



## How to Appropriate Sustainable Development Goals in Madagascar's Context

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### **Abstract:**

*Despite its socio-economic vulnerability, Madagascar has committed itself to carrying out development actions that are reflected in its National Policy. The aim of this study is to produce recommendations for decision-makers on local realities that need to be taken into account regarding the implementation of Sustainable Development Goals. To proceed, four Sustainable Development Goals or SDGs that directly concern cities have been chosen such as: SDG 6 "clean water and sanitation", SDG 7 "clean and affordable energy", SDG 11 "sustainable cities and communities" and SDG 12 "responsible consumption and production". The main methodology is based on an inductive method with a multiscalar approach that starts from the study of the particular case of Ambositra, the locality chosen for this study, to express an opinion on a broader and generalized perspective of Malagasy cities' situations. These results are highlighted: low access to clean water and sanitation, outdated and inadequate public infrastructure and facilities; polluting and non-renewable energy consumption. However, opportunities exist and can be used to achieve these four objectives. Sustainable development is a long-term task which must be included into local development frameworks.*

### **Keywords:**

*ambositra; cities; sustainable development; SDGs*

## I. Introduction

At the end of the United Nations General Assembly in 2015, 193 countries adopted 17 new objectives for 2030, which are the Sustainable Development Goals or SDGs. These 17 goals are shattered into 169 criterias (Gérardin et al., 2016). The concept of sustainable development advocates the relationships that must exist between three dimensions: economic growth, social development and environmental sustainability. The challenge of sustainable development is therefore to achieve a balance between these three dimensions. At the continental level, Africa has also adopted the vision: "Africa we want in 2060" which is a common framework for inclusive growth and sustainable development to be achieved over the next fifty years.

For Madagascar, the concept of sustainable development is not a new fact in the legislative and regulatory frameworks, following the example of the Environment Charter in 1990, even if the concept itself and its various components are not well assimilated at the local level. In 2016, a roadmap for the process of achieving SDGs was drawn up. Later, the “*Initiative pour l’Emergence de Madagascar*” which literally means: the Madagascar Emergence Initiative became the General Policy of the Malagasy Republic for 2019-2023. Its main ambition is to bring sustainable development and prosperity for all, but only within a generation.

Madagascar is one of the current 47 Least Developed Countries (LDCs) (CNUCED, 2018). The literature ranks Madagascar at 140th out of 149 countries in terms of its potential to achieve sustainable development by 2030. In Africa, Madagascar ranks 44th in 2019 out of 52 countries (Libya and Seychelles not counted) with a score of 44.57/100 (Begashaw and Sachs, 2019). So how can Madagascar improve this ranking? How will the Malagasy population be able to gradually appropriate these 17 objectives on a daily basis? In this regard, hypotheses are as follows: Madagascar's socio-economic situation does not allow for sustainable development to be established by 2030; opportunities based on individual or collective initiative can be exploited to already achieve certain SDGs targets. The purpose of this study is to monitor the prevailing local context by identifying the assets and struggles to the effective achievement of sustainable development in Madagascar by 2030.

For this purpose, the locality of Ambositra is chosen as the study area and four (4) SDGs that have a direct link with cities will be evaluated, namely SDG 6 Clean Water and Sanitation, SDG 7 Clean and Affordable Energy, SDG 11 Sustainable Cities and Communities and SDG 12 Responsible Consumption and Production. The methodology is based on a literature review, field data collection and direct on-site observation. These different methods will satisfy an inductive and multiscalar approach which is necessary to be able to state on and to project a broader perspective on the cases of Malagasy cities in terms of sustainable development. This article will be divided into three parts which will successively present the research methodology, the results, the discussion and the recommendations.

## **II. Materials and Methods**

This first part will detail the different methods and materials that have been used to optimize data collection related to our topic.

