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Designing Eco-Villages as a Dual Solution
Emergency Housing and Long-Term Sustainability

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Abstract

This Thesis Started based on the competition named " Live Green; Challenge to design an Eco-village" in the city of Boa Vista, northern part of Brazil, and developed along with the question: Can an eco-village be designed as an emergency solution? When discussing eco-villages, there is often confusion about their definition and how they differ from other forms of collective communities, such as sustainable neighborhoods or urban villages.

While the idea of communal living and sustainable development is not new—rooted in ancient traditions and cultural practices—eco-villages represent a modern response to pressing environmental and social challenges. As global concerns about environmental degradation, hazards, and sustainability grow, the principles of ecological design and regeneration are increasingly being integrated into architectural and urban planning projects.

These challenges are particularly acute in Brazil's Roraima state, the location of our eco-village design. Boa Vista, a key municipality in central-eastern Roraima, has a population density of 72,71 inhabitants per square kilometer, including a significant number of Venezuelan immigrants. Since the 1980s, Roraima has experienced a dramatic increase in net immigration, leading to the implementation of various regulations to manage land use, protect ecological resources, and address cultural and economic impacts. In this context, two critical factors—ecological changes and rapid population growth—have highlighted the need for innovative solutions. This thesis explores how eco-villages, as intentional communities focused on sustainability, can serve as a dual response: addressing both the need for sustainable living and the urgent demand for accommodation, particularly in Boa Vista. By defining and comparing eco-villages, reviewing emergency housing solutions, analyzing their potential, and collecting information by contacting UNHCR and Brazilian institutions, this research aims to provide insights into how eco-villages can contribute to sustainable development in regions facing ecological and demographic challenges.

At the end, it will be enclosed by designing a proposal eco-village that implements common principles, answering to competition's main requirements while addressing local challenges.

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Chapter 00

Introduction

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General Introduction

Expanding Horizons – General Framing

The journey of our thesis programming began as an extension of our shared passion for sustainable architecture and adaptive urban solutions. Initially inspired by a competition aligned with these interests, the project was rooted in the design of an eco-village that aligns with their principles while ensuring functional, comfortable living spaces in the specific context.
However, as we went deeper into the competition framework, we realized the need to transcend its boundaries. To address broader social and ecological challenges, we expanded our vision to create a more meaningful and impactful solution.

The competition posed some very critical questions about our way of living today, which is unsustainable, and how these affect the environment. It highlighted the consequences of overconsumption, resource inequities, and environmental degradation. These themes spoke quite strongly to us because our belief indeed was that architecture can enable enormous change in moving towards sustainability in daily life.

The eco-village-a community designed for low-impact living-is what dominated the competition. Examples such as Matavenero in Spain, Auroville in India, and Damanhur in Italy came to demonstrate how architecture could be in tune with nature. These communities also demonstrated their limits: their focus often leaned more toward idyllic self-sufficiency and less on finding urgent answers to current societal issues, such as emergency housing or sheltering displaced people.

Eco-villages differentiate themselves from other sustainable housing alternatives primarily by their status as "intentional communities." Unlike other types of housing settlements, an eco-village seeks to improve its inhabitants' sense of social cohesion, shared purpose, and belonging.

This feature, in addition to the challenges of our chosen site in Roraima, Brazil—where a huge influx of migrants suffers not only from material deprivation but also from a deep sense of detachment from the broader community—underscores the importance of implementing our solution with particular sensitivity and adaptability.

An ecovillage might bridge such social gaps and become a place of belonging where one is valued and able to contribute toward making a difference.

These opportunities created for us a reconsideration of the competition structure:

- Could a community be designed that gave emphasis to sustainable practices and met pressing needs?

- Could the ecovillage be redesigned as a resilience tool in the face of environmental and socio-economic challenges?

Beyond Idealism to Urgency

Our project locate in Roraima, Brazil—a region marked by its ecological richness and socio-economic challenges—prompted a re-evaluation of the eco-village concept. Roraima's unique context, particularly its shared border with Venezuela, presented a host of challenges and opportunities that the competition brief did not fully address.

▪Addressing Migratory Pressures and Accommodation Priority

Boa Vista, the capital of Roraima, has become a focal point for migration, particularly from Venezuela due to ongoing crises. The influx of migrants has strained existing housing and resources, creating an urgent need for scalable and sustainable housing solutions. Unlike traditional eco-villages, which often cater to stable, self-selecting populations, this thesis had to accommodate transient and vulnerable groups.
The urgency of providing housing for displaced individuals required us to rethink the purpose of an eco-village. Instead of being a long-term idealistic settlement, it could serve as a transitional model—a stepping stone for people in crisis to regain stability in a sustainable environment.

▪Fostering a Sense of Community and Integrating Local Context

One of the most critical challenges for migrants and displaced individuals is the erosion of social ties and the absence of a sense of belonging. This is where the eco-village concept becomes transformative. By prioritizing community-building alongside sustainability, the eco-village addresses both material and emotional needs. Drawing from the principles of the Global Ecovillage Network (GEN), we emphasized the creation of spaces and systems that encourage social interaction, collaboration, and mutual support. This intentional community model not only fulfills basic needs but also empowers residents to rebuild their lives with dignity.

Beyond immediate needs, the project had to respect Roraima's historical, cultural, and economic landscape. The region's agricultural traditions, for instance, offered a foundation for integrating sustainable food production into the community. Furthermore, the rich ecological environment demanded a design that harmonized with its natural surroundings while protecting local biodiversity.

The eco-village framework required adaptation to ensure self-sufficiency in food, water, and energy resources. By emphasizing renewable energy systems, localized food production, and water management strategies, the community could minimize its dependence on external resources.

Shaping a Vision; Ecovillage Meets Urgent Housing Solution

Our refined vision sought to merge the principles of eco-villages with the pressing requirements of urgent accommodation. This involved a multi-dimensional approach:

▪Redefining the Eco-Village Framework

Traditionally, eco-villages focus on long-term sustainability and self-sufficiency. Our adaptation redefined this framework to address urgent housing needs. The community's design prioritizes modular and scalable housing units that can be quickly constructed and adapted as the population grows or changes.

▪Balancing Sustainability and Urgency

The principles of sustainability—minimal resource use, mitigate overheating, renewable energy—remain central to the project. However, these principles were adapted to meet the challenges of emergency accommodation. For instance, lightweight, locally sourced building materials can speed up construction while reducing environmental impact.

▪Fostering Belonging Through Design

A cornerstone of our approach is creating a community where residents feel a strong sense of belonging. This is achieved through shared spaces such as community kitchens, gardens, and recreation areas. By integrating cultural and social activities into the design, the eco-village becomes more than just a housing solution—it becomes a place where people rebuild social ties and rediscover their agency.

▪Creating a Self-Sustaining Ecosystem

A core tenet of our design is self-sufficiency. This involves integrating systems for food production (such as vertical farming and community gardens), renewable energy (like solar and wind power), and water recycling. These systems not only reduce the community's ecological footprint but also empower residents to take an active role in maintaining the settlement.

▪Contextual Adaptation

The design reflects the cultural and historical identity of the region. For example, architectural elements draw from local vernacular styles, ensuring the community feels rooted in its environment. Additionally, the agricultural history of Roraima informs the integration of food production systems, while the social spaces foster a sense of belonging and resilience among residents.

Methodology and Next Steps

Our programming phase emphasized a holistic approach that balanced ecological, social, and cultural considerations. This involved the following key steps:

▪Iterative Design

Employing an cyclic process to test, analyze, and refine solutions, ensuring they remain responsive to evolving needs and priorities.
Moving forward, the next chapters will go deeper into the characteristics of emergency housing and explore the intersections between eco-village principles and emergency solutions. We will also analyze Roraima's historical, cultural, and economic features to ensure our design respects and reflects the identity of the region.

▪Principle Integration

Extracting relevant principles from global eco-village models and adapting them to local contexts and emergency requirements.

▪Comprehensive Site Analysis

A detailed study of Roraima's geography, demographics, history, and socio-economic conditions to ground

the project in the realities of the site.

▪Needs Assessment

Identifying both immediate and long-term needs of the community, with a focus on housing, food security, and social cohesion.

Conclusion

The programming phase of our thesis represents a significant departure from the competition's initial requirements. By broadening the scope to address local and urgent needs, we have transformed the eco-village concept into a dynamic and adaptable model that integrates sustainability with resilience.

This expanded vision challenges the conventional understanding of eco-villages as isolated, idealistic communities. Instead, it positions them as practical tools for addressing complex socio-economic and environmental challenges. By emphasizing their role as intentional communities, we have highlighted the transformative potential of eco-villages to foster belonging, rebuild social ties, and empower individuals in the face of crisis.

Through this approach, our project aims to create a community that not only protects the environment but also fosters stability, self-sufficiency, and social cohesion for its residents. This dual focus on ecological harmony and human resilience offers a blueprint for sustainable urban and suburban development that is both regenerative and responsive to the needs of vulnerable populations.

Exploring Competition

Framework and Guidelines

Here, we will explore the competition guidelines, which were the initial concepts for our thesis. As we also mentioned in the introduction, the main goal was to design an eco-village, which could be the answer to our unsustainable way of living.

The main question of the competittion was " How can architecture help to reduce the unsustainable footprint in the process of making conscious choices?" and by bringing some examples of eco villaged in India, Italy,.. tried to explore if it can provide a way of living that helps us to have sustainable sourcing of the food, household waste disposal, conscious choices in the smallest decisions we make every day can help in achieving this goal. While these kinds of communities tried to reduce their carbon footprint, there is a question of whether they can also focus on the people and their lifestyle by designing spaces that are too.

The competition highlight is: "Design an eco-village that blends in with its natural surroundings and reduces its carbon footprint as low as possible." The objective was to construct the community so that environmental preservation is the primary priority, without sacrificing the amenities and living spaces for the inhabitants. Maintaining suitable living areas and providing access to portions of nature without negatively affecting the systems is one method to persuade people to accept this way of life. Another strategy for reducing consumption while maintaining resident satisfaction is to include people in community maintenance. In order to improve building performance and lessen the adverse effects on the environment, sustainable strategies must be used. There are four main objectives: Interface, Form, Sustainable, and Comfort.

In the brief, the location of the project is in Brazil, Roraima, where the local environmental deterioration can directly affect global problems like biodiversity loss and climate change.

With rivers and other bodies of water dispersed throughout the state, the terrain is rich in hydrography. The location is in Boa Vista, in the vicinity of Paraviana. It is located alongside the Branco River.
Despite being on the outskirts and having a small population, the area offers basic amenities, such as a hospital, school, church, and other homes.
The program of the competition states the need for accommodation for 50 families with four members each, which means 200 members of the community.

The proposal should begin with the programmatic outline of:
▪Living units: Housing units with a living room, sleeping area, kitchen, and bathrooms.

▪Social spaces: Courtyard, community garden, terrace vegetation, roof gardens

▪Recreation spaces: Coffee shops and Bar, Multipurpose hall, fitness centre (gym, yoga studio)

▪Parking and Services (water, gas, electric supply, drainage, and waste management)

▪Any creative additions to the project may be done within the provided constraints.

We could modify the design program or add more relevant features and activities.

These first ideas promote us to start reading about the main features of ecovillages, where is Boa Viasta and its main challenges, and the most impactful part was investigation regarding the meaning of emergency and urgency while studing the differences. We followed the competion questions by creationg more question and main questaion was by considering the eco-villages principals, and the urgent neeeds in Boa Vista can eco-village be the answer for this area? And in which terms the eco-village's key features could be implimented in our design.

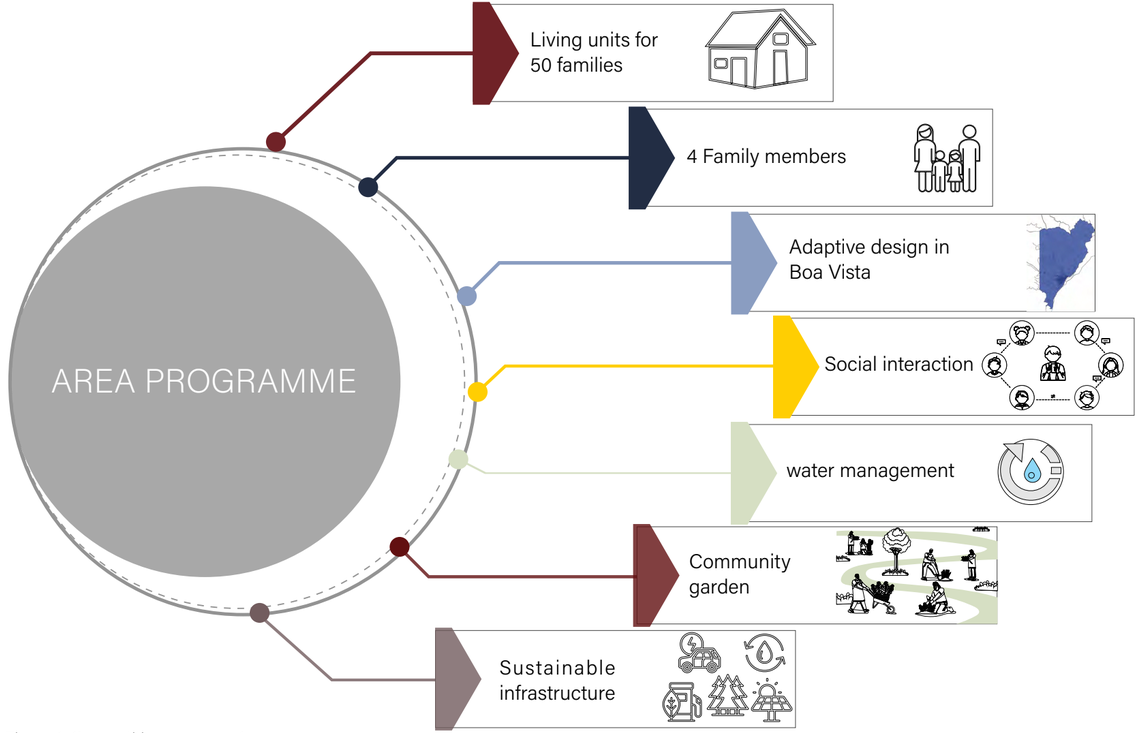

Figure 1: Competition program Area
Source:Illustrated by Aouthors based on UNI,Competition website

Chapter 01

Ecovillages Defining and Comparisons

01

. Review of the first notions and Later Interpreta tions
. Deeper Understanding by Comparison
. An Eco-village to Review (Ithaca Ecovillage)
. Tourism; Role and Impacts on Eco-villages

1.1 Review of the first notions and Later Interpretations History and Origin

1.1.1 History and Origins

1.1.1.1 Gaia Trust, 1991

Gaia Trust, located in Denmark, is a charitable entity supporting sustainabilty projects around the world. It was founded in 1987 on the initiative of Ross and Hildur Jackson, with the intention of supporting the transition to a sustainable and more spiritual future society through grants and proactive initiatives. (gaia, n.d)
In 1991, Gaia Trust tasked Diane and Robert Gilman with conducting a worldwide survey to identify outstanding examples of ecovillages as a foundation for developing future strategies. Their findings were published in the report, Ecovillages and Sustainable Communities, which included the now widely cited definition of an ecovillage: "a human scale, full-featured settlement, in which human activities are harmlessly integrated into the natural world, in a way that is supportive of healthy human development and can be successfully continued into the indefinite future." This definition has gained widespread acceptance and remains in use today. Its primary strength lies in its ability to center efforts on local work and community development, offering an alternative to increasing globalization. However, it has some limitations, such as insufficient emphasis on the social aspects of decision-making and the spiritual dimension. Additionally, the phrase "full-featured" can be challenging to translate across cultures, particularly between modern societies and ancient indigenous traditions.

Later that year, in September 1991, Gaia Trust hosted the first of two global gatherings at Fjordvang ecovillage in Thy, a district in northwestern Jutland, Denmark, where they had recently relocated. A second meeting in July 1994 led to the formation of a "seed group" of ecovillages, which would eventually grow into the Global Ecovillage Network (GEN). (Jackson, 1998)

1.1.1.2 The Findhorn Meeting, 1995

The ecovillage movement's turning point was the 1995 fall conference in Findhorn. There were 400 participants, many of whom came from ecovillage projects around the globe, and many more who were turned away due to limited space.
The seed group from the previous sessions in Thy met again after the conference to decide on the next course of action, and they decided to create the Global Ecovillage Network, GEN. (Jackson 1998)

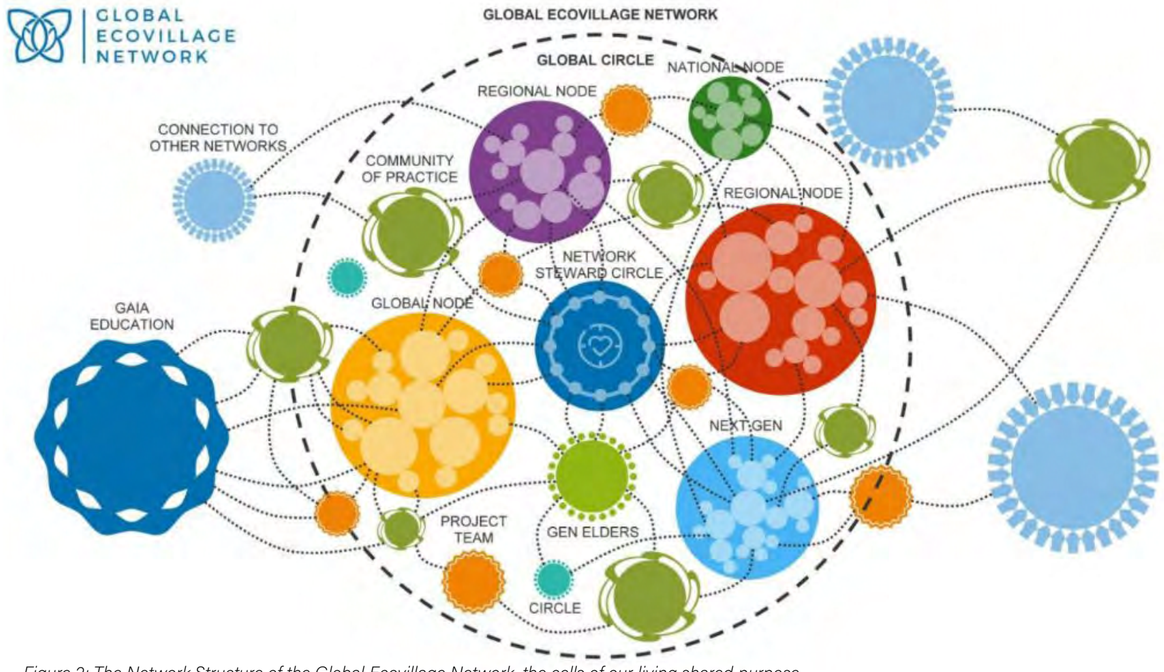

Figure 2: The Network Structure of the Global Ecovillage Network, the cells of our living shared purpose.
Source: Developed by Jennifer Trujillo Obando and Laura Kästele (GEN International Trustees from CASA Latina & NextGEN respectively), Mugove Walter Nyika (GEN International General Assembly & GEN Africa), Amanda Kiessel (external), Trudy Juriansz & Anna Kovasna(GEN International Team, also active in GENOA and previously GEN Europe), and Laurie Michaelis
Excerpted from the 2022 GEN Restructuring Report, https://media.licdn.com/dms/image/v2/D4E22AQF2N9R2xudahA/feedshare-shrink_1280/feedshare-shrink_1280/0/1732045839825?e=1758153600&v=beta&t=uVKo19W-7eLIQUvUPKoB-Z_aoPNahyEXf4_lNXwFRsA

1.1.2 Steps to Define an Eco-Village

The dynamic diagram figure 2, brings into view how different communities such as, GEN Elders, NextGEN, and regional and national hubs, shown as thematic circles-come together in building a robust collaborative ecosystem.

The “cells” in the structure of GEN are connected to symbolize the common living goal. In essence, GEN is much more of a network than an organization.

GEN places a strong focus on the building of long-lasting relationships, knowledge transfer between generations, and the connection of international projects to local ones for regenerative lifestyles. It is not a static framework but a living system that is continuously changing to adapt to the needs of the Earth and its members.

Originating in the early 1990s, the term *ecovillage* defines a specific kind of intentional community that has ecological sustainability as a primary focus. Intentional communities have been part of the US since the country’s founding, and their formation has been based on a range of factors, including religious beliefs, political or economic change, and personal growth (Kanter 1972). Although many intentional communities share some of the same goals, ecovillages are unique due to their overt emphasis on ecology. It is in how that ecological emphasis shapes the design principles, organizational structure, and community practices of ecovillages that differentiates them from other forms of communal living. Often referred to as the “three-legged stool” of sustainable living, ecovillages view themselves as holistic communities that work to balance the three fundamental facets of life: social, personal, and ecological. The objective is to establish a community that satisfies its citizens’ practical needs while also promoting their mental, emotional, physical, and spiritual well-being and upholding a strong commitment to environmental sustainability (Bang, 2005).

In practical terms, an ecovillage is typically a human-scale settlement, with populations ranging from 50 to 500 members, although there are exceptions.

