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**Understanding the Drivers of
Drought in Somalia: Environmental
Degradation as a Drought Determinant**

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TABLE OF CONTENTS

LIST OF ABBREVIATIONS -----	4
EXECUTIVE SUMMARY -----	5
KEY FINDING -----	6
KEY RECOMMENDATIONS -----	7
1. INTRODUCTION -----	8
2. METHODOLOGY -----	12
3. ENVIRONMENTAL DEGRADATION FACTORS AS DRIVERS OF DROUGHT -----	13
3.1 THE PROBLEM OF POPULATION GROWTH-----	14
3.1.1 POPULATION GROWTH IN SOMALIA ACORDING T O STATISTICS-----	14
3.1.2 POPULATION GROWTH ACCORDING TO COMMUNITY ORAL REGISTRATION-----	14
3.2 THECOSTOFURBANIZATIONORRURALCOLONIZATION-----	14
3.2.1 THE PROBLEM OF THE PROLIFERATION OF THE WATER CATCHMENTS (BARKADO)-----	15
3.2.2 THE PROBLEM OF TRAFFIC MOVEMENTS-----	10
3.3 DEFORESTATION-----	18
3.3.1 DATA OVERVIEW-----	18
3.3.2 DEALING WITH THE FIELDS FOR A SEARCH OF DATA-----	19
3.3.3 THE ROLE OF THE FOREST TO REDUCE GLOBAL WARMING-----	22
3.4 SOIL EROSION-----	23
3.5 THE QUESTION OF CLIMATE CHANGE-----	23
3.5.1 GLOBAL DIMENSIONS-----	23
3.5.2 THE BACKGROUND AND NATURE OF ENVIRONMENT OR CLIMATE CHANGE IN SOMALIA: A HISTORY OF 8000YR TRACEABLE TREND-----	24
A PICTURE OF THE CURRENT SITUATION-----	26
3.5.3 DROUGHT PROFILE IN SOMALIA -----	28
4. CONCLUSION AND RECOMMENDATION -----	29
4.1 CONCLUSION-----	29
4.2 RECOMMENDATION-----	30
5. REFERENCES -----	31
APPENDIX -----	35

LIST OF TABLES

Table 1:	Comparative environment-related indicators (% except CO2 emissions) -----	20
Table 2:	Proration of 40 year 55% vegetation-cover loss-----	24
Table 3:	Historical environment or climate change in Somalia-----	28

LIST OF FIGURES

Figure 1a: Oil change place on the main road of Garowe, June 9, 2016-----	13
Figure 1b: Oil change place in the front of Garowe government offices, and near the former Puntland State headquarters, Nov. 5, 2017-----	13
Figure 2: Overall cause-and-effect relationships-----	15
Figure 3 a: Kalabayr, a Barkad-created rural town, 56 KM SW of Garowe. Before the first barkad was dig here in late 1960s, this decertified valley was a forest, June 9, 2016. -----	18
Figure 3 b: Barkad without a cover at Kalabayr due to loss of traditional cover, duur, June 9, 2016.-----	18
Figures 4 a & b: This truck transported herding families to this valley, but over run more times on the place for more services for them on the same day. The field damage should develop to be a gully. But how about fields over run by heavier trucks, May 25, 2017.-----	19
Figure 5a: Barkad-created Fardhaddin town, 55 KM W of Garowe. the last remaining of duur were up-rooted to cover rural houses and barkads, June 2, 2016.-----	22
Figure 5b: rural house covered by duur,Kalabayr, June 9, 2016.-----	22
Figure 6: During the spring of 2015, Geelnuujis which means camel-feeding place, received around 600 MM of rain, the highest rate that a place in Somalia can usually earn. Why then is this young he-camel a weak and grazing the thorny sarmaan, supposedly unfavorable tree for him in a wet season? It's because most of the small plants in the place are invasive plus that, camels prefer to graze the tall trees. That is the fate of where trees were once dwarfing the camels, May 31, 2015-----	22
Figure 7: The historical forest of Darayle Springs at Garowe is recently replaced with prosopsi.-----	23
Figure 10: Lake Cuun , 50 km NE of Garowe, 4 km long and 60 m wide, is one of the few remaining lakes and springs in Nugaal valley. We recently found here ruins of sizeable medieval city which is apparently "Badda" of Al-Idriisi (1154) and Ibn Said (1260s). Obviously the lost city of Badda, which means 'the sea', was named after the lake which was far greater than today's one, May 31st, 2016-----	29

LIST OF ABBREVIATIONS

BP:	Before present
CE:	Common Era (AD)
FAO:	Food and Agriculture Organization of the United Nations
KM:	Kilometer
M:	Meter
MM:	Millimeter
PDRC:	Puntland Development Research Center
SIDRA:	Somali Institute for Development and Research Analysis
UNDP:	United Nations Development Programme
WSP:	War-Torn Societies Project

EXECUTIVE SUMMARY

Drought recurrence is a persistent phenomenon in Somalia. The latest one has continued for the last three years. Although the subdued Gu rains that fell between April and May provided some temporary relief, the depressed nature of this critical precipitation means the country is still experiencing the pangs of the drought to a great extent. At least for the herding community rainfall does not mark the end of drought. Rainfall failure is traditionally viewed as primary cause of a drought shock. Furthermore, overexploitation of natural resources leading to their degradation especially the vegetation cover (trees, grass etc) is a major contributor to drought conditions. The environmental degradation is basically characterized by depleting the natural resources and environmental pollution. These basic problems are themselves driven by population growth, rising urbanization, overgrazing, deforestation, soil erosion and climate change.

The raging drought continues to choke a society that has already been weakened by shrinking pasture for livestock well-being and declining rural family income. The effects of environmental degradation are such that, even sufficient rainfalls do not adequately solve the problem as they contribute to further erosion in a land whose vegetative-cover ability has already been degraded, further reducing productivity. Moreover, the great efforts of the herders to save the herding lifestyle by utilizing new techniques such as expanding water points, and adopting mobile watering and transporting systems exacerbate the problem.

In the foregoing, the society is left with only two options; to continue watching the deterioration increase in scale and veracity towards an irreversible national disaster or taking determined, short-term emergency actions combined with long-term solutions such as adoption of a sedentary pastoralist system and integrative natural resource management.

A common cause of misunderstanding of the nature of the problem maybe an impaired methodological or conceptual approach which may not represent the exact needs/ views of the local communities. For example, most of the existing materials tend to explain land degradation primarily through charcoal production; or identify drought mostly with climate change. For a researcher or a decision-maker, this concept may be misleading, and for a pastoralist it may lead to terminological inconvenience. Available climate change information systems lack details for localised needs; some approaches of development agencies do not deliver the required message or benefits at best; and local communities do not comprehend the meaning of climate change and what is required to for its mitigation. An essential way of avoiding these misconceptions is respecting the interconnection between human-caused environmental degradation factors and the way they contribute to the drought problem.

This study analyzes five of the factors, namely population growth, cost of urbanization or rural colonization, deforestation, soil erosion and the climate change.

KEY FINDINGS

- **Population growth.**

Somalia's population growth rate has been estimated at 2.4% per year, one of the highest rates in the world. The number of the households in northern Somalia has increased to 221% during the last 30 years. According to our survey, 195 families that existed in mid-1987 have produced at least 431 additional families during the 30 years. Our finding (see below, the appendix and section 3.1.2) corroborates the estimation of 2011 which holds that around 45% of the Somalis are less than 15 years. Another indication of population pressure on the pasturelands is unusual rural-to-urban migration. Nearly 67% of those households now live in the cities but still keeping pressure on the rural resources. Of these, 91% have joined the city life throughout the last 30 years while only 9% of them represent the city residents of 30 years ago. Unusual demographic trends represent unusual loss of the land resources. The biggest resource loss in Somalia has occurred during the last eight decades, specifically the last 40 years, because of population and technology growth. However, the population growth is a problem in Somalia because of poor natural resource management

- **Cost of urbanization.**

The Somali pastoralists seek usually to use the most productive available technology for exploitation of the rangeland resources. Reduction of the resources necessitates adoption of a new technology to reach out the remaining forage. There was a time (1960s-1990s) that the technology of barkado (dams) were allowing maximization of forage and water consumption in the rangelands. Today, they aren't, because the rangelands are fully colonized and abated. Consequently, trucks, water tankers, and large water containers go to the fields to enable the herders to attain the last remaining of the forage. It's the dream of every rural family to acquire these technologies but their destructive impact on the environment is not taken into consideration. This has created a new system of destructive-mechanised nomadism. As the process leads to further desertification, there is no

sign of an option left for the traditional Somali pastoralism except adapt to the changing environment. With continuation of the traditional pastoralism, effective resource management or conservation is apparently untenable.

- **Deforestation and desertification.**

All species of grasses, most of forbs (non-grass small plants) and shrubs, and the wildlife elements; animals, birds or plants, have mostly gone at least in northern and southeastern parts of the country. For the last 30 years, nearly 70 to 90% of the vegetative-cover in the valleys and 25 to 35% of the plants in the hills has been lost. New plants can hardly rise, and the remaining plants have poor regrowth ability due to drought and overgrazing. Annual deforestation rate is about 4% -- a sign of a rapid desertification process. Water and human-caused gully erosions and invasive plants will overtake most of the pasturelands soon. These environmental indications strongly suggest that, the remaining vegetation will most likely be lost in five to ten years.

- **Soil erosion.**

Rapid loss of vegetation-cover means rapid soil erosion and soil nutrient losses. As a result, in every half a km² at least in the north-of-Shabeelle regions, there is a sign of soil erosion be it boholo (deep gully), jeexdin (riff), dhudhub (gorge), gawaan (dead flat surface), bataax (subsoil), or bacaad (died sand).

- **Climate change.**

Somalia has been facing traceable environmental or climate change for the last 8,000 years. However, the increase of frequency and duration of the droughts; the dry up of many springs and the traditional autumn humidity; and the non-human-caused loss of some plants and many species of birds, might explain the effects of current climate change. But, the more obvious interconnection between the droughts and the land erosion is that, an amount of rain that was enough to sustain the survival of certain number of animals over 30 years

unprecedented deterioration of the land productivity.