### **2.1 Research Approach**

This work is based on an inductive approach that starts from observations and leads to a scientific hypothesis or model. It is a generalization to a class of objects of what has been observed in a few particular cases. The case study is based on an inductive approach according to which the construction of knowledge presupposes the use of observation and analysis of particular situations in order to move towards broader perspectives. It develops a construction of the processes that could explain the reality and compares it with the context under study in order to verify its validity. This inductive approach is complemented by a multiscalar analysis. The multiscalar approach is highly recommended in geography homework and research like ours. It is an approach that helps to think more about space (Buzenot, 2007).

## **2.2 Data Collection**

### **a. Literature Review**

A literature review was first undertaken. This was a structured literature search using key terms and synonyms in combination with "Ambositra", "Madagascar" or "Sub-Saharan Africa" to narrow the search in space, using search engines such as Google Scholar, JSTOR and AGORA. Key terms included "sustainable development", "SDG", "water and sanitation", "energy", "sustainable cities", "responsible consumption and production", "resilient city" in various combinations.

### **b. Fieldwork**

Questionnaire surveys of large numbers of people offer the possibility of statistical processing (Goeldner-Gianella and Humain-Lamoure, 2010). The aim of surveys is to seek information either in the form of quantifiable results or in the form of quantitative results. The questionnaire is used to obtain concrete and objective data from primary sources. For this study, the questionnaire was administered indirectly: the interviewer notes the answers provided by the interviewee. It is divided into six (06) modules: identification of the respondent and characteristics of the household; a dedicated section for each SDG and a section that was used to collect other qualitative information from the respondent. The questions asked took several forms: dichotomous, multiple choice, semi-open and open-ended. The choice of households to be surveyed was made using a random method whose main criteria was their location in Ambositra in order to have a representative sample of household types (typically urban, rural, modest, medium, wealthy). These households numbered one hundred and fifty-three (153). Direct observation, on the other hand, is fundamental to have a direct view of realities (in the form of a scientific ballad) to observe and read the environment within an informal but enriching discussion with the heads of households.

The classification of all information obtained either through documentation or through questionnaire surveys has been done according to a logical division or subdivision. This consists of creating an initial class characterized by the four SDGs. These initial classes will then be successively divided into sub-classes, groups and subgroups that correspond to the criteria of each SDG. This technique has facilitated the manipulation and processing of each sub-class not only for data analysis but also to make it easy to insert the data while writing this article.

## **2.3 The Study Site**

Ambositra (between 46°50' and 48°10' East; 20° and 21° South) belongs to the north Betsileo. It is located about 260 km south of Antananarivo and 150 km north of Fianarantsoa. It spreads over an area of 14 km<sup>2</sup>. The whole urban and rural municipalities are inhabited by 59939 inhabitants in 2019 (INSTAT, 2020).

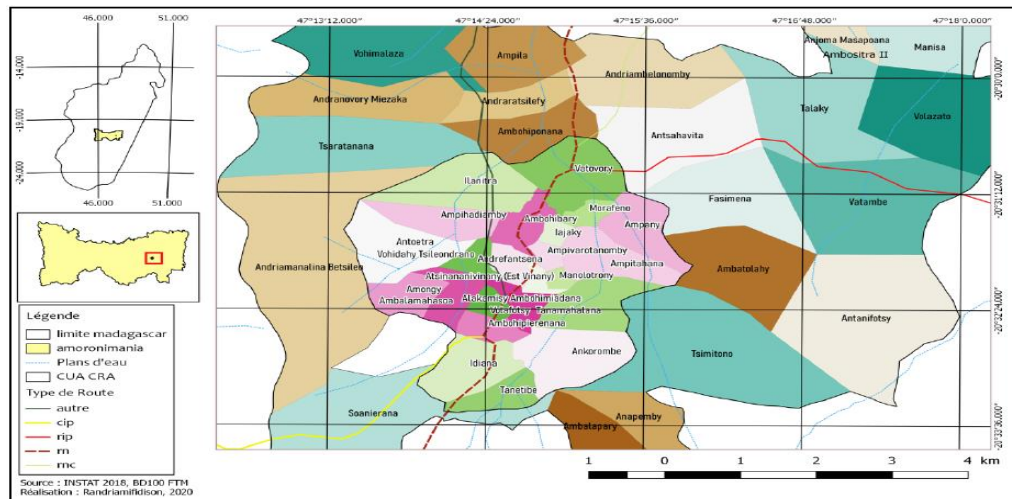


Figure 1. Area of Study

Ambositra is particularly chosen for this study because it is typical of the Malagasy central highlands towns and cities, combining both urban and rural living conditions. This characteristic is interesting for the review of all SDG criteria.

