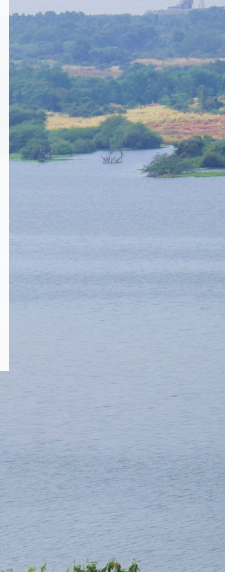


Closing the Loop: Towards self sufficiency via community engagement in Florianópolis



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Florianópolis in Context

Florianópolis is the capital city of Santa Catarina State, in the southern region of Brazil. Most of its land is located on an island connected to the mainland by two bridges. The interconnectedness of the city with the surrounding Florianópolis Metropolitan Nucleus (FMN) and the mainland has grown simultaneously with urban population growth. This mainly occurred during the second half of the 20th century up to 2010. Currently, the city and the surrounding municipalities have reached a plateau in the rate of urbanization because Florianópolis now occupies the totality of its “buildable” land (land not limited by geographical aspects). Florianópolis has a population of mainly urban inhabitants and is the 17th densest city capital of Brazil. In comparison to other cities in the country, its population size is manageable and this, as well as southern Brazil's history of successful economic and social development, has contributed to Florianópolis having the third best Human Development Index score in Brazil [6]. In this context, Florianópolis has become a reference for quality of life in Brazil and has the strongest economy in the FMN [7].

Food-Water-Energy Nexus in Florianópolis

Currently, despite the expectation that the above-mentioned socio-economic aspects would attract an influx of immigrants to the city, the rate of



Facts & Figures

Population

421,240 (2010) [3]

Annual population growth rate

2.1% [4]

GDP of Florianópolis

USD 9,310.76 (2017) [5]

Population Density

62,724 persons/km² (2010) [3]

Land area

443,36 km² (2018) [5]

urbanization and economic growth has decreased in the last decade [8]. This is in part due to the decrease in availability of “buildable” land which has impaired horizontal growth. In addition, the city is almost completely dependent on resources from the surrounding municipalities, which implies a lack of efficiency within the food, water and energy nexus (FWEN).

Decentralization from metropolitan/regional and federal spheres of government to support the supply of FWE in Florianópolis, is a central challenge faced by the city. For instance, the main supplier of electricity to the municipality is CELESC (*Centrais Elétricas de Santa Catarina*), which is responsible for powering Santa Catarina State and 92.7% of the households in Florianópolis [8]. The current composition of the energy matrix in Florianópolis could be improved by greater collaboration and participation of decentralized energy sources such as solar and wind power, as recommended by the Sustainable Florianópolis Action Plan (SFAP) in its Transversal Strategic Lane of Action regarding Electricity.

“Florianópolis is said to be a sustainable city but most of what it needs comes from elsewhere, so we do not produce our own energy, water comes from outside too, and the majority of our food comes from the ‘green belt’ that we have surrounding the city”.

Cibele Assmann Lorenzi, general director of the Institute of Planning and Urban Research of Florianópolis (IPURF)

Despite springs being located within the island part of the city [9], water resources are mostly provided by mainland sources. Located at the Southeast Basin, east of Santa Catarina, the Tijucas, Biguaçu, Cubatão and Madre rivers supply the FMN and are distributed between the cities by the Catarinense Company for Water and Sanitation (CASAN) [10].