They are “full-featured” communities as they provide food, shelter, manufacturing, social opportunities, and commerce within the community. The idea being to reduce reliance on the outside world while maintaining connections to broader networks. Ecovillages are designed to integrate human activity into the environment in a manner that will optimize long-term health for people and the planet. The ideal ecovillage would foster the healthy development of its residents-physically, emotionally, mentally, and spiritually-with little harm to the natural world. However, as Ross Jackson reminds us, this “ideal” ecovillage is still an unfinished product. Ecovillages are dynamic, evolving communities that frequently fall short of these ideal goals, but their ongoing learning process is at the heart of their mission. In practice, an ecovillage does not have to correspond to all these criteria of an ideal definition but rather is the guiding vision toward creating a living community in balance and harmony with the environment. (Jackson, 2004)

While ecovillages aspire to some degree of self-sufficiency, particularly in terms of food, energy, and resources, they do not aim to be completely isolated or self-contained. Instead, ecovillages see themselves as part of a larger and interconnected global network. Rather than escaping from the wider world, they work to build connections with other ecovillages, local communities, and regional, national, and international organizations. This broader network allows ecovillages to share resources, knowledge, and ideas, while also advocating for political, economic, and social reforms that align with their sustainable living principles. (Jackson, 2004)

The formation of the Global Ecovillage Network (GEN) in 1995 was a significant step in formalizing the ecovillage movement and creating a global framework for collaboration. Initially, GEN was founded by 25 community representatives from around the world. Since then, it has grown to represent eco-villages from different regions, including GEN Europe, GEN Oceania and Asia, and the Eco-village Network of the Americas (ENA).

These regional branches work in partnership with various international organizations, including the United Nations, to promote sustainable practices and policies. GEN’s role in the eco-village movement is not only to connect communities but also to provide a platform for advocacy, education, and support for communities striving to align with eco-village principles.

1.1.3 Eco-village principles

The Global Ecovillage Network embraces a holistic approach to integrating the social, cultural, ecological, and economic dimensions of living. In practical terms, holistic design is at the heart and interlinks these areas.

It is a framework called the Ecovillage Map of Regeneration (figure 4), guiding the development of ecovillages-both intentional and traditional communities in urban and rural settings-through participatory methods that balance ecological, economic, social, and cultural aspects in revitalizing communities and natural ecosystems.

This map is based on 32 regeneration concepts, eight of which concentrate on holistic design and six of which are for each of the four main areas. It reflects decades of experimentation, collective learning within the global ecovillage network, and contemporary research on sustainability, resilience, and participatory design processes.

Developed in collaboration with Gaia Education, the map and principles embody GEN's commitment to fostering community-driven approaches to resilience and sustainable living on Earth.

It is in this light that the Ecovillage Map of Regeneration and founding principles stand to inform ecovillage practice. They will support reflection, education, dialogue, design, and research by individuals, groups, organizations, and governments, and provide a framework for the implementation of ecovillage lifestyles in creating positive change.

They would turn to be guiding principles for everything, from individual action and organization strategy to community building and initiative creation, anywhere and by whoever. They thus give a general rule on taking up sustainable and regenerative practices, whoever one is or wherever he/she may be.

▪Society

A main goal within ecovillages is the fostering of transparency, cooperation, and trust among all individuals. In this respect, the community hopes to ensure that all voices are being truly heard, respected, and valued. Ecovillages foster a great sense of community through deepened relationships, collective projects undertaken, and shared common goals pursued. However, they also celebrate diversity, recognizing that unity is strengthened by embracing differences rather than expecting uniformity. Building on these values, ecovillages translate their principles into concrete practices, such as:

- Nurture diversity and cohesion for thriving communities
- Develop fair, effective and accountable institutions
- Practice conflict facilitation, communication and peace building skills
- Empower collaborative leadership and participatory decision making
- Ensure equal and lifelong access to education for sustainability
- Promote health, healing and wellbeing for all

Figure 3: Consensus decision-making and Community work
Source: ecovillageithaca.org -Ecovillage at Ithaca

▪Culture

Celebrations, art, and dance, along with other forms of creative expression, are a part of what can bring vibrancy to life within an ecovillage community. Every ecovillage design honors, in its unique manner, the lives of life-supporting systems and beings. These practices flow into the guiding principles of ecovillages:

- Vision and Higher Purpose Clarify
- Cultivate Mindfulness and Self-reflection
- Fulfillment in Life - an Expression with Arts and Celebrations
- Honor Indigenous Wisdom, Invite Innovation in
- Active Protection for Communities and Nature
- Reconnection to Nature and Lifestyle with Low Impact

▪Ecology

Ecovillages seek to obtain essential resources such as food, shelter, water, and energy in harmony with nature's cycles. Their goal is to integrate human activities with the natural world in ways that enhance biodiversity and restore ecosystems. By doing so, they provide opportunities for individuals to experience their intercon-

nectedness with the systems and rhythms of life on a daily and tangible level.

- Rhythms of life on a daily and tangible level.
- Grow seeds, food and soil through regenerative agriculture
- Clean and replenish sources and cycles of water
- Move towards 100% renewable energy and transport
- Innovate and spread green building technologies
- Work with waste as a valuable resource
- Increase biodiversity and restore ecosystems
-

▪Economy

In most ecovillages, the land and infrastructures are communally owned by its members so that individual ownership does not lead to speculative real estate. This model of communal ownership guarantees that resources are not diverted away from the sustainable goals of the community. The members can invest in cW-structures, and the generated surplus is reinvested in the community or distributed fairly among its members.

- Commit to responsible production, consumption and trade
- Social entrepreneurship will foster local regeneration.
- Improve economic justice by sharing and collaboration.
- Ensure access to land and resources is equitable.

(GEN, n.d)

▪Integral Design

Integrated Design is a holistic approach to high performance building design and construction. It relies upon every member of the project team sharing a vision of sustainability, and working collaboratively to implement sustainability goals at appropriate phases during the project. Effective integrated design leverages synergies among building components, resulting in reduced life cycle costs of the project.

As an example the international Nemetschek Group has unveiled Integrated Design, a new workflow solution that is being marketed as a paradigm change for the industry that would enable smooth collaboration between engineers and architects. Model duplication and redundant work may be eliminated by Integrated Design, an improvement in model-based coordination between architects, structural engineers, and MEP en-

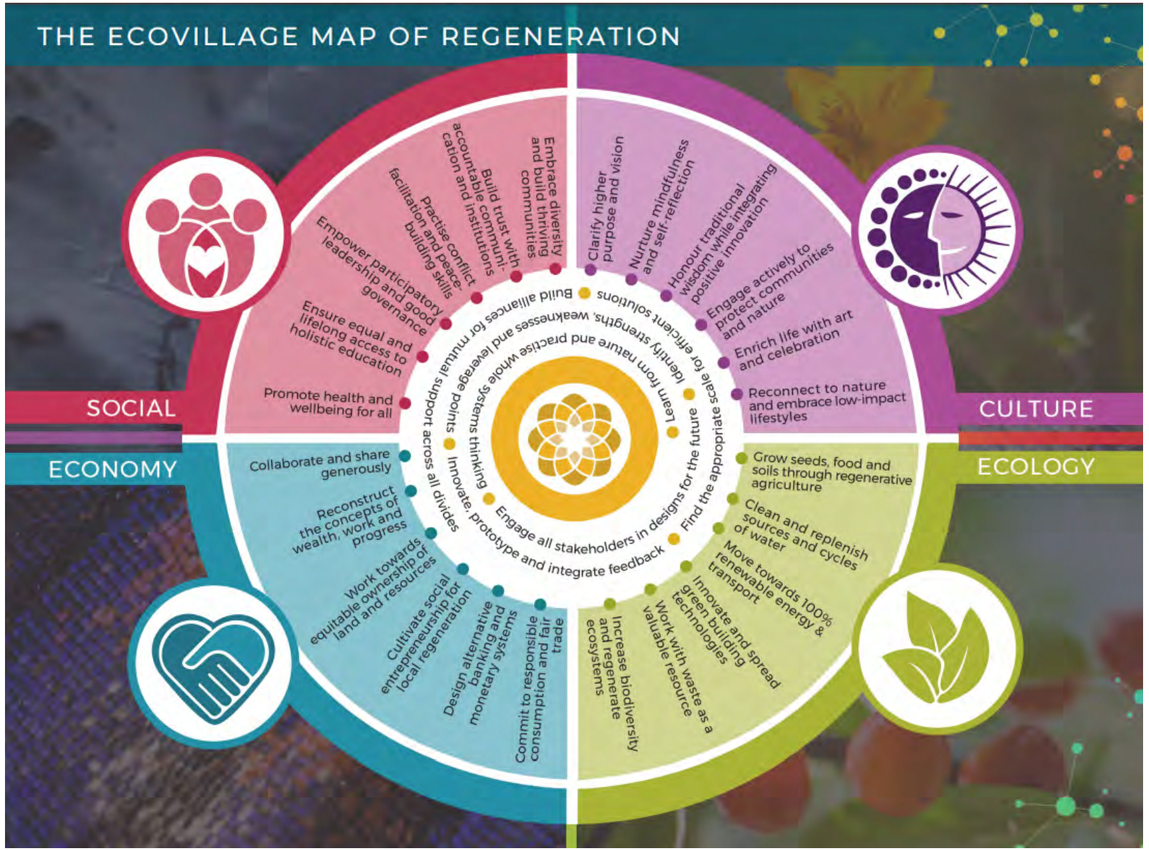

Figure 4: The Ecovillage Map of Regeneration
Source: GEN Annual Report 2022, https://www.linkedin.com/posts/global-ecovillage-network_globalecovillagenetwork-sustainability-activity-7203818026847133697-BLps/

gineers using a shared BIMcloud environment. The "federated model," which is now the most popular method of collaboration, involves several independent BIM models that are exchanged between the engineer and architect and then integrated (federated) at different stages of the project. (Schires 2020)

Certain principles are universal across all Areas of Regeneration, serving to unify them within holistic designs that foster resilient communities and systems. At GEN, this integral approach to design and regeneration emphasizes collaboration and participation. It ensures that these principles are implemented in ways that actively involve all stakeholders and promote transparency at every stage.
Integral design in ecovillages is mentioned as on of the principles of eco-villages in the GEN website:

- Learn from nature and practice whole systems thinking
- Identify assets, needs and leverage points
- Adapt solutions to scale and context
- Be aware of privilege and use it for the benefit of all
- Build alliances across all divides
- Engage all stakeholders in designs for the future
- Spread core patterns of regeneration
- Listen to the feedback of the world (GEN, n.d)

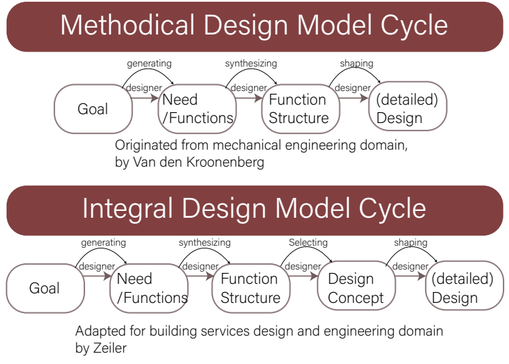

Figure 5: Comparison between system theory and methodical design
Source : Diagram by Zeiler & Quanjel ,2007-Recreated by Authors

2.1.3.1 Munksøgård Ecovillage, An Example

According to the material provided about Munksøgård Ecovillage, the development has been planned to accommodate a range of house sizes and ownership styles while also catering to various age groups.
About 225 children, youths, and adults can be housed in the development's 100 row houses of various sizes, creating a vibrant community.
There are several forms of ownership among the housing groupings. One group of homes is privately owned and consists of single-family homes, while the other is a cooperative association, in which the inhabitants jointly own the homes but also privately own a portion of the homes they live in. The Roskilde Building Association owns three of the housing groups, and these residences are available for rent. The residents have the power to decide who moves into the rental homes. One of the three living groups is exclusively for youth, another is exclusively for the elderly, and a third is available to persons of all ages.
In the center of the town lies an old farm that is part of the community. Numerous shared activities are supported by the farm facilities, including a cafe, a vegetable shop, a gift shop, office space for rent, an overnight room, a bicycle shelter, a workshop for repairing bicycles, storage space for rent, and animal keeping.

Figure 6: Munksøgård ecovillage welcoming board
Source: Munksøgård Eco Village Offficial Facebook

Figure 7: Munksøgård ecovillage
Source: Munksøgård Eco Village Offficial Facebook

1.1.4 Intentions and Conceptions

As previously discussed eco-villages' main recognizing factors are their focus on ecological life and the INTENTION of the community. In addition, they are supported financially by NGOs and the people who are living there.

Almost everyone wants to live in an ideal sustainable and ecological area.Still, the difference is that people who decide to live a long are interested in sharing resources and having intense communal interaction. Besides all ecological principles and goals, people join Eco-villages to fulfill their conceptions and imaginations, which are not all about being in environmentally friendly villages. Governance and decision-making methods in ecovillages need to harmonize the alignment between community intention and individual conception.

Some researchers are dedicated to investigating what personal goals lead people to live in them. In some cases, affordability, safety, and being part of the larger family are added reasons. What matters in these societies is not all the imaginations and conceptions will be answered, and the importance is how the community can prioritize and decide among all the initial intentions and individual conceptions.

1.14.1 Establishing Intentions

During the summer of 2006, Van Schyndel Kasper started to visit eight ecovillages in three southeastern and two northeastern states. Ecovillages, established in the early 1990s or later, were selected for study based on specific community characteristics, including openness to visitors, accessible driving distances, and diversity in location and age. The visitation of these ecovillages lasted between one and eight days, averaging two days, and involved activities such as interviews, informal conversations, and participation in work projects and social events. His observation provided a basis for understanding the challenges of the formation and maintenance of ecovillage. Here we reviewed these ecovillages reports, focusing particularly on how ecovillages endeavor to implement a new paradigm and the types of communities these efforts create.

Ecovillages report a wide range of reasons for wanting to join an ecovillage. While many, especially founders, report long-standing ecological values combined with a desire to take action to express them, others come from less environmentally conscious backgrounds. Motivations reported by these latter individuals include community, safety, or a nurturing environment for children.

For example, Sarah was "mainstream" and not an environmentalist, yet she joined an ecovillage after a health condition, Multiple Chemical Sensitivity introduced her to the founders. Similarly, Linda said she had first been attracted by the relative affordability of home lots compared with neighboring communities, although she later became favorably disposed to the community's ethos.

Prospective members often express a desire to "find people to care about and who care about them," "escape consumer society," or "seek a meaningful livelihood." Regardless of their initial motivations, members are expected to commit to the community's overarching mission and goals, which are typically outlined in a vision or mission statement. Founding members usually draft these guiding documents, a process that can be lengthy and subject to revisions as individuals join or leave the project.

Prospective members often say that they would like to "find people to care about and who care about them," "escape consumer society," or "seek a meaningful livelihood." Whatever their reason for joining, members are encouraged to embrace the community's broader mission and purpose, if not just immediately then usually soon after joining, as noted in a vision or mission statement. These are documents guiding whatever is usually drafted by the founding members, which may be long and complicated with many changes as people join and leave the project.

While these statements attract new members, they are also subject to formal changes over time to reflect the needs and views of the community that are changing with time. Some are wordy, others brief, but all provide a base on which reposes the community's organization, activities, and daily life. They also serve as a referent point for reflection or adjustments. These mission statements often express the community's realization of the interdependence between people, the land, and all other living things, pointing to the intrinsic value of the land and one's responsibility toward caring for it. In other words, they unveil the very essence of the ecovillage's values and its relationship to the natural world. (Kasper, 2008, pp. 13–14)

In summary, an ecovillage forming Group has to decide what matters most to them. Workshops can be very helpful in the first attempt at that process. The design process for an ecovillage is evolving. In the design stage of development in ecovillage development, one of these three legs of ecovillage development, social, culture,

ecology might dominate and normally the integration of all three components develops over time. On new projects, this can make it clear where the group currently is and what its principal goals are.

For example, the community may have to make a decision between social needs of the community, such as houses on a street or clustering houses together, and environmental concerns, such as housing facing the sun or creating solar traps to enhance micro-climates. Similarly, they might want a "landscape temple" rather than a common village center with collective facilities such as children's playrooms, meditation halls, shops, meeting rooms, offices, or health centers. There is no right or wrong answer; it is just a case of the group's priorities. This kind of variation in these wishes should be embraced as an actual reflection of diverse people's divergent needs and aspirations.

1.1.5 Eco-villages: Beyond Rural Boundaries

It is more accepted that sustainability must play a more influential role in shaping the future of urban development all over the world. Cities must take proactive steps towards trying to reduce their contribution to the environment with new policies and strategies for ensuring resource utilization sustainably and reducing waste (Newton, 2008). This involves reconfiguring traditional urban planning in a way that aligns it with regenerative thought, energy efficiency, and resilience (Beatley, 2011). While the term "eco-village" may recall rolling fields, it is a robust, integrated style of living that can be realized in any environment—suburbia, city, or countryside (Litfin, 2014). Urban eco-villages, in particular, offer a workable model for incorporating ecologically sustainable living into the very densely urbanized landscape. They are not without special challenges due to the complexity of city systems, higher population densities, and competing land use. The cities must provide an environment for thriving by putting nearby main amenities, such as local food markets, schools, and recreational parks so, they are accessible on foot (Irrgang, 2005; Litfin, 2014).

Furthermore, to reduce reliance on private vehicles and develop efficient and sustainable public transport systems, metropolitan traffic must be redesigned. To a large degree, reducing carbon footprints and urban living healthiness can be achieved by making cities more independent of cars, stimulating investments in pedestrian infrastructure, and promoting cycling (Gehl, 2010). These projects not only improve environmental sustainability but also improve the living standards of the urban population, making the cities more livable and climate-resilient.

Figure 8: Ecovillage at Ithaca, Although Ithaca is more suburban than urban, the EVI includes urban-inspired planning that integrates closely with the nearby town.
Source: https://world-habitat.org/world-habitat-awards/winners-and-finalists/ecovillage-at-ithaca/#award-content

1.1.5.1 Gaining widespread acceptance

Eco-villages are a fairly recent phenomenon, but one that is spreading rapidly across the globe. This led to an investigation of the main reasons why they are so popular and where the settlements tend to be found.

The Global Eco-village Network (GEN) has a map of the worldwide distribution of Eco-villages, not only in the developed world but also in regions like Sub-Saharan Africa.

In such regions, Eco-villages become hubs for solving issues at the local level through food sovereignty, the availability of green energy, and the acquisition of knowledge related to sustainable agricultural practices. The spread of such villages across the world indicates the applicability of the concept of Eco-villages in multiple cultural and economic settings.

The new Eco-villages, have gained a lot of attention in recent years because individuals across the world increasingly embrace sustainable lifestyle aspirations. Grassroots action for climate change and sustainable development is numerous. Contemporary literature on grassroots innovation highlights the extensive range of grassroots initiatives for climate change and sustainable development. The Eco-village movement is one of the grassroots innovations that transform based on the conditions at hand while pursuing alternative lifestyles with less environmental impact.

One of the key factors in the success of eco-villages is the intentional involvement of individuals who construct or choose to become a part of them. Individuals who share common values and goals of eco-villages—interdependence, nature care, and community living—are individually responsible for their creation and long-term viability. This intentionality gives them a deeper sense of meaning and belonging within these communities, making them not just sustainable but also very fulfilling communities for their residents.

By addressing both ecological and social needs, Eco-villages are becoming more than just alternative ways of living, but beacons of hope for a world struggling towards sustainability and cooperation.

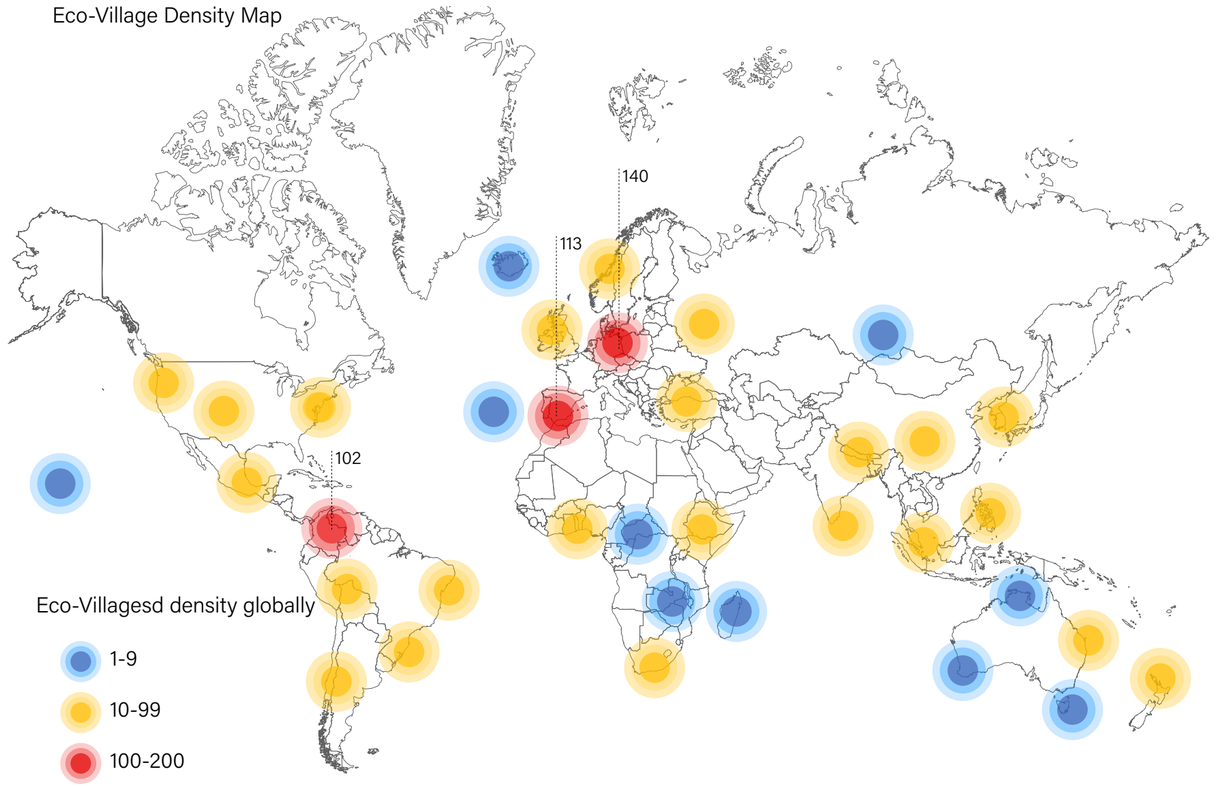

Figure 9: Eco-Village Density Map,
Data Source: https://ecovillage.org/ecovillages/map/ -Illustrated by Authors

1.1.6 Organizational and Network Structure

The worldwide network GEN is made up of five regional branches (GEN Africa, GEN Europe, GEN Oceania and Asia, GEN North America, and CASA Latina), a youth branch (NextGEN), national and bioregional networks, and GEN International. In addition to these, GEN encompasses ecovillages, initiatives, teams, and people all across the world who are striving for a resilient and regenerative future.