### III. Results and Discussion

#### 3.1 Results

This section summarizes the findings for the study area and for each SDG.

##### a. SDG 6 Water and Sanitation

"Ensure availability and sustainable management of water and sanitation for all". The targets of this objective concern access for all to a safe drinking water of good quality, resulting from rational management and the elimination of any pollution that may come from the precariousness of hygiene and sanitation systems.

Table 1. SDG 6's Criteria

By 2030, achieve universal and equitable access to safe and affordable drinking water for all  
 By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations.

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By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally.

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By 2030, substantially increase water use efficiency across all actors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity.

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By 2030, implement integrated water resources management at all levels, including through trans boundary cooperation as appropriate.

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By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes.

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By 2030, expand international cooperation and capacity building support to developing countries in water and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies

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Support and strengthen the participation of local communities in improving water and sanitation management.

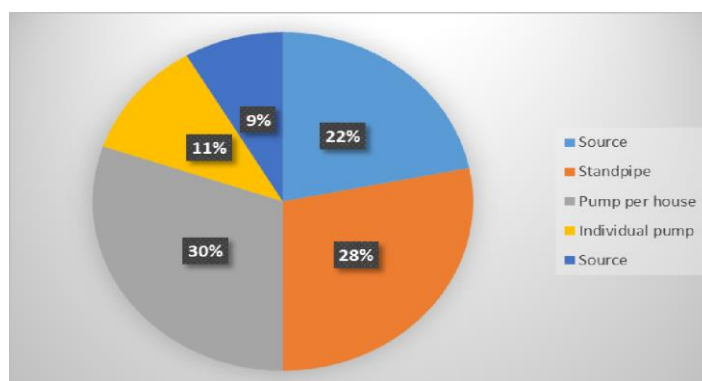
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Source: IAEG-SFGs, 2016

Providing safe drinking water and basic sanitation for their populations is one of the major challenges for African governments (Salami and *al.*, 2014). More than 1 billion people do not have access to a safe source and 2.6 billion people lack adequate sanitation (WHO, 2017). Threats to water resources are threats to health. Waterborne infectious diseases account for 9.1 per cent of global disease and 6 percent of global deaths each year. Every year, 2 million deaths are attributable to unsafe water and inadequate sanitation and hygiene (WHO, 2017). Access to safe drinking water and good sanitation therefore helps prevent many water-related diseases.

According to the Falkenmark index, Madagascar has a threshold of  $> 1700\text{m}^3$  of available water per year per inhabitant, its water situation reveals that there is no water stress (Heath and *al.*, 2012). However, the water shortages that have occurred in Madagascar's major cities in recent years reveal a completely different situation linked to a disruption in rainfall, which has its origin in global warming. Water is one of the main media through which climate change will influence the Earth's ecosystems and people's livelihoods. Climate change will have serious impacts on these service providers, and current water and sanitation management practices may not be robust enough to cope with these impacts.

