondents generally in Ethiopia is

low. This could hardly support the daily needs of the majority of the respondents bearing in mind the high cost of living in the major cities. This could harm environmental management and resource utilisation. The capacity to cope with climate change-induced disasters could also be compromised leading to increasing poverty and vulnerability to environmental challenges (Gebremichael *et al.*, 2014; Ayinu *et al.*, 2022)

Ethiopia, like other countries in sub-Saharan Africa, is vulnerable to climate change and its associated effects (Harris *et al.*, 2020; Ayanlade *et al.*, 2022; Ayinu *et al.*, 2022). The environmental and social issues identified in the study included pollution (air and water), increasing temperature, population increase and urban expansion, waste collection, transportation issues, flooding, deforestation and resource depletion. These issues have been documented in the literature to have implications on or for climate change either as drivers or outcomes. For example, air pollution and other environmental issues are usually generated locally but with international implications on climate change as a result of the concatenation of the global atmosphere (Ramanathan and Feng 2009; Kasim *et al.*, 2018). Human activities as noted by Etyemezian *et al.* (2005) have contributed significantly to air pollution owing largely to fossil fuel consumption. In addition to this, poor land use planning, weak capacity to monitor air quality and insufficient pollution control measures have consequences for local meteorological parameters on the one hand and will subsequent, on the other hand, feedback on global climate change (Kasim *et al.*, 2018).

As noted by Beatley (2009), managing climate change and its impact is a function of the coping capacity of communities. This depends significantly on existing local community institutions and social networks (Aldrich, 2012). Mitigation and adaptation strategies are usually strengthened by using the community's knowledge of climate change impacts; improved social and economic trends; community norms and values systems; positive and healthy partnerships among formal actors and social groups and organisations; and strong social communication infrastructures. Several researches have been done in Africa on climate change and its impacts on sustainable development. Also, over the years, in developing countries, a lot of resources have been deployed to propagate information on climate change and its associated impacts, using a variety of mediums. As indicated in this study, about 85.0% of the sources of climate change information were from government establishments. The state controls most broadcasting outlets and there is a state monopoly on the telecommunication system in Ethiopia. Access to the internet and mobile telephone

services have been constrained in the country during incidences of social unrest (Grinberg, 2017; Hernández and Anthonio, 2022). As observed by Heeks *et al.* (2013), the reliability level of information produced and disseminated using a centralized government system is always low and this validates the finding of this study. With the primary involvement and control of the Ethiopian government in the information dissemination structure, the citizens generally have apathy towards information emanating from government institutions such as the mass media. The long period of government control and high handedness, on the critical issue of development including and, especially human rights, may be part of the reasons why citizens are skeptical of information from the public information dissemination apparatus.

To change the general perception that people have about a phenomenon, information about the issue and the reliability of the source of information are important. Therefore, it is important to evolve an all-inclusive strategy to disseminate information about climate change and its impact. For example, in public relations research, religion is a relatively unexplored territory for inclusive development which can be used to influence public opinion about global issues, such as climate change (Clarke, 2010; 2013). Religion and family are central to society, especially in religious-conscious countries such as Ethiopia. As observed in the study, the family, local community, environmental group and educational institution had a higher RI value than the mean RI for the study. However, the major source of information on climate change as captured in the study is the media. This outcome presents a paradox where the major source of information on climate change is from the media and it is the least reliable. This can only be explained as emanating from a deep distrust of government-controlled media houses as agents of propaganda (Yetnayet, 2010; Gedion, 2010).

All the identified dissemination agents cannot be divorced from the family and religion. For instance, the family is the bedrock of religious institutions and information from the religious organisations is mostly disseminated through the family. However, with the larger influence of religious institutions as an agent of ecclesiastical and emotional change, studies have regularly recognized the role of religion as a facilitator of

citizen participation in political activities, community engagement, environmental action, volunteerism, social-organisational membership and other behaviours through which society seeks to control, exert power and influence developmental agenda (Alex-Assensoh and Assensoh, 2001; Musick *et al.*, 2000; Wallace *et al.*, 2004; Pew Research Center, 2012; 2018; Paul-Choudhury, 2019). Faith-based organisations have been taken for granted in the developmental agenda, largely due to their proselytization attributes (Heist and Cnaan, 2016). The share number of persons who identify with religious groups is about 84% of the global population (Pew Research Center, 2012), therefore, there is a need to engage the untapped population resource at the disposal of religious institutions in Africa for sustainable development.