- **Weak Policy.**

The available policies toward natural resource management are concerned with short term emergency actions such as resource conservation. But this option is not sustainable. Additionally, the environment of the ongoing automobile-

borne nomadic pastoralism is neither manageable nor sustainable. Sustainable resource management requires interplay of short-term emergency actions and long-term strategic solutions. These requirements can be achieved through integrated approaches of resource management including encouragement of sedentary pastoralism.

KEY RECOMMENDATIONS

There are currently a good number of recommendations in relation to the environment and drought problems provided by different studies on Somalia. The recommendations in this study are addressed at the end of the document. They are derived from its findings; and accordingly deal with new initiatives.

Short-term action strategies

- Mobilize and sensitize the general public on: the meaning and magnitude of environmental degradation and its impact on the survival of the national endowments; creating and supporting pro-environment social movements; and pressuring the governmental institutions to begin taking necessary actions towards environmental protection services.
- Control developmental activities to ensure they adhere to environment regulations and create an environmental police department to enforce environmental regulations.
- Enact and enforce regulations to manage the currently unrestricted traffic and population movements and the new phenomenon of the destructive-mechanized mobile nomadism.
- Encourage proper investment in fodder planting and stocking for strategic consumption.
- Prevent the new water points from turning to be desertification points by regulating the use of the land surrounding them while building pro-environment dams initially at sea-entering togs (seasonal rivers).
- Control proliferation of urban settlements.
- Stop inappropriate or illegal privatization of more-favored public rangelands by urban-based groups; and encourage investing in less-favored areas and reversing their degradation by agricultural developments.

Long-term solution strategies

- Encourage and develop establishment of sedentary pastoralism, creating a pilot program for the encouragement and for the strategy.
- Work with the urban based relatives of pastoral communities in rural areas to transform their assistance to contribution in forming sedentary pastoralism.
- Reduce the population pressure on the traditionally-coveted Hawd by developing less-favored coastal and inland plains.

1. INTRODUCTION

Traditionally, modern states or societies have mostly been preoccupied by efforts towards economic development. Economic development programs have largely been undertaken at the expense of environmental protection. People are happy with a new product without paying attention to the adverse effects on the environment and humans. And this makes the difference between a passive observer and a concerned citizen. The ignorance of many people about the needs of the natural environment or what environmental scientists call "perils of ignorance" represent social and political factors that contribute to the problem¹. The scientists emphasize that, "No citizen of the Earth can afford to be ignorant of environmental issues."² This attitude has gradually changed by action of pro-environment social movements and academic efforts, governmental policies and actions.³ Today, many environmental academicians recognize the necessity of providing the whole nature of the environmental problem through education. As the local environmental problems are linked with the global ones, comprehensive education and understanding is seen as the first step toward environmental conservation action.

The process of environmental degradation or environmental impact refers to the effects of human activities on the natural environment. Human activities alter the nature and cause resource depletion and environment pollution. This means that the population growth and industrial technology are the two main forces that lead to negative environmental impact. These two forces use too much input from the natural resources and produce too much output from these resources for their unlimited needs. This

means resource depletion and pollution. The population growth is inherently multiplicative by reproduction and the technological growth is correspondingly multiplicative by expansion and enlargement.⁴ The impact of these two forces on the environment is explained⁵ in the following equation: Impact = Number of Individuals x Consumption per Individual, or simply $I = P \times C$.

What constitutes the 'environment' anyway? The environmental system integrates the four spheres of our Earth: the biosphere which includes all life such as humans, animals and plants; the hydrosphere which includes oceans, seas, lakes, rivers and ground water; the atmosphere which is the gaseous cloud that surrounds the Earth; and the lithosphere which is the energy and minerals. If a mistake occurs in one sphere, that mistake affects the well-being of other spheres. For instance, the fossil fuel of lithosphere is excavated and burned for energy needs. The process of energy production brings chemical wastes to all spheres and particularly releases gases to the atmosphere. The polluted atmosphere eventually causes global warming. Global warming disturbs the hydrosphere system by instigating floods. It also disturbs the biosphere system again by drought shocks and agricultural problems. In addition, uncontrolled human consumption causes deforestation. The deforestation affects the atmosphere which means further disturbances in other spheres.

Environmental scientists warns that humanity stands today at unique crossroads. The current situation strongly suggests that the Earth and its inhabitants will drastically be changed by environmental outcome in the next few decades.⁶ Accordingly, there

¹ Michael McKinney & Robert Schoch, 1998, *Environmental Science: Systems and Solutions*, pp. 3-6.

² McKinney, Robert, and Logan, 2007, *Environmental Science*, p. 2.

³ McKinney et al., 2007, p. 15 with chapter 20.

⁴ However, economic developments are achieved through technology, so it's not about the technology itself but how and for what it's used.

⁵ McKinney et al., 2007, *Environmental Science*, pp. 9-12.

⁶ Sharp, Z., editor. 2011. *Annual Editions: Environment 10/11, unit 4 with the preface*; McKinney et al., 2007, pp. 13-14; Mann, M., and Lee K., 2009, *Dire Predictions*

are only two options, as they suggest.⁷ First: to deal with uncertain future, when the population growth is over resource capacity and technology continues to be harmful to the nature at a level in which the environment can't decently support more than few people. Second: to work for sustainable future by modifying the technology to make it helpful or at least less harmful to the environment, with managing the population growth wisely in accordance with resource limitation. This necessitates also a lifestyle modification.

Where Somalia ranks in this environment stressed world?

In Somalia, the level in which the productivity of the environment can support a decent life might be the lowest because of the rate of the ongoing degradation. Indeed, the situation in rural Somalia can be a good example of an uncertain future. Somalia has long been suffering from uncontrolled land degradation caused by human activities and accelerated by drought effects, and absence of environmental services and disaster-control means. In fact, Somalia is ranked at number 7 out of 233 countries and regions in the world experiencing the highest impact of the climate change in 2011-12.⁸ In Somalia, the high toll of this impact attributed to the climate change is actually taken largely by the directly human-caused degradation factors such as abuse of natural endowments.

From late 1980s onwards, the Somalis have been ignoring or miscomprehending the problem due to lack of awareness and leadership crises. The "untold human tragedy in the loss of the lives, wealth and dignity during the era of agony and aberration has been accompanied with loss of the land itself to deep environmental destruction."⁹ As description of the tragedy, African Development Bank Group has recently

noted, "There is no institutional framework and policy for environmental protection and water resources management. Beside the conflict, this facilitated desertification, destruction of valuable grazing zones and fertile soil for agriculture and livelihoods. The overall damage has yet to be assessed, but it is likely to be significant.

The critical ecological degradation will be difficult to reverse."¹⁰ That is also the view of the latest studies on the issue.¹¹

Over the last ten years, few sites, mostly in the north of the country, have benefitted from an assistance mostly provided by the European Union. But this is almost cancelled by the size of the problem. The Somali government is now starting to deal with the problem. But the Somali move is still limited to proposing policies toward mitigating drought effects and environmental degradation.

Problems in the presented environmental policies

First, the available documented policies for environmental protection usually mention 'conservation' as a protection approach. These policies focus on conservation actions within the existing pastoral system.¹² But the question is, how can it happen when the existing system licenses a continuation of unmanageable way of pastoralism and a serious violation of the carrying capacity of the rangelands? Conservation is one of three approaches for environmental protection. The approaches include preservation, conservation and restoration. In other words, resource-use can be minimized by these three approaches. Preservation (dhawrid) is the first one of them. It means protecting a land in its natural condition. The land is prevented from usage so its original biodiversity is allowed to be sustained. Conservation (tashiil) is using a resource carefully and

⁷ McKinney et al., 2007, p. 14.

⁸ Government of Somalia and United Nations – Somalia, 2015-2017, UN Joint Programme of Sustainable Charcoal Production.

⁹ Said Hussein, 2011, Long Term Solutions for Drought Prevention in Somalia.

¹⁰ African Development Bank Group, Somalia: Country Brief, 2013, P. 4.

¹¹ Government of Somalia and United Nations – Somalia, 2015-2017, UN Joint Programme.

¹² For example see, Puntland Government of Somalia, Puntland Environmental Policy, 2014. This is the first and one of the most detailed policies presented so far in Somalia.

efficiently. Resource-use efficiency is pursued. For example, overgrazing and other deforestation practices are determinedly avoided. Restoration (soocelin) is a work of returning a resource almost to its natural state. In other words, restoration is a renewal of a degraded land.

Unfortunately, it's physically clear that the Somali environment has largely lost the opportunity of applying preservation. So with restoration is a costly job, conservation option is usually entertained in the policies. But one option is too little for Somalia. By definition, conservation is not necessarily providing services for restoration of the lost resources. That can be achieved by restoration operations. The environmental scientists urge that resource sustainability can be realized only by utilization of the all options.¹³

Secondly, the policies focus mostly on short-term emergency actions without dealing explicitly with the long term solutions. Long-term solutions can be represented by seeking sedentary pastoralism through a pilot program. Understandably, the establishment cost of a sedentary pastoralism may seem to be high at this time. But the benefits of its manageability in the long run should pay off its initial high cost. The cost of staying on the current course may even exceed the cost of sedentarization. In fact, many families tend now to sedentarize themselves, but the absence of a functioning government impedes their efforts. The Somalis like to copy the developments. If the pilot program succeeds, the pastoralists will follow the pattern.

