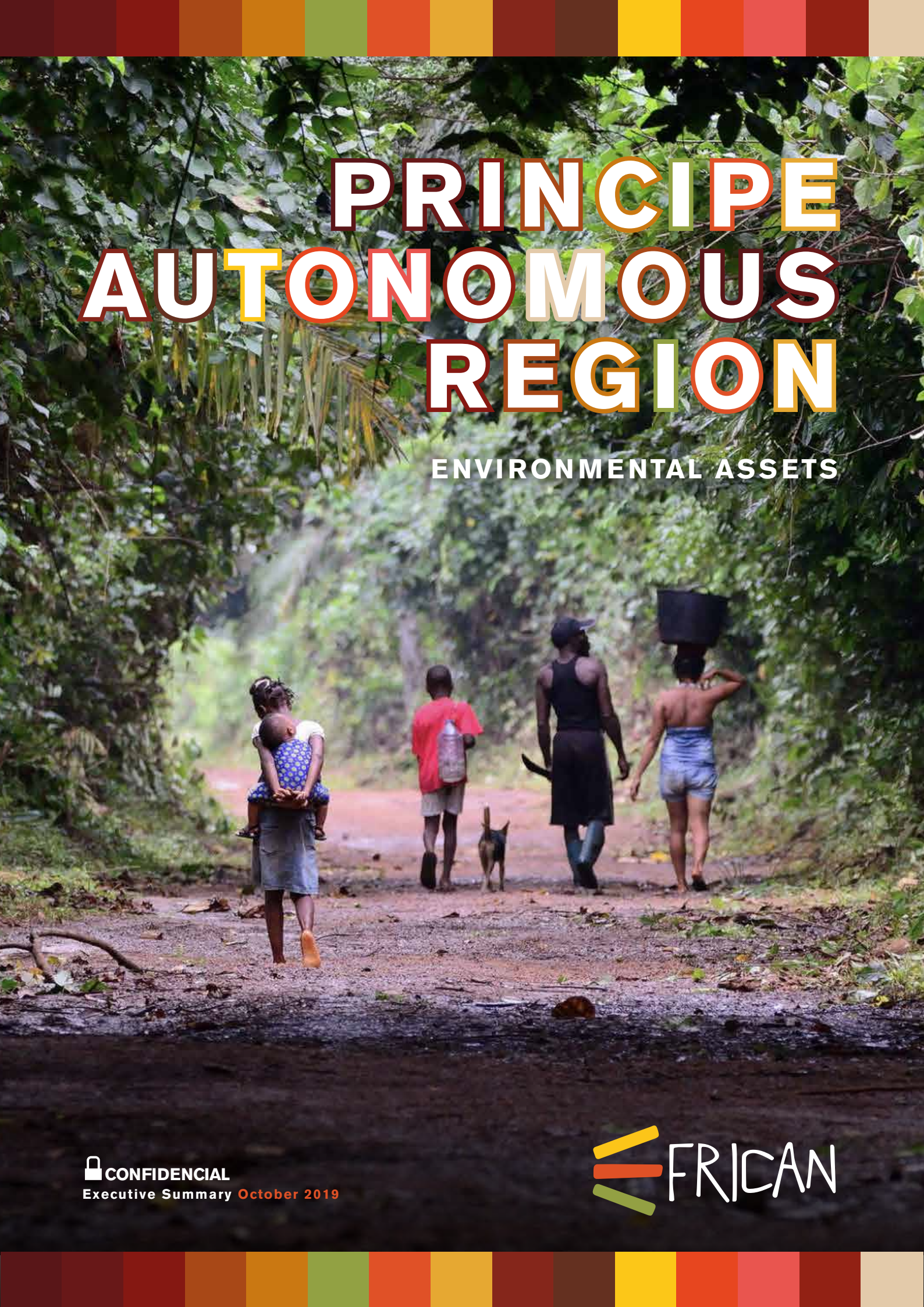




PRINCIPE AUTONOMOUS REGION

ENVIRONMENTAL ASSETS

The climate issue and forests are closely related, considering the influence of the latter in absorbing and retaining carbon stocks, i.e. CO₂ equivalent. Regarding the importance of forest resources, many points are not considered when taking into account different forms of preservation and ecosystem services associated with climate change mitigation. Forests and natural ecosystems have a large number of carbon stocks that can be used in a variety of conceptual and strategic forms, and can bring positive changes in the environment, in the preservation of biodiversity and in the supplementation of ecosystem service.