The Council of Elders, NextGEN, and Regional and Global Nodes are all connected by the Network Steward Circle (NSC). The NSC maintains GEN's common goal, coordinates the network, and encourages equitable participation across regions with three delegates from each Node.

GEN International: The Worldwide Hub

To further the network's objective, GEN International offers forums, advocacy, and worldwide coordination. It is managed by a Board of Trustees and a staff team that was chosen by a General Assembly that included representatives from the Council of Elders, NextGEN, and the five GEN regions. Additionally, regional and national GEN networks have their governance structures and teams. Additional information can be found on the GEN website under the Regions section.

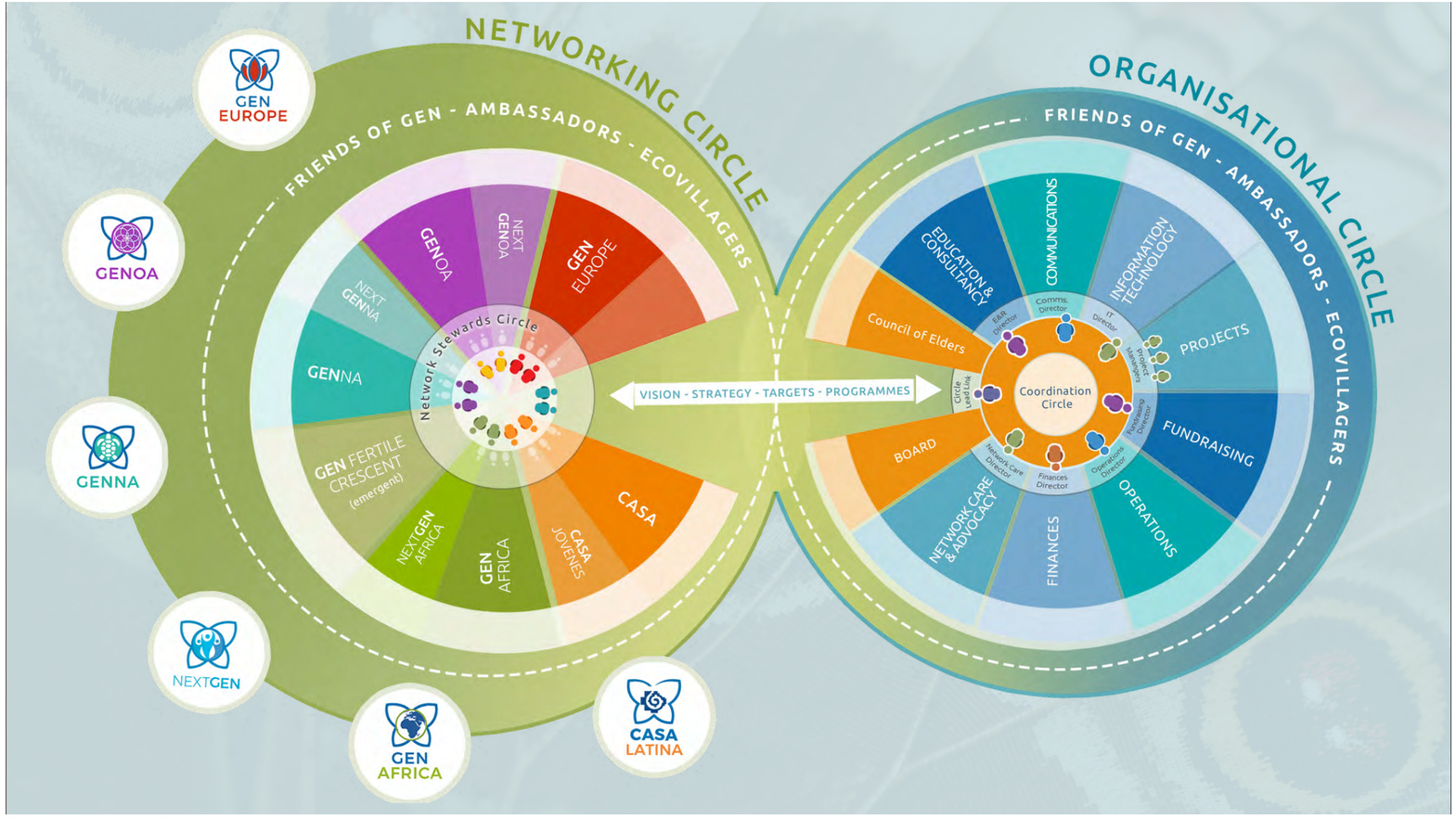

Figure 10: A view of GEN Nonprofit Organizational Structure
Source: https://www.canva.com/design/DAGe6HpXa5o/gjo2BPVDKF4WQCjlO05Gaw/view?utm_content=DAGe6HpXa5o&utm_campaign=designshare&utm_medium=link2&utm_source=uniquelinks&utlId=h6d4a9e13d5#25

Figure 11: EcoVillage Ithaca
Source : https://ecovillageithaca.org/, Photograph by Robert Nickelsberg, Getty

Figure 12: Village life at EcoVillage Ithaca
Source : https://ecovillageithaca.org/live/

1.2 Deeper Understanding by Comparison

1.2.1 Reviewing Eco-Village, Co-housing and Urban-Villages

To understand ecovillages better, it's helpful to compare them to similar community models like co-housing communities and urban villages. While these communities share some similarities with eco-villages, their priorities and approaches differ. Looking at these models helps us see how eco-villages combine their strengths to create sustainable, intentional ways of living.

Co-housing communities are intentional neighborhoods that focus on collaboration and shared resources. They value community and cooperation but don't always prioritize ecological sustainability. Urban villages, on the other hand, are small, self-contained neighborhoods in cities designed to reduce commuting and create a stronger sense of community. While they promote livability and social connections, they don't always address environmental concerns.

By comparing these models, we can better understand what makes eco-villages unique. Eco-villages take the community aspects of co-housing and urban villages and combine them with a deep focus on sustainability and environmental harmony. This makes them an innovative model for building resilient, regenerative communities to address today's social and ecological challenges.

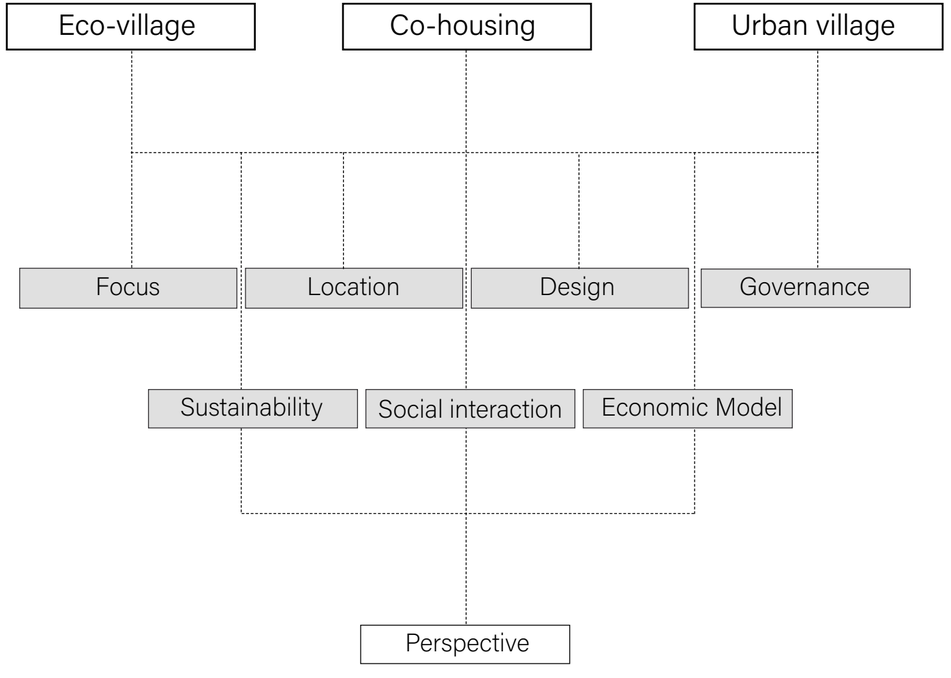

Figure 13: Eco-Village, Co housing, Urban village principals
Illustrated by Authors

1.2.2 Intentional Communities: Co-housing

Intentional communities are groups of people living together with some shared purpose or intention and usually a vision of a better life for themselves and their children than they perceive is available conventionally. Types include: communes, co-housing, eco-villages and kibbutzim. Here we explore more about the co-housing and its main cores as its investors.

1.2.2.1 Co-housing Movement

Intentional communities are groups of people living together with some shared purpose or intention and usually a vision of a better life for themselves and their children than they perceive is available conventionally. Types include: communes, co-housing, eco-villages and kibbutzim. Here we explore more about the co-housing and its main cores :

Cohousing is a modern intentional community model of communal living where communities unite with the specific intention of building a socially integrated and mutually supportive society. This communal way of living prioritizes the interdependence of social dynamics and eco-friendly actions of its inhabitants. Cohousing communities are characterized by shared land ownership, mutual resources, and collective aspirations. They frequently eat together, meet, and socialize together.

Cohousing communities are busy publishing and organizing national conferences and are connected with a larger communalist movement.

This way of living has numerous technical, social, and environmental benefits. Cohousing communities achieve greater efficiency in the use of resources and energy by sharing equipment and by maximizing the use of living space. Social support in the communities is notably in contrast to much contemporary suburban loneliness, where neighbors may barely know each other (Lowe, 2005).

Cohousing promotes human interaction and provides support to disadvantaged community members. It creates an environment that fosters awareness of the impact of individual actions on others and the environment. This model of living reimagines urban life structures, presenting a vision of a civilized and environmentally sustainable future.

Architecturally, cohousing features distinctive design and site planning elements. Typically, these communities consist of purpose-built, attached housing within a carefully designed neighborhood. While residents have autonomous private dwellings, they share ownership of common utilities and recreational facilities. These communities often include a large communal building with amenities such as a kitchen, dining room, meeting space, children's play area, laundry facilities, and guest rooms. Community business is managed through consensus-based meetings, and residents often share meals several times a week.

Proponents of cohousing believe that cooperation can lead to a more economical, interesting, and enjoyable lifestyle while also minimizing environmental impact (MaCament & Durrett, 2003).
While there are similarities between co-housing and ecovillages, some key differences exist. Eco-village residents typically prioritize energy conservation and resource management more than community living, which influences different architectural designs. Co-housing communities are usually centered around a common house, emphasizing its importance by placing it at the center or entrance of the community. This design promotes frequent interactions among residents. Pedestrian pathways in cohousing also encourage face-to-face encounters.
To sum up the main cores of co-housing:
. Intentional Design for community living
. Private Homes with Shared Facilities
. Resource Sharing
. Community-Centric Culture

2.2.2.2 The main investors in co-housing communities

1- Future Residents (Community Members):
Residents typically create and finance co-housing communities, placing the value of their contribution in terms of financing and decision-making. (McCamant & Durrett, 2003)
2- Cooperative Housing Groups:
Meltzer talks about cooperative housing systems as a starting point for most cohousing communities, where members share resources for collective ownership and control. (Meltzer, 2005)
3- Private Developers:
Major involvement of private developers in turning co-housing schemes into reality, especially when working in collaboration with prospective residents in balancing commercial and common interests. (Durrett, 2009)
4- Nonprofit Organizations:
The article provides examples of nonprofit organizations financing and sustaining cohousing projects to bring more sustainable housing within the affordability range for more people.
5- Government or Public Funding:
Governments aid cohousing via grants and policy, specifically when used as a means for social and environmental benefit promotion. (Williams, 2005)

Figure 14: External area of the Shangri-lá housing cooperative, in Taquara, in Rio's West Zone.
Photo by: Alexandre Cerqueira
Source: https://rioonwatch.org/?p=76699

Figure 15: The Father Josino Basic Ecclesial Community (BEC), inside the Shangri-lá Housing Cooperative,
Photo by: Alexandre Cerqueira
Source: https://rioonwatch.org/?p=76699

"Shangri-lá is a housing cooperative, the first of its kind in Rio de Janeiro. The community was built from the ground up by a significant portion of its residents through self-management and collective action. Its roots trace back to 1996, and since then, Shangri-lá has been home to families united by a shared vision of community living. They have taken on the responsibility of building and governing their territory. The history of Shangri-lá holds powerful lessons about the strength of collective struggle in securing the right to adequate housing in Rio de Janeiro—a basic need denied to millions of carioca families." (Litsek & Fernandez, 2023)

1.2.3 Comparison between Eco-villages and Co-housing Communities

Eovillages and cohousing communities are two distinct models of sustainable and community living. As much as they have the same similarity in facilitating the sense of community and emphasizing sustainability, they differ considerably in their philosophies, model structures, and functional approaches. The comparison below delves into these differences with a view to providing a better understanding of their respective contributions towards sustainable and community living.

Society-oriented neighborhoods, like Danish cohousing communities, prioritize the social component of neighborhood living. The homes are constructed near each other, usually in rows along a street or in circles around common spaces like play spaces or decks. This configuration makes it easy for the residents to interact and keeps the attention on the needs of children. The communal homes, and the community centers, are placed in strategic areas—either at the gateway or at the center of the development. To make the community walkable, cars are relegated to the periphery of the community.

Dwellings in socially based eco-villages are often built in smaller clusters to foster greater friendships among occupants. Each cluster of homes also typically has a common home used to serve the purpose of the shared area needed. To nurture deeper relationships among people, the sizes of these clusters are kept practical with an average number between 10 to 30 dwellings. In Denmark, for example, Munksøgaard is divided into five clusters of 20 households each. These clusters are catering to different age groups: three are allocated to families, one is for the elderly, and one is for young adults. The family clusters further diversify the housing alternatives by providing owner-built, cooperative, and rental units to suit people from various socio-economic classes.

Similarly, EcoVillage in Ithaca, New York, consists of 175 acres of land with a five-residential cluster vision. Two clusters containing 30 homes each have already been constructed. A Community Supported Agriculture (CSA) farm is already established in the village, encouraging sustainable farming and high levels of social interaction. Plans are in place to construct a third cluster, duplicating both social and environmental visions of sustainability.

These models demonstrate how ecovillages and cohousing, are driven by social motives, thoughtful design, and incivility. Through the provision of spaces that encourage interaction and responsiveness to diverse

demographic and income levels, these villages demonstrate the potential for sustainable and convivial living arrangements. Through planning, they are able to balance the public and private space and demonstrate that diverse populations are able to live and thrive in well-designed communities meant for cooperation and connection. (Jackson, 2004)

1.2.3.1 Philosophical Foundations and Organizational Differences

Ecovillages may also be inspired by a more holistic understanding of sustainability at the intersection of ecological, social, and spiritual dimensions. Ecovillages often aspire to develop a livelihood that is attuned with the natural world in harmony, thereby being inspired and implemented through permaculture, renewable energies, and producing local food (Litfin, 2014).
Cohousing communities, while less explicitly focused on environmental sustainability, emphasize shared living spaces and cooperative decision-making. The primary focus of such a community is to nurture interpersonal relationships and collective responsibility while maintaining individual autonomy (McCamant & Durrett, 2011).

The physical designs of ecovillages and cohousing communities also reflect their different emphases. While ecovillage projects are often built on larger pieces of land to accommodate sustainable agriculture and conservation areas, other natural building materials may be off-grid energy systems or shared gardens. Governance structures for Eco-villages are usually designed to facilitate ecological and social harmony; many use techniques such as sociocracy or consensus decision-making to achieve their holistic philosophy of life (Jackson, 2004).

Co-housing communities are designed to fit into urban or suburban contexts, often on smaller parcels of land. In their design, shared kitchens, play areas, and workshops become communal spaces, while the dwellings are private. This design methodology encourages interaction among members, with a sense of community, but it does not have to rely on ecological emphasis in the same way as Eco-villages. Governance in Co-housing communities tends to be light touch, focusing upon the pragmatic and logistical issues that contribute to smooth operation. (McCamant & Durrett, 2011)

Ecovillages tend to use recycled building materials more frequently than cohousing communities. Cohousing, as defined by McCament and Durrett, is characterized by six key features: a participatory process, intentional neighborhood design, use of common facilities, self-management, absence of hierarchy, and separate incomes. In contrast, Jonathan Dawson identifies five key features of ecovillages (Christian, 2007).
These distinctions highlight the varied focus and characteristics of each community type, emphasizing their unique approaches to sustainable and communal living. (Choi, J. S. 2008)

1.2.3.2 Community Involvement in Decision-Making

While the approaches differ, both models strongly support participatory government. It is not surprising that decisions within an ecovillage are often made by consensus, given the emphasis on inclusiveness and holism (Jackson, 2004). While governance practices for cohousing communities may be similar, they typically focus on practical problem-solving to ease the demands of daily life (McCamant & Durrett, 2011).

1.2.3.3 Social and Economic Aspects

Because they may entail collective ownership of land and resources as well as a shared commitment to ecological living, ecovillages frequently demand substantial lifestyle and financial obligations from their members. Although they also demand investment, cohousing communities typically offer more financial participation and lifestyle flexibility (Litfin, 2014).

Ecovillages and cohousing communities are perhaps the unique pathways to the way ecology and community come together. While ecovillage initiatives are by and large more aligned with comprehensive ecological and social transformation, cohousing community represents a pragmatic approach to shared living within mainstream urban and suburban settings. Together, they convey important messages concerning potential ways of reconceptualizing community and sustainability within modernity.

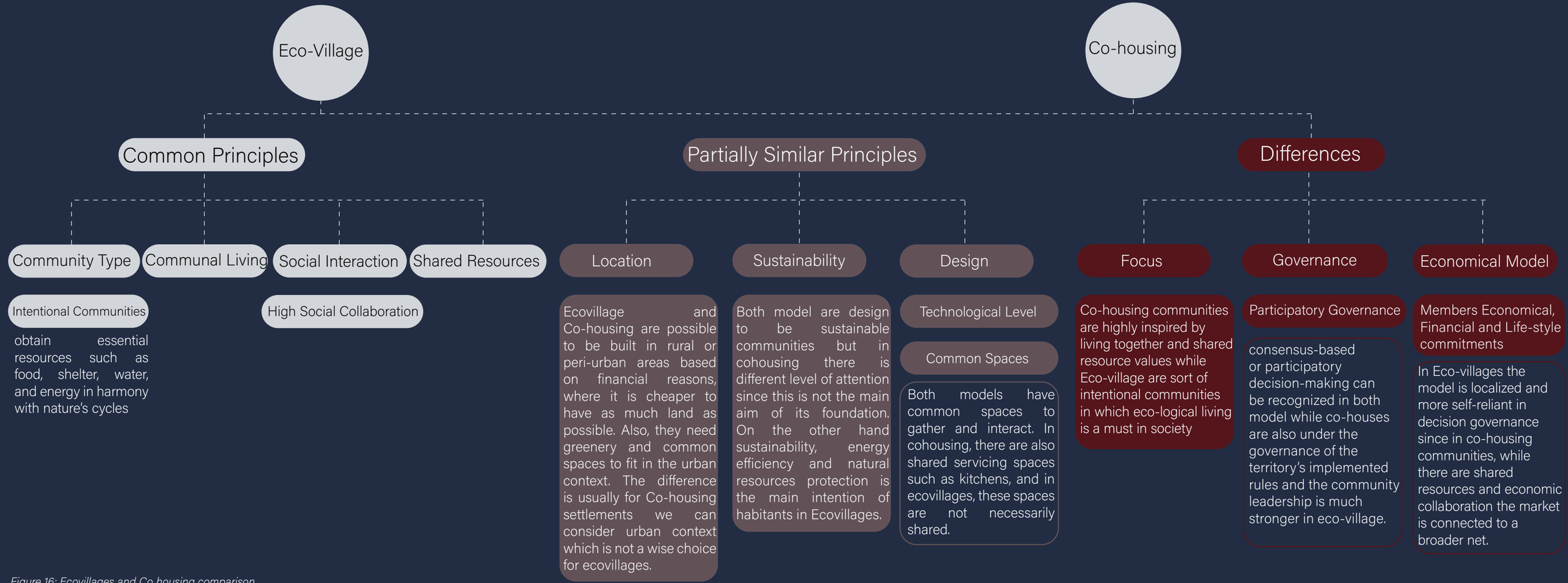

Figure 16: Ecovillages and Co housing comparison, Illustrated by Authors

1.2.4 Urban Village Concept and Evolution

The Urban Village Movement was founded to respond to parts of the world that were more characteristic of rapid urbanization and sprawl. As the towns grew, many became fragmented, and impersonal, and left many of their people in disconnected states with their communities. Urban villages were designed to go against these trends with walkable mixed-use neighborhoods. They seek to balance the demands of modern urban life by focusing on sustainability and community interaction with a sense of belonging and ecological awareness. This movement, very prominent in the late 1980s, started with the Urban Villages Group (UVG) spearheaded by the Prince of Wales, and has since spread throughout the UK and globally (Urban Villages Forum, 1992). Urbanization was also a prime contributor to the birth of urban villages, emphasizing the need for alternative models of cities faced by problems such as overcrowding, environmental degradation, and social disconnection.
Urban Villages emerged to become an important and viable method of creating successful, long-lasting neighborhoods. Principle to urban villages as a means to refocus urban development at a neighborhood scale.