To be sure, sedentarization is only environmental and developmental necessity here. It's not sociopolitical or socioeconomic transformation necessity as claimed by some who like to depict the sedentarization, not the pastoralism, as it "was the precondition for a civilized life", according to the observation of Korf and others.¹⁴ Contrary to that view, historical Somali pastoralism

have demonstrated that, the Somali herders have been enjoying higher life standard, freer economic opportunities, and better orientation to mercantilism and connection with the international trade system than the other societies in the greater Horn of Africa including the supposedly-sedentary groups. Historical Somali pastoralism has hardly existed without trade partnership and without services for the world's demand in natural products,¹⁵ an issue that has long been ignored. It is sadly degraded today by the environmental problems and the impact of local and regional politics.¹⁶

Thirdly, even the trade squeezes on the pastoralism from a new front today. Because of absence of any commercial check, merchants usually import a lot of poor quality manufactured goods. Most of these goods are used for a short time and thrown as waste which is dumped into the environment. The policies may mention waste management without addressing the hazard of this anti-environment, anti-economy avoidable garbage.

Fourthly, there is no sign of practical will to take an action for saving the environment. Realistically speaking, unrestricted environmental destruction means irresponsible human action of unavoidably or selfishly exploiting the common natural endowments by the society. This, itself, is due to an absence of institutional responsibility and public consciousness toward taking care of the public properties. The Somalis as individuals or institutions continue practically to ignore or to misread what constitutes environmental destruction and what results from such destruction. For instance, all types of automobile oil changes are daily made openly in the front of main government offices, and in the middle of the rangelands and waterways. Does this need a big money or a tough policy? Actually no; it needs just a municipal order of stopping the practice and a simple action of follow up. What is then the point of putting words as a policy on a paper?

¹³McKinney et al,2007,pp.15,154

¹⁴Korf et al, 2015, p. 1.

¹⁵Hussein, 2014; Leonard, 2007; Devereux, 2006, FAO, 2004.

¹⁶Devereux, 2006; FAO, 2004.



Figure 1a: Oil change place on the main road of Garowe, June 9, 2016.



Figure 1b: Oil change place in the front of Garowe government offices, and near the former Puntland State headquarters, Nov. 5, 2017

Finally, traditional tendency of explaining the land degradation primarily by the charcoal production problem; and identifying the droughts mostly with climate change¹⁸ is reflected in the policies. Comprehensive scoping of the dimensions of the problem is the requisite of usefulness of a policy or action. The purpose of this paper is to demonstrate why rainfall deficiency isn't the only driver of drought in Somalia for the case of the herding community.

¹⁷For example see: Government of Somalia and United Nations – Somalia, 2015-2017, UN Joint Programme; Leonard, 2007, *The Political Economy of Livestock Policy Among the Somalis*, P. 16; Farah et al, 2015, *Charcoal and Deforestation*.

¹⁸Government of Somalia and United Nations, 2015-17.

2. METHODOLOGY

The research approach of this study is mixed: besides interviews, survey questionnaire and review of the existing records, the researcher carried out field research for the last three years in areas of northeastern Somalia. The field research was supplemented with experience in the situation of the pasturelands between Harar plateau and Cal Mountains in 2008 and 2002, and Lower Jubba region in 1991-92. But the true personal insights go beyond that experience as the researcher is a child of a pastoralist family.¹⁹ The researcher sought an answer for a question of, what is the research design that can enable us to measure the extent of vegetative-cover loss in a Somali terrain. One problem is that, there is no much quotable environmental statistics on Somalia. However, there is a reality on the ground. In fact, an experience is inferred from the previous statistics on the natural resources which mostly fail to reflect the reality on the ground apparently due to relying on presumed statistical numbers not field assessments.²⁰ Without intimate field assessment, it's difficult to measure environmental degradation in Somalia.

Besides the experience of the researcher, the people who use the land in question, the herders, almost know the difference of vegetation-cover between two given periods. Every season in the year they assess the situation of the forage on the fields. They know the seasonal trends; the main stages of decline of certain plant or plants; and the long term changes in the vegetative-cover. But still the researcher sought, on the bases

of his experience, to challenge self in the situation and to understand the weaknesses and strengthens of their experiences, and the pitfalls in their judgements. Corroboration was not only sought from among the various judgements of the informants but also from between theirs and that of the researcher. The judgements on the extent of overall vegetative-cover loss throughout 40 years with increasing rate were almost unanimous. But estimations on the periodical pattern of the obvious cover changes were quite varied, although there were no extreme variations. For that case, a conclusion was driven from the level of strengthens among a set of criteria which include the following: a majority-minority judgement scenario; informant's publicly-recognized special knowledge on the issue; the researcher's observation and experience in the issue.²¹

The study approached 27 key informants, known to having special knowledge on the aspects of the problem. The interviews were open as a convenience for herder's way of data provision and also for data refinement.²² These efforts ensured data came from experienced informants who understand the dimensions of the environmental situation and the requirements of a knowledge claim. Reflections and insights from these various experiences did not only give the researcher a capacity to safeguard biased information from the interviews but also to get good quality data.

¹⁹The research is also based on two interlinked studies conducted by the author in 2016 to which this study relates also. The research methods of those studies were similarly mixed. (Said Hussein, 2016, 2017, *Factors Affecting Cattle Production in Puntland State of Somalia; Pending Collapse in Somali Pastoralism: Socioeconomic Factors Affecting the Survival of the Sector*; (unpublished).

²⁰Hussein (a), 2017, section 2.4, 4.4.

²¹For more on the research design, see section 5.1.2 for population growth and section 4.3.2 for vegetation loss.

²²However, besides the key informants, the author dealt with ideas and opinions of tens of individuals who belong to all social segments. When conducting a conversation with a target informant, the situation was sometimes turning to be like 'focus discussion group'. This actually reflects the pastoralists' statement of, "Talo reer maaro waa loo dhammaadaa – a discussion about a family's forage management must be inclusive". That is why the author preferred to leave anonymity the names of informants, due to their number and diversity.

3: ENVIRONMENTAL DEGRADATION FACTORS AS DRIVERS OF DROUGHT

Selectively, five fundamental problems: population growth, cost of rural colonization, deforestation, soil erosion, and climate change are treated here as causes of environmental degradation which further cause the drought. The following figure shows the overall interaction:

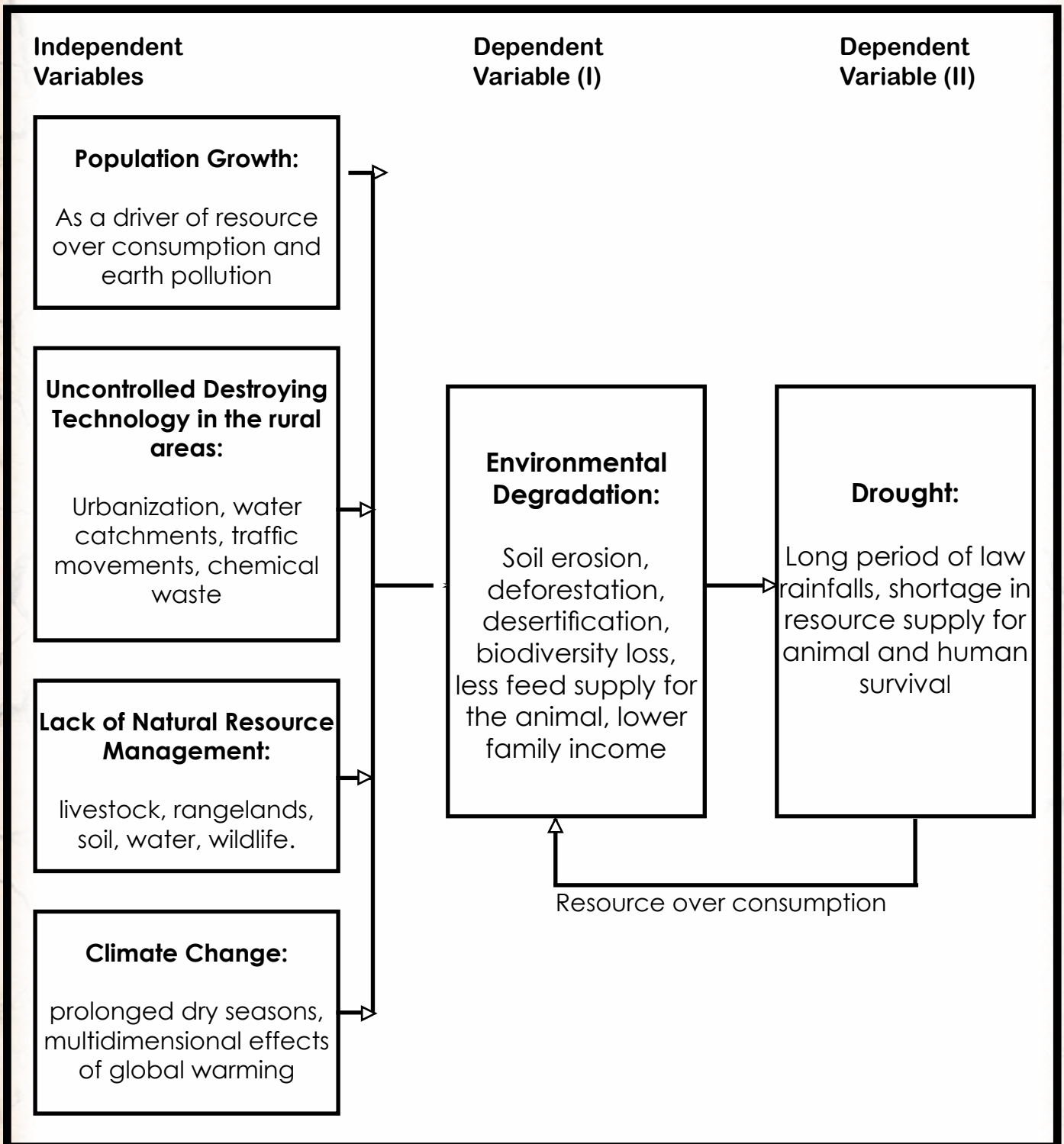


Figure 2: Overall cause-and-effect relationships

3.1 The Problem of Population Growth

3.1.1 Population growth in Somalia according to statistics

The human population was approximately 1 billion in 1800; 2 billion in 1930; 5 billion in 1987; and it is over 7 billion in 2017. This makes the case of the Population growth as one of the major factors in the respect of the environmental degradation.²³ Like the most other countries in Africa and the Middle East, Somalia is one of the countries that have the highest population growth rate in the world. Somalia's population growth rate has recently been estimated at 2.4% a year while the average rate of population growth in Africa is 2.3% annually. Nonetheless crude death rate (per 1,000) in Somalia is 15 persons per year comparing to 12.6 of average rate in Africa. The higher crude death rate in Somalia is compensated for by a higher crude birth rate (42.9 in Somalia compared to 34.2 per 1,000 in Africa) such that the growth rate in Somalia still remains high. On the other hand, population density (persons per km²) in Somalia is comparatively low (15 in Somalia compared to average 3.4 in Africa).²⁴ However benefits of the lower population density in Somalia for the environment are compromised by other factors including high rate of deforestation and desertification. For instance, the arable land in Somalia is estimated to be only 1.6% out of the total land area to compare with Africa's average 7.8%.