As such, aware of its social responsibility and to provide sustainable financing alternatives for developing countries, Aenergy has partnered with the Regional Government of Príncipe to assess and monitor forest-related ecosystem services, calculating the amount of carbon qualitatively and quantitatively, in CO₂ equivalent, of the environmental assets. These environmental assets calculated in a specific area over a period of time are based on the technical recommendations of the Project on Advanced Natural Capital Accounting, supported by NORAD.



Bear upon the technical recommendations of SEEA (Experimental Ecosystem Accounting) prepared jointly by the United Nations Environment Program (UNEP), the United Nations Program for Sustainable Development (UNSD) and the Biodiversity Convention (CBD); the document with the final recommendations is from October 2017, making this study developed in Príncipe island the first study to follow the SEEA recommendations for ecosystem services. The SEEA identifies four key ecosystem services: soil, water, biodiversity and carbon. In the present study, for strategic reasons, forest ecosystem services quantified by CO₂ absorbed by Príncipe island forest were studied and considered. The most widely used CO₂ calculation methodologies were very precisely implemented. This makes this project the first project to quantify the environmental assets related to the ecosystem services of the forest and vegetation of Príncipe Island.

Ecosystem accounting is a coherent framework for integrating measures of ecosystems and the flows of their services, with measures of economic and other human activity. Ecosystem services accounting complements, and builds on, the accounting for environmental assets as described in the System of Environmental-Economic Accounting (SEEA) Central Framework (UN, et al., 2014a). In the SEEA Central Framework, environmental assets are accounted for as individual resources such as timber, soil and water resources.

In ecosystem accounting as described in the SEEA Experimental Ecosystem Accounting (SEEA EEA) (UN et al., 2014b), the accounting approach recognizes that these individual resources function in combination within a broader system.





The prime motivation for ecosystem accounting is that separate analysis of ecosystems and the economy does not adequately reflect the fundamental relationship between humans and the environment. In this context, the SEEA EEA accounting framework provides a common platform for the integration of:

- (i) information on ecosystem assets (i.e. ecosystem extent, ecosystem condition, ecosystem services and ecosystem capacity), and
- (ii) existing accounting information on economic and other human activity dependent upon ecosystems and the associated beneficiaries (households, small businesses and the government).

The integration of ecosystem and economic information is intended to mainstream information on ecosystems within decision making. Consequently, there must be a strong relevance of the data set to current issues of concern. The purpose of ecosystem accounting described in the SEEA EEA was for application of the framework at a national level. That is, linking information on several ecosystem types and multiple ecosystem services with macro level economic data, such as measures of national income, production, consumption and wealth.

However, since the first release of the SEEA EEA it has been proved relevant to apply the SEEA EEA ecosystem accounting framework at regional and sub-national scales. For example, for individual administrative areas such as provinces, protected areas and cities; and environmentally defined areas such as water catchments. Indeed, at these sub-national scales, the potential of ecosystem accounting can be demonstrated more easily by being linked directly to the development of responses to specific policy themes or issues. Thus, a sub-national focus may be of particular interest in the development of pilot studies on ecosystem accounting which is facilitated by the increasing availability of data about ecosystems at this detailed level.

It's important to note that using a common accounting framework for the measurement and organization of data at sub-national levels supports the development of a more complete national picture. This same logic also extends to the coordination of ecological information on trans-boundary and global scales. Overall, the coordination and integration of data using an accounting framework can provide a rich information base for both local and broad scale ecosystem and natural resource management.





The essence of ecosystem accounting is that the biophysical environment can be partitioned to form a set of ecosystem assets. Potential ecosystem assets include forests, wetlands, agricultural areas, rivers and coral reefs. To date, the focus has been on accounting for land areas, including inland water, but there are also innovative applications for different approaches considering the context of coastal and marine areas. Each ecosystem asset is then accounted for in a manner analogous to the treatment of produced assets such as buildings and machines in the System of National Accounts (SNA) (EC, et al., 2009). The analogous treatment implies that ecological information pertaining to ecosystems can be recorded using the same measurement framework that is used to record information on produced and other economic assets. Thus, the stocks and flows of each asset are recorded as a combination of :

- (i) balance sheet entries at points in time and;
- (ii) changes in assets due to investment or depreciation and degradation.