It aimed to create well-designed, sustainable, mixed-use communities that emphasized a sense of place and belonging. The Prince's critique of modern architecture and advocacy for human-scale development inspired this vision, calling for a return to principles seen in traditional, thriving neighborhoods. Initially supported by the UK Government, the concept responded to dissatisfaction with contemporary urban development and gained traction during a period of economic downturn, offering an alternative to unsustainable urban sprawl.

1.2.4.1 Features

▪Location

Urban villages are primarily situated within urban areas, often in inner-city locations. They are frequently developed on sites with previous mixed-use purposes, such as old railway yards, ex-industrial zones, and older residential neighborhoods. Additional redevelopment has occurred on former large industrial sites, Ministry of Defence properties, and hospitals.

▪Facilities

A defining feature of urban villages is their mixed-use character. Most developments include essential amenities such as grocery stores, play areas, and community halls. However, smaller villages often lack facilities like post offices and pharmacies. Employment opportunities within urban villages are typically limited. Many are located around new or proposed major employment centers and have a residential emphasis.

▪Size

Urban villages can be large or small and can be located on greenfield or brownfield sites, depending on the context and purpose. In urban areas, they are usually relatively small-scale developments that maximize limited space. At the edge of cities, they can be larger, combining urban and rural features in self-contained communities. Most of them are characterized by proximity to transport hubs, as good connectivity increases accessibility and reduces travel time. Examples include the compact layouts of Poundbury in the UK and the larger, redeveloped urban villages of Shenzhen, China

1.2.4.2 The Role of Urban Villages in Urbanization

Urban villages act to bridge the issue of urbanization and sustainable development. They will help solve the challenge of sprawling cities by being an alternative to traditional suburban and high-rise development. Efficient land use with a mix of social services reduces the burden on city infrastructure. It is a method that not only furthers economic activity but makes neighborhoods desirable for residents, having a better quality of life as a result of social and environmental considerations.

Urban villages are one of the innovative ways of dealing with urbanization, creating possibilities for solving key problems of housing shortage, environmental degradation, and social dislocation. Implementing sustainable lifestyles, building community, and supporting local economies offer quite another model of city growth for the future. Significantly, careful planning is pursued and participatory decision-making is developed, and find or discover innovative solutions to resolve other difficulties. Lessons from urban villages will play an important role in shaping more sustainable and inclusive urban environments as cities growing.

1.2.4.3 West Silvertown Urban Village, an Example

▪Urban Design
urbanist design principles s have been adopted

Figure 17: Garston Village Masterplan
Source: https://urbed.coop/projects/garston-masterplan, Garston Village Masterplan Report 2017

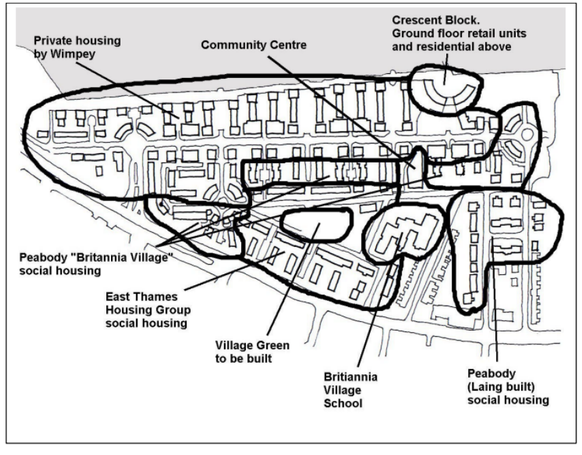

Figure 18: Features of the West Silvertown Urban Village
Source: The Urban Village: A Real or Imagined Contribution to Sustainable Development ?, Biddulph, et al. (2002)

▪High-Density Development

▪Identity and Place-making
In West Silvertown, the location, isolation, and new urban form give a clear identity

▪Community Involvement
A planning weekend was held at West Silvertown, but had little influence on the outcomes

▪Environmentally Friendly Design

▪Mixed Use
Has some live/work units

▪Public Transport
Considerable effort has been put into transport links, from a low base.

▪Social Sustainability
The majority are new residents, who do not expect to stay long-term. Here a Trust has been formed to assist in community development, but social integration is weak (Biddulph, et al.,2002)

1.2.4.4 Investors and Decision makers in Urban Villages

The wide category of investors ranges from private developers and governments to sustainability-focused institutions. Public-Private Partnerships are especially increasing in countries where urban villages will be a part of the larger redevelopment of cities, which is the most common case as seen in China. Public developers are for the profitability coming from well-developed, mixed-use neighborhood areas, and government entities finance such projects just to address housing demands and improve urban planning. Sustainability-focused investors, such as NGOs and environmental organizations, contribute funding to ensure that eco-friendly practices are integrated into the design and construction processes.

In order to ensure that local villagers and village collectives actively participate in the urbanization process and to give the market better play in resource allocation, the promotion mode of urbanization, guided by new-type urbanization, moves from "government-dominated" to "government-coordinated and multi-actor participation." (Wu et al., 2022; Chen et al.,2018)

1.2.5 Comparison, Eco-villages and Urban villages

Urban villages and ecovillages represent two divergent paths to community planning and living, each with its respective goals, structures, and priorities. How they differ and converge on the independent frameworks for investment, decision-making, population, geography, and guiding principles is explored in this comparative analysis.

1.2.5.1 Values and Objectives

Urban villages focus on improving livability and social cohesion in urban environments. To curb urban sprawl while promoting quality of life, they insist on mixed-use developments, walkability, and access to amenities (Census Bureau, 2022; Dempsey et al., 2011). In contrast, ecovillages are driven by regenerative techniques and ecological sustainability. It focuses on creating resource-efficient, self-sustaining communities (United Nations, 2018; Global Ecovillage Network, 2023).

1.2.5.2 Location

Urban villages could be both inside or near cities. To maximize land use and minimize transporting times, they are connected to the city's main infrastructure

(Census Bureau, 2022). Usually, in rural or semi-rural, ecovillages are designed based on the ecological factors that support projects, like permaculture and access to natural resources for renewable energy (GEN, 2023).

1.2.5.3 Population

Thousands of people live together in urban villages, serving demographies such as families, elders, and professionals. They try to reduce overpopulation in major cities; a representation of urban density (Census Bureau, 2022). Eco-villages are formed with smaller populations, comprising a few dozen to several hundred, promoting stronger, more personal-level relationships and care for one another (GEN, 2023; United Nations, 2018).

1.2.5.4 Decision-Making

Decision-making in urban villages is typically hierarchical, involving local governments, urban planners, and developers (Dempsey et al., 2011). In ecovillages, governance is often consensus-based or participatory, emphasizing egalitarian principles that align with their sustainability ethos (GEN, 2023; Trainer, 2000).

1.2.5.5 Investors and Funding

These are usually financed through public-private partnerships, whereby finances come from both private organizations such as estate developers and municipal budgets (Dempsey et al., 2011; Census Bureau, 2022). In addition, ecovillages would rely on some grassroots finance mechanisms such as cooperative investments, grants, and member donations. This is in line with their philosophy of non-profit and community-driven (GEN, 2023).

1.2.5.6 Similarities

Both models integrate communal living with sustainable practices, albeit to different extents. Urban villages and ecovillages feature green spaces and shared amenities to foster social interaction and well-being (Dempsey et al., 2011; GEN, 2023). They aim to create resilient communities, addressing housing needs innovatively.

To conclude, while urban villages optimize urban living with a focus on integration and density, ecovillages represent intentional communities that emphasize environmental stewardship. Together, these models provide valuable insights for addressing the challenges of urbanization and sustainability.

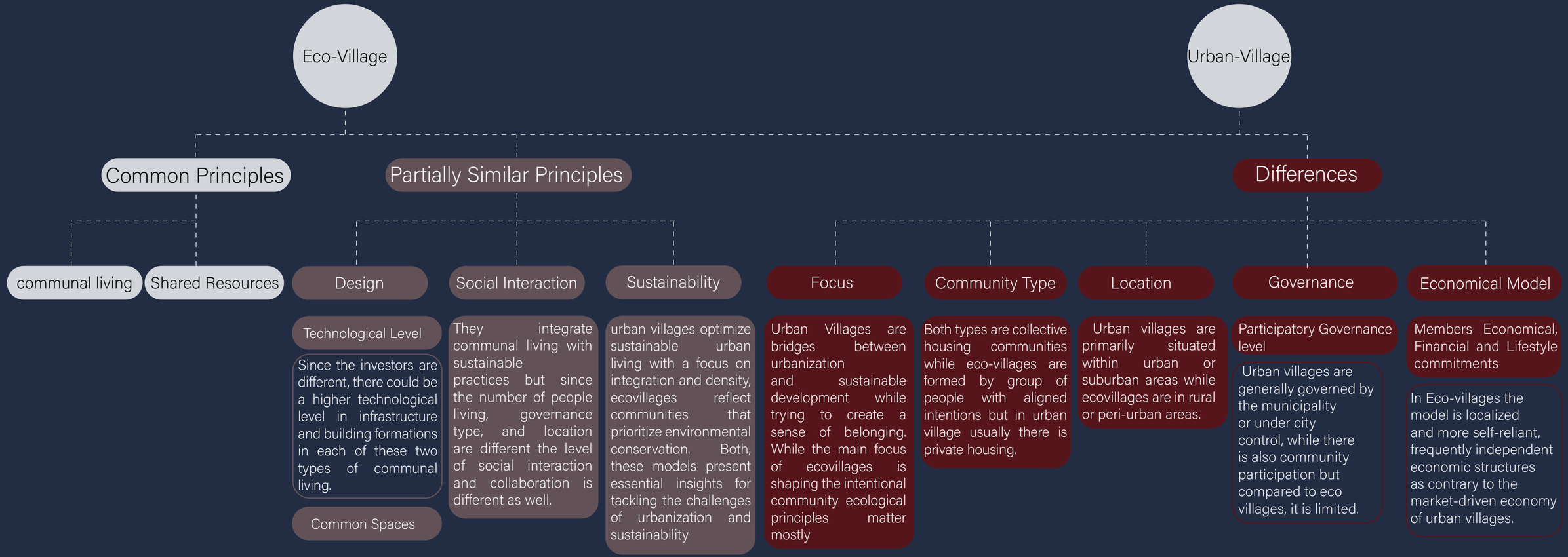

Figure 19: Ecovillages and Urban Villages comparison, Illustrated by Authors

1.2.6 Eco-villages, Co-housing and Urban village comparison Diagram

This map compares the urban village, co-housing community, and eco-village in an organized way based on key factors such as location, emphasis, governance, and sustainability. Each model reflects a different approach to community organization, urban and rural living, and environmental goals.

▪Location and Design

While urban villages focus on compact, walkable neighborhoods and are mainly based in cities or suburbs of a city or suburban locations, co-housing communities value highly shared spaces such as gardens or kitchens. In contrast to eco-villages, the emphasis is on integrated communities forged for environmental harmony, and these are usually located in rural or peri-urban settings.

▪Governance and Focus

Urban villages are generally governed by the municipality or the city. This focuses on mixed-use development and community participation. Co-housing communities seek to promote intentional contact and resource sharing, adopting a shared, community-led decision-making process. Eco-villages are collectively controlled and highly prize sustainability and consensus-driven processes.

▪Sustainability

Urban villages would not have an ecological emphasis at all, or one minimal, and will often rely on the infrastructure of the metropolis where their location is based. Co-housing communities apply eco-friendly techniques as well; yet, its social cooperation perspective precedes all others in these groups of people. Ecovillages approve regenerative and self-sufficient lives, rooting sustainability within its core activities such as applying renewable sources of life and local produce.

▪Economic Model and Social Interaction

Due to accessibility and closeness, social engagement is moderate in urban villages. High degrees of cooperation and resource sharing are encouraged in co-housing communities. Similarly, eco-villages prioritize close bonds and common intentions, in addition, they function within regional, frequently independent economic structures as contrary to the resource-sharing model of co-housing or the market-driven economy of urban villages.

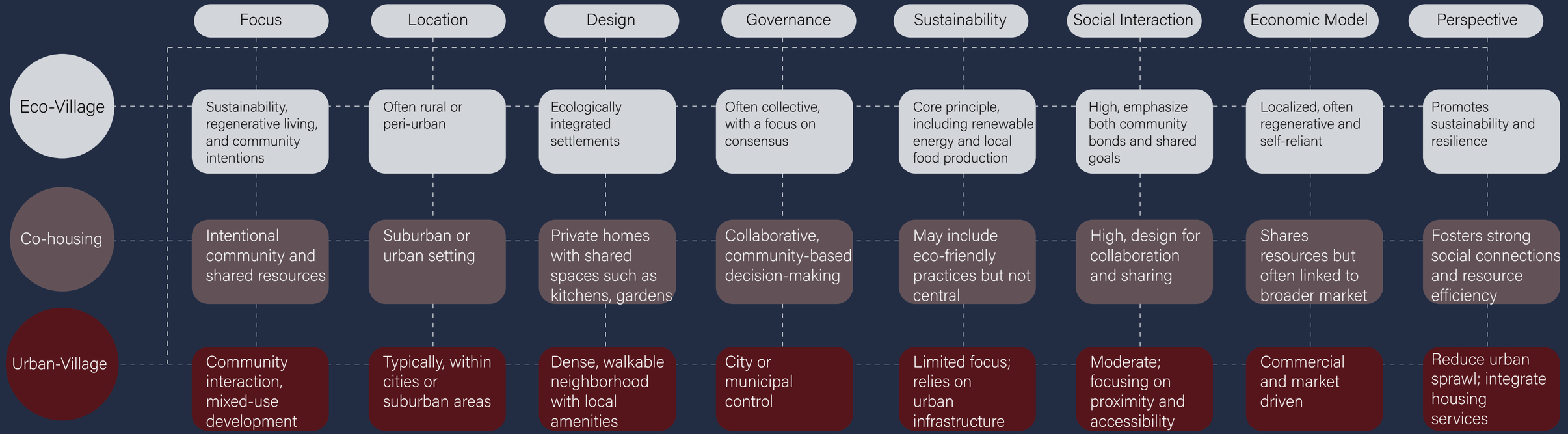

Figure 20: Ecovillages, Co housing, and Urban village features comparison, Illustrated by Authors

1.3 An Eco-village to Review (Ithaca Ecovillage)

1.3.1 Ecovillage at Ithaca

Liz Walker's book Ecovillage at Ithaca: Pioneering a Sustainable Culture offers a compelling and in-depth description of the community that, by being innovative, was able to envision and realize a sustainable way of life. The book provides a realistic and optimistic account of how deliberate planning and coordinated effort could address environmental, social, and economic issues. The pen, which is based on Walker's experience, is quite personal to her and gives voice to all of the struggles and victories involved in creating this community. In our research on this instance, when idealism and realism coexisted to implement widespread sustainable practices, this book was provoking.

The Ecovillage at Ithaca vision began in the late 1980s. It was a response to concern over environmental deterioration and a dream for a better community. It was initiated by a small but committed group of individuals who sought to create a sustainable village that would combine eco-living, resource conservation, and close social relationships. They began by looking into ecovillages throughout the world and speaking with professionals in sustainable design. They started building a cooperative housing community based on shared sustainability objectives after purchasing land close to Ithaca, New York.

The first stage was filled with challenges from fundraising to zoning laws negotiation, to attract and convince potential members to collaborate and invest into an idea that did not exist yet. Though collaboration was key to their aim, sometimes conflicting agendas and ideas made the process slow. However, the group was able to overcome the problems because of its common dedication, efficient communication, and determination.

They began development with a focus on energy-efficient homes, ecologically friendly building practices, and shared facilities including common areas and gardens.

The village ultimately evolved into a successful, intergenerational community where individuals work together to maintain communal resources and remain committed to their goal of living lightly on the planet.

Walker's book documents this visionary endeavor and is itself a manual and source of inspiration for others laboring to create sustainable communities. It illustrates how vision, collaboration, and determination are required to bring grand ideas turned into tangible achievements (Walker, 2005).

Advice to ecovillage builders
To Merrill-Lynch's client and other developers, our Eco Village me sage is basically this:
1. Create a site plan based on balancing the needs of the natural environment with the people who will live there.
2. Preserve 80 percent to 90 percent of the site as open space.
3. Integrate organic agriculture into the plan.
4. Build passive solar and/ or very energy efficient homes.
5. Create pedestrian streets where children can play and adults can chat.
6. Create common houses or community centers where people can interact. Integrate small businesses and encourage home offices.
7. Build near a public transit line. By far the toughest part of the work is to build a sense of community. Tend not to gather in the common house .

ECOVILLAGES

Marketing the Ecovillage garden's organic produce at a local farmer's market.

are people working on creating ecological city design and plenty of small rural communities, I can speak most knowledgeably about our own EcoVillage at Ithaca—built on the edge of a city. There are several reasons for the appeal in working on an edge-city design:

• This is where the majority of new development takes place. A replicable model can therefore have much influence

By far the toughest part of the work is to build a sense of community.

• It offers an alternative to suburban sprawl and can save large tracts of natural areas and farmland.

• It can integrate organic agriculture, wetlands, woods, orchards, etc.

• There is plenty of economic and cultural interface with the nearby population center, minimizing the insular effect of a rural community.

Planning Process

Soon after we purchased the land in June, 1992, we initiated a democratic process to plan how the land could best be developed. The group that started EcoVillage began with two assumptions: 1) we would preserve a minimum of 80 percent of the site as open space; and 2) we would use the cohousing model as the means to develop neighborhoods which could eventually house about 500 people.

I want to emphasize here that EcoVillage bought the land from a previous developer who went bankrupt. This developer had planned a typical suburban development of 150 homes (the same number EcoVillage is planning) which would have completely covered the site with roads, garages and houses. He left 10 percent of the site for open space, as mandated by the Town of Ithaca. Thus by developing EcoVillage we were in effect preserving green space and farmland that would otherwise have been paved over.

We spent nine months on the land-use planning process. I chaired a planning committee that met for three hours weekly to research and discuss the options regarding the site. We looked at water, soil types, wind patterns, agricultural potential, alternative waste treatment, and more. There were often five to six subcommittees that presented their findings to us. Next we brought in the broader community and the experts. We held a land-usese planning forum that brought 60 people together for an intensive weekend experience. Among the participants were planners, architects, landscape architects, ecologists, students, future residents, and others. We walked the site in small groups, focusing on the best location for a village of five to six neighborhoods, the best location for organic gardens, the place to put a visitor's center. By the end of the weekend we pooled our findings and came to consensus on two important items: 1) the best agricultural soils were to be preserved for gardens; and 2) existing water on the site would be preserved and enhanced through constructed wetlands, ponds, and recharging the aquifer.

Hardly the way a normal developer would proceed. The site we chose to develop for the village ended up on the worst soils, set far back from the road. It was on the highest point of land to enable an eventual biological waste treatment system to be gravity-fed. The fields we chose had enough room for neighborhoods to cluster around a village green.

Another three planning forums later, we had all that we needed to create our own "Guidelines for Development," which spelled out everything from how densely clustered neighborhoods should be (30 homes on no more than three acres) to our goal for energy efficiency. Meanwhile, in a parallel process, a local ecologist teamed up with a local architect to create a beautiful map of this vision which remains as our icon today. This colorful "envisioning plan" is to our group what the blue and white Earth image is to environmentalists: it helps us to remember the whole picture of where we are going and gives us the nest to continue when the going gets rough.

Now, three years after that initial planning process, we are grappling with implementation. Our ecological development guidelines have pressed us to develop a 2,700-ft. road and related infrastructure that is more costly than we would like. We have had to go through a lengthy process to get town approvals because of our innovative design. Choices such as densely clustering the houses in order to preserve more open space made us wade through the creation of a "Special Land Use District." Although the Town Planning Board was sympathetic to our goals, the net result was to lose the 1995 building season, and push off construction for another nine months. Despite how many hurdles we've had to cross, I think people in EcoVillage would agree it's been worth it.

Advice to ecovillage builders

To Merrill-Lynch's client and other developers, our EcoVillage message is basically this:

1. Create a site plan based on balancing the needs of the natural environment with the people who will live there.
2. Preserve 80 percent to 90 percent of the site as open space.
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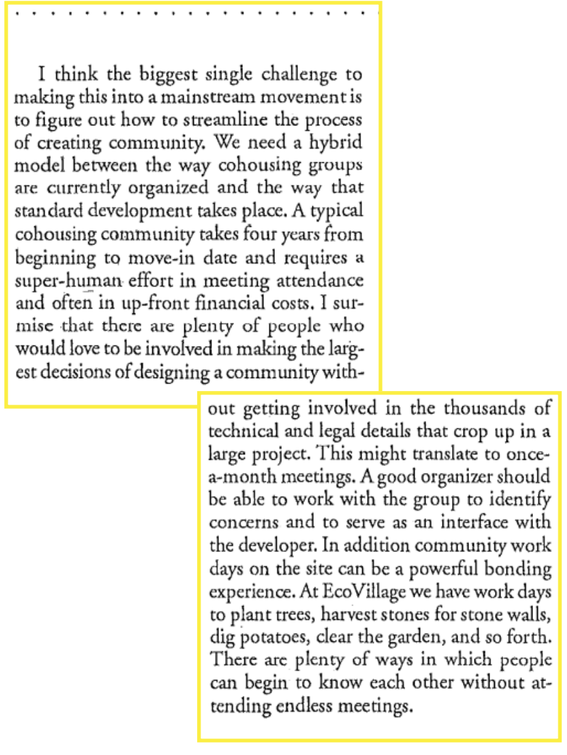
5. Create pedestrian streets where children can play and adults can chat.
6. Create common houses or community centers where people can interact. Integrate small businesses and encourage home offices.
7. Build near a public transit line.