3.1.2 Population growth according to community oral registration

An easier way to estimate population pressure on the resources for local understanding is to know about the changes in the number of families of extended family between two given periods and where they live today. For example, if the families of extended family were four in 30 years ago, how many families does the extended family consist of today?

How many of them did live in a city 30 years ago and how many of them do so now? City means here both the urban cities and rural towns where household's income doesn't mainly come from shepherding.

Extended family here is a family or number of families that share a grandfather or a father with grown sons. The families of married daughters aren't included. This might be the most convenient unit because it's somewhere between one man's family and a sub-clan. The approach must be based on the Somali way of oral community registration. The head of the families mostly know the number of the individuals or families of the extended family or even a sub-clan. A researcher or enumerator must know and carefully collect the situational data. It isn't like a sort of quick questions taken from an interviewee to fill up a form. It's a conversation through which the interviewee understands the type of the questions of the interviewer. So the latter is aware of a possible misunderstanding on the part of the informant.

This survey found that 195 families which existed in mid-1987 have increased to 626 families (see the appendix, table 4). The households that ceased to exist were deducted, so the net increase is 431 (626 – 195). The net increase is then 69% of the current total while only 31% of the total represents the original 195 households. In other words, the households increased up to 221% during the last 30 years. This may go along with estimation of 2011 which proposes that, the age of almost 45% of the Somalis is less 15 years.²⁶ On the same token, thirty years ago, the city-dwelling households from the 195 families were 22%, but now they are 67%. This means that, about 91% of them have joined the city life during the last 30 years with only 9% of them represent the city residents of 30 years ago.

²³McKinney et al., 2007, p. 29.

²⁴African Development Bank Group, Somalia, 2015, Annex 6.

²⁵Ibid.

²⁶See below, table 1.

This shows that the growth of the number of the families was too high for the last 30 years, and the increase of rural-to-urban migration has similarly been very high. Regardless of the statistics, it's locally well known that, the high majority of today's urban population originated from the rural areas during the last 30 years. There is no indication that the rural family has more children than the urban family. The new comers in the cities are mostly young generation which has no confidence in this herding lifestyle.²⁷

High rural-to-urban migration is indicator of population increase and resource decrease. As further indicator, a herding population that is likely to occupy today a given area of land in a season of normal rainfall is apparently four times more than it was 40 years ago. Likewise, unlike 30 years ago, no pastureland is allowed to replenish even in a season of a good rainfall. The pattern of family expansion and rural-to-urban migration has been steady for the last seventy years in the north-of-Shabeelle Somalia i.e. northern and southeastern regions. Some localized differences could exist but the pattern can anyway be generalized. These findings can then be applied to those entire parts of the country at least.²⁸

It may appear that the lower growth in the numbers of rural families would reduce the pressure on the natural resources. But that is not the case actually, because demands from and for the countryside do not change. For example, many new comers employ themselves in activities that keep pressure on the resources such as land-grabbing, contributing to barkad-building, driving trucks that collect the charcoal, or other undoing traffic and trade movements among the cities or between the cities and the countryside. Thus the urban population is largely still exploiting the rural resources in one way or another.

However, on the bases of today's geographical population distribution, it can be observed that the issue of population growth leads to pasture shrinkage. The more the pasture area shrinks the more a large population comes to concentrate on specific grazing area, and causes a devastating violation of the carrying capacity. Accordingly, the population growth is mainly made a problem by the absence of mechanism of mitigating drought effects and controlling the deforestation process and population movement.

3.2 The Cost of the Urbanization or Rural Colonization

3.2.1 The Problem of the Proliferation of the water-catchments (barkado)

Besides the wells and natural water-catchments, the man-made rain-fed water source in traditional Somalia was waro (sing. war). Waro are open surface dams. The Somalis have been digging and using these water-catchments since time immemorial in less watered areas. By late 1950s, another kind of water-catching system called barkado (sing. Barkad) was adopted in the north of the country. The barkad, a cemented cistern or dam, was probably introduced

from Yemen or modeled from 'war'. Since then the use of wells has significantly been replaced with the barkado in the north-of-Shabeelle regions.

As an example, there were around 750 barkads in 1970s in the Hawd of Xarshin district,²⁹ South of Hargeysa. But today there are over 3000 of them in the district. Another example, in late 1960s, there were about three barkado points with few barkads in the Hawd between Garowe and Gaalkacyo. But today there are barkado-

²⁷Hussein, 2017 (a), section 2.3.3.

²⁸The process of urbanization was probably slow traditionally in non-coastal areas of the south-of-Shabeelle regions. But even in these regions, the situation has drastically been changing during the last 30 years

²⁹Korf, B., Hagmann T., and R. Emmenegger, 2015, *Re-spacing African Drylands*.

created settlements in every 20 kilometers approximately in Hawd region with thousands of individual barkads. Nevertheless, among the groundwater sources, barkado provide the least water share. They contribute about 10% to groundwater consumption in the country.³⁰ But they cause a big damage

because they have been built in the heart of the rangelands. The barkado points turned to be cities and villages. They were the first step of rural urbanization or 'colonization'. Today they are seen as drivers of unrestricted urbanization, environmental destruction, and crisis in rural sanitation.³¹



Figure 3 a: Kalabayr, a Barkad-created rural town, 56 KM SW of Garowe. Before the first barkad was dig here in late 1960s, this decertified valley was a forest, June 9, 2016.



Figure 3 b: Barkad without a cover at Kalabayr due to loss of traditional cover, duur, June 9, 2016.

Still barkado are going to be replaced with portable plastic water containers (haamo). With a volume capacity of 40 barrels, haamo are filled up by water tanker at the side of the station of the herding families. In fact, it was observed that whenever these pastoralists experience scarcity of resources, they resort to environment-destroying technology. The process continues in the absence of a regulatory framework. X The camel-borne herding system is now replaced with vehicle-borne one. Likewise, camel-borne trade activities in the countryside are eliminated by a trade through country-going vehicles. You can call this a country colonization, rural colonization, or simply urbanization. But we need to understand the environmental costs of the services provided by such colonization.

3.2.2 The Problem of the Traffic Movements

Besides the water erosion, the traffic movement is the largest force that creates the gully formation today. With its maintenance needs such as oil changes, it has become a big destructive technology. Camels play insignificant role in rural transportation today, a role that is being left out without proper considerations on the effect of the alternatives. as animals move further and further away in search of pasture, herders use lorries to ferry water causing further environmental damage. Rural supply of goods from urban areas also use automobiles. Animal and forest products are similarly transported to the villages and

³⁰Somali Institute for Development and Research Analysis (SIDRA), 2016, *Climate Change in Somalia*.

³¹Since the barkado points are now cities and villages, most of them get the rain water through open canals today. The author observed that, a truck oil-change was made on a barkad canal.

cities by the automobiles. The Lorries were designed to transport commercial goods but in Somalia they are converted to carry everything, even the camels. Hundreds of lorries and other vehicles go daily to all fields. They cause yearly a deep destruction that would take water and wind erosions to accomplish for many years.



Figures 4 a & b: This truck transported herding families to this valley, but over run more times on the place for more services for them on the same day. The field damage should develop to be a gully. But how about fields over run by heavier trucks, May 25, 2017.

There is also a proliferation of mobile trade camps which require daily traffic movement. Urban families driving mostly Land Cruisers always visit also the rural families. Camping at a corner of remote valley in south of Garowe at the end of May, this year, the study observed over ten times of traffic errands at the place in one day. By an assistance of urban-dwelling relatives, every rural family has owned or is working to own a truck to eliminate the cost of renting it.

Another negative aspect, whenever a rain falls on somewhere, every family rushes to take a truck to become the first one who gets there. After a few hours the place becomes full of people and animals. The phenomenon is called "Rays dardar". Rays is a wet soil by rain; dardar means crash or overtake. The expression means, 'even before the plants began to come out, the wet soil is overrun and destroyed'. So immature grazing is not even waited for. The use of mobile telephone also contributes to the problem. Almost all adults of a rural household, including late teenagers, have a mobile telephone. These telephones provide benefits for the herders such as information sharing. This information-sharing accelerates the phenomenon of 'Rays Dardar'

3.2.3 The new trend of the tragedy

What is the recent vehicle-borne mass migration to Bari Somalia telling us? For nearly three years, most of the Somali Peninsula has been experiencing a devastating drought. On Dec. 25 2016, seasonally-unscheduled good rain covered the southern part of Bari region. As can be expected, this has resulted in automobile-borne extra ordinary mass migration to rained area. A large population from the eastern half of the Somali land namely the regions of Bari, Sanaag, Nugaal, Sool, Mudug, Galgaduud, Togdheer, Berbera, and eastern Somali Galbeed were transported back and forth to target places. As a result, thousands of trips were conducted to remove the humans and animals and to supply food and water for them. Thousands of trees were cut down or destroyed. Thousands of kilometers were degraded. Thousands of liters of chemicals were released into the soil. Thousands of metric tons of gases from the vehicle-burning fossil fuels were released into the air. And thousands of kilograms of garbage were left on the fields.