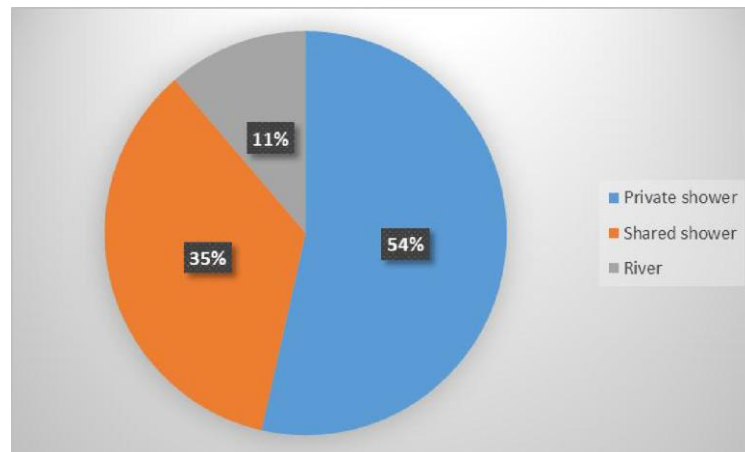
According to data obtained from the Jirama Group, Ambositra has approximately 2000 households with water subscriptions. The following figure gives an overview of the different types of water points used and available to the survey population.



**Figure 2.** Water Point Typology

The majority of the households surveyed share a single water point connected to the Jirama network with their neighbors. 28% of the households surveyed use the standpipes installed in each Fokontany. They pay a monthly bill of 3000 Ariary (less than one Euro). 31% do not have access to a drinking water source and collect water either from a source located in the rice-growing fields and lowlands or from a well. Only 11% of households have a drinking water point within the household. This demonstrates unequal access to drinkable water. The water supply in Jirama is often interrupted because of overly necessary maintenance in either the collection or transport of water. The dilapidated networks, combined with technical deficiencies, can no longer withstand, for example, during bad weather and the pipes are often silted up or broken.

Access to a shower or a toilet, whether private or collective, provides information on the precariousness or not of household living conditions or on the population's awareness of the importance of hygiene and sanitation. For the locality of Ambositra, having a place for showers is not necessarily a luxury but is the result of a lack of consideration shown by some owners when building houses.



**Figure 3. Sanitation Conditions**

More than half of the target population has access to a private shower. 35% of households share toilet corners with their neighbors and about 10% of household's toilet themselves on the banks of a watercourse. The latter case, apart from the lack of privacy. This is a source of pollution.

**b. SDG 7 Clean and Affordable Energy**

"Ensure access to affordable, reliable, sustainable and modern energy for all".

Energy contributes directly to the formation of the Gross Domestic Product GDP by generating added value, creating jobs and promoting exports. Achieving SDG 7 will require increasing electricity generation, developing distribution infrastructure and upgrading technologies to enable a modern and sustainable energy supply, and generating more electricity from renewable energy sources.

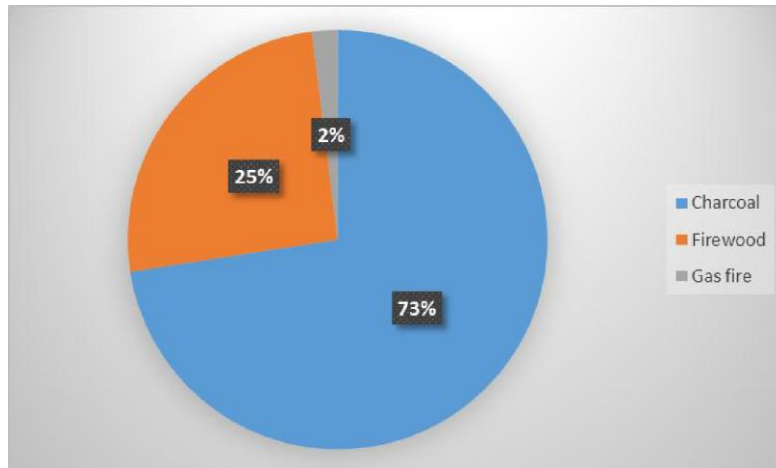
**Table 2. SDG 7's Criteria**

By 2030, ensure universal access to affordable, reliable and modern energy services
By 2030, increase substantially the share of renewable energy in the global energy mix
By 2030, double the global rate of improvement in energy efficiency
By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology.
By 2030, expand infrastructure and upgrad technology for supplying modern and sustainable energy. Services for all in developing countries, in particular least developed countries, small island developing States and landlocked developing countries, in accordance with their respective programmes of support.