This scenario represents a dependency by Florianópolis, not only for the supply and distribution of water, but for the management of this resource. As well as CELESC, CASAN is a state level institution responsible for the territory of Santa Catarina [10]. This is crucial for



Figure 1 – Community members gathered at an urban garden in Florianópolis

the coordinated administration of these natural resources that transcend municipal barriers. However, it also implies greater vulnerability in the city, as pointed out by Cibele Assmann Lorenzi, general director of the Institute of Planning and Urban Research of Florianópolis (IPURF): *“the water issue is the most urgent for the city: how much water is there at the municipality today? Is the water intake sufficient? [How] is the refueling and quality of the aquifers?”*

Food production in Florianópolis makes up less than 1% of local economic activity. Therefore, the city is dependent on the 22 municipalities that make up the MNF, known as the “Green Belt”. The transportation of food contributes to the greenhouse gas (GHG) emissions of the city [2], mainly as a result of the road transportation system between the mainland and island parts of Florianópolis. This long supply chain also adds

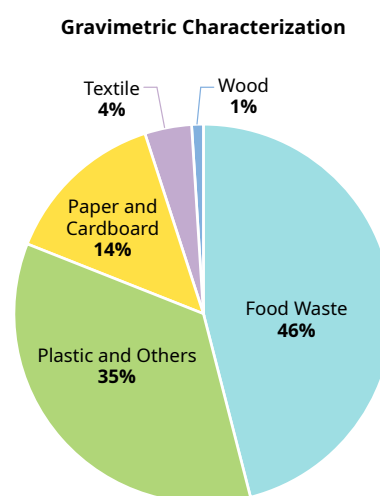


Figure 2 – Percentage of residues produced by Florianópolis [adapted from 7]

to the price of the final products, impacting the accessibility, particularly of organic food. The local structures are insufficient in processing food waste which has also contributed to the city's GHG emissions. These fall within the "residue" category of emissions [2].

Pressure on FWE is amplified by the city's seasonal tourism industry. It is estimated that during December, January, February and March, the city's population triples [8]. Despite greatly contributing to the economy of the city, this activity puts pressure on the distribution of FWE resources and accelerates the importation rates of resources to the city, as well as waste production.

A Story of Innovation: Decentralization of Food Production

The Municipal Urban Agriculture Program (Cultiva Floripa), established in Florianópolis in June 2017 by a decree and updated in 2020, aims to promote urban agroecological practices. This includes producing and processing food efficiently and locally, as well as improving access to healthy and low-cost food produced with agroecological methodologies within the urban context. In addition, the Cultiva Floripa aims to support local organic food producers commercialize products directly, which reduces production chains and transportation requirements. In doing so, the project aims to enhance the co-benefits from these practices such as the repurposing of land use within the urban context and maintaining clean and litter-free urban areas while promoting community participation and engagement [11].

In order to achieve these goals, six actors are

responsible for co-managing the program:

- Environment Municipal Foundation (*Fundação Municipal do Meio Ambiente - FLORAM*)
- Fishing, Mariculture and Agriculture Municipal Superintendency (*Superintendência da Pesca, Maricultura e Agricultura*)
- Municipal Health Secretariat (*Secretaria Municipal de Saúde*)
- Municipal Improvement Autarchy (*Autarquia de Melhoramentos da Capital - COMCAP*)
- A Collegiate composed of representatives from the direct and indirect administration bodies that are members of the program [12]
- Municipal Education Secretariat (*Secretaria Municipal de Educação*)

Government institutions (from Municipal, State and Federal levels), universities, community members, Non-Governmental Organizations (NGOs) were invited for the implementation of the Cultiva Floripa and they collaborate with seminars and capacity building, covering several themes. The main organizations that intergrated the working group with the municipal managers are as follows:

- *Rede Semear*, a network that connects civil organization members, municipal, state and federal representatives and other institutions interested in broadcasting and mainstreaming urban agriculture [13]
- The Center for the Study and Promotion of Group Agriculture (*Centro de Estudos e Promoção da Agricultura de Grupo - CEPAGRO*), founded in 1990 by small farmers and technicians interested in the development of