A survey by Pew Research Center (2018) indicates that the share of persons in sub-Saharan Africa who consider religion to be very important in daily lives is very high, ranging from a high of 98% in Ethiopia to a low of 71% in Botswana with a regional average of 89%. A holistic view of FBO activities shows that, like other organisations, FBO is designed to improve the living conditions in the communities where they are located using mores, teachings and generally acceptable injunctions (Rakodi, 2012; Gifford, 2015; Heist and Cnaan, 2016). Therefore, information dissemination strategy should incorporate the role that faith plays in transforming customs, norms, and other behavioural aspects of humans to expected dictates in mitigating and adapting to climate change (Mueller, 2004; Tilson and Venkateswaran, 2004; Tilson, 2011).

In addressing the need for action in climate change mitigation and or adaptation, King (2003), using a farming process analogy, identifies three possible phases and purposes of dissemination. The first phase is termed 'scattering abroad' by sowing the seed. This phase primarily refers to the propagation of information about an innovation (climate change) through publishing and reporting of research findings, twitting, blogging, emails and websites. In this study, 'scattering abroad' is satisfied by the media houses based on their reliability index. The second phase is termed 'sowing'. This involves explicitly guiding the scattering of the information, for example, on climate change in a more targeted manner to the

audience. This is satisfied by the government agencies, educational institutions, environmental groups and the family. The final phase is called 'propagating, breeding or growing, reproducing and nurturing' the growth of the seed planted in a precise location. This entails the adoption and or use of an innovative strategy piggy-backed on an existing working entity such as FBO to nurture the uptake of the sowing as indicated by its reliability index in this study.

For example, throughout the history of Ethiopia, religion has played significant roles in the socio-economic and political development of the country (Erlich, 2010; Abbink, 2011; Girma, 2018). As documented in the literature, religious institutions in Ethiopia are venerated and the utterance of priests carries a lot of respect and weight (Erlich, 2010; Karbo, 2013). This is the role this study is advocating for, the hitherto neglected, FBO in the quest to translate information on climate change into action and reality. In performing this role, Shoenberg (2001) likens FBO to the grafting strategy where buds and branches of information are attached to strong rootstock for effectiveness and sustainability. As shown in this research, the sources of information on climate change, in Ethiopia, can be strengthened with the inclusion of FBO as a medium for disseminating information. For example, the media and communication experts can collaborate with FBO to design climate change-specific mitigation or adaptation strategies that focus on tree planting; waste management; water, sanitation and hygiene (WASH); and holistic environmental management. As noted by Olowu (1999), most public relations programmes are yet to fully integrate religious institutions as stakeholders in discussion and or research communication. Therefore, communication professionals, whether educators or practitioners, should foster religious dialogue and mutual understanding of the working of FBOs as agents of change in climate change issues (Tilson, 2011).

Conclusion

Climate change is a global problem that has local impacts and drivers. Ethiopia, a country in Africa, is vulnerable to the effects of climate change, while also contributing to greenhouse gas emissions. The consequences of climate change can reverse the progress Ethiopia has made in development. Consequently, it is crucial to have a comprehensive

approach to educating everyone in the country about climate change, its causes, and solutions. This requires collective action aimed at reducing greenhouse gas emissions, minimizing exposure to climate change impacts, protecting people, and reducing their vulnerability to climate shocks. Climate change is a global issue that affects everyone, regardless of race, gender, religion, or political affiliation. In Ethiopia, religious institutions play a significant role in the country's political and social landscape, making them valuable partners in raising awareness about climate change and promoting strategies to adapt and mitigate its effects. Reliable information dissemination on climate change is essential for the sustainability of mitigation and adaptation strategies in Ethiopia. Faith-based organisations (FBOs) offer a platform to propagate information on climate change impacts and drivers in Ethiopia. However, concerns such as proselytization and member focus need to be addressed. Despite these concerns, FBOs play a critical role in achieving the development and uptake of research outcomes. Thus, in Ethiopia, with its strong religious attachment, the involvement of FBOs in climate change discourse and information dissemination is crucial. Future research should be carried out on the appropriate mechanisms to incorporate climate change-related activities into religious discourse to achieve effective results and an all-inclusive climate change information mechanism.