But migration is still continuing in many parts of the Somali Peninsula due to the spring

rainfall deficiency. For example, the people of the southeast, i.e. Galgaduud and Mudug, have been moving to Mid Hawd and Upper Nugaal in the center and the north of the Peninsula for the late spring. Usually, rains revive the land after the droughts reduce

the animals. The endless automobile-borne migration is depriving that opportunity from the land. This destructively-mechanized nomadism is the reality of the future of the Somali pastoralism.

3.3 Deforestation

3.3.1 Data overview

Deforestation is the most serious problem facing the forests of the world today. FAO estimates that between 2000 and 2005 the world lost around 36 million hectares, over 1% of the various forested areas. Africa is leading the world in the process of the degradation losing that period about 3.2% of its forested area, followed by South America in losing 2.5%. In other words, the annual deforestation rate in Africa is 0.7%.³²

The deforestation rate in Somalia has not been known with certainty. But, on the bases of physical and new other accounts, Somalia must be one of the countries in the world that have the highest annual rate of deforestation. In fact, various studies on land degradation in Somalia suggest different rates of vegetation loss ranging from 1.5 to 6% per year.³³ This is very unusual deforestation rate.

Table 1: Comparative environment-related indicators (% except CO2 emissions)

	Year	Somalia	Africa	Developing countries	Developed countries
Population growth rate	2011	2.4	2.3	1.3	0.6
Population < 15 years	2011	44.9	40.3	29.0	17.5
Arable land as total land area	2008	1.6	7.8	10.6	10.9
Annual rate of deforestation	2009, 2017	4	0.7	0.4	-0.2
Per capita CO₂ emissions (metric tons)	2009	0.1	1.1	2.9	12.5

Source: African Development Bank Group; deforestation rate estimation in Somalia is by Author.

³²Mckinney et al., 2007.

³³SIDRA, *Climate Change in Somalia, 2016*

3.3.2 Dealing with the fields for a search of data

The most vegetated part of the Somali peninsula is Hawd, the central and western plateau of the land. Hawd means 'thicket or woodland'. The author has been observing for years the changes in forest cover of the eastern part of the plateau, an area which encompasses eastern Ogadenia in the west and southeast of Garowe in the east; and between Nugaal basin in the north and Mudug plains in the south. The field research has also covered Nugaal valley and Qardho plateau in the north of Hawd. The ongoing environmental situation of eastern Hawd can be a good example for the whole country. It has been one of the most forested regions in the country. Many places in the region were not easily accessible seventy years ago. Hawd with the almost-decertified Galmudug plains in the south, and the vast basins and coastal plateau in the north is what we call north-of-Shabeelle regions. The environmental degradation is most prevalent to these areas across the nation.

In addition to the extended observations and interviews with well-informed herders, the study investigated the once-forested valleys of Hawd in varying number of days of the first 10 days of June 2014, 2015, 2016, 2008 and 2002 as a selected experimentation case. That was the case of Nugaal basin for those dates plus different times from mid-November 2016 to late June 2017. Many plants observed in 2002 were missing or demising as species or individuals in 2014 and after. The difference was also obvious between 2014, and 2016 and 2017 mainly because of the drought.

Comparing today's rangeland situation to that of 40 years ago, around 70 to 90% of valleys vegetation has been lost during that period. The assessment doesn't focus only

on quantitative shrinkage of the botanical mass but the qualitative condition of the remaining plants also. For example, the survival weakness of many of them is obvious plus that today's vegetative-cover includes invasive plants.

The field researches reveal also that, in the vast land of northern Somalia it's difficult to find half a km² (with known history of vegetation) that doesn't have an aspect of deforestation. Such aspects are marked by a recent loss of vegetation and a sign of decline in the remaining vegetation. What was 40 years ago a thick bush, in which you couldn't generally see the camels of few meters away from you, is now a semi-empty field that you can mostly see the things on the horizon from kilometers.

The various species of grasses, including the huge tall semi-grass 'duur'³⁴, are all but gone. Roofed by the tall trees, duur was a shielding cover for the grasses, shrubs and forbs. Duur was about 50% of the forest mass in most of this part of Hawd. Shrubs and forbs are largely replaced with unpalatable plants. Some of the shrubs, such as geedcad³⁵, rako, and sarin³⁶, still survive. But geedcad was unlikely to be consumed by the animals 30 years ago.

The tall trees in the valleys are largely replaced with acacia trees of qurac³⁷ or sarmaan, and garanwaa (prosopsi juliflora). Qurac and sarmaan are native invasive but garanwaa is totally an alien invasive. The few surviving tall trees are turning to be 'dying stems'. As an example, one of the most popular trees that used to cover these valleys is 'mareer – *Cordia somalensis* Bak. Mareer, which is known for its rich feed supply for the humans by fruits and for the animals by leaves, is on its way to extinction

³⁴Locally, duur contains various tall grass species including *andropogon abyssinicus* Fresen.

³⁵Locally, geed-cad contains various species including *Aerva javanica* (Burm.f) Schultes.

³⁶Locally, sarin contains various species including *Crossandra infundibalisformis* (L.) Nees.

³⁷Locally, qurac is thorny trees with thin leaves, including *acacia raddiana* (Savi) Brenen.



Figure 5a: Barkad-created Fardhaddin town, 55 KM W of Garowe. the last remaining of duur were up-rooted to cover rural houses and barkads, June 2, 2016.

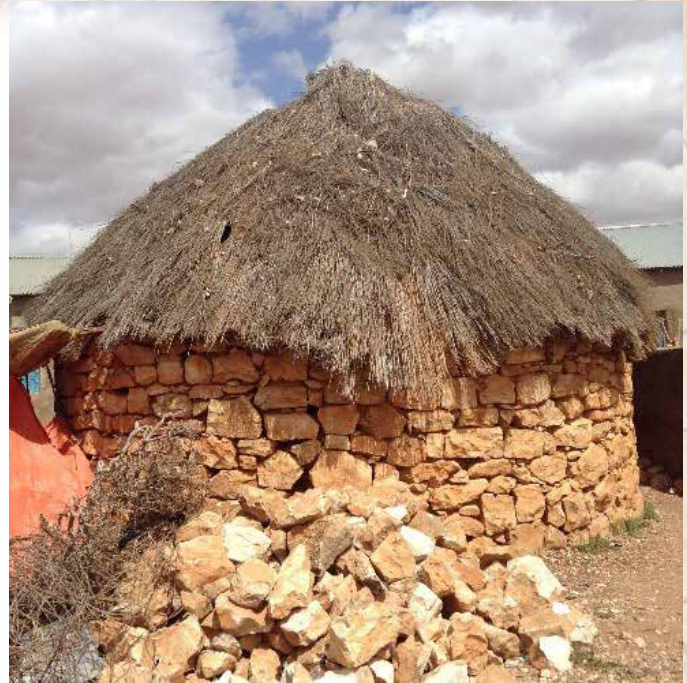


Figure 5b: rural house covered by duur, Kalabayr, June 9, 2016.



Figure 6: During the spring of 2015, Geelnuijis which means camel-feeding place, received around 600 MM of rain, the highest rate that a place in Somalia can usually earn. Why is then this weak young he-camel a weak and grazing the thorny sarmaan, supposedly unfavorable tree for him in a wet season? It's because most of the small plants in the place are invasive plus that, camels prefer to graze the tall trees. That is the fate of where trees were once dwarfing the camels, May 31, 2015



Figure 7: The historical forest of Darayle Springs at Garowe is recently replaced with prosopis.

The forest cover on the hills is better, but still in a deteriorating condition. In this part, 25 to 35% of the vegetation including all grass species, various wild fruits and honey production is lost. It's difficult for the animals to survive without grass consumption. The pastoralists describe the situation as 'Jawo' which means pasture shortage. New plants can hardly rise, and the surviving plants aren't adequately growing the necessary branches or leaves due to the droughts and over grazing. In the dry seasons, the animals resort to consume the remaining parts of the reduced branches, a situation making the trees waning woods. But this has not even been available during the ongoing drought so the animals have been fed by corn and cartons as a fodder. The situation suggests that the remaining vegetation is doomed to fade in five to ten years.

Can we find the ongoing deforestation rate? The average number of gross vegetation-loss among the various landscapes in the last 40 years is 55%. Since the deforestation rate was continuously increasing during that period, the rate should be prorated among the years in the period. With that, average rate for every five years is estimated. That is because the maximum period of unequivocal sight of change in the vegetation cover is five years. Before the current drought, the frequency of drought occurrence was also every five years. Based on these considerations, the vegetative-cover loss increases every five years by one-third ($1/3$) of the former five years rate. That makes the current deforestation rate about 3.06% per year.

Table 2: Proration of 40 year 55% vegetation-cover loss

Period	Annual deforestation rate in five years, %	Five year vegetation cover loss, %	30 year cumulative vegetation cover loss %
1977-1981	0.41	2.05	0
1982-1986	0.55	2.73	4.78
1987-1991	0.73	3.64	8.42
1992-1996	0.97	4.85	13.27
1997-2001	1.30	6.46	19.73
2002-2006	1.72	8.61	28.34
2007-2011	2.30	11.48	39.82
2012-2016	3.06	15.30	55.12

But still, it appears that the ongoing devastating drought has so far claimed 8 to 16% of the vegetation-cover from Dirac (winter) of 2015 onwards, which is 4% per year. The loss of the first 4 months of 2017 is almost equivalent to that of 2016 or 2015. So the gross loss can be prorated on bases of three years. Since 3% has already been counted in, there has thus been extra 1% per year. Taking these accounts together, therefore, the deforestation rate must be around 4.06% per year at this time. Accordingly, the last five years of table 2 must be readjusted as this:

2012-2014	3.06	9.18	49.00
2015-2016	4.06	8.12	57.12

Some of the previous estimations may support our judgement on the vegetation-loss of the last 40 years. For example, the median number of the above-mentioned previous two rates, 1.5 to 6%, per year is 3.75%.