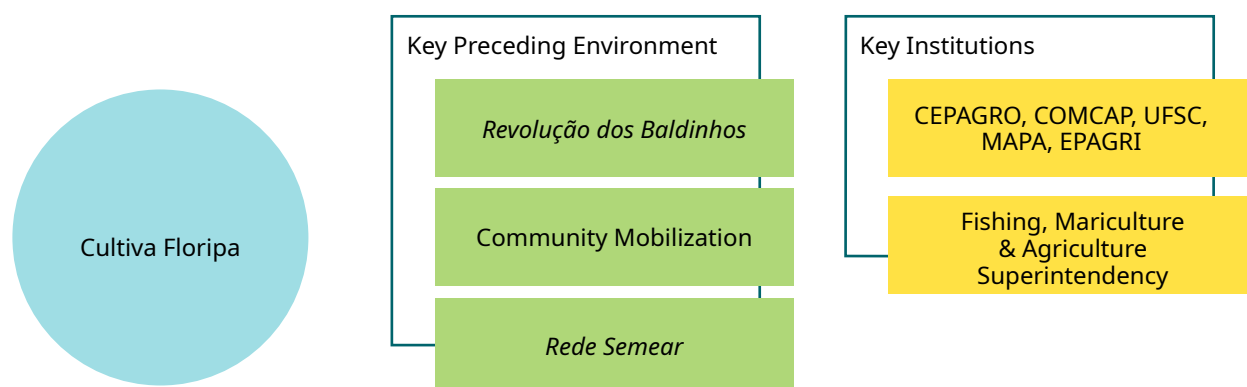


Figure 3 – Key environment and institutions for the development of Cultiva Floripa



Figure 4 – Workers composting food waste [18]

small local productive networks as a way of making family farms viable [14]

- Santa Catarina Federal University (Universidade Federal de Santa Catarina - UFSC)
- Ministry of Agriculture, Livestock and Supply (Ministério da Agricultura, Pecuária e Abastecimento - MAPA)
- Santa Catarina Agricultural Research and Extension Company (Empresa de Pesquisa Agropecuária e Extensão Rural de Santa Catarina - EPAGRI) [15]
- *The Revolução dos Baldinhos* was a community project, implemented by different community organizations, including CEPAGRO

The *Revolução dos Baldinhos*, “Bucket Revolution”, represents an important initiative for community mobilization and engagement actions. In 2008, professionals from the Health Center in the Monte Cristo neighborhood [16] assembled with CEPAGRO and representatives from local schools and nurseries to discuss strategies for facing disease spreading pests and illegal littering (of mainly organic materials). Aiming to systematically combat this issue, not only through pest control, the region could benefit from receiving organic matter as fertilizer for gardens. This is yet to be implemented [17].

The *Revolução dos Baldinhos* has generated a network who are responsible for collecting organic matter from houses, processing it, and distributing it to the urban gardens of the region. In 2016, the project published a handbook that consolidates the methodology for Community Management of Organic Waste and Urban Agriculture [18] and has been replicated in over 22 states [19]. These successful efforts have been identified by representatives of the municipality as key for developing the Cultiva Floripa and

also for addressing city-wide challenges such as increased independence of food production, food security and waste management. The initiative receives support from the municipality, providing the site for the activities and support in the transport of waste to the composting site.

Cultiva Floripa is funded by specific public notices and has the support of project coordinators,



Figure 5 – The main themes and impacts of the Revolução dos Baldinhos project [1]

who are responsible for technical support with the maintenance of the gardens, as well as wooden lacquers to cover the compost piles and seedlings. According to the questionnaire given to representatives from the Fishing, Mariculture and Agriculture Superintendency, “The municipality invests in goods and services to the project - such as tools, seedlings and technical guidance for the implementation of the project. [...] A specific program for Urban Agriculture was created in the budget of the Municipality of Florianópolis and funds are raised through public notices (editais), as is the case of the ‘Expansion and Strengthening of the Valorization of Organic Waste in Florianópolis’ project”. In 2019, the Municipality Annual Budget Law (Lei Orçamentária Anual - LOA) included a specific item for Urban agriculture actions.