By far the toughest part of the work is to build a sense of community. In Denmark it has been found that cohousing communities built by developers without resident participation are not as likely to work. People tend not to gather in the common house. There seems to be a crucial element of bonding in the arduous process of designing, getting approvals and building a cohousing community.

42 Communities

Number 91


I think the biggest single challenge to making this into a mainstream movement is to figure out how to streamline the process of creating community. We need a hybrid model between the way cohousing groups are currently organized and the way that standard development takes place. A typical cohousing community takes four years from beginning to move-in date and requires a super-human effort in meeting attendance and often in up-front financial costs. I surmise that there are plenty of people who would love to be involved in making the largest decisions of designing a community without getting involved in the thousands of technical and legal details that crop up in a large project. This might translate to once-a-month meetings. A good organizer should be able to work with the group to identify concerns and to serve as an interface with the developer. In addition community work days on the site can be a powerful bonding experience. At EcoVillage we have work days to plant trees, harvest stones for stone walls, dig potatoes, clear the garden, and so forth. There are plenty of ways in which people can begin to know each other without attending endless meetings.

Source 21: Ecovillage at Ithaca: Pioneering a Sustainable Culture (Walker, 2005)

2.3.1.1 Further Insights into Development

The Ecovillage at Ithaca (EVI) is home to about 170 adults and 40 children in the village, for a total population of 210. It consists of 3 neighborhoods, Frog, Song and Tree. It represents an exemplary model of intentional community building, sustainability, and cooperationWhile Walker (2005) presents the origin and development of EVI in a very catchy way, Franke (2012) goes deeper into researching and analyzing broader implications of such an initiative, mainly regarding social and environmental impact. These works together create a full picture of how the ecovillage evolved and what it is nowadays.

1.3.1.2 Social Cohesion and Governance

The main challenge, as Franke (2012) said, was the need to develop a model that could effectively balance inclusiveness with sound decision-making. The village followed consensus decision-making, although it is usually more time-consuming to conclude but suited to the principles of equality and collective responsibility of the village. Members are very actively involved in various village committees dealing with maintenance, food systems, education, and other aspects. The governance structure provides for a high degree of ownership and responsibility among its members.

1.3.1.3 Economic Models and Challenges

The articles highlight the financial hurdles faced by EVI, particularly during its initial stages. These included creative financing for land acquisition and development. The financial model in operation at the ecovillage today is a hybrid, wherein community members share expenses related to community resources while individually contributing to project expenses. This economic strategy sustains affordability with the additional effect of project viability over time (Franke, 2012).

1.3.1.4 Environmental Protection and Food Systems

As Walker (2005) points out, and Franke (2012) also indicates, the primary decision principle is environmental management at EVI. The village incorporates organic farming, sustainable principles, and renewable energy systems into its infrastructure. Residents manage the gardens and agricultural plots together, being able to produce a lot of their food locally. Composting, waste management, and recycling reinforce further how much EVI is concerned with sustainability issues.
The community significantly draws most of its power needs from renewable energy sources, such as rooftop solar panels and shared energy grids, reflecting the care of EVI towards energy self-sufficiency. (Christian, 2003).
Public transportation gives priority to walking and cycling rather than automobiles.
Shared vehicle programs and a focus on compact, pedestrian-friendly layouts support a low-carbon lifestyle (Mulder et al., 2006).

1.3.1.5 Architectural Design

EVI employs architectural typologies that prioritize sustainability and social interaction. Houses are built with passive solar principles, high insulation, and natural ventilation, significantly reducing energy use and lowering carbon footprints (Walker, 2005). The materials used are predominantly local and environmentally friendly, emphasizing resource efficiency.

The clustered layout of EVI reduces land use, with ample space for agriculture and nature and a feeling of proximity between residents (Franke, 2012). Common spaces like guest rooms, communal kitchens, and multi-purpose halls reduce redundancy in personal spaces and support mutual living (Kasper, 2008).

1.3.1.6 Impact Beyond the Community

The impact of EVI goes far beyond its local surroundings. According to Franke (2012), the village has emerged as a prime location for academic research, educational field studies, and workshops, thus stimulating similar initiatives around the world. Key information obtained from EVI, particularly on self-governance of the community, green building, and ecological design, has been disseminated far and wide, thus supporting the global ecovillage movement.

1.3.2 Lessons for Future Ecovillage Designs

▪Holistic Design
Prioritize integration of eco-friendly materials and passive architectural features to enhance energy efficiency.

▪Shared Spaces
Design communal facilities that reduce redundancy and foster social cohesion.

▪Open Space Preservation
EVI preserves 90% of land for agriculture, natural meadows, forests, and ponds.

▪Local Food Production
Two resident-owned farms supply organic fruits and vegetables to 1,500 county residents during the growing season.

▪Water and Energy Systems
Provide a self-sufficiency approach possible with renewable energy and closed-loop water management integration.

▪Governance Models
Apply a consensus approach and ensure active participation of habitants in decision-making.

▪Diversified investment
Ensure funding comes from a private investment, grants, and income-generating programs such as education and tourism.

▪Reflections
The combined insights from Walker (2005) and Franke (2012) reveal EVI as more than just a residential community—it is a living experiment in sustainable living. Its development highlights the complexities of aligning social ideals with practical realities, but it also underscores the transformative potential of collective effort. The architectural typology, governance model, and environmental practices serve as a blueprint for future sustainable communities.

Figure 22: Aerial view of Eco-village at Ithaca showing the layout of the first two neighborhoods and the pond. The long structures are the -carports. Source: Franke, 2012

Figure 23: Personal and Community Gardens
Source: https://ecovillageithaca.org/grow/farming-and-food/

Figure 24: Children play area outside and in a Common House
Photo by: Amanda Silvana Coen
Source: https://inhabitat.com/ecovillage-at-ithaca-offers-sustainable-living-in-a-community-setting/

Figure 25: TREE began construction in late 2012. TREE is a neighborhood of 40 households, with yet another variant in neighborhood layout and building construction. All homes are expected to be certified as LEED Platinum. Members of TREE come from all over the U.S. and the world, with families moving from as far away as Malaysia, Italy, Hawaii, Texas, Florida, and other states.
Source: https://ecovillageithaca.org/live/neighborhoods/

Figure 26: FROG (First Residents Group) is EcoVillage Ithaca's first neighborhood, completed in 1997. As in FROG, 30 homes are built as duplexes to save energy and materials. A large pond is a central focus for activities in summer and winter – swimming, skating and bonfires.
Source: https://ecovillageithaca.org/live/neighborhoods/

Figure 27: Song neighborhood, was completed in 2006 and launched. However, SONG employed a different construction strategy using a self-development model, rather than a single architect and are individually customized, demonstrating a wide variety of sustainable building techniques
Source: https://ecovillageithaca.org/live/neighborhoods/

1.4 Tourism; Role and Impacts on Eco-villages

1.4.1 The Role of Tourism in Ecovillages: Balancing Goals and Challenges

Ecovillages were initially conceived as intentional communities that could offer solutions to urgent environmental problems, particularly climate change. These are communities attempting to realize ecological principles in design and infrastructure, as well as in social practices, often with the support of organizations like the Global Ecovillage Network (GEN) and Gaia Education (Jackson & Svensson, 2002). A key feature of ecovillages is the sharedness of ecological values among their residents, despite a diversity of personal motives. In due course, many ecovillages have been converted into places of tourist consumption, based on needs such as economic requirements, growing interest in ecologically sustainable lifestyles, and the novelty of their communitarian and new ways of life. This chapter discusses the ecovillage as a tourism destination, its impact on the local economy and social life, and whether this current trend represents an alignment or contrasts the original intentions of the ecovillage movement.

1.4.2 Ecovillages as Tourist Destinations

1.4.2.1 An Overview

Several reasons exist as to why ecovillages are an increasingly popular destination for tourists. First, it is argued that those interested in sustainable living practices are drawn to them by their distinctive design, dedication to sustainability, and alternative lifestyles (Dawson, 2006). Second, such communities currently can be seen as ideal destinations due to the popularity of eco-consciousness in popular culture (Smith & Richards, 2013). Third, since tourism is a major source of income for the development and sustainability projects of ecovillages, economic reasons often motivate them to embrace tourists (McIntosh & Zahra, 2007).

1.4.2.2 Historical Context

The rise of eco-tourism in the late 20th century initiated the trend of ecovillages as a form of tourism destination. Ecovillages, as examples of sustainable human settlements, grew from the concept of ecotourism's initial concentration on conservation and natural environments (Dawson, 2006). Founded as educational programs, prototype ecovillages like Findhorn in Scotland and Auroville in India began to expand their services related to tourism.
Ecovillages were further integrated into the global tourist network by the 2000s due to the increasing demand for ecotourism travel and the rise of experiential tourism (Jackson & Svensson, 2002).

1.4.2.3 Economic Impacts of Tourism on Ecovillages

Ecovillages may profit from tourism. Income derived from crafts, workshops, accommodations, and guided tours can be reinvested in further ecological advancements, the building of better infrastructure, and financing community projects. GEN, 2021.
For instance, the Findhorn Foundation derives high revenues from visitor programs, which also support its environmental programs and stimulate the local economy as well (Dawson, 2006).
Similarly, tourism can reduce dependence on external funding or bids through the provision of employment opportunities for the residents.
On the other hand, dependence on tourists is also economically burdensome. Fluctuations in visitor numbers, especially during the low season or in response to international emergencies such as the COVID-19 pandemic, may result in financial instability (Smith & Richards, 2013). The commercialization of ecovillages also has a potential risk of compromising their original ethos if it leads to visitor demands overriding local needs (McIntosh & Zahra, 2007).

1.4.2.4 Social Implications of Tourism

Ecovillage tourism may inspire cross-cultural sharing. It may spread awareness about existence. Generally, visitors often go back home and inspire changes in certain ways of their lifestyles toward ecological adaptation, thus sprouting the movement even beyond the village's boundaries (McIntosh & Zahra, 2007).
For instance, in Auroville, visitors attend workshops on permaculture and renewable energy, which they share with the rest of the world (GEN, 2021).

On the other hand, tourism inflow can destroy the social tissue of ecovillages: intrusion into privacy and shifting the focus from living together to pleasing an external audience. Conflicts between longer-term residents and short-term visitors can also arise in the background of different expectations and values (Jackson & Svensson, 2002).

1.4.2.5 Ecovillages Identity Changing

Tourism has the potential to alter the identity of ecovillages from being intentional communities into some sort of commodified experience. In so doing, it dilutes their core principles as they are forced to meet the demands of tourists. For example, in some ecovillages, aesthetic appeal may be stressed over ecological functionality as a means to attract visitors, thus presenting a superficial version of sustainability (Smith & Richards, 2013; Sharpley, 2000). Sharpley (2000) draws on earlier works by Butler (1999) to illustrate how tourism often evolves into stages of commodification that can erode the original ethos of sustainable practices Richards (2005) further extends this by pointing out that the pressure to appeal to tourist tastes can result in far-reaching changes in the ways that ecovillages distribute resources, perhaps pushing their ecological projects to the periphery in favor of visitor-related amenities. Such transformations risk turning ecovillages into eco-themed resorts rather than authentic examples of sustainable living (McIntosh & Zahra, 2007; Saarinen, 2006)

1.4.2.6 Aligning Tourism with Ecovillage Goals

Despite these challenges, ttourism can be made to align with the goals of ecovillages if managed thoughtfully. Strategies include:

▪Education-Focused Tourism
Designing visitor programs that are essentially learning and participatory, such as permaculture courses or workshops on renewable energy (Jackson & Svensson, 2002).

▪Capacity Limits
The number of visitors must be controlled to minimize environmental impact and maintain the community's integrity (Dawson, 2006).

▪Community Involvement

▪Sustainable Practices
Implementing eco-friendly tourism infrastructure, such as solar-powered accommodations and zero-waste facilities (Smith & Richards, 2013).

1.4.3 Case Studies

▪Findhorn, Scotland
One of the oldest ecovillages, Findhorn attracts thousands of visitors annually for its educational programs. While tourism supports its sustainability projects, the community carefully balances visitor activities with resident needs to maintain its identity (Dawson, 2006).

▪Auroville, India
This experimental township receives a significant number of tourists, many of whom participate in workshops and volunteer programs. Auroville's focus on education helps align tourism with its mission, but the sheer volume of visitors poses challenges to its infrastructure and community dynamics (Jackson & Svensson, 2002).

▪Crystal Waters, Australia
This ecovillage integrates tourism through eco-cottages and guided tours, using the income to fund permaculture projects. The community actively involves residents in tourism management to ensure alignment with their goals (GEN, n.d).

1.4.4 Conclusion; Positive and Negative Aspects of Tourism

This ecovillage incorporates tourism through eco-cottages and guided tours, bringing the income into ecological projects, such as permaculture. Residents are also engaging in tourism management by the communities, so, it will be aligned with their goals (GEN, n.d).
So, tourism can generate economic stability and enhance finances to be spent on ecological projects (Smith & Richards, 2013).
It also can spread awareness and green practices to the host community as well. But at the same time, it can lead to cultural dilution, environmental impact, and social strife(Mcintosh & Zahra, 2007).

Ecovillages as a tourist destination is a multifaceted phenomenon that is bound to provide opportunities, as well as pitfalls. If not handled properly, it can potentially endanger the stability of such communities even as it may potentially enable the spread of the movement's message and offer crucial economic assistance. By holding on to their core principles, ecovillages can leverage tourism to advance their ecological and social objectives through sustainability, educational programs, and community involvement. To reinforce those methods and turn tourism development into an advantage instead of a drawback to the ecovillage movement, greater research and collaboration between ecovillages and tourism specialists are needed.

Mapping the Main Features of Eco-villages

This model ensures that resources remain dedicated to the community's sustainable objectives.

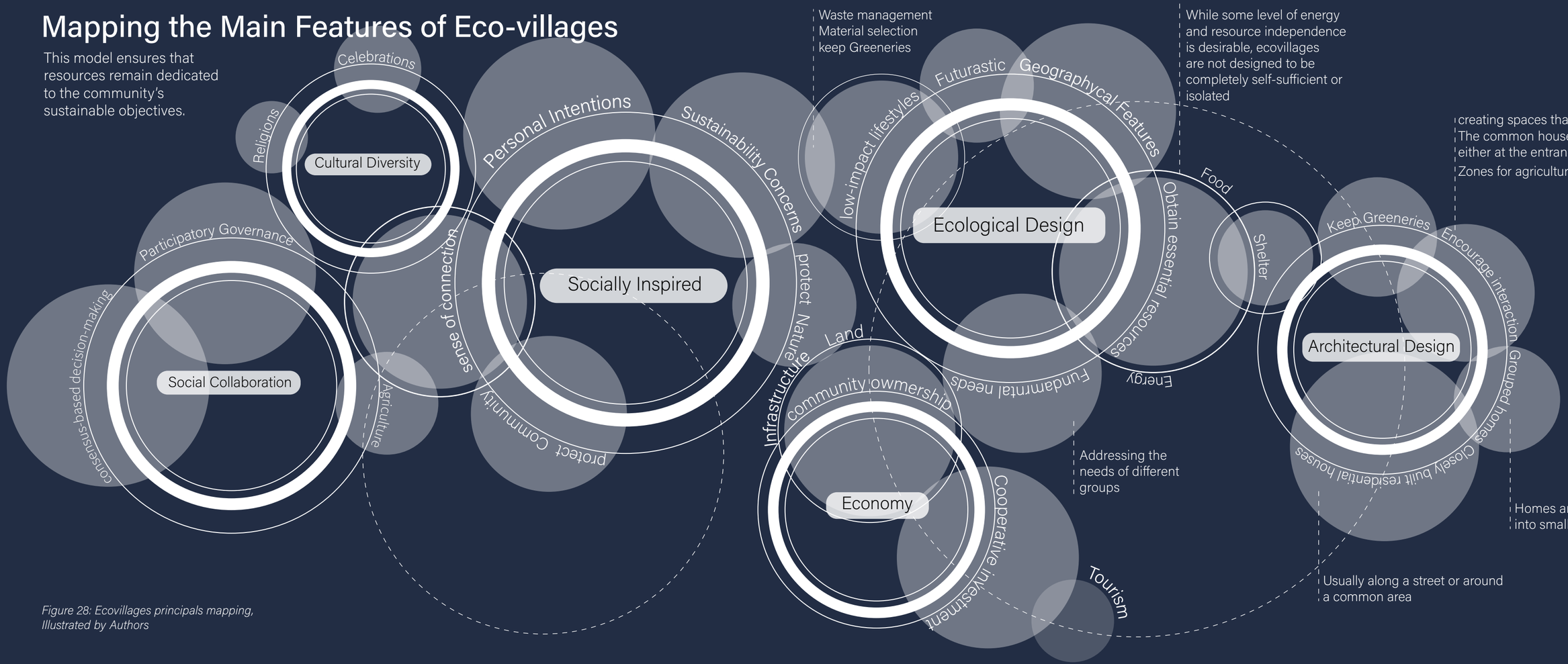


Figure 28: Ecovillages principals mapping, Illustrated by Authors

Chapter 02

Exploring Emergency and Urgency Methods

02

. Emergency | Urgency solution Defining
. Case studies: from emergency response to urgent solution

2.1 Emergency | Urgency Solutions Defining

2.1.1 Introduction

Emergency solutions are one of the immediate response mechanisms for the needs that crises-natural disasters, conflicts, or mass migrations-create. It is usually conceived as quickly constructible, cost-effective, and adaptable to various contexts. In providing only a primary shelter solution, there are significant challenges, especially related to long-term shelter provision for displaced persons and their full integration into the social and environmental spheres of the receiving areas. This is the case of Boa Vista in Brazil, underlining that emergency housing has to be developed as a typology of houses that goes beyond the notion of shelter. These solutions should address the socio-economic and environmental burdens they impose while fostering community building and self-reliance.

This chapter provides insight into the architectural features of emergency housing, the difficulties in maintaining accommodation for emigrants, and the valuable contribution of a community in planning long-term. We also cherish the strain the movements put into local economies and onto land use and natural resources; thus, supporting those designs in line with these qualities of encouraging sustainability and self-sufficiency.

2.1.2 Features and Challenges of Emergency Housing

Emergency housing is a kind of housing that can be quickly deployed and constructed, many times under specific time and budgetary constraints. Materials generally come as prefabricated components or in modular systems that can be easily assembled and disassembled quickly. Adaptability is one of the characteristic keys since these accommodations often have to be used in different climates and terrains.

Financial responsibility for emergency housing often falls to governments, international aid organizations, or NGOs. This can be the case with organizations such as the UNHCR, which has taken a leading role in the provision of shelter during global crises (UNHCR, n.d). In the mentioned context, mitigating the Venezuelan migration crisis is often facilitated through partnerships between local governments and international organizations.

While these projects are in operation, the question of long-term usability for emergency housing often arises. The design for temporary use very often creates problems of durability and maintenance when crises prolong themselves. As Corsellis and Vitale (2005) have identified, emergency shelters must be designed from the beginning as part of a continuum of housing solutions to transition into permanent structures when required.

The emergency housing for migrants who have to flee their countries is much more than a physical structure; it constitutes the first contact with a different cultural and social environment. In Roraima, thousands of Venezuelans have been making this transition, painfully. Many of them arrived with little in their wallets, linguistic barriers, and emotional wounds, raising needs that go far beyond the availability of a roof.

A very important issue is cultural and social dislocation, which usually characterizes migrants. As Zetter and Deikun (2010) point out, housing not only provides a physical need but also tries to address cultural and psychic needs. In Roraima, the need exists to design spaces respectful of the cultural practices of Venezuelan migrants while including them in Brazilian society.

In addition, the ecological and infrastructural carrying capacity of the host region is usually strained. Roraima is already an economically fragile state that needs to find a balance between its own local citizens and the incoming migrants. Such a scenario further reinforces the demand for resource-efficient and ecologically sustainable housing solutions, as reiterated by Davis (2011).

2.1.2.1 Environmental and Economic Burdens

The massive influx of migrants in any particular region often burdens the natural resources and economy. For example, in Roraima, there is documented evidence that temporary settlements are related to deforestation and overexploitation of water resources. Devising appropriate responses to such environmental challenges involves a rethinking of housing design for the purpose of reducing ecological footprints.

For instance, the incorporation of self-sustaining features such as rainwater harvesting, solar energy, and small-scale agricultural spaces in emergency housing reduces its impact on the environment. This is evidenced in works by Turner, 2015, where, while trying to reduce environmental degradation, such inclusion has also offered the migrants avenues for self-sufficiency.

On the economic side, the costs of emergency housing and other related services are sometimes excessive for local budgets. In creating self-sufficient neighborhoods, though, some of those pressures can be alleviated. Skill-building workshops and local entrepreneurship programming also allow migrants to contribute to the local economy-to transform what might appear to be a burden into an opportunity.

2.1.3 Architectural Typology and Technological Considerations

Architectural solutions for displaced settlements must balance speed, cost, and adaptability. Its emphasize that temporary shelters must transition into durable solutions. Key architectural typologies include:

▪Temporary Tents
Lightweight, portable, and cost-effective, tents are ideal for initial emergencies. However, their lifespan and insulation are limited.

▪Transitional Shelters
These structures fill the gap between temporary and permanent housing; they are made from durable, reusable materials that can be upgraded over time, such as corrugated metal or prefabricated panels.