Source: IAEG-SDGs, 2016

Nearly 1.3 billion people in the developing world, one-fifth of the world's population, do not have access to modern electricity in their homes. Rural Sub-Saharan Africa SSA ranks last in terms of access to electrical energy, with an electrification rate of 14.2 percent (Pavlik and *al.*, 2013 ; Sola and *al.*, 2013). SSA countries, such as Madagascar, remain dependent on biomass fuels, which provide more than 60 per cent of total energy demand. With only 30 percent of the population having access to electricity, biomass fuels play a rather critical role in domestic energy, mainly in the form of firewood and charcoal (Sola and *al.*, 2019).

In Ambositra, for cooking, wood energy is the most important energy source. It takes two forms: charcoal and firewood.

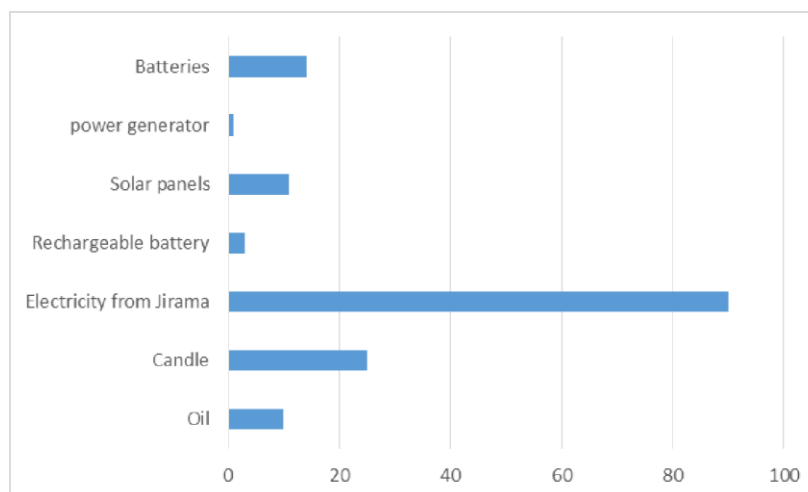


**Figure 4.** Cooking Energy Types

Of the 153 households surveyed, more than 73% use charcoal to cook food, 25% collects firewood and only 2% have the option of using gas (TotalGaz or Vitogaz).

Although fuelwood value chains support millions of people and are an important source of energy for many, they remain informal, illegal and repressed, not accounted for in national accounts, and their contribution to the national economy is not officially recognized. Most of these problems are believed to be due to poor governance. The growing demand for charcoal in urban areas is due to rapid population growth and high rates of urbanization. Charcoal is central to the lives of millions of people in Madagascar. Indeed, one of the most common criticisms of the country's charcoal industry is that it is so poorly governed. Charcoal enables and sometimes maintains important links between rural and urban populations and their livelihoods. Most charcoal is produced, processed and transported informally, outside existing legal frameworks. Charcoal has interesting characteristics as a renewable fuel. It can be obtained from sustainably produced feedstocks, processed with efficient technology, and provides a product that has a relatively high energy content (between 28 and 33 Millijoules/kg) (Schure and *al.*, 2019), is highly reactive, reaches high temperatures suitable for metal smelting and other industries, and is easy to store and handle compared to firewood.

In addition, several energy sources are available for domestic lighting and for charging electronic, telephone and household devices.



**Figure 5.** Lighting and Charging Energy Types

The Jirama Ambositra group provides electricity for about 4200 subscribed households. The price per Kwh varies from 141 Ariary (about 0.028€) to 900 Ariary (about 0.022€) depending on the type of tariff (tariff 14 or tariff 16). These unit prices appear to be inexpensive, but the procedures involved in requests for connections are major obstacles to access to the local electricity network. This could be a business opportunity for renewable energy such as solar panels. For the survey population, more than twenty households still use candles and lamp oil for lighting, batteries to power radios and some telephones are charged in kiosks.

**c. SDG 11 Sustainable Cities and Communities**

"Make cities and human settlements inclusive, safe, resilient and sustainable."