Each ecosystem asset supplies a stream of ecosystem services. For produced assets, the services provided are known as capital services (e.g. housing services provided by a dwelling). The flows of services (both for ecosystem assets and produced assets) in any period of time are related to the productive capacity of the asset. These services also generate an income flow for the economic unit that owns or manages the asset and they are inputs to the production of other goods and services. This fundamental accounting model remains consistent throughout all these recommendations. In this first phase of the Príncipe Island Project, it was only considered carbon and the forest as environmental assets in order to generate resources, not including the other environmental assets of the Island defined on the methodology such as: soil, water and biodiversity.

The Príncipe Island was considered due to its unique forests that shelter important biodiversity and provide many ecosystem services. These forests were extensively studied to fully assess their extent and conservation status, thusly enabling us able to begin developing solutions to many environment related problems faced nowadays.



Multiple different areas were surveyed, since May 2018 until December 2018, to promote a broader understanding of the topic. The different areas can be observed in the figure below:

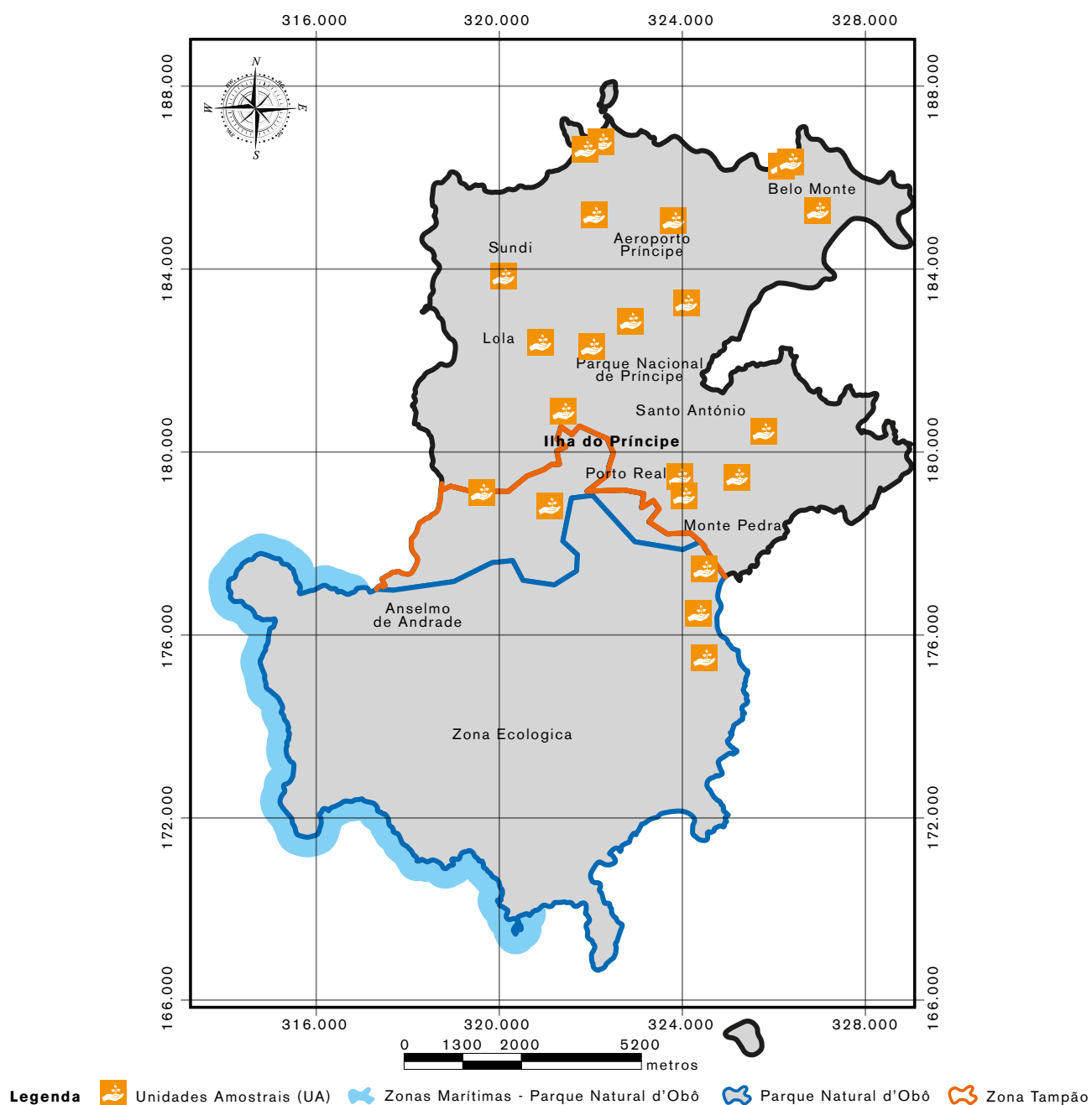


Figure 1 - Distribution of sampling units carried out in Príncipe Island

One of the most important aspects of the work was based in the forestry inventory to support the estimation of biomass, the specification of geographical data and the development of procedures to systematize the information that was collected. Although this study was expeditious, it had a methodological design that allowed to obtain and compile a large volume of data, which supported all subsequent technical analysis. The study is composed of nine chapters, which are presented below.

- The first chapter of the study, point 2 of the report, comprises the biophysical and socioeconomic characterization of Príncipe Island. For this purpose, a compilation and analysis of the available bibliographic information was carried out, complemented by the collection of complementary data in loco, which also allowed to validate some of the assumptions and conclusions.
- The second chapter, point 3 of the report, aims to present the main information related to the planning and development of field activities, especially with regard to forest inventories, through the definition of Sampling Units, photogrammetric surveys and mapping.
- The third chapter, point 4 of the report, presents the procedures for sampling and collecting data at mapping level, stratification of vegetation cover, land use, and parameters for estimating present vegetation biomass and necromass. In addition, the procedures adopted for the systematization of data collection are also presented.



- The fourth chapter, point 5 of the report, descriptively displays the location and processing information of the photographs obtained with drone surveys. This report prioritizes aerial photogrammetric surveys information, but information on other performed flights(non-metric) is also presented. Attached to the report are orthophotos in ECW format, orthophoto maps in PDF format and image files (JPG) of flight photographs.