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Declaration of interests

The author declares that he has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this manuscript.

References

- Abbink, J. (2011). Religion in public spaces: Emerging Muslim–Christian polemics in Ethiopia. *African Affairs*, 110(439), 253–274.
- African Development Bank Group (2023). *Innovation & entrepreneurship for climate action in Africa. Africa Economic Brief*, Vol. 14, Issue 9. Abidjan; African Development Bank Group. Retrieved on 30 December, 2023 from <https://www.afdb.org/fr/documents/innovation-entrepreneurship-climate-action-africa-volume-14-issue-9>.
- African Union (2022). *The African Union Climate Change and Resilient Development Strategy and Action Plan (2022-2032)*. Addis Ababa, The African Union.
- Agbola, S. B. (2011). Climate Change and Poverty in Nigeria. *Regional Development Dialogue*, 32(1), 54–79.
- Agbola, S. B. and Kasim, O. F. (2018). Urban Development, Climate Change and Disaster Management Nexus in Africa. Keynote paper presented at the “Sustainable African Cities” Conference Organized by the Ghana Academy of Arts and Sciences (GAAS), the Network of African Science Academies (NASAC) and the German National Academy of Sciences Leopoldina and held in Accra, Ghana between the 4th and 6th July, 2018.
- Aithal, A. and Aithal, S. (2020). Development and Validation of Survey Questionnaire & Experimental Data – A Systematical Review-based Statistical Approach. *International Journal of Management, Technology, and Social Sciences (IJMTS)*, 5(2), 233–251.
- Aldrich, D. P. (2012). Social, not physical, infrastructure: The critical role of civil society in disaster recovery. *Disasters*, Vol. 36, 398–419.
- Alex-Assensoh, Y. and Assensoh, A. B. (2001). Inner-City Contexts, Church Attendance and African-American Political Participation. *Journal of Politics*, Vol. 63, 886–901.
- Anukwonke, C. C., Enohetta, B. T., Nwafor, D. C. and Malik, K. T. (2022). Climate Change and Interconnected Risks to Sustainable Development. In Bandh, S. A. (ed.). *Climate Change: The Social and Scientific Construct*. Springer Cham. <https://doi.org/10.1007/978-3-030-86290-9>. pp 71–86.
- Asian Development Bank (2011). *Key Indicators for Asia and the Pacific 2011: Framework of Inclusive Growth Indicators, Special Supplement*. Mandaluyong City, Philippines, Asian Development Bank.
- Ayanlade, A., Oluwaranti, A., Ayanlade, O. S., Borderon, M., Sterly, H., Sakdapolrak, P., Jegede, M. O., Weldemariam, L. F. and Ayinde, A. F. O. (2022). Extreme climate events in sub-Saharan