▪Permanent Housing
Permanent housing solutions arise in circumstances of protracted displacement. These are more substantial in materials and designs and reflect local architectural styles, so they blend into host communities.

▪Technological Advances
Recent innovations include modular construction systems, 3D printing, and the use of sustainable materials such as bamboo or compressed earth blocks. These technologies reduce the cost and environmental impact while at the same time improving shelter quality. (Corsellis and Vitale, 2005)

2.1.4 Who are In charge

2.1.4.1 The Role of Community in Emergency Housing

The community is very instrumental in making emergency housing successful. Housing facilities that encourage social interaction and mutual support among their residents are much better for the well-being of the displaced persons. In Roraima, where a large part of the population is comprised of displaced Venezuelans, nurturing the spirit of belonging is of utmost importance, both for migrants and for the host community.
Key aspects of community involvement include:

▪Social Integration
Community spaces, such as schools, markets, and recreational areas, help bridge the cultural gaps between displaced populations and host communities.

▪Livelihood Opportunities
Creating opportunities for self-sufficiency, such as community gardens or vocational training centers, reduces dependency on aid and builds resilience.

▪Participatory Planning
Involving displaced people in the design and management of settlements ensures that shelters meet their particular cultural and practical needs.

▪Conflict Resolution
Stronger communities are more prone to finding settlements on possible disputes about the resources of land and/or water.
Communal spaces can be designed to be shared, including kitchens, gardens, and recreational areas. Such spaces, may directly enable the formation of social bonds through design alone. Moreover, giving migrants a possibility to take part in the design and building process empowers them and nurtures a sense of ownership instead of dependence on aid. (Dovey, 2010)

2.1.4.2 Stakeholders in Displaced Settlements

Corsellis and Vitale (2005) emphasize that successful management of displaced settlements necessitates teamwork. The principal parties involved are:

▪Humanitarian Groups
The coordination of resources, infrastructure, and policy is frequently led by organizations like the UNHCR, Oxfam, and regional NGOs. These groups offer their knowledge of long-term settlement tactics, resource distribution, and shelter design.

▪Host Governments
Host governments are critical in providing land, regulatory frameworks, and integration pathways for displaced populations. In Brazil's Roraima, local governments play a central role in managing Venezuelan migrants.

▪Local Communities
Host communities are essential stakeholders in fostering social integration and providing economic opportunities for displaced populations. Surly, the communist acceptance and support determine the success of rural or urban integration.

▪Private Sector
Private companies often contribute in the form of funding, technical expertise, and innovation in building materials and methods of construction.

▪Displaced Populations
The displaced population's involvement in the planning and management of the settlements ensures that their needs are duly met. Participation ensures ownership and reduces dependency on aid. These private contributions normally come in the form of funds, technical know-how, and innovation in building materials and methods of construction.

2.1.5 Displaced Settlement Options

As we mentioned displaced settlements are essential in providing immediate shelter for populations affected by any kind of hazard which caused large-scale displacement. It is emphasized that settlements must cater to both immediate survival and the long-term goal of reintegration or resettlement.These are divided into a number of types, each suited to particular circumstances with which the response has to be adaptable and efficient. This section considers the main types of displaced settlements, stakeholders, architectural considerations, and the most important stakeholder-the community. (Corsellis and Vitale, 2005)

2.1.5.1 Types of Displaced Settlements

The main types of displaced settlements include planned camps, self-settled camps, mass shelters, rural settlement integration, and urban integration. Each has unique advantages and challenges in its regard:

▪Planned Camps
These are pre-designed areas designed with minimal infrastructure to temporarily house the displaced persons as quickly as possible. These camps are normally set on flat, accessible land and away from hazards. Examples include large refugee camps in host countries managed by commissions such as the UNHCR. These are immediate forms of shelter, but they tend to be overcrowded and experience a lack of socio-economic integration.

▪Self-Settled Camps
In this model, the displaced people find their space themselves and very often form informal settlements. These can be seen more in the border areas where no official infrastructure has been set up. These self-settled camps mostly lack governance and basic services and often challenge sanitation and resource management.

▪Mass Shelters
Usually former buildings, like schools, warehouses, or community centers, are used as mass shelters to house people temporarily. These shelters are extremely resource-intensive and generally inappropriate for long-term sheltering.

▪Rural Settlement Integration
This approach disperses the displaced into host rural communities. This model is very beneficial for social integration and local economies, but requires a high level of cooperation on the part of the host community and management of resources.

▪Urban Integration
In many cases, urban areas absorb the displaced through informal settlements or directly integrating into the host communities. While urban integration provides greater access to health and education, it places pressure on the urban infrastructure. (Corsellis and Vitale, 2005)

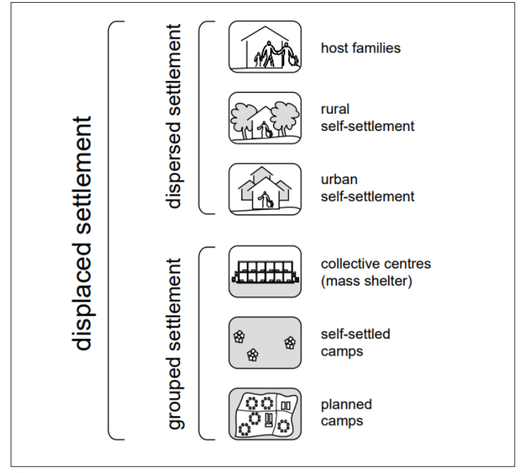


Figure 29: Dispersed or grouped settlement
Source: Corsellis and Vitale, 2005

2.1.6 Optimizing Response: From Emergency to Urgent Action

When we talk about an emergency, picture a sudden, overwhelming event. Think of a natural disaster or a conflict that forces people to flee immediately. In these moments, the focus is purely on survival and immediate safety.
When a crisis or disaster hits, emergency housing is absolutely critical. Think of it as the fastest way to respond. We've seen that things like tents often become the go-to solution because they're quick to set up and practical when people need shelter right away.

But what happens when we're looking at housing for immigrants? This situation isn't quite the same as an immediate emergency. We're talking more about an urgency here.

The line between "emergency" and "urgent" housing isn't always super clear, but you can think of it this way: with urgency, there's more room to consider things like economic factors, how people will interact socially, and even the architecture of the living spaces. These become much more important than in a pure emergency, where the only goal is immediate survival.

Ultimately, whether it's an emergency or an urgent need, these housing solutions need to do more than just provide shelter. They should also tackle bigger challenges related to society, the environment, and the economy so they don't create new problems down the line.

Take the Venezuelan migration crisis in Roraima, Brazil, for example. That situation really highlighted the need for new, better ways to house people – solutions that are sustainable and help build a community.

2.1.6.1 Facing an Urgency Situation

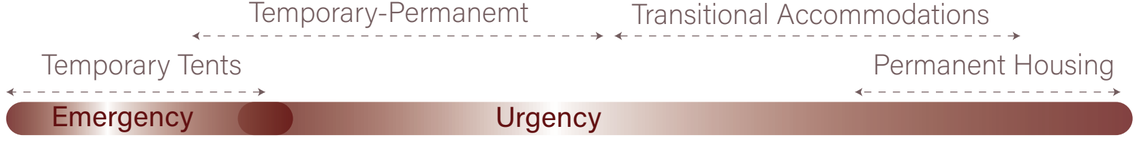
The people who are arriving in Roraima are not in immediate crisis, as they are relocating to settle permanently. Therefore, accommodation is not an emergency in the traditional sense. However, there is an undeniable urgency to implement housing solutions.

We will begin by evaluating initial emergency accommodations— typically tents— before transitioning to more permanent housing. The current situation involves a continuous influx of people relocating to live, which requires a long-term approach to housing.

There's no expectation for the people who are in the "Emergency" situation and escaping to take on economic burdens or social responsibilities; they're simply trying to get to safety. They've just been through something incredibly difficult, and their primary need is immediate relief.

But then there's an urgent situation, which is what you're addressing with the idea of an ecovillage. Here, people still have pressing need for shelter, but there's also a crucial difference: the potential for active participation and future planning. In this urgent phase, after the initial needs has passed, the goal shifts from just surviving to rebuilding.

It's not just about putting a roof over someone's head; it's about creating a space where a new community can begin to form. Once people are settled in the ecovillage, they can start to play a part in their new environment. This means taking on economic roles, perhaps through shared work, local initiatives, or skill-building. It also means engaging in social interactions, building connections, and contributing to the well-being of the collective.
The beauty of the being in the community is that it provides a framework for this transition. It's a place where, after the immediate need for accommodation is met, the residents can actively participate in shaping their lives and their new community.
They can learn, contribute, and truly become part of a sustainable living environment, moving beyond the immediate crisis towards a more stable and self-sufficient future.
So here we will review some example of three different type of emergency ⟶ Urgency accommodations.
As a conclusion, we are not designing an emergency shelter but we are studying if designing an eco-village in this urgent condition could be a solution.



2.2 Case Studies: From Emergency Response to Urgent solution

2.2.1 UNHCR Temporary Tents

As it is commonly and reasonable the United Nations High Commissioner for Refugees tents are one of the first signs of aid.
For decades, designers have attempted to reinvent this simple tent. Polyurethane yurts, shipping containers, and prefabricated buildings have all been proposed or tried. However, as the agency kindly notes in its emergency goods guidance, none of these techniques have worked well in refugee settings thus far. Because other emergency shelter arrangements will have been arranged before these systems ever reach, the majority of them fail. Some tent substitutes are thought to be "too permanent," which makes it challenging to set them up in host communities and limits the motivation for refugees to go back to their home countries. Others are expensive or hard to duplicate.

However, there has been a rising awareness in the agency in recent years that a drastic redesign of the typical family tent's design is both possible and desirable. The agency often deploys plastic sheeting first in emergency situations. This sheeting may be the first and last line of defense, depending on the scope and intricacy of the situation. But there has been a rising awareness in the agency in recent years that a drastic redesign of the typical family tent's design is both possible and desirable. The agency often deploys plastic sheeting first in emergency situations. This sheeting may be the first and last line of defense, depending on the scope and complexity of the situation.

So, while tents are the simplest, fastest, and most effective way of providing shelters, being relocated, and settling up in an emergency situation, they are still under development, crisis, and experimentation. One important attempt is to try to replace them with other alternatives that are created using sustainable materials, are human-scale, and have more livable conditions, higher durability, and a protective sense.

Figure 30: Above right image: The Lightweight Emergency Tent in use in Meulaboh, West Sumatra, after the Indian Ocean tsunami of 2004. The tents are arranged at an angle to prevent those in facing tents from being able to see inside when the flaps are opened.
Photo by: G. Fardanesh/UNHCR

Figure 31: The tent packs in a carrying case and can be easily erectedPhoto by: G. Fardanesh/UNHCR

2.2.2 Light-weight Transitional Housing Paper Log Houses

Paper Log Houses are temporary shelters for victims of disasters. They are based on the project of the Japanese architect Shigeru Ban. They were realized for the first time in 1995, in occasion of the Kobe earthquake, in Japan. They were used for the earthquakes in Turkey, 2000, in India, 2001, and for the typhoon in Philippines, 2013. The general constructive logic involves the use of lightweight prefabricated inexpensive materials which are essentially either locally available or recycled and which can be dry-assembled without the aid of skilled manpower. The name derives from the material used for the load-bearing elements: 106 mm diameter, 4 mm thick paper tubes, made with recycled paper.

The first version of the house was made in this way: a basement made from beer crates loaded with sandbags, two plywood panels, separated by paper tubes, as floor, load-bearing walls made by placing vertical paper tubes, and a paper tube framework to support the roof envelope made by tenting material. In time, this configuration was adapted to different contexts. For instance, in the Philippines, which is characterized by hot wet climate, paper tubes were used as a framework skeleton that supports a building envelope made with vernacular woven bamboo sheets. Paper Tube Houses are based on a building technology that is originated by combining vernacular principles (local adaptation, dry assemblage, using recycled materials, and so on) with contemporary industrial materials. The result is a shelter of reasonable quality, in terms of appearance and thermal control, very inexpensive, very rapid to be built and also easy to be disposed of, recycled or re-used. (Leonardo G. F. Cannas,)

Figure 32: Paper tubes brought to Yenisehir Indoor Sports Hall, Mersin
Source:https://shigerubanarchitects.com/news/relief-for-turkey-and-syria/

Figure 33: Workshop for Log House Construction was Held on-site.
Source: https://shigerubanarchitects.com/news/relief-for-turkey-and-syria/-Photos by Voluntary Architects' Network in Antakya

Figure 34: As a response to the 1999 earthquake which occurred in northwestern
Source: https://shigerubanarchitects.com/news/relief-for-turkey-and-syria/-*Photos by Voluntary Architects' Network in Antakya*

Figure 35: As a response to the 1999 earthquake which occurred in northwestern
Source: https://www.archdaily.com/998888/shigeru-ban-unveils-updated-prototype-for-temporary-housing-in-response-to-the-turkey-syria-earthquake-Photos by Voluntary Architects' Network

Figure 36: As a response to the 1999 earthquake which occurred in northwestern Turkey
Source: Source: https://www.archdaily.com/998888/shigeru-ban-unveils-updated-prototype-for-temporary-housing-in-response-to-the-turkey-syria-earthquake-Photos by Voluntary Architects' Network

Figure 37: A second workshop for log house construction was held on-site.
Source: https://shigerubanarchitects.com/news/relief-for-turkey-and-syria/-*Photos by Voluntary Architects' Network in Antakya*

2.2.3 From Temporary Tents to Transitional Collective Communal Housing

Moving From temporary shelters to alternatives with developing potential could be the solution to be considered from the beginning of building and locating shelters. Many factors, such as the cause of the emergency, the host context regulation, timing and planning, and economic situation are the challenges in this way. Since we are trying to tackle the immigrant population accommodation issue and answer it by designing a fast but not temporary solution in the next step we review another case studie, the housing in Iquique, designed by Alejandro Aravena, which has modularity, low-cost houses, local materials, and expansion capability as the main principles.

Quinta Monroy is an award-winning housing project for over 90 families on 50000m land at Iquique in Chile. After death of the owner ‚Neighbors' started to complaints about the disorderly , crime and fire risks. From 2003, a social housing project was coordinated by the "Elemental" architecture firm with US$7500 per each house unit. With the settlers temporary relocated and 93 modular and linked apartments were built around a series of courtyards. These apartments, which were designed as "half-houses," were subsequently co-opted by residents adding rooms in locations planned in advance by Elemental. (O'Brien & Carrasco, 2021)

They were only able to accommodate 30 families on the property, if one begins to answer the question with the assumption that 1 house = 1 family = 1 lot.
Isolated homes have the drawback of being extremely inefficient with regard to land use. For this reason, social housing frequently searches for the least expensive land. Typically, that acreage is far from the employment, educational, transit, and health options that cities provide. Due to this method of operation, social housing has tended to be localized in an impoverished urban sprawl, resulting in the creation of belts of social conflict, injustice, and resentment.

Figure 38: INDEX Design to Improve Life
Source: https://www.elementalchile.cl/works/index-design-to-improve-life?slide=2

Despite the elevated property value in the area, it keeps the community on the same plot of land close to the center of Iquique, thus maintaining emotional and work ties. It also favors the use of communal space and rich and articulated living conditions. The design of each element and its assembly was developed to be inexpensive and easy to maintain, and no pictorial or populist gratification appear on the houses of Quinta Monroy. The need here was to build a structure - the indispensable base from which to start a new life. This was something that the inhabitants, installed precariously for too many years, had been unable to do.

Many households have since doubled the size of their apartment and reformed the settlement in ways not anticipated by Elemental. Despite densification pressures, open spaces had been maintained by the community to facilitate social interaction during festivals, a social resource that Elemental later used as a cue for their urban design strategy.

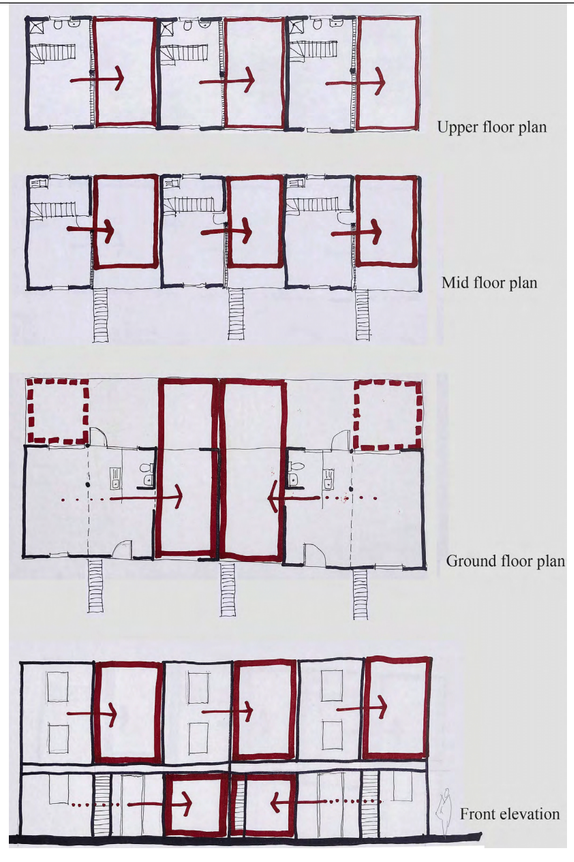


Figure 39: Diagram of initial apartments (black) and proposed additions (red). The two apartments at ground floor and three above were intended to be expanded horizontally. An option to enclose the dashed space was also possible.
Source: O'Brien, D., & Carrasco, S. (2021)

Figure 40: Quinta Monroy Housing Project
Source: https://www.elementalchile.cl/works/iquique-violeta-parra-ex-quinta-monroy?slide=8-Photo by Cristóbal Palma

Main Principles of Urgency Solutions

Emergency housing must address the urgent need for shelter while also protecting the community's sense of belonging and social integration. In places like Roraima, Brazil, the Venezuelan migration crisis highlights the importance of housing solutions that go beyond survival.
By incorporating sustainable designs, communal spaces, and cultural sensitivity, emergency housing can restore identity and foster resilience. It focuses on creating typologies that provide not just shelter, but also a foundation for rebuilding community and strengthening integration.

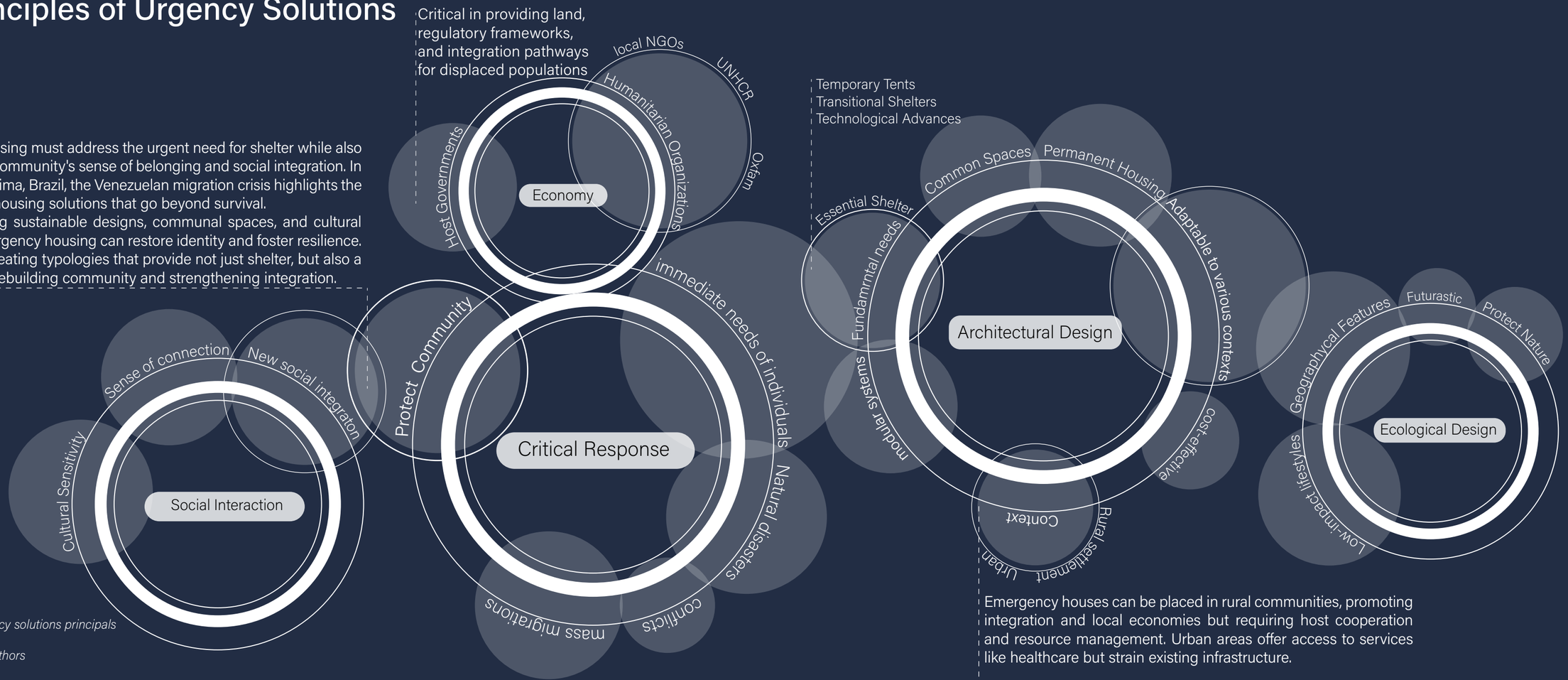


Figure 41: Urgency solutions principals mapping
Illustrated by Authors

Emergency houses can be placed in rural communities, promoting integration and local economies but requiring host cooperation and resource management. Urban areas offer access to services like healthcare but strain existing infrastructure.