Figure 5 shows the main themes and impacts of the Revolução dos Baldinhos project. Community engagement and technical support are represented by the characters; volunteer action is highlighted on the left blue sphere and on the right, financial support; the green sphere in the center represents the composting facilities and gardens supplied by them. Image from the Handbook “Revolução dos Baldinhos - The Social Technology of Community Management

of Organic Waste and Urban Agriculture”, a project that inspired Cultiva Floripa [1]. Figure 4 shows workers depositing food waste onto composting piles. These will become fertilizers and nurture the food gardens in the city.

In 2019, the Cultiva Floripa program supported the implementation of 112 urban gardens in several locations in the city [19]. Vulnerable areas of the city, such as the Tapera Neighborhood, have benefited the most from the community gardens installed by the program. Their economy had been based on fishing activities which have been reduced in the past few years, diminishing the local economy. In this sense, the gardens have provided an opportunity for the population to access organic food without additional cost [20].

In 2018, 54 workshops focusing on composting techniques were also provided via a partnership with the Worm Head Program (*Programa Cabeça de Minhoca*). At these capacity building programs, locals learned how to process organic waste at home by using vermicomposting techniques. More than 500 people attended the first classes and today the program has a waiting list of more than 1500 people [19]. Capacity building actions such as this are essential for the successful implementation of the initiative as voluntary action is required for the correct separation of organic material and its repurposing as fertilizer for urban gardens [21].

Also, since 2019 the program supports the Street Fair at the Alfandega Square in the center of the city. This allows organic food producers to sell products directly to consumers, shortening production circuits and enhancing the autonomy of the municipality in food production. The Ministry of Agriculture, Livestock and Supply significantly contributes to the legalization of organic production in the municipality. Zenilto Custódio da Silva, a technical assessor from COMCAP, highlights that the fair not only makes safe, nutritious food available for the population

at an affordable price, but also showcases the result of separating organic residues from recyclable materials. This reinforces the importance of such practices to the population which is a central part of the project [20].

Florianopolis produces 180 tons per day which costs approximately R\$ 1.000.000,00 per month to take to the landfill. Currently, the city diverts 3% of the total organic waste that was sent to the landfill and is now composted. In 2020 the program launched an innovative approach for composting which establishes the payment for composting services in the city. With an invested R\$ 980.000,00 from the Caixa Socioenvironmental Fund, the Project aims to compost 60 tons daily in the first year. This represents one third of what is generated. For 2030, the city aims to compost 90% of the organic waste [23].

Currently, professionals from Environment Municipal Foundation, Mariculture and Agriculture Municipal Superintendency work full time on the Cultiva Floripa program whereas Municipal Health Secretariat are working part-time and helping to implement and maintain the 150 communitarian urban gardens in Florianopolis. In the 2020 Decree, the Municipal Superintendence of Fisheries, Mariculture and Agriculture assumes the administrative coordination of the Program.

As seen, the initiative has provided the city with the possibility to reuse organic waste by composting the material and repurposing it as fertilizer for organic urban gardens. By doing so the city has achieved:

- Greater independence for food production at the local scale, increasing food safety and security
- Greater independence for waste management
- Less waste taken to landfills. These direct impacts could potentially generate associated co-benefits, such as:



Figure 6 – Vegetables growing in an urban garden



- Reduction of GHG emissions due to the reduced food input to landfills and reduced transportation of food from the mainland to the island part of the city
- Increased water quality and quantity due to reduction of landfill byproducts polluting aquifers
- More permeable surfaces in urban centers
- reducing flooding events
- Reduced energy usage due to the shorter production chain
- Urban green areas providing better air quality, water infiltration and micro-climate regulation as well as provision of habitat for urban fauna

Table 1 – Stocktaking of innovative interventions that have been undertaken with regards to FWE or that impact the nexus as well as GBI