- Africa: A call for improving agricultural technology transfer to enhance adaptive capacity. *Climate Services*, 27, 100311. <https://doi.org/10.1016/j.cliser.2022.100311>.
- Ayinu, Y. T., Ayal, D. Y., Zeleke, T. T. and Beketie, K. T. (2022). Impact of climate variability on household food security in Godere District, Gambella Region, Ethiopia. *Climate Services*, 27, 100307. <https://doi.org/10.1016/j.cliser.2022.100307>.
- Beatley, T. (2009). *Planning for Coastal Resilience: Best Practices for Calamitous Times*. Washington, DC, Island Press.
- Chowdhury, S. R., Wahab, H. A. and Islam, M. R. (2019). The role of faith-based NGOs in social development: Invisible empowerment. *International Social Work*, 62(3), 1055-1074. doi:10.1177/0020872818767260.
- Clarke, G. (2010). Trans-faith Humanitarian Partnerships: The Case of Muslim Aid and the United Methodist Committee on Relief. *European Journal of Development Research*, 22(4), 510-528.
- Clarke, G. (2013). Religion and development: Challenges for donors and for faith groups. In Moksnes, H. and Melin, M. (eds.). *Faith in Civil Society Religious Actors as Drivers of Change*. Uppsala; Uppsala Centre for Sustainable Development, Uppsala University. pp 13-30.
- de Jong, J. A., Dorer, B., Lee, S., Yan, T. and Villar, A. (2018). Overview of Questionnaire Design and Testing. In Johnson, T. P., Pennell, B., Ineke A. L., Stoop, I. A. L. and Dorer, B. (eds.). *Advances in Comparative Survey Methods: Multinational, Multiregional, and Multicultural Contexts (3MC)*. New York, John Wiley & Sons, Inc. pp 113-137. <https://doi.org/10.1002/9781118884997.ch6>.
- Erllich, H. (2010). *Islam and Christianity in the Horn of Africa: Somalia, Ethiopia, Sudan*. Boulder, Colorado; Lynne Rienner.
- Etyemezian, V., Tesfaye, M., Yimer, A., Chow, J. C., Mesfin, D., Nega, T., Nikolich, G., Watson, J. G. and Wondmagegn, M. (2005). Results from a pilot-scale air quality study in Addis Ababa, Ethiopia. *Atmospheric Environment*, Vol. 39, 7849-7860.
- Farquharson, E., Yescombe, E. R., de Mästle, C. T. and Encinas, J. (2011). *Public-Private Partnerships in Emerging Markets: How to Engage with the Private Sector*. Washington DC: PPIAF/World Bank, 2011.
- Food and Agriculture Organisation (FAO) (2009). *How to Feed the World in 2050*. Rome: FAO.
- Foster, C. and Heeks, R. B. (2013). Conceptualising inclusive innovation: modifying systems of innovation frameworks to understand diffusion of new technology to low-income consumers. *European Journal of Development Research*, 25(3), 333-355.
- Gebremichael, D., Gebremichael, A. T., Worku, A., Abshare, M. W., Habtemariam, Y. M., Balcha, G. and Gebremichael, D. (2014). *Building Urban Resilience: Assessing Urban and Periurban Agriculture in Addis Ababa, Ethiopia*. Nairobi; United Nations Environment Programme (UNEP).
- Gedion, T. (2010). Freedom of expression in Ethiopia: the jurisprudential dearth. *Mizan Law Review*, 4(2), 201-231.
- Gifford, P. (1994). Some recent developments in African Christianity. *African Affairs*, Vol. 93, 513-534.
- Gifford, P. (2015). *Christianity, Development and Modernity in Africa*. London: Hurst.
- Girma, M. (2018). Religion, politics and the dilemma of modernising Ethiopia. *HTS Teologiese Studies/Theological Studies*, 74(1), 4878-4886.
- Grinberg, D. (2017). Chilling Developments: Digital Access, Surveillance, and the Authoritarian Dilemma in Ethiopia. *Surveillance & Society* 15(3/4), 432-438.
- Harris, I., Osborn, T. J., Jones, P. and Lister, D. (2020). Version 4 of the CRU TS monthly high-resolution gridded multivariate climate dataset. *Scientific Data*, 7(1). <https://doi.org/10.1038/s41597-020-0453-3>.
- Heeks, R., Amalia, M., Kintu, R. and Shah, N. (2013). *Inclusive Innovation: Definition, Conceptualisation and Future Research Priorities Reference Paper No. 53*. Manchester; Centre for Development Informatics Institute for Development Policy and Management, SEED University of Manchester.
- Heist, D. and Cnaan, R. A. (2016). Faith-Based International Development Work: A Review. *Religions*, Vol. 7, 19. doi:103390/rel7030019.
- Hernández, M. D. and Anthonio, F. (2022). *The Return of Digital Authoritarianism Internet Shutdowns in 2021*. The #KeepItOn Campaign. <https://www.accessnow.org/wp-content/uploads/2022/05/2021-KIO-Report-May-24-2022.pdf>.
- Hiremth, R. B., Balachandra, P., Kumar, B., Bansode, S. S. and Murali, J. (2013). Indicator-based urban sustainability: A Review. *Energy for Sustainable Development*, 17(6), 555-563.
- Intergovernmental Panel on Climate Change (IPCC) (2007). *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Summary for Policymakers* Retrieved on 20th June, 2008 from <http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1-Print-SPM.pdf>.
- IPCC (2022). *Climate change: a Threat to Human Wellbeing and Health of the planet. Taking Action Now Can Secure Our Future — IPCC*. IPCC. Retrieved on 12 December, 2023 from <https://www.ipcc.ch/2022/02/28/pr-wgii-ar6/>.