Chapter 03

Characteristics of the Host Region and Project City, Boa Vista

03

. Roraima
. Boa Vista, Heart of state of Roraima
. Population and Immigrant growth impact
. Survey, collective information from UNHCR, Brazilian institutions
. Design location
. Climatically features

3.1 Roraima State

3.1.1 The State of Roraima: History and Migrations

Roraima, located in the northernmost part of Brazil, is a state characterized by its diverse ecological and geographical features. Spanning an area of approximately 223,644 square kilometers, it is one of the least densely populated regions in the country(27th), with about 2.8 inhabitants per square kilometer as of recent estimates. It has 15 municipalities, ans Boa Vista, the state capital, is the only Brazilian state capital located entirely in the Northern Hemisphere. Roraima is bordered by Venezuela to the north, Guyana to the east, and the Brazilian states of Amazonas and Pará to the south and southeast, respectively

The history of Roraima is closely associated with that of the rest of the Brazilian Amazon. Given its remote location, the area remained isolated for centuries until the Portuguese implemented the first aldeamentos in the 18th century. The model proved to be ineffective as the physical isolation combined with the dependency upon larger Amazonian centers for supplies and the hostile native populations jeopardized this colonization attempt

Roriama's isolation was finally broken by the rubber cycle when the local economy and population expanded substantially. Roraima's economy prospered with the production of beef in the cattle ranches of the savanna region, becoming the primary source of beef for the entire Northern Amazon sub-region5 (Silveira and Gatti, 1988).
This period also coincides with the arrival of the first Northeast Brazil migrants. Fleeing the recurrent droughts that plagued Northeast Brazil, many individuals spontaneously arrived in Roraima, seeking employment in the thriving beef industry. Notwithstanding the economic bonanza of the time, Roraima remained sparsely populated, as cattle ranching was undertaken in an extensive fashion, requiring little labor demands. It is estimated that around 10,000 individuals inhabited Roraima by 1900. With the demise of the rubber economy, this small population became even smaller as many returned to birth places or relocated elsewhere in the Amazon.
By 1920 the area known today as Roraima counted 7,424 individuals (Silveira and Gatti, 1988).

The inception of the new municipalities created many job opportunities in the public administration sector. In turn, the agricultural frontier remained active also drawing migrants from all over Brazil. The combination of such factors led to another population surge during the late 1990s and 2000s making Roraima's population reach 324,397 inhabitants in 2000 and 450.479 inhabi-

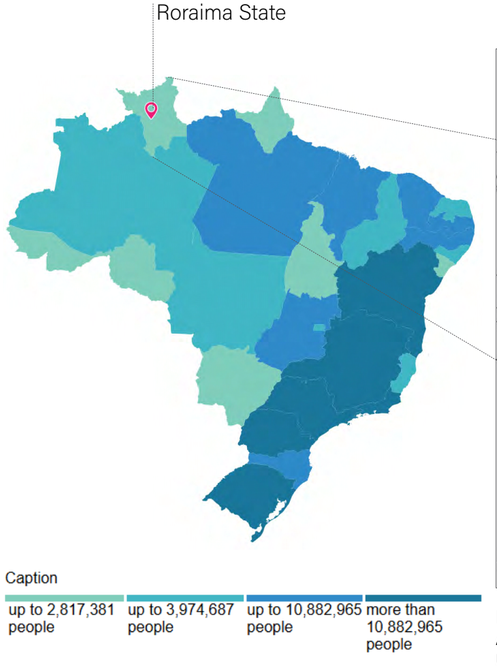


Figure 42: Roraima states population
Source: https://cidades.ibge.gov.br/brasil/rr/boa-vista/panorama

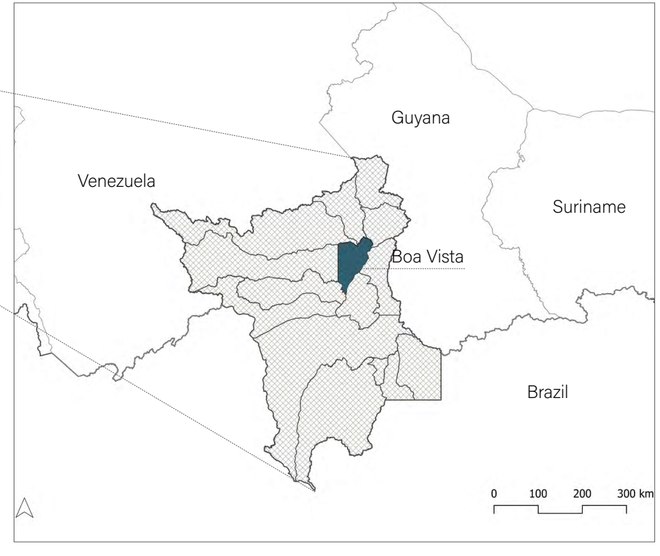


Figure 43: Roraima state,Capital : Boa Vista
Area : 223,644.534 km² (14th in the country)
Urbanized area [2019] : 229.30 km²
Population Density [2022]: 2,85 inhabitants per square kilometer
Illustrated by Authors

tants in 2010 and 636.70 person in 2022.

The first noticeable aspect is that interstate migrants are far more numerous than intrastate ones. Nonetheless, while both have experienced substantial increments over the past decades, the rate of growth of intrastate migration has been more pronounced, suggesting that within a few years, one will witness it overtake.

Two factors conspire for the surge in intrastate mobility. First, the emancipation of municipalities and the inherent economic development it induces, creating jobs and economic opportunities where none once existed. Secondly, the low migrant retention rates endemic at colonization projects also fuel intrastate mobility, as rural settlements generally do not hold the means to retain the migrants they attract.

At the intrastate level, Roraima experienced a new migration paradigm marked by the intensification of population exchanges between Boa Vista and the other municipal seats. Outward movements from Boa Vista are directed to Bonfim, Pacaraima, Alto Alegre, Mucajaí, Caracaraí and Rorainópolis; whereas the in and outbound movements established by the capital city with Caracaraí and Rorainópolis are equivalent. The attractiveness of Rorainópolis is noteworthy, as after Boa Vista it is the município with the largest number of intrastate immigrants.
Within this context Boa Vista deserves special attention as it has been working historically as a redistributor of population. Puzzled by the contradictory nature of migration in Roraima during the 1990s, it is set out to be explored why despite the rural nature of migrant pull factors, the majority of Roraima's population was concentrated in the city of Boa Vista.

Evolution of Roraima State's Total Population

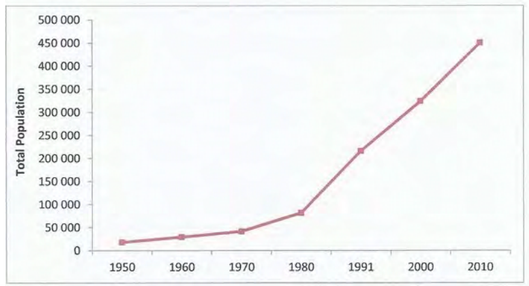


Figure 44: Total population changes between 1950-2010
Source: Diniz and Gonçalves Lacerda 2014

Roraima's main Migration Flows (1975-1980, 1986-1991 and 1995 - 2000)

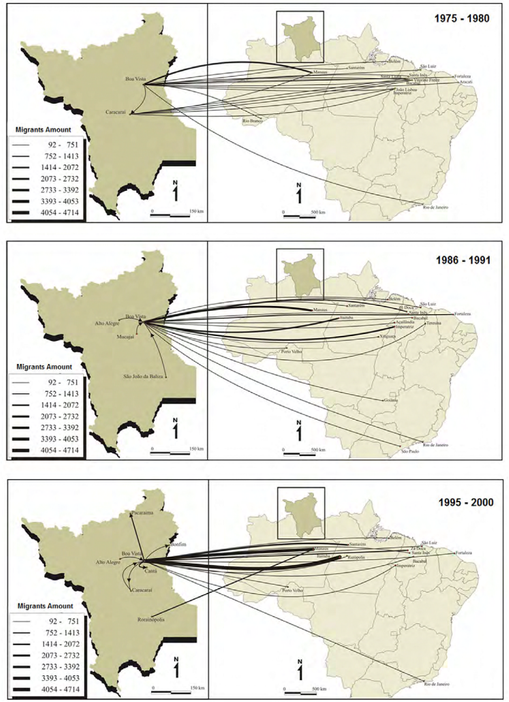


Figure 45: Main migration flow
Source: Diniz and Gonçalves Lacerda, 2014

3.1.2 Roraima Municipalities: Population to Area Comparison

Based on the population and area data for various cities in Roraima, it is evident that Boa Vista stands out as the most populous and urbanized city in the state. With a population of 470,169 and an area of 5,687 km², Boa Vista is not only the political and administrative capital but also the central hub for economic, cultural, and infrastructural development in Roraima. It serves as the focal point of the state's growth and attracts a significant portion of the population from both within Roraima and neighboring regions.

In contrast, while Rorainópolis, Caracaraí, and other cities like Pacaraima and Mucajaí have large land areas, their populations are much smaller. For example, Caracaraí has an expansive area of 47,410.9 km², but its population of only 22,443 shows that the population density is significantly lower compared to Boa Vista. Pacaraima and Mucajaí also exhibit lower population figures but play vital roles, particularly with Pacaraima's proximity to the Venezuelan border, influencing migration patterns.

Overall, Boa Vista is the heart of Roraima, demonstrating high urbanization and population density, while the rest of the cities, despite their large areas, remain less populated and less developed. This population concentration in Boa Vista underscores its importance as the primary economic and cultural center of the state.

Roraima's Net Migration (2005-2010)

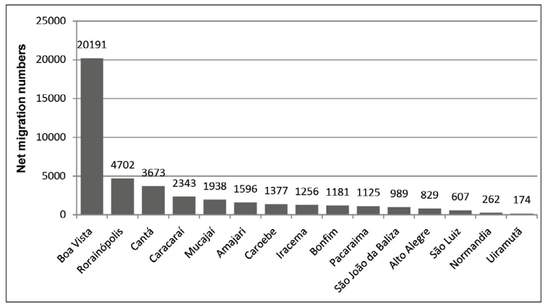


Figure 46: Net Migration comparison between Roraima's municipalities
Source: Diniz and Gonçalves Lacerda, 2014

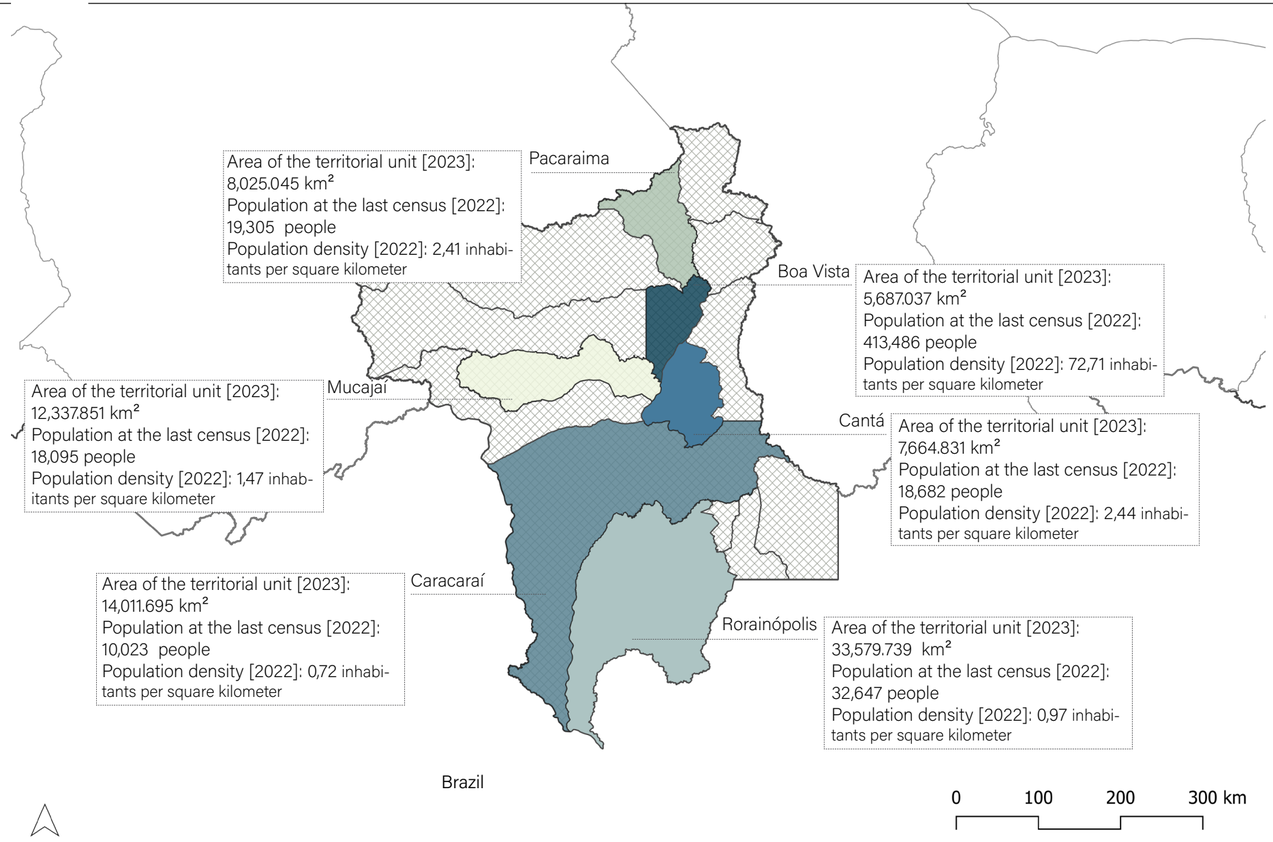


Figure 47: Roraima main municipalities, Territory area, Population, and population density. The figure illustrate Boa Vista has the highest population density by 72.71 inhabitant per square kilometer and Cracarai with nearly 14,000 km2 has 0.72 inhabitant per square kilometer.
Figure Illustrated by Authors , Data Source: Instituto Brasileiro de Geografia e Estatística,

3.1.2.1 Population Growth and Its Impact on Roraima's Ecology and Economy

The Amazon region is globally recognized for its immense biodiversity and varied ecosystems, including unique savanna landscapes. Roraima's Lavrado savannas, the largest continuous savanna area in the Amazon, span approximately 43,000 square kilometers and are part of the Rio Branco-Rupununi landscape shared with Guyana and Venezuela. These grasslands are similar to the Cerrado of Central Brazil, with broad plains dotted with trees and plants (Prance, 1996; Barbosa & Campos, 2011). These ecosystems have been greatly impacted by human activities like agriculture and cattle ranching over time, and they have rapidly expanded since the 1970s as a result of infrastructure development and population growth (IBGE, 2004; Sanaiotti et al., 2002). Remote sensing technologies have become essential tools for analyzing land use changes, offering insights critical for sustainable management (Barbosa & Campos, 2011).

The human settlement of Roraima's savannas began in the late 18th century with Portuguese colonization, marked by the establishment of Fort São Joaquim and state-run cattle farms in the Rio Branco valley. These grasslands played a central role in the region's early economy through cattle ranching, which flourished until the late 19th century before declining during the Amazon rubber crisis (Diniz and Gonçalves Lacerda 2014). Development efforts during Getúlio Vargas' government and later infrastructure initiatives, such as the BR-174 highway, facilitated migration and economic activities in the mid-20th century.
However, the rapid growth of agriculture, particularly mechanized farming of crops like soybeans, has emerged as a dominant force transforming the Lavrado. This shift was supported by state policies offering incentives for agribusiness and leveraging the savannas' water resources and favorable climate.

In recent decades, the Lavrado has faced increasing pressures from economic development, with agriculture and cattle ranching driving significant land use changes. Modern geotechnological tools, such as remote sensing, have become indispensable for mapping these transformations and guiding policy decisions. However, these changes raise concerns about environmental sustainability and the balance between economic growth and conservation. By understanding the historical and ecological dynamics of Roraima's savannas, strategies can be developed to preserve these unique landscapes while addressing the needs of local communities and economic demands (Sanaiotti et al., 2002)

3.2 Boa Vista, Heart of Roraima

3.2.1 Background to the formation of the city of Boa Vista

Boa Vista, the capital of the state of Roraima in Brazil, is located in the northern part of the country, within the Amazon rainforest region.

The city of *Boa Vista** originated as the headquarters of a farm established there in the 19th century. Around the headquarters of the farm, called Boa Vista do Rio Branco, a small village emerged, the Freguesia de Nossa Senhora do Carmo, which for a long time was the only village in the entire region of the upper Rio Branco. In 1890, the village was elevated to the status of a town and in 1926 it became a municipality, adopting the name of the old farm, Boa Vista.

With the creation of the Federal Territory of Roraima in 1940, the city was chosen to be the capital. The city's population is about 440,000, making it one of the more urbanized areas in the state. It experiences a tropical savanna climate (Köppen climate classification Aw), characterized by distinct wet and dry seasons.

Figure 36: Jaime Brasil Avenue: Municipality of Boa Vista - 1954
Source:

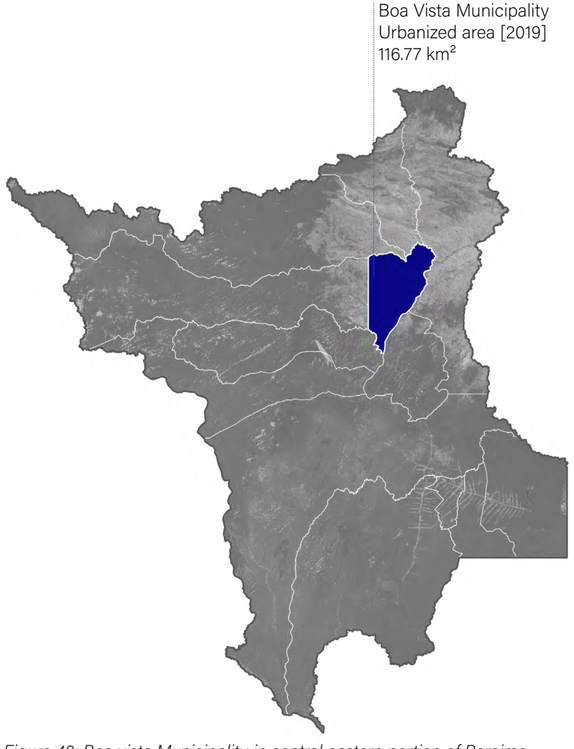


Figure 48: Boa vista Municipality in central eastern portion of Roraima
Figure illustrate by Authors

*Boa Vista City is the capital city of the state of Roraima, which is one of Brazil's 26 states.
Boa Vista Municipality:
In Brazil, cities are often part of larger administrative regions called municipalities. The municipality of Boa Vista includes the capital city (Boa Vista City) and its surrounding areas

3.2.1.1. Development of Boa Vista city

In 1775, the Portuguese territory became aware of the need for defense and established the São Joaquim fort at the confluence of the upper Branco River with the Tacutu River. This marked the first occupation of the area and led to the mobilization of a military contingent and their families in the region. Over time, military establishments were established and solidified, ultimately reaching their consolidation in the 1970s.

Within this deliberate defensive strategy, there is a political endeavor to enhance the urban features of the region, achieved through the establishment of the Federal Territory of Rio Branco in 1943. This territory served as the site for the implementation of a successful urban planning project, which was awarded to engineer Darcy Aleixo Derenusson through a competition. This project was in line with the development of new cities in Brazil, such as Belo Horizonte and Goiânia. These cities were planned with a focus on modernization through urbanization, which included the construction of wide roads for cars, sanitation systems, and electricity distribution. Carla Moraes and Gregório Gomes Filho (2000, p. 147-149) highlight these infrastructure improvements.

Figure 49: Aerial photo, partial view from the city of Boa Vista (RR) - 1978
Source: https://biblioteca.ibge.gov.br/index.php/biblioteca-catalogo?view=detalhes&id=48475

Figure 50: Headquarters of the Olho D' Água Farm (RR) - 1954
Source: https://biblioteca.ibge.gov.br/index.php/biblioteca-catalogo?view=detalhes&id=48304

Figure 51: Aerial view of Boa Vista's city center,
Image by Image by Rafael Moura Macuxi for Mongabay.
Source: https://news.mongabay.com/2021/06/in-boa-vista-indigenous-brazilians-retake-their-identity-through-education/

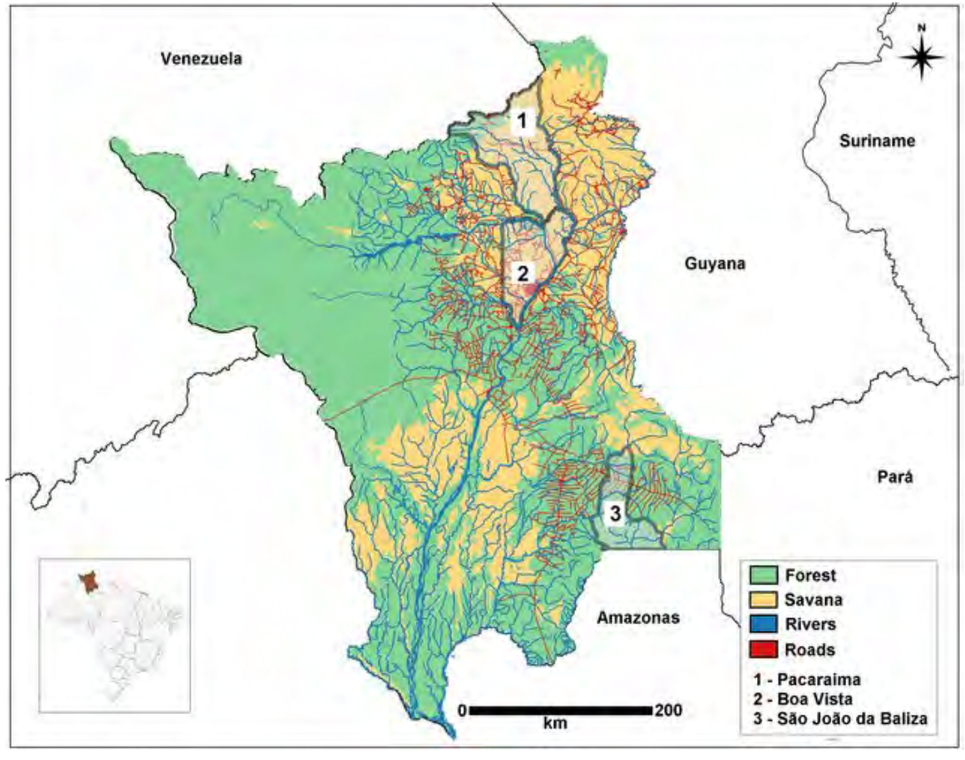


Figure 52:Map of Roraima State with highlights on rivers, roads, vegetation, and locations of the municipalities of Pacaraima—1, Boa Vista—2 and São João da Baliza – 3Photo by Stephanie Vieira, Platô Filmes , ISA
Source: de Almeida, N. C. V., et al. (2022).