Initiative	Goals	Main Actors	Main Impacts	Innovative Aspect	GBI / FWEN Aspect
Municipal Urban Agriculture Program	Composting organic material and repurposing it as fertilizer for organic food production at urban gardens	Fishing, Mariculture and Agriculture Superintendency; COMCAP, Municipal Health Secretariat and <i>community volunteering</i>	Greater independence for food production at the local scale, increasing food safety and security, reduction of waste sent to landfill	Inspired by Community-Based project, educating with School Garden and Gastronomy and community-based actions requires active participation from community, repurposing littering as fertilizer	Food was the entry point but water could be impacted by reduced pollution and more infiltration; less energy required for food processing
Sustainable Florianópolis Action Plan [8]	To assess and prioritize infrastructure projects as well as actions to tackle the challenges of local sustainability before they obstruct development	Inter-American Development Bank, Social Environmental Fundo CAIXA (<i>Fundo Socioambiental CAIXA</i>) and City of Florianópolis through the Emerging and Sustainable Cities Initiative (<i>Iniciativa Cidades Emergentes e Sustentáveis</i>)	Development of Action and Investment plans with objective goals towards sustainable management as well as indicators to monitor their implementation	Integrated, interdisciplinary approach based on three dimensions of sustainability: environment and climate change, urban and governance	Multisectoral and territorial analysis of compiled data and traced strategies for FWE that optimize the nexus through GBI
Efficient Cities Project (Projeto Cidades Eficientes) [23]	Implement sustainable practices for climate change mitigation and improved resilience by supporting sustainability-oriented public policies and communication between actors	Financed by the United Kingdom's government through the Foreign and Commonwealth Office; Co-financed by CSI ² . Implemented by BCSB ¹ in partnership with Florianópolis Municipality	Identification of inefficient buildings and tracing strategies to reduce consumption as well as mobility mapping, capacity building and action-oriented checklist	Integrated, interdisciplinary analysis of energy and water efficiency, tracing strategies to optimize infrastructure, mobility and management as integrated aspects towards mitigation and resilience	Energy and water consumption were directly evaluated
GHG emission diagnosis [2]	Provide data relating to the contribution of each sector (transportation, housing, industrial, etc.) to GHG emissions and establish a local action plan	Inter-American Development Bank (through the Sustainable Florianópolis Action Plan) and City of Florianópolis	Development of an inventory for GHG emissions and action plan for reduced emissions	First GHG inventory and action plan for Florianópolis	Energy was the entry point. Food transportation and water/ sewage systems also impacted the study

Academy	Public (such as the Federal University of Santa Catarina and the State University of Santa Catarina) and private (such as South Santa Catarina University) universities, as well as institutes (such as the Federal Institute of Santa Catarina) develop research regarding innovation of the FWEN	Research professors and groups as well as laboratories and research teams are responsible for developing the research. Funding is provided through public (federal, state and municipal level) and private initiatives	Providing innovative methodologies, frameworks, compiling best-practices and successful cases, identifying characteristics that promote success of FWEN initiatives, depicting the nexus within urban systems	Better understanding of the components and nature of the nexus	All
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¹ Brazilian Council for Sustainable Building (*Conselho Brasileiro para Construção Sustentável*);

² Climate and Society Institute (*Instituto Clima e Sociedade*).

Enabling Environments & Capabilities

The capabilities required for this initiative are present at different levels. Firstly, the municipality holds the third best Human Development Index (HDI) score in Brazil and therefore has the human capital and economic means for encouraging social welfare and developing programs such as those mentioned above. An overall engagement of the public sphere towards sustainability issues had already been established, as the city had the Sustainable Florianópolis Action Plan. The city was already aware of its GHG emissions, waste production, and need for more independent production and processing systems of FWE elements.

More specifically, the municipality had a strong movement towards urban agriculture and waste management through health promotion and composting actions in a collaborative format via the *Rede Semear* and the *Revolução dos Baldinhos* that had previously been developed by community members. Cultiva Floripa was able to compliment these initiatives and previously established goals. Supported by these initiatives, Florianópolis had already developed a community waste management system. The Cultiva Floripa was able to reinforce these practices and encourage the use of organic waste as fertilizer in urban gardens.