- Kaplinsky, R. (2011). Schumacher meets Schumpeter: Appropriate technology below the radar. *Research Policy*, 40(2), 193-203.
- Karbo, T. (2013). Religion and social cohesion in Ethiopia. *International Journal of Peace and Development Studies*, 4(3), 43-52.
- Kasim, O. F. (2018). Wellness and Illness: The Aftermath of Mass Housing in Lagos, Nigeria. *Development in Practice*, 28(7), 952-963.
- Kasim, O. F., Abshare, M. and Agbola, S. B. (2018). Analysis of Air Quality in Dire Dawa, Ethiopia. *Journal of the Air and Waste Management Association*, 68(8), 801-811.
- Kasim, O. F., Agbola, S. B. and Oweniwe, M. F. (2020). Land use land cover change and land surface emissivity in Ibadan, Nigeria. *Journal Town and Regional Planning*, Vol. 77, 71-88. DOI: <http://dx.doi.org/10.18820/2415-0495/trp77i1.6>.
- Ki-Moon, B. (2007). *Climate Change Has No Respect for Borders and Affects All*. New York, UN News Centre.
- King, H. (2003). Disseminating educational developments. In P. Kahn and D. Baume (eds.). *A guide to staff and educational development*, London: Kogan. pp 96-115.
- Lyons, K., Walters, P. and Riddell, E. (2015). The Role of Faith-based Organizations in Environmental Governance: The Case of Forestry in Solomon Islands. *Journal of Environmental Policy and Planning*. DOI:10.1080/1523908x.2015.1098524.
- Marshall, K. and Saanen, M. V. (2007). *Development and Faith Where Mind, Heart, and Soul Work Together*. Washington, D.C; World Bank.
- Meyer, B. (1998). Commodities and the power of prayer: Pentecostalist attitudes towards consumption in contemporary Ghana. *Development and Change*, Vol. 29, 751-776.
- Moreno Pires, S., Fidélis, T. and Ramos, T. B. (2014). Measuring and comparing local sustainable development through common indicators: Constraints and achievements in practice. *Cities*, Vol. 39, 1-9.
- Mueller, B. (2004). *Dynamics of international advertising: Theoretical and practical perspectives*. New York, Peter Lang Publishing.
- Musick, M. A., Wilson, J., Bynum, W. B. Jr. (2000). Race and Formal Volunteering: The Differential Effects of Class and Religion. *Social Forces*, Vol. 78, 1539-1571.
- Nwagwu, W. E. (2006). Integrating ICTs into the globalization of the poor developing countries. *Information Development*, 22(3), 167-179.
- Obama, B. (2015). We can no longer delay action on climate change. *Miami Herald*, April 28, 2015. Retrieved on 30th April 2015 from <http://www.miamiherald.com/opinion/op-ed/article19830744>.
- Odufuwa, B. O., Odufuwa, B. A. and Fasina, S. O. (2012). Climate Change and Livelihood: The Two Sides of a Coin. *Indonesian Journal of Geography*, 44 (1), 53-66.
- Olowu, 'Dele (1999). Professional Developments: Building strong local government through networks between state and non-governmental (religious) institutions in Africa. *Public Administration and Development*, Vol. 19, 409-412.
- Paul-Choudhury, S. (2019). Tomorrow's God: What is the Future of Religion? BBC Future's Best of 2019 Collection. Retrieved on 6 September 2020 from <https://www.bbc.com/future/article/20190801-tomorrows-gods-what-is-the-future-of-religion>.
- Pew Research Center (2012). *The Global Religious Landscape*. Washington DC, Pew Research Center.
- Pew Research Center (2018). *The Age Gap in Religion Around the World*. Washington DC, Pew Research Center.
- Prakash, S. (2008). *Climate Change Hinders Progress on MDGs*. New York: Media Global. Retrieved on 16th September, 2008 from <http://www.media-global.org/article/2008-05-11/climate-change-hinders-progress-on-mdgs>.
- Qader, S., Lefebvre, V., Tatem, A., Pape, U., Himelein, K., Ninneman, A., Bengtsson, L. and Bird, T. (2021). Semi-automatic mapping of pre-census enumeration areas and population sampling frames. *Humanities and Social Science Communication*, 8(3). <https://doi.org/10.1057/s41599-020-00670-0>.
- Rakodi, C. (2012). A framework for analysing the links between religion and development. *Development in Practice*, Vol. 22, 634-650.
- Ramanathan, V. and Feng, Y. (2009). Air Pollution, Greenhouse Gases and Climate Change: Global and Regional Perspectives. *Atmospheric Environment*, 43: 37-50.
- Science for Environment Policy (2015). Indicators for sustainable cities. In-depth Report 12. Produced for the European Commission DG Environment by the Science Communication Unit, UWE, Bristol. Retrieved on 23 February, 2018 from <http://ec.europa.eu/science-environment-policy>.
- Shoenberg, R. E. (2000). *Disseminating Proven Reforms: An overview*. US Department of Education.
- Southwell, D., Gannaway, D., Orrell, J., Chalmers, D. and Abraham, C. (2005). Strategies for Effective Dissemination of Project Outcomes: A report for the Carrick Institute for Learning and Teaching in