- The fifth chapter, point 6 of the report, presents the data analysis procedures and the phytosociological survey results. Through the phytosociological analyzes, the information collected can be used to provide knowledge about the abundance of plant species and to describe the behavior and structure of the vegetation. The detailed classification, mapping and description of vegetation form a scientifically defensible basis on which decisions can be made in relation to man-made impacts.
- The sixth chapter, point 7 of the report, aims to present the results of the forest inventory carried out, as well as to detail the statistical procedures for the analysis and obtaining of the volume, biomass and carbon data of the forest areas. This study consisted of looking into three specific categories, those being the arboreous, regeneration and necromass inside each of the Sampling Units and then calculating those categories to get a better perspective for the total biomass and carbon presents.
- The seventh chapter, point 8 of the report, describes the adopted procedures for the mapping of Príncipe Island, as well as presents the products obtained from the dynamics of human use and occupation of the soil. Likewise, the sources of secondary information used during the execution of the project in the different stages of execution of the project activities are presented. For a better presentation of the information the data were grouped into three different categories, being: images, vectors and others.



- The eighth chapter, point 9 of the report, corresponds to the quantification of forest and carbon forest environmental assets, in line with the methodology and recommendations - SEEA Experimental Ecosystem Accounting. It was found that the island presents a total of 6.782.956,18 t CO₂ equivalent per hectare, as presented in the next table.

Table 1 - Estimated values for biomass, carbon and CO₂ equivalent

Indicators	Total per hectare	Total for all forestry classes
Total volume of trunk	374,97 m ³ .ha ⁻¹	4.807.040,41 m ³
Total Estimated Biomass	307,02 Mg.ha ⁻¹	3.935.935,00 Mg
Carbon from Bushes and Necromass	144,30 t C.ha ⁻¹	1.849.897,14t C
Carbon equivalent	529,10 t CO ₂ equivalent.ha ⁻¹	6.782.956,18t CO ₂ equivalent

- The Ninth and last chapter, point 10 of the report, corresponds to the Bibliographic Data Base, which consequently presents the main sources and references that were consulted and used in the planning, structuring and development activities of the entire project. Given the high fragmentation and dispersion of existing data, this volume also allows for its compilation for future memory.

The main strategy is to use those environmental assets calculated and evaluated through the methodologies indicated on the SEEA Experimental Ecosystems Accounting to finance the conservation of the island and invest in priority areas for the benefit of its inhabitants.

This investment will support the implementation of a very innovative approach to evaluate natural capital and to revert that evaluation for the benefit of the local communities in building a green smart Island while aware of their contribution for the adequate management and use of the Natural Capital.