The Municipal Health Secretariat/Coordination of Health Promotion, was

responsible for submitting the project to the Civil Office of the municipality via the Dengue Contingency Plan, specifically keeping the land free from pathogens, especially those with irregular garbage disposal. Another body, and therefore a key player in this initiative, is Comcap with composting systems [24].

It was also necessary to have municipal support in order to gain access to areas of the city regulated by land use legislation. This was important for accessing areas of the city where cultivation could be carried out and making links with schools and health centers around the city to develop the program.

Lastly, the practical aspects of the project were made possible by the voluntary participation of the community who separated the organic waste for it to be composted at the facilities of the project. Technical guidance provided and subsidized by COMCAP and CEPAGRO was also important for maintaining the composting facilities as well as the gardens which have now been opened to the public. In addition, agroecological knowledge from Santa Catarina Federal University and the supporting NGOs on how to develop the gardens and composting facilities was essential for the initiative.



	Capabilities (initial) & Enabling Factors (facilitating)					
	Knowledge (types and sources of knowledge)	Institutional Who was involved (governments / stakeholders)	Social (relationships required between partners)	Ecological (landscape / ecological / geographic unit, and scale)	Technological	Economic
Capabilities	Overall engagement of the public sphere towards sustainability issues and movement towards urban agriculture and waste management through the Rede Semear and the Revolução dos Baldinhos	Comcap, Municipal Health Department, Municipal Environment Foundation (FLORAM) Education Department MAPA, EPAGRI, UFSC The Municipal Civil Office through Mayor Gean Loureiro, Legislative House from Councilor Marcos Jos de Abreu	Voluntary participation of the community to separate organic waste correctly for it to be composted at the facilities of the project, technical guidance provided and subsidized by COMCAP and CEPAGRO for maintaining the composting facilities as well as the gardens	Understanding regarding the composting process, the correct techniques to cultivate these and agroecological knowledge to cultivate the urban garden	Agroecological knowledge to cultivate the urban gardens	Cultiva Floripa is funded through specific project notices and receives support from the coordinators of the project, such as COMCAP who are responsible for providing technical support for the maintenance of the gardens as well as wood chips for covering the composting piles and seedlings
Enabling Factors	Specialist civil servants and technical assistance for public gardens and composting	City Hall's commitment to waste management since 2000 Different departments from the municipality (environmental, agriculture, public health, education)	Highly motivated civil society organizations Integration between civil society organizations and municipality	City and the surrounding municipalities have reached a plateau in the rate of urbanization		High costs in organic waste transportation Resources from Caixa Socio-environmental Fund

Table 2 – Enabling factors and capabilities for Florianópolis according to the framework structure

Synthesis

Florianópolis is certainly engaged in becoming more self-sufficient regarding FWE provision. The city is achieving this by shortening supply chains and removing intermediaries that impair the population's access to these resources. This has led the city to discuss land use within its territory, an issue aggravated by its geographical limits and large areas to environmental protection, aspects that make productive land more disputed within the urban context.

The need for local initiatives that increase the independence of the municipality from FMN was a key driver for the project, as well as the need to tackle the greatest source of GHG emissions in the “residue” category, food waste. These issues, added to the pre-existing projects that already developed community waste management and urban gardens, formed the basis of the development of the initiative.



The Cultiva Floripa Program has supported the city to face these challenges as it increases local food production as well as supports waste management. The project also potentially generates co-benefits such as GHG emission reduction, increased water quality, increased permeable surfaces in the urban center, reduced energy use and increased urban green areas.

This project highlights the benefits of optimizing the nexus between food and waste management and how this in turn, can affect water and energy. Community mobilization and political interest were key for the initiative to take place, and establishing it as a municipal law provided the necessary conditions for its expansion. By repurposing waste “From the Trash to the Table”, Florianópolis is becoming a more self-sufficient city.

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