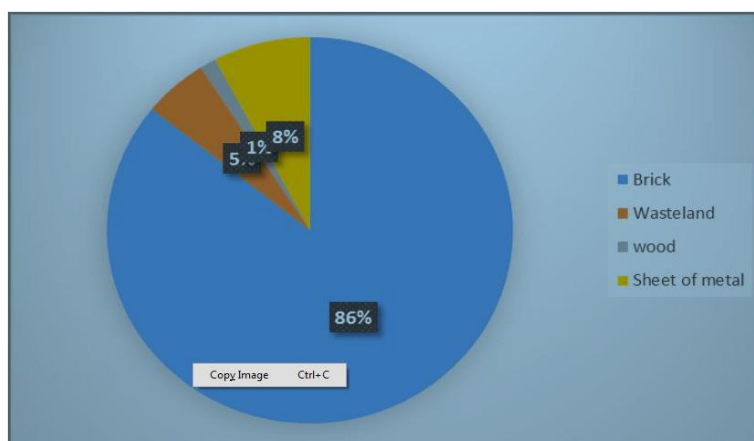
Many cities around the world face serious challenges in managing rapid urbanization, ensuring adequate housing and infrastructure to accommodate population growth, coping with the environmental effects of urban expansion and reducing vulnerability to natural disasters.

**Table 3.** SDG 11's Criteria

By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums.
By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situation, women, children, persons with disabilities and older persons
By 2030, enhance inclusive and sustainable urbanization and capacity for participatory integrated and sustainable human settlement planning and management in all countries.
Strengthen efforts to protect and safeguard the world's cultural and natural heritage
By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations.

Source: IAEG-SDGs, 2016

Between 2000 and 2014, the number of people living in slums increased from 807 million to 883 million. The rate of new housing construction remains below the growth rate of the urban population. The majority of people living in slums are located in three regions: East and South-East Asia (332 million), Central and South Asia (197 million) and sub-Saharan Africa (189 million) (United Nations, 2019).

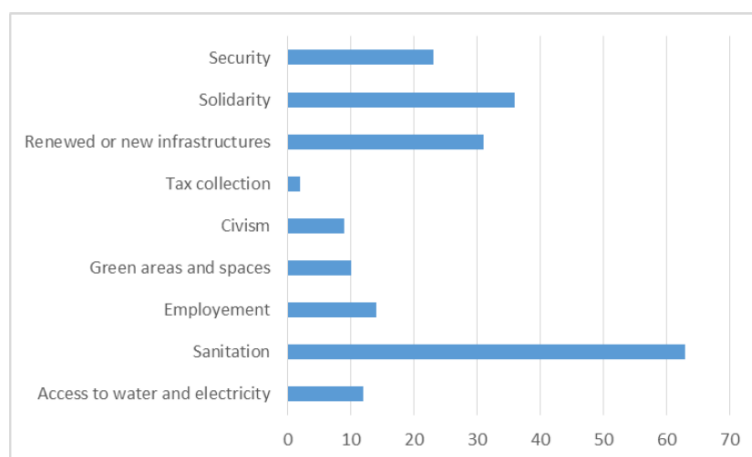


**Figure 6.** Houses Types

In Ambositra, houses are built in red mud bricks. This raw material is widely available locally. The roofs are made of flat sheet metal. Outside the town center, the houses are made of wasteland and thatched roofs. A proportion (about 1%) of the population still lives in wooden facilities, far from any comfort and vulnerable to bad weather, fire and insecurity.

Safe collection, removal, treatment and disposal of solid waste are some of the most important services in urban areas. In sub-Saharan Africa, only half of all municipal waste is collected, with adverse effects on the health of residents. Moreover, even when waste is collected, it is not necessarily treated and disposed of in a sustainable and environmentally friendly way. Waste management therefore remains a major problem for urban areas such as the city of Ambositra.

During the data collection, the heads of households were asked what they think must be prior for the city of Ambositra.



**Figure 7.** Population Basic Needs and Priorities

The need for massive sanitation of the city appears to be a priority, followed by the need for village solidarity to carry out actions to maintain security. The rehabilitation or creation of new infrastructures is also important.

