

Annex 19: Methodology for calculating direct and indirect beneficiaries

A. Introduction

1. The project is designed to address the vulnerability of local communities residing within three municipalities of Marajó, an area subject to multiple climate hazards that pose significant risk to livelihoods and agricultural land. Extreme tidal floods, soaring temperatures, erosion, severe weather events, and saltwater intrusion are converging factors projected to have detrimental impacts, leading to diminished food production and increased food prices.
2. Coastal regions, directly exposed to oceanic, atmospheric, and continental processes, are highly vulnerable to the impacts of climate change. Among Brazil's coastal municipalities, the Marajó archipelago stands out as particularly susceptible. This vulnerability is reflected in its economic and social indicators. Marajó's GDP per capita is three times lower than the national reference.
3. Moreover, the archipelago ranks low in terms of human development, with eight out of the 50 worst Human Development Index (HDI) values in Brazil found in Marajó. The IDHM values in all 16 municipalities are below the national average. Healthcare indicators also highlight disparities, with higher infant malnutrition and mortality rates.
4. The economic challenges faced by the region are evident. Among the 27 Federation Units of the country, Pará, the state where Marajó is located, occupied the 20th place in relation to GDP per capita. If the Marajó archipelago was a state, it would be in last place. Additionally, the healthcare expenditure in Marajó falls below the national average, further exacerbating disparities in access to quality healthcare.
5. These significant economic and social challenges underscore the urgency and necessity of implementing the project in Marajó. To address these issues, the project proposes the widescale implementation of Diversified Agroforestry Systems (DAS) as a strategic climate adaptation solution. DAS has proven to be a resilient land management approach, capable of mitigating the impacts of climate change. By embracing DAS, the vulnerability of Marajó's rural and urban populations can be significantly reduced, bolstering their resilience and ensuring both food security and sustainable livelihoods amidst the challenges posed by climate change..

B. Direct Beneficiaries

6. The project directly benefits an estimated 74,499 individuals (50.4% are men and 49.6% are women)¹, which is equivalent to the total population of the three target municipalities, as per official population projections for 20212.
7. The vulnerability of the total population in these three municipalities is evident when considering the General Municipal Vulnerability Index (MVG) as a baseline measurement. The MVG, calculated for municipalities in the State of Pará, takes into account various factors that contribute to vulnerability, such as the extent of native vegetation cover in relation to the total area, the occurrence of natural disasters and extreme rainfall events, the length of the municipal coastline, its proximity to urban centers, the prevalence of endemic diseases, and various socio-economic variables. The index ranges from 0 to 1, with ratings ranging from extremely low (0 - 0.19) to extremely high (0.80 - 1), reflecting different levels of vulnerability.
8. It is important to note that the MVG is calibrated based on a comparison among the municipalities of Pará, which are already facing high levels of vulnerability. Consequently, the three municipalities directly intervened by the project would likely exhibit even higher

¹ The proportion of women and men was obtained from the Department of Informatics of the Unified Health System (DATASUS): <https://datasus.saude.gov.br/aceso-a-informacao> .

² Population estimated for Soure in 2021 was 25752, for Salvaterra was 24392 and for Cachoeira do Arari was 24355, according to <https://cidades.ibge.gov.br/brasil/pa/soure/panorama> .

levels of vulnerability if compared to other states in Brazil. The table below presents the MVG values for the three municipalities where direct actions will be implemented:

Municipality	MVG
Cachoeira do Arari	0,74
Salvaterra	0,58
Soure	0,84

Source: da Silva Santos et al., 2021

9. This underscores the urgent need for targeted interventions to address the specific challenges and vulnerabilities faced by these municipalities and the importance of the project's efforts to enhance their resilience and promote sustainable development. The widespread practice of diversified agroforestry systems (DAS) provides significant benefits to the general population. These benefits include enhanced climate resilience in the face of extreme events, achieved through increased crop and tree diversity. This diversity improves the capacity to adapt to changing climate conditions and mitigates the risk of food production losses. Moreover, DAS promotes food security by increasing food availability, while also creating additional income opportunities for smallholders and individuals engaged in product commercialization. These benefits directly contribute to climate change adaptation efforts and support sustainable development objectives.
10. The benefits to these individuals are based on the following considerations:
 - a) The municipal policy and governance instruments to scale DAS will generate direct benefits to the entire population of the three municipalities, including rural and urban population, as policy measures expected under component 2 relate to implementation, production, processing, distribution, and commercialization of DAS products, thereby affecting producers and consumers.
 - b) Açaí, one of the primary products cultivated within the proposed diversified agroforestry plots, constitutes a crucial part of Marajó's residents' dietary intake (Murrieta et al., 1999). Its importance extends beyond mere consumption, as it forms an integral part of the local socio-economic landscape. Many rural inhabitants rely on harvesting açaí palm fruits for their livelihood, given the high demand in the regional urban market as well as river-based trade (Brondizio et al., 1994; Brondizio & Siqueira, 1997; Murrieta et al., 1989). The deployment and expansion of Diversified Agroforestry Systems (DAS) stand to reduce the vulnerability and increase productivity of açaí and other crops, with direct benefits for the local diet as well as the local trade dynamics. The policy instruments to promote DAS will consider different aspects of the value chain, from production, commerce, and consumption in both urban and rural sectors, thereby benefiting all people relying on açaí intake and commercialization in the three municipalities.
 - c) The implementation of the Reserve Fund for Community Access to Credit (USD 200,000) has the potential to benefit approximately 17,600 individuals, raising USD 2,000,000 through average loans of USD 1,500 per family unit, considering an average family size of 4.4 members and three loan rotations during the project's duration.
 - d) The implementation of 800 ha Diversified Agroforestry Systems and a capacity building program to enhance other 30 ha of already successful smallholders undertaking DAS as demonstration sites will directly benefit 3,652 individuals.

C. Indirect Beneficiaries

11. The estimated number of indirect beneficiaries in this proposal is 503,291 people (51.9% men and 48.1% female), representing the entire population of the 13 municipalities surrounding the directly intervened ones and 5.7% of the population of Pará state³. These interconnected

³ Estimated at 8.777.124 for 2021.

municipalities, sharing the archipelago ecosystem, face similar vulnerabilities to climate change. Successful interventions in the directly affected municipalities can thus serve as a model, promoting widespread implementation of these practices by smallholders across the region.

12. Moreover, the sharing of knowledge and implementation of supportive policies will generate knowledge and expertise in adapting these practices to the local conditions of Marajó. This will facilitate the replication of policy measures and knowledge transfer to the entire archipelago, with active involvement from municipal governments.
13. Additionally, the institutionalization of a fund in Marajó initially prioritizes the three directly intervened municipalities but will subsequently extend its availability to all rural residents of the archipelago.
14. Furthermore, the climate and non-climate benefits resulting from the direct implementation of Diversified Agroforestry Systems (DAS) transcend specific areas, increase ecosystem services⁴, and have an impact at ecosystem level. A wider population will also benefit from a greater variety of agroforestry products. These inclusive benefits can positively impact the entire region of the archipelago.
15. The geographical and environmental interconnection and interdependence, shared challenges, and potential for knowledge transfer and best practices emphasize the positive influence that success in some municipalities can have on the entire region. By implementing DAS and promoting environmental sustainability in Marajó, shared benefits can be realized, benefiting all inhabitants of the archipelago. Knowledge and exchange practices will be implemented to support practices and across the archipelago.
16. To ensure the replication of benefits to indirect beneficiaries, various activities and outputs will be undertaken to promote the adoption of DAS across the region. These activities include capacity building through training sessions, workshops, and knowledge-sharing events. Engagement with smallholders, extension workers, and relevant stakeholders will ensure a wide reach and dissemination of information about DAS practices and their benefits. Below are presented the foreseen activities:

Activity 1.1.3: Implement the peer-to peer capacity building program.

Activity 1.3.1: Co-create knowledge about DAS implementation and its benefits through a locally-led participatory monitoring system.

Activity 1.3.2: Produce and share knowledge on DAS and climate adaptation with key stakeholders from the 3 municipalities, Marajó and Pará state.