Is this a deforestation rate or desertification rate? Somalia is categorized as arid and semiarid land with annual rainfall of 200 to 600 millimeter. So it is not a desert but it can easily develop so into one, depending on climate conditions and human activities.³⁸ About 12% of the land has previously been categorized as bare. Around 48% of it receives less than 300 MM annually; and in

many areas evaporation exceeds rainfall.³⁹ With deforestation rate of about 4% annually and invasion of unpalatable plants, the country is actually experiencing a disaster of a desertification. It's more obvious in the plains of northwest, northeast, and southeast. Desertification occurs when a deforested area turns to be unproductive.

3.3.3 The role of the forest to reduce global warming

The places that does not contain much forest-cover like Somalia, rangelands take the role of the main forest. Rangeland's vegetation-cover is basically a source of life and development; protector of biological diversity; contributor of a healthy soil formation; regulator of water-flow, wind-speed and the pattern of the raindrops; and preventer of soil erosion, and disturbing intruders such as enemies and weather effects. Besides these vital benefits, the water that evaporates from the forest and the land surface provides moisture for the clouds which eventually result in rainfall. This evaporation similarly cools the atmosphere system. It also removes chemicals released to atmosphere by industrial technologies such as heat-catching carbon dioxide. Carbon dioxide intercepts the heat and consequently causes global warming. As moderator of the water flow, vegetation reduces soil erosion, floods, and droughts.

³⁸Carla Montgomery, 2000, *Environmental Ecology*, pp. 204-05.

³⁹FAO Somalia Water and Land Information Management, 2007; SIDRA, 2016.

3.4 Soil Erosion

Healthy soil determines basically the survival of the humans. However, the soil is one of the resources that can easily be lost to natural and human-caused problems. A major study sponsored by the United Nations Environmental Program was completed before 2007. The findings of the study are deeply disturbing. Globally, more than 1964.00 million hectares equal to 17% of the Earth's vegetation have been degraded by humans to varying degrees from about 1945-1990. In Africa over 494.00 million hectares or 22.1% of its vegetated land was degraded during that period at the highest rate among the regions of the world. Overgrazing, wind erosion, and poor agricultural practices are behind the Africa's problem.⁴⁰ The findings of the study also include the percentage role of the drivers of soil degradation around the world which are as following:

- Livestock overgrazing is responsible for 35% of land degradation
- Deforestation for 30%, and
- Agricultural activities for 28%.

As usual, the study may not have adequately investigated Somalia, but the findings imply that there is severer soil loss in Somalia.

While the livestock herding is the dominant economic activity in the country with the highest degree of resource mismanagement, overgrazing, water and wind erosion, traffic movements, and poor agricultural practices are the primary soil degradation drivers in the country. Similarly, depending primarily on the plants and soil as construction materials, this practice was continually taking a high toll from the environment.

It is clear in Somalia how deforestation, soil erosion and drought are interrelated. Owing to the great loss of vegetation, the rain water now easily run over the fields and causes unusual floods with gully soil erosion and further deforestation. As a result, in every half a km² in the north-of-Shabeelle regions, there is a sign of soil erosion be it boholo (gully erosion), jeexdin (riff), gawaan (flat died surface), bataax (subsoil), or bacad (died sand). For a land with characteristics of poor soil moisture⁴¹, it appears that the living soil has mostly been lost. Such soil may relatively remain only in the lower points of some valleys. After all, this means shortages of pasture which is an introduction of a drought and contributor to the climate change.

3.5 The Question of the Climate Change

Drought problem is literally connected today with climate change. But sometimes its difficult to comprehend the interconnection. Below is summarized the nature of the problem in global and local dimensions.

3.5.1 Global dimensions

Geological history of the earth suggests that, on any timescale (decadal, century, millennial, or millions of years) climate has been characterized by fluctuation.⁴² Local climates, from icy terrain to hot deserts, can exist at any given time; and climates in the regional areas can seasonally vary in temperature and rainfall.⁴³ The last two million years are generally called an ice age and divided into two epochs: Pleistocene which lasted from 2 million years ago to 10,000 years ago, and the Holocene which covers the last 10,000 years. We thus live now in warmer epoch of the earth's most recent ice age, the Holocene.⁴⁴ Modern observations on climate conditions have reported modern decadal climate changes and

⁴⁰McKinney et al., 2007, pp. 369-370.

⁴¹SIDRA, 2016.

⁴²Michael E. Mann and Lee R. Kump, 2009, *Dire Predictions*, p. 14.

⁴³Montgomery, *Environmental Ecology*, 2000, pp. 207-11.

⁴⁴Mann and Kump, 2009, *Dire Predictions*, p. 14.

general global warming trend. Average peak warmth of the last few decades has exceeded the old one by about 0.5C.⁴⁵

The prevailing view on climate change holds that, a variety of human and natural factors together cause the current global warming. Despite this joint contribution, natural factors are routine and old in nature while human actions are industrial and new in timescale. Natural impact such as the Sun's Earth warming and gases from volcanic eruptions trapped in the atmosphere, occasionally contribute to global warming. But it's the human impact that largely causes the problem. Industrial technology such as fossil fuel burning (coal, oil, gas) releases some gases known as greenhouse gases like carbon dioxide (CO₂) and methane (CH₄) to the atmosphere. Carbon dioxide is blamed for contributing to over 50% of the current global warming. The rest of the contribution is taken by other gases emitted by things with which we deal every day in the life such as refrigeration, solvents, insulation, foams, cattle and other livestock; wood burning, landfills, fertilizers and other industrial and commercial uses.

These gases absorb heat and consequently warm the atmosphere around them. Consequently, carbon dioxide causes a hole in the ozone layer. Ozone is made up of three oxygen atoms (the oxygen we breathe contains two oxygen atoms). Ozone prevents unhealthy levels of ultraviolet radiation from the Sun that would otherwise reach Earth's surface and could make it largely uninhabitable. On the other hand, it's irritating gas when encountered with surface of polluted air. Deforestation decreases the ability of the atmosphere to control the greenhouse gases.⁴⁶

3.5.2 The background and nature of environment or climate change in Somalia: a history of 8,000-year traceable trend?

Prehistoric times

Archaeological data from the Nile Valley and the Horn of Africa suggest that around 8,000 years ago an arid phase advanced and therein caused the retreat of early Holocene Phase. From about 7,000 years ago warm and humid conditions developed: fields were wetter; waters of lakes, rivers, wadis and springs were in higher levels; and animals and plants were experiencing in better conditions.⁴⁷ It was this period that the Cushitic peoples in the Horn had made a significant progress in food production both in herding and farming activities.

Around 4,500 years ago, during the Mid Holocene, widespread arid period took place. Although a period of humidity appeared in northern parts of the greater Horn, the increasing aridity has ever remained in the region generally. According to the huge rock art in northern Somalia and to the linguistics, from 5,000 or earlier to 3,000 years ago the pastoralism in northern Somalia was characterized by humpless cattle, goats and sheep with presence of camels. From around 3,000 to 2,000 years ago, the increasing aridity resulted in replacement of humpless cattle with humped cattle. Prehistoric Somalis selected this type of cattle breed for quality of survival within environment of increasing aridity.⁴⁸ Additionally, during this period, camels population increased as more people began having camel at the first time.⁴⁹

This generally means that various animal species were gradually disappearing from aridity-stricken but more populated northern part of the Somali Peninsula. The reason of adopting humped cattle and more camels was the changes in climate. Northern Somalia was wetter 5,000-3,000 years ago than 3,000-2,000 years ago. The humpless cattle survive better in a wetter environment.

⁴⁵Mann and Kump, 2009, p. 46.

⁴⁶Montgomery, 2000, *Environmental Ecology*, pp. 207-11.

⁴⁷Steven Brandt & Nanny Carder, 1987, *Pastoral Rock Art in the Horn of Africa*. Accessed by July 13, 2017.

⁴⁸Hussein, 2017(a), section 4.5; FAO, 2004, *Somalia*.

⁴⁹Hussein, 2014, *Ancient Kingdom of punt*, section one.

The growing aridity drove also the large wild animals from many areas in the north as suggested by other rock art sites. In addition to the humpless cattle, goats and sheep, Dhambalin paintings, in the desert surrounding the Red Sea port of Berbera, depict giraffes, antelope and ibex. Although it can contain some pictures of historic times, the art site is estimated to be about 5,000 years old. Generally, these animals, at least giraffes, have not lived there for centuries. The scene, therefore, "reveal an environment that was once more hospitable than today's desert."⁵⁰ Besides the climate change, it's probable that, a human factor involved in the case of the animal loss. Overgrazing with eventual loss of traditional grass in the foot hills of the northern cool plateau can be another reason in disappearance of the humpless cattle from the region.

Medieval times

Medieval traditions and records corroborate these prehistoric evidences of human and the nature roles. The loss of some animal species has continued until recently. But all losses were not due to the effects of the climate change. Humans were part of the problem. By 935 CE, Al-Mas'udi of Baghdad stated that, a large number of elephants had being killed in far southern Somalia for ivory exportation to Oman and from there to India and China where the demand of ivory was very high.⁵¹

The traveler stated also that, the people in northern Somalia and relating parts of the Horn of Africa were dressing in hides of tigers, and thereby the hides were exported to the then Muslim world as the biggest and best type of such hides.⁵² He further attested that, there were wild and tamed giraffes in the region down to northern Somalia⁵³, which suggests that these animals were also taken from there. In fact, less than three centuries after Al-Mas'udi's work, Al-Hamawi

of Syria who wrote in 1223 stated that the Somalis were exporting giraffes to Persia. The Persians were making their shoes from the hides of giraffe. Apparently because of decrease of the numbers of the animals in the north, the Somalis were bringing the hides as far as from the region of the Jubba River in the south where the practice of making shoes from the giraffe⁵⁴ hide has prevailed until recently. By early fifteenth century, the Somalis were also exporting to China rare animals including Penguins, Giraffes, Zebras, lions, tigers and ostrich.⁵⁵ At least some of these could also be tamed animals.