**d. SDG 12 Responsible Consumption and Production**

"Establishing sustainable consumption and production patterns".

How societies use and manage their natural resources has a fundamental impact on their quality of life. One of the main objectives of the Sustainable Development Agenda to 2030 is to make economic growth less dependent on the amount of resources used and to reduce its environmental impact, including by promoting resource efficiency, while improving people's well-being. This can be achieved by adopting more sustainable consumption and production patterns.

**Table 4.** SDG 12's Criteria

Implement the 10 Year Framework of Programmes on Sustainable Consumption and Production Patterns, all countries taking action, with developed countries taking the lead, taking into account the development and capabilities of developing countries.
By 2030, achieve the sustainable management and efficient use of natural resources
By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post harvest losses

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By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment

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By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse

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Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle

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Promote public procurement practices that are sustainable, in accordance with national policies and priorities

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By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature

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Support developing countries to strengthen their scientific and technological capacity to move towards more sustainable patterns of consumption and production

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Develop and implement tools to monitor sustainable development impacts for sustainable tourism that creates jobs and promotes local culture and products

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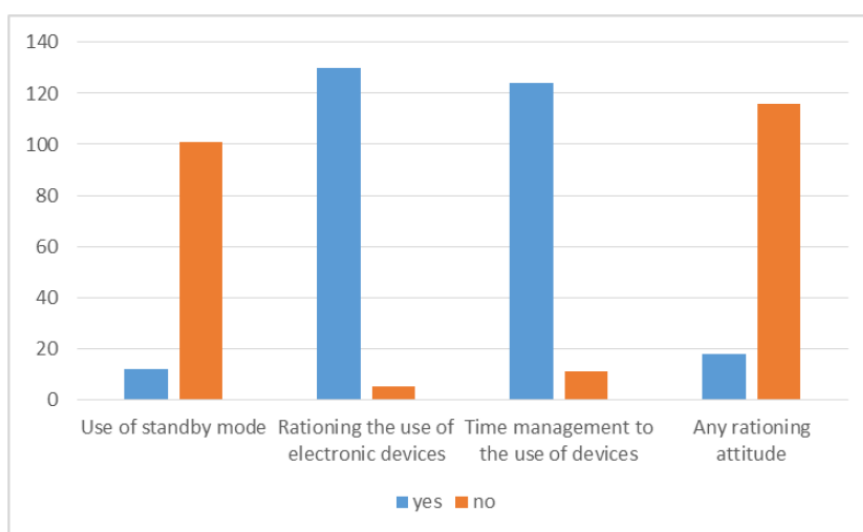
Rationalize inefficient fossil-fuel subsidies that encourage wasteful consumption by removing market distortions, in accordance with national circumstances, including by restructuring taxation and phasing out those harmful subsidies, where they exist, to reflect their environmental impacts, taking fully into account the specific needs and conditions of developing countries and minimizing the possible adverse impacts on their development in a manner that protects the poor and the affected communities.

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Source: IAEG-SDGs, 2016

This change requires national policies that promote enabling environments, social and physical infrastructure and markets, as well as a transformation of business practices in global value chains. Sustainable consumption and production policies are a key mechanism for improving living standards without compromising the resource needs of future generations. Such policies aim to decouple economic growth from environmental degradation, use resources more efficiently and promote more sustainable lifestyles.