Activity 2.1.1: Promote knowledge building workshops with local decision makers in Marajo to provide climate information about the three municipalities and prepare them for the re-evaluation of current local policy instruments that foster DAS implementation as adaptation solutions.

Activity 2.1.2: Conduct knowledge building activities for local authorities in the three municipalities on the benefits and role of DAS in providing adaptation solutions to climate change and the need for these issues to be integrated into local policy frameworks.

Activity 2.1.4: Conduct knowledge building activities for local authorities on existing Federal and State adaptation to climate change relevant regulations, to increase knowledge on adaptation priorities and their importance to align with local policy that foster adaptation solutions proposed in Marajo such as DAS.

Activity 3.1.3: Increase capacities of local productive associations and cooperatives in Marajo on the financial management for their organizations and activities.

Activity 3.2.2: Provide capacity building in financial management to smallholders in the three target municipalities, on how to calculate production costs and utilities, and organization for financial capital for their agroforestry-based products.

Activity 3.2.4: Conduct capacity-building activities on the selected processing techniques for smallholders in the three target municipalities.

Activity 3.3.1: Conduct capacity building activities for highly vulnerable smallholders on requirements to access PRONAF financial products for their agroforestry-based products needs.

⁴ DAS will contribute to ecosystem services such as soil erosion prevention, water retention, carbon sequestration, and biodiversity conservation, further enhancing the ecological sustainability of the region.

17. Additionally, demonstration sites will be established to showcase successful DAS implementation. Farmers from other municipalities will have the opportunity to visit these demonstration sites, learn from them, and be inspired to adopt similar practices on their own lands. Policy advocacy efforts will focus on engaging with municipal governments and relevant institutions to integrate DAS practices into local policies and programs, creating an enabling environment for widespread adoption among smallholders in the region. Below are presented the foreseen activities:

Activity 1.2.2: Conduct visits for smallholder beneficiaries to the demonstration sites in the three municipalities, with a gender-responsive approach.

Activity 2.1.1: Promote knowledge building workshops with local decision makers in Marajo to provide climate information about the three municipalities and prepare them for the re-evaluation of current local policy instruments that foster DAS implementation as adaptation solutions.

Activity 2.1.2: Conduct knowledge building activities for local authorities in the three municipalities on the benefits and role of DAS in providing adaptation solutions to climate change and the need for these issues to be integrated into local policy frameworks.

Activity 2.1.4: Conduct knowledge building activities for local authorities on existing Federal and State adaptation to climate change relevant regulations, to increase knowledge on adaptation priorities and their importance to align with local policy that foster adaptation solutions proposed in Marajo such as DAS.

18. By implementing these activities, the benefits of DAS will be disseminated, and knowledge transfer will occur, positively impacting the entire archipelago. The project's detailed implementation plan will provide a clearer roadmap for the allocation of benefits and activities, ensuring a systematic approach and effective spread of benefits among the municipalities.

D. References

Brondizio, E. S., Moran, E., Mause l, P., and Wou, Y. (1994). Land use change in the Amazon estuary: Patterns of Caboclo settlement and landscape management. *Human Ecology* 22 (3): 249-278.

Brondizio, E., and Siqueira, A. (1997). From extractivists to forest farmers: Changing concepts of Caboclo agroforestry in the Amazon estuary. *Research in Economic Anthropology* 18: 233-279.

Murrieta, R. S., Brondizio, E. S., Siqueira, A., and Moran, E. F. (1989). Estratégias de subsistência de uma população ribeirinha do Marajó -Acu, Ilha de Marajó, Brazil. *Boletim do Museu Paraense Emilio Goeldi, Série Antropologia* 8(50): 147-163.

Murrieta, R. S., Dufour, D.L., Siqueira, A. (1999). Food Consumption and Subsistence in Three Caboclo Populations on Marajó Island, Amazonia, Brazil. *Human Ecology*, Vol. 27, No. 3, 455-475.

Silva Santos M.R., Vitorino, M.I. Carneiro, L.C., Silva Pimentel M.A. and Quintão A.F. (2021). Socioenvironmental Vulnerability to Climate Change: Conditions of Coastal Municipalities in Pará State. *Revista Ambiente & Sociedade*, Vol. 24.