In northern Somalia, usually, people and place names express presence of some animals which have not been seen in the region for many years. These represent usual presence of elephants, rhinoceros, and giraffe in the region throughout most of the last millennium. This suggests that, whilst the large animals were disappearing from many areas in the north, they remained also in the better vegetated areas. This is further attested by an important Awdali (Somali state) document regarding earlier decades of the sixteenth century. According to the document, there were large herds of elephants and antelopes in today's arid lowlands in the west of Harar uplands where forests were also prevalent.⁵⁶ Additionally, besides the surviving Hawash River, the study names at least five other rivers in the area between Harar and Shawa plateau.⁵⁷ All these living elements have gone by the nineteenth century or before.

Post-medieval times

Latter observations give us also a picture about the course of historical animal and plant retreat in the region. We can particularly cite one statement in the report of major Swayne of Britain about one of his trips through the Somali peninsula. Traveling through the valleys in between

⁵⁰UNESCO, 2014, *Scoping Study on the Culture Sector of Somalia*, p. 36, citing Sada Mire (2011).

⁵¹Al-Mas'udi, 1982, Vol. I, p.339.

⁵²Ibid. p. 329.

⁵³Ibid. pp. 329-30.

⁵⁴Al-Hamawi, ed. 1956, Vol. II, p. 100.

⁵⁵Mary Arnoldi, 1986, *The Artistic Heritage of Somalia in 'Somalia in Word and Image'*, p. 17.

⁵⁶Carab-faqiih, Futuux Al-Xabashah, *Arabic Version of Shaltuut*, 1973, pp. 32-33.

⁵⁷Abid. pp. 9, 10, 19, 24, 33, 4, 116.

Jigjiga and Harar in late direac (winter) of 1893, the explorer described the place as well-watered, beautiful terrain “covered with forest and dense undergrowth,” used as pasture by the Somali herders in the area. The traveler learned that the valley has historically been “a favourite resort of elephants and rhinoceroses”. But he also noted “since the Abyssinians came to Harar [in 1887] their number have diminished and we only saw the track of one bull rhinoceros, which had come to drink at the stream two nights before.”⁵⁸

Since then, the vegetation and the water of the area have largely gone, as it's everywhere in the region, due to the speeding up of the population and technology growth. Early mid-1900s, the feeling of the Somalis toward this unprecedented, natural and human-caused environmental degradation was clearly expressed by the poems and stories.⁵⁹ Although, therefore, the climate and human had long been damaging the wildlife, heavy wild animals continued to survive in the north until they are claimed by an aggressive human intervention in our times.

Table 3: Historical environment or climate change in Somalia

Date of Data	Type of Data	Issue	Condition
8,000 to 7,000 BP	Paleoenvironment, Archaeology	less skills in food production	Some aridity
7,000 to 4,500 BP	Archaeology, linguistics	Herding and farming developed	Warm, humid
5,000 to 3,000 BP	Rock-art, Archaeology, linguistics	Hump less cattle prevailed, camel appeared	Aridity aspects
3,000 to 2,000 BP	Rock-art, linguistics	Hump less cattle replaced with humped cattle and camel herding increased	Aridity aspects
1,000 to 1,900 BP	Records, tradition	Springs, rivers, elephants, giraffe, rhinos	Still active but declined at the end of the period
1,900 to now	Current local knowledge	All kinds of wildlife, birds, plants	Declined or dwindling by human activities and climate change

A picture of the current situation

Due to the ongoing human-caused global warming, it's projected that tropical regions suffer more losses as a result of climate change than do temperate regions in decrease of livestock and crop production in the coming decades. The Horn of Africa is an example of the places in which the loss occurs. Researchers attribute the recurring droughts in Somalia and the increasing poverty among the rural population to climate change at least partly.⁶⁰ This does imply that, the already-dry climate of Somalia is further disturbed. The high rate of

⁵⁸Major Swayne, 1900, *Seventeen Trips Through Somaliland*, 2nd edition, pp. 175-76.

⁵⁹For example, Ismaciil Mire poem of 'Guuguule'.

⁶⁰Mann and Kump, 2009, pp. 59, 131

the deforestation, and uncontrolled urban-waste-burning should also increase the currently low CO2 emissions per capita.

More obvious example is the continual dry up of the springs in the country. Looking at Nugaal region, a well-watered large valley in the northeast, the picture is obvious. Besides the near groundwater, the togs (seasonal rivers) of the valley have been yielding many permanent springs and some streams, with lake-like amount of water at some points.⁶¹ Springs contribute 11% to groundwater availability in the country.⁶² Nugaal is one of the leading areas for the spring water sources. The inhabitants appreciate the gift of the place as they say, “Nugaaley Hooyo, Haan kalax la soo daray – O Nugaal, the mother, indeed you’re a water container with easy water drawing nature”. Apparently, 70 to 90% of the water that the springs were yielding 30 years ago has gone now. Puntland ministry of environment also mentions dry up of wet valleys or springs.⁶³ The phenomenon must be common across the nation.



Figure 10: Lake Cuun , 50 km NE of Garowe, 4 km long and 60 m wide, is one of the few remaining lakes and springs in Nugaal valley. We recently found here ruins of sizeable medieval city which is apparently “Badda” of Al-Idriisi (1154) and Ibn Said (1260s). Obviously the lost city of Badda, which means ‘the sea’, was named after the lake which was far greater than today’s one, May 31st, 2016

⁶¹Said Hussein, 2017 (a).

⁶²SIDRA, Climate Change, 2016.

⁶³Ministry of Environment (Wasaaradda Degaanka Dawladda Puntland), p.19

The retreat of what is called 'dharab', humidity in the mornings of autumn wet season, is also a noticeable sign for the problem. During November, people in Somalia used to see in the mornings light-shower-like moisture on the plants and the soil. It's hard to see that moisture anymore. Another example can be the situation of the wild life in the country. The loss of many non-domestic animal species can be attributed to the human population growth and the deforestation, but what about the disappearance of many species of birds? Obviously, these particular problems of resource loss can be ascribed to the climate change. However one thing is certain: the deeper the human impact on the environment, the bigger the signs of climate change and biodiversity loss.

3.5.3 Drought profile in Somalia

The droughts that have approximately occurred in north-of-Shabeelle Somalia since the beginning of the twentieth century are as following: 1902-03, 1911-12, 1950-51, 1964-65, 1974-75, 1991-92, 1999-2000, 2003-04, 2009-10, and 2014-17. We see here, of the ten droughts, at least five of them occurred for the last 25 years. Of these, the droughts of 1964-65, 1991-92, 1999-2000, 2003-04, 2009-10 may have claimed the least number of humans. The droughts of 1903-04 and 1911-12 were exacerbated by the effects of Dervish Movement warfare, and ideology also affected the drought of 1974-75.

The longest drought may take 18 months which falls on 3 years cycle with the first 10 months being pre-drought period. The process maybe started with less rainfall in the autumn (dayr) of year 'A' and the spring (gu') of year 'B'. Animals may show weakness in the summer (xagaa) of year 'B'. But erratic rainfalls in the autumn of year 'B' make clear an existence of a severe drought. In that case, animals begun to perish in the late part of that autumn with acceleration in the winter (diraac) of year 'C'. Diseases usually

come with the droughts and they may claim most of the lost animals.

However, a typical drought takes 5 to 8 months falling in 2 years. It starts with a weak spring followed by autumn of erratic rainfalls in year (A) and a harsh winter in year (B). So its peak time is from December of year 'A' throughout January-April of year 'B'. Usually, a drought shock commonly occurs in the Somali Peninsula. For example, studies on economy of State of Punt in Somalia⁶⁴ and Somali Galbeed in Ethiopia⁶⁵ show that the droughts occurred in the two regions in the same years. That is apparently the case all in the North-of-Shabeelle regions. However localized situations occur always.

This has been the pattern of the traditional droughts.⁶⁶ Today the case is totally different. The current frequency of drought occurrence is faster and the duration is consequently longer. Today's drought is not the same as yesterday's one even within same level of rainfall failure and same length of duration. For example, there was a rainfall deficiency in the country from the spring of 1968 to autumn of 1969. The Somali government announced an occurrence of drought before the October of 1969. The efforts of assessing the effects of the drought resulted in the tragic death of the nation's president on October 15, 1969, when visiting the north of the country.

However, within that almost year and half of the difficult situation, human and animal fatalities were insignificant except the case of the cattle which were singled out by a disease. There were many similar situations in the past. If it was today, it would be a period of a drought disaster. The difference is known. The population, traffic, and barkado movement or distribution; and the level of vegetation-mass loss were, unlike today, insignificant at that time also.

⁶⁴PDRC, 2004, *Macro-Economic Analysis*.

⁶⁵Devereux, 2006, *Vulnerable Livelihoods in Somali Region, Ethiopia*.

⁶⁶The Somalis have long been using an accurate solar calendar for identifying solar periods of the rainfalls, agricultural production, maritime activities, and weather changes. Basing on weakly cycle, it consists of 12 solar months with a total of 365 days (Said Hussein, 2014, *The Somali Calendar*).

4. Conclusion and Recommendation:

4.1 Conclusion:

The ongoing environmental condition in Somalia is reminiscent of environmental history of Easter Island, on the Pacific Ocean. The island had a historical civilization but its environment was destroyed by its people before it was transformed to tourism place in the colonial era. Irresponsible human actions on the environment have become an example of how a civilization and prosperity in greenland can be turned upside down with extreme poverty. Resources were abused through the tragedy of commons.⁶⁷ The reality of the tragedy of the common properties was academically explained by Garrett Hardin in his essay of 1968: "The Tragedy of the Commons". Although the idea could be a common knowledge among the cultures, Hardin's work brought the nature of the problem to the attention of many people. The essay highlights that the common things, such as the environment, are usually destroyed for private needs. That is the case of today's Somali environment.