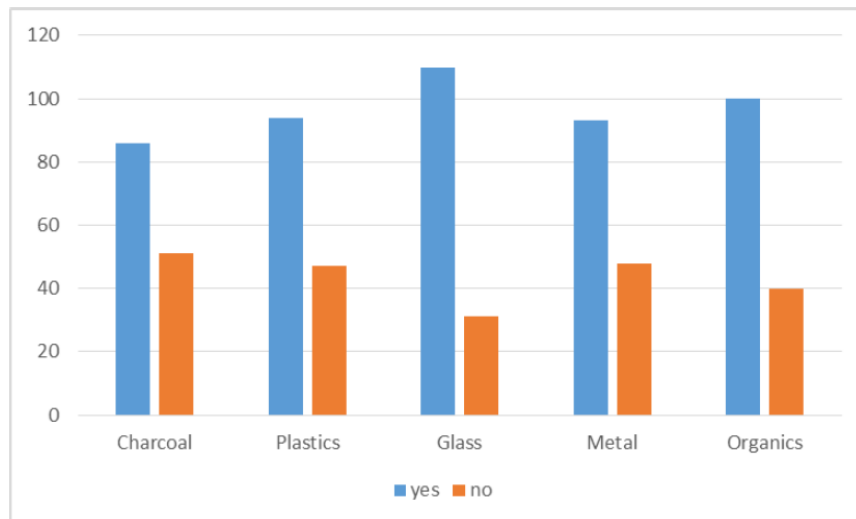
Households that have access to electricity and have electronic and household appliances have consumption patterns that are directly related to managing the cost of the monthly electricity bill.



*Figure 8. Ways of Using Electronic Devices*

Households answered positively to adopting daily gestures in rationing the use of devices while managing time. As a result, devices are mostly turned off and standby modes are rarely used.

The material footprint per capita in developing countries has increased from 5 metric tons in 2000 to 9 metric tons in 2017, representing a significant improvement in material living standards (United Nations, 2018). For all types of raw materials, developed countries have a per capita material footprint that is double that of developing countries; their footprint for fossil fuels is also more than four times greater.



*Figure 9. Recycling Habits*

Non-biodegradable materials are rarely discarded after use. These are plastic, glass or metal containers. Organic waste is used either for composting or for pet food. We can consider that the survey population does recycle, therefore, participates in the reduction of waste, even if people always adopt these gestures to minimize expenses by avoiding buying them.

### 3.2 Discussion

Poverty levels in Madagascar affect 71.5 percent of the population; about 93 per cent live on less than \$2 per day. Fifty-five per cent of the population lives in extreme poverty. Based on current trends, ¼ criteria of SDGs 2 and 15 can be achieved. Madagascar is likely to achieve at least one third of the criteria of SDGs 3, 8, and 10. For SDGs 1, 4, 5, 6, 7, 9, 11, 12, and 13 criteria, the status quo or even regression will be maintained. Only criteria of SDG 17 would be achieved (UNDP, 2018).

In our study area, only 44% of the households surveyed are aware of or have heard of the sustainable development objectives. The population's living conditions (access to basic services, housing, etc.) reveal a very precarious reality of survival without any consideration of sustainable development. However, consumption patterns based on questions of survival, rationing, cost reduction, impossibility of doing more are profitable for the implementation of SDGs. The situation in Ambositra gives an overview of the possible cases in other Malagasy cities, a situation that may be even worse, as in the case of Antananarivo (Heath and *al.*, 2012). For the present study, some of the targets related to the 4 SDGs were not taken into account in the questionnaire. Field data collection was spatially limited and did not cover all *Fokontany*. Nevertheless, the hypotheses that were previously made were verified.

In relation to the results obtained for each SDG, a few recommendations are presented. For SDG 6, it is important to strengthen the hygiene awareness and education campaigns and facilitate access to drinking water for all households. Public policies on communal sanitation must be conducted properly. The use of solar panels by a few households is already a promising fact for the energy transition. Households should be oriented not to the demand for a connection to the Jirama grid but to the conversion to green energy and, at the same time, encourage the adoption of daily gestures of sustainable and responsible consumption.

#### IV. Conclusion

Decoupling economic growth from resource use is one of the most important and complex challenges facing humanity today. Addressing it effectively will require policies that promote the creation of an environment, social and physical infrastructure and a market conducive to such changes, as well as a deep transformation of business practices in global value chains. This research collected quantitative data on the situation of not only urban but also rural households regarding SDGs. This can help in understanding the realities. The situations in other cities are similar to those in Ambositra, but are not identical. Further investigations are therefore necessary to put in place appropriate policies and actions for each locality.

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