- Higher Education. Queensland: The University of Queensland and Flinders University.
- Swart, I. and Nell, E. (2016). Religion and Development: The Rise of a Bibliography. *Hervormde Teologiese Studies*, 72(4), 1–27.
- Tilson, D. J. (2011). Public Relations and Religious Diversity: A Conceptual Framework for Fostering a Spirit of Communitas. *Global Media Journal*, 4(1), 43-60.
- Tilson, D. J. and Venkateswaran, A. (2004). Toward a peaceable kingdom: Public relations and religious diversity in the U.S. *Public Relations Quarterly*, 49(2), 37–44.
- UN-Habitat (2011). Cities and Climate Change: Policy Directions. *Global Report on Human Settlements 2011*. London, Earthscan.
- UN-Habitat (2015). *Sustainable Urban Development in Africa*. Nairobi, UN-Habitat.
- United Nations Environment Programme (UNEP) (2008). Environment and Disaster Risk: Emerging Perspective. Geneva. Prepared on behalf of the ISDR Working Group on Environment and Disaster Reduction, UNEP.
- United Nations Population Fund (UNFPA) (2019). *New Methodology: a hybrid census to generate spatially disaggregated population estimates*. Retrieved April 9, 2024, from <https://www.unfpa.org/resources/new-methodology-hybrid-census-generate-spatially-disaggregated-population-estimates>.
- Vaughan, O. (2016). *Religion and the making of Nigeria*. London, Duke University Press.
- Vidal, J. and Radford, T. (2005). One in Six Countries Facing Food Shortage. *The Guardian*, Thursday, June 30, 2005. Retrieved on 14 September, 2008 from <http://www.guardian.weekly.com.uk>.
- Wallace, J. M. Jr., Myers, V.L and Holley, J. (2004). *Holistic Faith-Based Development: Toward a Conceptual Framework*. New York; An independent research project of the Rockefeller Institute of Government supported by The Pew Charitable Trusts.
- Wenjing, L. (2011). Government information sharing: Principles, practice, and problems - an international perspective. *Government Information Quarterly*, Vol. 28, 363-373.
- Yetnayet, K. (2010). *Chained independence: the influence of political officials on the independent political news reporting of Ethiopian media*. Saarbrücken: VDM Verlag.