In fact, the misfortune of commonly-owned properties has always been a known-problem by the Somalis as expressed in the saying, "Wax la wadaago la'aantood baa ka roon – giving up commons is better than depending on them". The saying may appear as discouraging public responsibility to be exercised on the commons. But, what it exactly wants is to warn the problem of neglecting or misusing the common properties. Reflections of such painful experience have long been held in another expression, "Reer ba'ow yaa ku leh – O ill-fated family who owns you"! Family means here a regular family, community or land.

It's an expression of feeling sad for a public or private entity neglected by its owners or care-takers.

Drought recurrence is not explainable today only by a rainfall failure or climate change in Somalia. It's rather mainly constituted by destruction of the rangelands through uncontrolled rural settlements, resource over consumption, traffic movements, waste dump, and resultant erosion. Thus, there are many environment destroying factors that extremely outdo the only, weak environment saving factor, the rainfall. Today's any level of rainfall as a factor of vegetation regrowth can't keep pace with the damage of the destruction factors. The stage of the land degradation in Somalia is deeper than deforestation. It's a process of desertification. The land has lost the ability to produce enough pasture even within enough rainfalls. A rain can't restore a continually ravaged land. Current herding system faces collapse. As it stands today, it is costly, unpaying job. It can't be repaired. It must be reformed. Beside technical solutions, the problem demands a different institutional system with different set of values. After the destructive prolonged civil war, the most difficult situation of the country today is apparently the problem of saving the environment. In late 1980s, the Somalis did know that their country was going to a political collapse but they ignored the problem because of pursuing special interests. The Somalis need to understand today that their actions are driving the country to environmental collapse. No civilization and decent life can survive within collapsed environment.

⁶⁷Jared Diamond, 2011, *Collapse*, Chap. 2.

4.2 Recommendations

There are currently a good number of recommendations in relation to environment and drought problems provided by different studies on Somalia. Bearing that in mind, the recommendations produced by this study are mostly related to its findings. Many of them are dealing with new initiatives. As presented below, they are made to the government as well as the general public.

Land management

Using and rewarding the rural residents

- Teach, equip and reward the rural population to protect the environment. There are some examples Give appropriate bags to a family to collect garbage from the fields surrounding it and reward the family if they do the job according to the guidelines.
- Teach the rural families to collect stones from the nearby hills and level them at appropriate position on the nearby ravines to help slowing down the water flow.
- Teach them to put heaps of dungs from the animal station into the ravine in order to serve as fertilizer and water moderator (appropriate equipment, consultation and assessment by area environmental supervisor must be available).

Developing sedentary pastoralism

- Encourage and develop settled pastoralism starting with a pilot program and then scale up
- Manage and encourage families to control the number of animals they keep per family by supporting off take programs
- Encourage adoption of a new form of composition of livestock species per family, depending on the features of the family's land. The new system must give majority of the land a time to replenish, conserved or restored then allow the pastoralists to be out of the farms temporarily to graze the restored land. Thus, the traditional way of free movements of the herders is maintained
- Urge the herders' urban-based relative supporters to transform their assistance to contribution in forming sedentary pastoralism where supporters should assist the herders for adaption to the option.

Reduction of the garbage in the commerce

- The government to intervene in the importation of anti-environment and anti-economy garbage by regulations.
- Introduce and enforce regulations of recycling and waste managing systems.

Utilizing solar energy

- Somalia is a hot, sunny place. It is one of the countries that consume the most expensive electrical energy. The use of the solar energy is seen today as one of the best ways to protect the environment. Somalia must work to prioritize use of this invaluable resource. Since there is a problem of public finance, private sector can initially be encouraged adapting to the initiative.

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Appendix:

This survey covered extended families from the districts of Garowe, in Nugaal region; Qardho in Bari region; Laascaano in Sool region; Dhahar in Sanaag region; Gaalkacyo in Mudug region. All these regions are in the Northeast. But it also includes Boorame district in Awdal region of the Northwest. Boorame is agro-pastoralist district. The data collection from other districts is continuing. This survey shows that, 195 families which existed in mid-1987 consist of 626 families now. The households that ceased to exist were deducted, so the net increase is 431 (626 – 195). The net increase is then 69% of the current total while only 31% of the total represents the original 195 households. This means an increase of 221% during the last 30 years. Thirty years ago, the city-dwelling households from these families were 22%, but now they are 67%. Thus, 91% of them have joined the city life during the last 30 years. It means that, only 9% of them represent the city residents of 30 years ago.

Table 4: Comparison of number of families in Extended Family of 30 years ago to current one and their rural-to-urban migration trend (part of ongoing survey)

30 Years ago				Now			
S. No	Total Families in extended families	In rural with %	In city with %	Total Families in extended families	In rural with %	In city with %	District
1.	3	3 = 100%	0	10	4 = 40%	6 = 60%	Garowe
2.	3	2 = 67%	1 = 30%	18	6 = 33%	12 = 67%	"
3.	2	2 = 100%	0	6	3 = 50%	3 = 50%	"
4.	2	2 = 100%	0	7	3 = 43%	4 = 57%	"
5.	2	2 = 100%	0	8	5 = 63%	3 = 37%	"
6.	2	1 = 50%	1 = 50%	4	0	4 = 100%	"
7.	4	3 = 75%	1 = 25%	13	8 = 62%	5 = 38%	"
8.	6	4 = 67%	2 = 33%	13	4 = 30%	9 = 70%	"
9.	5	1 = 20%	4 = 81%	16	2 = 13%	14 = 87%	"
10.	2	2 = 100%	0	2	0	2 = 100%	Gaalkacyo north
11.	2	2 = 100%	0	8	2 = 25%	6 = 75%	"
12.	2	2 = 100%	0	10	2 = 20%	8 = 80%	"
13.	3	2 = 67%	1 = 33%	18	4 = 22%	14 = 78%	"
14.	2	2 = 100%	0	7	4 = 57%	3 = 43%	"
15.	2	2 = 100%	0	9	6 = 67%	3 = 33%	"
16.	4	1 = 25%	3 = 75%	10	0	10 = 100%	"
17.	4	4 = 100%	0	21	6 = 29%	15 = 71%	"
18.	5	5 = 100%	0	24	19 = 79%	5 = 21%	"
19.	6	4 = 67%	2 = 33%	16	0	16 = 100%	Qardho
20.	3	2 = 67%	1 = 33%	11	2 = 18%	9 = 82%	"
21.	2	1 = 50%	1 = 50%	12	0	12 = 100%	"
22.	2	2 = 100%	0	4	2 = 50%	2 = 50%	"
23.	2	2 = 100%	0	4	2 = 50%	2 = 50%	"
24.	3	1 = 33%	2 = 67%	14	1	13	"
25.	2	1 = 50%	1 = 50%	5	1 = 20%	4 = 80%	"
26.	2	2 = 100%	0	5	4 = 80%	1 = 20%	Laascaano

27.	5	4 = 80%	1 = 20%	10	2 = 20%	8 = 80%	"
28.	8	7 = 87%	1 = 13%	20	14 = 70%	6 = 30%	"
29.	4	1 = 25%	3 = 75%	4	0	4 = 100%	"
30.	4	4 = 100%	0	19	10 = 53%	9 = 47%	"
31.	4	4 = 100%	0	14	5 = 36%	9 = 64%	"
32.	2	2 = 100%	0	23	3 = 13%	20 = 87%	"
33.	1	1 = 100%	0	6	3 = 50%	3 = 50%	"
34.	3	3 = 100%	0	14	6 = 43%	8 = 57%	Garowe
35.	1	1 = 100%	0	4	1 = 25%	3 = 75%	"
36.	4	2 = 50%	2 = 50%	7	2 = 29%	5 = 71%	"
37.	2	2 = 100%	0	7	2 = 29%	5 = 71%	"
38.	3	2 = 67%	1 = 33%	6	0	6 = 100%	"
39.	2	2 = 100%	0	5	3 = 60%	2 = 40%	Boorame
40.	4	4 = 100%	0	13	4 = 31%	9 = 69%	"
41.	5	3 = 60%	2 = 40%	15	1 = 7%	14 = 93%	"
42.	6	2 = 33%	4 = 67%	14	0	14 = 100%	"
43.	5	4 = 80%	1 = 20%	14	5 = 36%	9 = 64%	"
44.	3	3 = 100%	0	9	3 = 33%	6 = 67%	"
45.	3	3 = 100%	0	11	0	11 = 100%	"
46.	3	3 = 100%	0	7	6 = 86%	1 = 14%	"
47.	5	4 = 80%	1 = 20%	12	4 = 33%	8 = 67%	"
48.	1	1 = 100%	0	3	0	3 = 100%	"
49.	2	2 = 100%	0	18	4 = 22%	14 = 78%	"
50.	2	2 = 100%	0	6	1 = 17%	5 = 83%	"
51.	3	2 = 67%	1 = 33%	7	5 = 71%	2 = 29%	Dhahar
52.	3	2 = 67%	1 = 33%	12	1 = 8%	11 = 92%	"
53.	6	5 = 83%	1 = 17%	16	6 = 38%	10 = 62%	"
54.	2	2 = 100%	0	4	1 = 25%	3 = 75%	"
55.	2	2 = 100%	0	7	6 = 86%	1 = 14%	"
56.	4	4 = 100%	0	11	5 = 45%	6 = 55%	"
57.	6	4 = 67%	2 = 33%	13	2 = 15%	11 = 85%	"
58.	4	4 = 100%	0	10	7 = 70%	3 = 33%	"
59.	3	2 = 67%	1 = 33%	6	2 = 33%	4 = 67%	"
60.	3	3 = 100%	0	4	2 = 50%	2 = 50%	"
Total	195	153 = 78%	42 = 22%	626	206 = 33%	420 = 67%	"

ABOUT SIDRA

SIDRA is a registered independent, not-for-profit Research and Policy Analysis Think Tank based in Garowe, Puntland, Somalia

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