3.2.2 Geographical and Natural Properties

Boa Vista's hydrological and environmental profile is shaped by its location along the Branco River, a key tributary of the Rio Negro within the Amazon biome. Its geographical position influences water availability and seasonal patterns, impacting agriculture, urban development, and nearby indigenous territories. The Branco River, along with its tributaries such as the Cauamé, experiences significant seasonal fluctuations. During the wet season (April to November), heavy rains replenish water levels but also heighten the risk of flooding, affecting low-lying areas and occasionally displacing residents (IBGE, 2022). In the dry season (December to March), reduced water levels strain the water supply for agriculture and urban consumption, creating challenges for local sustainability.

oa Vista's dependency on diesel for electricity has spurred efforts to explore renewable energy, such as solar power. Partnerships with local and international organizations have facilitated the development of renewable projects and improvements in water infrastructure. The installation of wells and sanitation systems addresses the needs of both local communities and the growing migrant population. However, proposals for hydroelectric projects like the Bem Querer Dam on the Branco River have raised concerns. While these projects aim to address energy demands, they face opposition due to potential ecological disruptions, the submersion of indigenous lands, and displacement of affected communities (Fearnside, 2016). Advocacy for alternative energy solutions continues as a less invasive approach to meeting regional energy needs.

Geographically, Boa Vista is situated on the western bank of the Branco River at approximately 2°N latitude, making it the only Brazilian state capital entirely in the Northern Hemisphere. It has a tropical savanna climate with two distinct seasons: a wet season from May to August and a dry season from September to April. Annual temperatures range between 23°C and 35°C, with high humidity during the wet season. The rainy season brings frequent storms and heavy rainfall, while the dry season has scarce rainfall, often leading to water scarcity concerns (INMET, 2023).

Its proximity to Venezuela gives it a strategic position for trade and cultural exchanges. The city's urban design, inspired by French architect Alfred Agache, features a radial layout with broad avenues radiating from a central Civic Center. This unique planning approach enhances traffic flow and supports urban expansion, distinguishing Boa Vista as one of Brazil's few cities with this archi-

tectural model (Silva, 2020).

3.2.2.1 Hydrology and Water Resources

▪The Branco River:

This river is vital for Boa Vista, providing the primary water source for drinking, irrigation, and other uses. However, seasonal variations significantly impact its flow. During the rainy season, water levels can rise quickly, leading to localized flooding along the riverbanks. In the dry season, reduced water levels pose challenges for water availability.

▪Aquifers and Groundwater:

Due to the dry season's impact on surface water, Boa Vista has increasingly relied on groundwater extraction from shallow aquifers. These aquifers are crucial during the dry season when surface water resources like the Branco River diminish. However, reliance on these aquifers raises concerns about sustainability, especially with the potential for over-extraction.

▪Seasonal Wetlands and Floodplains

Surrounding Boa Vista are floodplains and wetland areas that store rainwater, regulate floods, and recharge aquifers. These areas are ecologically significant, supporting various flora and fauna. Urban expansion, however, threatens these wetlands, reducing their flood-mitigation capacity and impacting biodiversity.

3.2.2.2 Environmental Challenges

Constant changes in Roraima's biodiversity, changes in the forests, plant coverage, and declining river water levels have caused major problems. These issues fuel more fires, deforestation, and poor air quality, drought, creating a vicious cycle.

▪Fires and Deforestation Impacts

Roraima is currently experiencing an intense drought, worsened by El Niño. The Rio Branco, the state's main drinking water source, has hit a historic low of -0.39 meters, nearing its all-time minimum. According to the Roraima Water and Sewage Company (Caer), this has cut water supply to Boa Vista by 30%, while Mucajaí is even worse off, with a 70% disruption in service. (ISA Journalist, Araújo, 2024)

In *Xaud (2013)* doctoral research at the National Institute for Space Research (Inpe), studied 50 forest plots

Figure 53: Fire spots in the Serra da Lua Indigenous Land, in Roraima, in images taken in February 2024
Photo by Conselho Indígena de Roraima (CIR)
Source: https://www.socioambiental.org/noticias-socioambientais/megaincendios-em-florestas-de-roraima-podem-causar-desastre-ambiental

in Roraima from 1997 to 2010, monitoring fires and their effects on biodiversity under five scenarios: forests untouched by fire, hit once with low impact, hit once with high impact, hit twice, and hit three times. His findings show a clear pattern of worsening damage.

"With each fire, the forests degrade further," Xaud explains. "I noticed an increase in certain plant species typical of secondary forests, which are not usually found in well-preserved forests. When fires happen, biodiversity changes. More and more, species associated with disturbed environments take over."

Xaud describes the plants that emerge after fires as "pioneer species." These plants play a key role in recovering ecosystems because they allow the original vegetation, which depends on shady, moist conditions, to return slowly over time. These "climax species" can only thrive once the forest starts to heal.

But as fires occur repeatedly, forests lose biomass and height, which lets more sunlight and wind in. This makes the area hotter and drier, creating conditions unsuitable for shade-loving species and better suited for pioneers like the embaúba tree.
"The entire forest composition changes," Xaud notes. "Species that were once common are replaced by others, leading to a simplified version of the original tropical forest. Biodiversity becomes more uniform in areas severely affected by fires."

Xaud points out that these changes don't just harm the forest itself but also cause economic losses. Trees with high-value wood species disappear, and large amounts of carbon are released into the atmosphere. With each fire, the area becomes even more vulnerable to future blazes.

"Invasive species, like certain grasses, begin to take over the forest floor. These plants burn more easily and intensely, making the entire forest increasingly prone to new fires," he explains.

The impacts go beyond vegetation. The local wildlife also suffers. Research in the Amazon shows that fires affect animals ranging from invertebrates to large mammals, though animals higher up the food chain are hit the hardest. Many species struggle to find food or reproduce in these disrupted ecosystems, leading to serious long-term consequences for biodiversity. (ISA Journalist, Araújo, 2024)

Figure 54:The level of the Rio Branco, in Boa Vista, reached almost 40 cm below the minimum measurement,
Photo by Stephanie Vieira, Platô Filmes , ISA
Source: https://www.socioambiental.org/noticias-socioambientais/megaincendios-em-florestas-de-roraima-podem-causar-desastre-ambiental

▪Urbanization Impact

The expansion of Boa Vista has led to environmental degradation in surrounding areas, including erosion, habitat loss, and pollution from increased urban waste. Rapid population growth has also placed a strain on infrastructure, affecting waste management and water treatment, especially during the rainy season when floods can spread contaminants into the Branco River.

▪Air Pollution

According to Fabrício Araújo, a journalist at ISA (2024), the air quality in Boa Vista becomes unhealthy for half the year, mainly due to smoke from fires and burnings. Research from the National Institute of Amazonian Research (INPA), published on April 6th, highlights this issue in their report Air Quality Monitoring in the City of Boa Vista - Roraima, which analyzed data between 2020 and 2024.

While Boa Vista isn't a heavily industrialized city that generates large amounts of urban pollutants, smoke from forest and other fires has significantly impacted air quality in recent years. Researchers Reinaldo Imbrozio Barbosa and Arthur Camurça Citó note that the city experiences many days of unhealthy air conditions because of this.

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▪Water Management and Sustainability Efforts

The government and local organizations have initiated water management projects to ensure reliable water supply during dry periods. These include investments in groundwater infrastructure, water recycling programs, and environmental monitoring to assess pollution levels and mitigate contamination from mining activities. Indigenous groups and environmental organizations actively participate in discussions about sustainable development and conservation efforts. Traditional knowledge on land and water management is increasingly being recognized as valuable in forming sustainable urban and rural development plans for Boa Vista and Roraima at large.

Boa Vista, Heart of Roraima

3.3 Population and Immigrant Growth Impacts

3.3.1 Urban Growth and Land Use in Boa Vista

In 2000, Boa Vista, the capital of Roraima, was home to 200,568 residents, comprising 65.4% of the state's population (IBGE, 2000). The city's economy primarily relied on the public sector, supplemented by a growing tertiary sector. Despite urbanization and commercial expansion, agriculture gained prominence following the decline of illegal mining activities, which had previously been a significant economic driver.

Land use analysis revealed that 83.6% of the municipality's 4,746 km^2 was covered by natural vegetation, predominantly savannas and grasslands. Forests, including riparian areas, made up 11.38% of the land. Urbanized areas were limited, and agricultural land accounted for only 0.89% of the total area, with irrigated rice being the main crop. This reflected the municipality's early stage of anthropogenic activity despite economic shifts favoring agriculture.

Boa Vista's abundant water resources, including the Boa Vista aquifer system spanning approximately 14,000 km^2 , supported urban and agricultural demands. These water resources are crucial for the region's socio-economic development, supporting urban, industrial, agricultural, and recreational needs. Despite occupying only 1.47% of the municipality's total area, Boa Vista's urban area plays a central role in the state, serving as the economic, educational, and healthcare hub. As it is emphasized that the city is a critical urban landmark, particularly at the tri-border frontier, connecting Roraima with the southern regions of Venezuela and Guyana. (Silva, 2007)

By 2014, urban expansion and intensified agricultural activities reshaped land use patterns. The increased cultivation of soybeans, among other crops, signaled a shift in economic priorities, contributing to landscape alterations in the municipality's savannas. The use of modern geotechnologies for mapping land cover changes highlighted these transformations, driven by both state policies and economic incentives.

▪Changes in the Urban Landscape

The establishment of the Federal Territory of Rio Branco in 1943 marked a significant moment in the political and urban development of the region, driven by the aim to enhance urban infrastructure and modernize the area. This territorial creation allowed for the implementation of a comprehensive urban planning project in Boa Vista, which was designed by engineer Darcy Aleixo Derenusson, following a competition. This urban project reflect-

Planimetry of the map of Use and land cover of the Boa Vista municipality (RR) in 2010

CLASSES OF USE AND LAND COVER	AREA (km^2)	AREA (%)
Grassland and Savanna Formations	4,746.0	83.60
Forest Formation	646.2	11.38
Agriculture	50.9	0.89
Urban Area	83.9	1.47
Bodies of Water	145.9	2.66
Total	5,672.9	100,00

Figure 55: Planimetry of the map of Use and land cover of the Boa Vista municipality (RR) in 2010
Source: SILVA & OLIVEIRA, 2018, Calculation obtained in GIS.

Planimetry of the map of Use and land cover of the Boa Vista municipality (RR) in 2014

CLASSES OF LAND COVERAGE AND USE	AREA (km^2)	AREA (%)
Grassland and Savanna Formations	4,643.2	81.86
Forest Formation	600.9	10.59
Agriculture	182,8	3.22
Urban Area	102.3	1.80
Bodies of Water	143.7	2.53
Total	5,672.9	100.00

Figure 56: Planimetry of the map of Use and land cover of the Boa Vista municipality (RR) in 2014
Source: SILVA & OLIVEIRA (2018), Calculation obtained in GIS.

ed a broader trend in Brazil, aligning with other newly planned cities like Belo Horizonte and Goiânia, which were conceived to embody modernization through urbanization. The planning included the development of wide roads, sanitation systems, and electricity distribution, all intended to foster a modern and organized urban space (Moraes & Gomes Filho, 2000, p. 147-149).

Derenusson's design for Boa Vista adhered to the principles of the international modernist movement, incorporating elements from the garden city model. This approach emphasized the automobile as the primary mode of transportation and included features such as a circular city layout with wide avenues, a central area housing public buildings and cultural facilities, and industrial zones located at the periphery. These principles reflect the urbanist ideals of the early 20th century, including the creation of monumental public spaces and the prioritization of functional, well-planned urban zones (Choay, 1979, p. 219-228).

The urban design also mirrored that of Belo Horizonte, reserving central spaces for public administration buildings and utilizing straight lines, broad avenues, and perspectives converging at the city center. Such planning was in line with broader development policies for Brazil's newly created Federal Territories (Moraes & Gomes Filho, 2009, pp. 148-156).

Furthermore, the city's design was influenced by the need to organize the population into distinct areas. Central locations were primarily allocated to government entities and the elite, ensuring access to the best services and infrastructure, while peripheral areas, where less privileged populations lived, lacked essential amenities like sanitation and lighting. This disparity continues today, highlighting the social and economic divisions rooted in the city's planning (Silva, 2009).

Boa Vista's development was further shaped by the expansion of diamond and gold mining in the region, particularly from the late 1930s to the 1980s. This mining boom, coupled with military occupation, significantly impacted the city's layout. The prospector monument in the city center serves as a reminder of the state's role in encouraging such economic activities, despite the resulting conflicts with indigenous populations (Oliveira, 2010).

Additionally, Boa Vista's position as a key point for migration, especially from neighboring countries like Venezuela and Guyana, has shaped its demographic composition. The city has seen significant cross-border movement, with Boa Vista acting as both a transit hub and a final destination for many migrants. This international migration has increasingly impacted the city's infrastructure and governance, as the state of Roraima, and Boa Vista in particular, must address the challenges of integrating these migrant populations into urban life (Rodrigues & Vasconcelos, 2012). This migration is often accompanied by efforts to strengthen border controls and regulate international protection applications, which have become a key part of the region's administrative focus.

In conclusion, Boa Vista's urban and social landscape reflects a complex history of modernization, migration, and socio-economic division, all of which continue to influence the city's development

Population and Immigrant Growth Impacts

3.3.2 Agricultural Intensification and Environmental Impacts

The development of agriculture in Boa Vista was influenced by federal programs such as PRO-VÁRZEAS, introduced in the 1980s, which promoted irrigated rice cultivation in floodplain areas. Roraima's climate, with its stable temperatures, ample sunlight, and abundant water resources, ensured high yields, ranging from 5,000 to 7,000 kg/ha in 2008. Although rice dominated early agricultural activities, by the 2010s, soybean cultivation emerged as a key driver of land use changes. This transition marked a shift toward mechanized farming, with grain production displacing traditional livestock grazing in the savanna regions.

State policies emphasizing agricultural expansion transformed Boa Vista's savannas into central hubs for economic productivity. The Lavrado areas, akin to the Cerrado of Central Brazil, became focal points for these developments. However, such activities mirrored the ecological challenges observed in the Cerrado since the 1970s, including habitat loss and environmental degradation (Barbosa & Campos, 2011). The relocation of livestock activities to southern forested areas exacerbated these impacts, altering ecological balances and contributing to deforestation.

State-driven strategic measures have reinforced the importance of agriculture and livestock as economic pillars of Roraima. Despite its contributions to regional development, the intensification of land use has raised concerns over sustainability. The need for balanced policies that harmonize economic growth with environmental preservation remains critical for safeguarding Roraima's unique ecosystems.

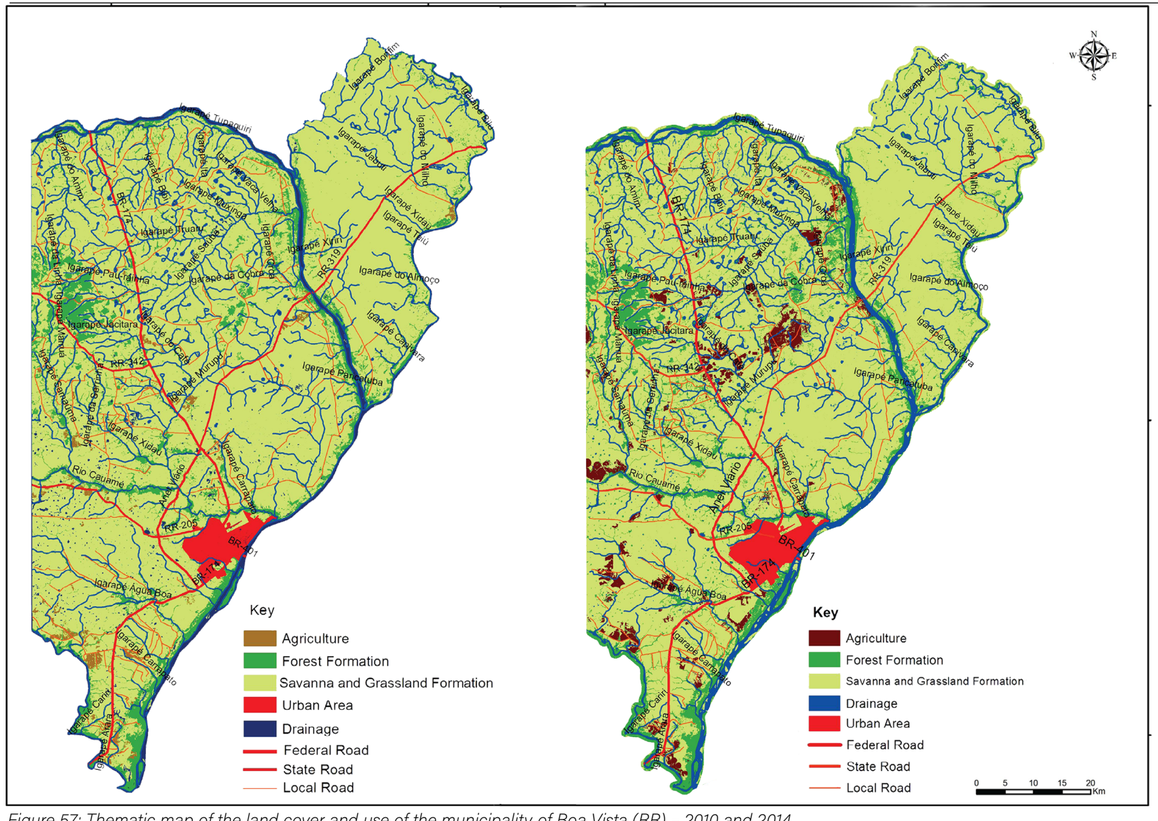


Figure 57: Thematic map of the land cover and use of the municipality of Boa Vista (RR) – 2010 and 2014
Tematic map obtained from the OIS Landsat-8orbit/point 232/58 for the year of 2010 and 2014
Source: SILVA & OLIVEIRA (2018), Author: Gladis de Fatima Nunes da Silva

3.3.3 Cultural Transformation: The Impact of Venezuelan Migration on Boa Vista

The great majority of the more than 260,000 Venezuelans who applied for refugee or resident status in Brazil between 2013 and 2019 did so through Roraima. The UNHCR, civil society partners, and federal authorities are assisting the state in managing how to respond to the influx and provide humanitarian aid to the newcomers. Approximately 25,000 Venezuelans have left Roraima for other Brazilian towns where there are opportunities for social and economic integration thanks to a significant initiative called the Interiorizacao voluntary relocation program.

Motivated by the need for reliable information to guide interventions and the broader discussion of the influx's effects on Roraima's economy and society, researchers from the Federal University of Roraima (UFRR), the International Migration Observatory (OBMigra), and Brazil's Department of Public Policy Analysis of Fundação Getulio Vargas (FGV DAPP) examined official socioeconomic data and spoke with key parties in charge of the state's economy and response to the influx. They discovered that during the intense Venezuelan migration, Roraima saw good economic growth and diversification. In contrast, poverty and unemployment increased over this period.

From the economical Point of view, From 2016 to 2017, when the Venezuelan migration was at its highest, Roraima's economy expanded more quickly than other states'. The GDP of Roraima increased by 2.3% over this time, outpacing the 1.4% average growth of neighboring Brazilian states.

Brazil nuts and several cattle products were among the agricultural products whose production increased significantly in Roraima. While Brazil as a whole witnessed a 0.6% decrease in planted area between 2017 and 2018, Roraima was the state with the biggest documented growth in planted area (28.9%), much exceeding second-place Paraíba (10.3%). Between the end of 2018 and the first half of 2019, Roraima's Tax on Circulation of Goods and Services (ICMS) collection increased by 25%. Furthermore, during the same time period, Roraima saw robust expansion in international trade at a rate not seen anywhere else in the nation.

But when we look at the labourand employment situation we see, the Venezuelan migration led to a rise in unemployment and poverty in Roraima. This is because the majority of Venezuelans came to the country jobless. When comparing third-quarter rates from 2017 to 2019, Roraima's unemployment rate increased by 6.1 percentage points, while Brazil's decreased by 0.6 percentage points.

In addition to greater unemployment, Roraima's rate of extreme poverty increased from 1.6% in 2015 to 5.7% in 2018, which was significantly higher than Brazil's 4.2% rate that year. (UNHCR, 2020)

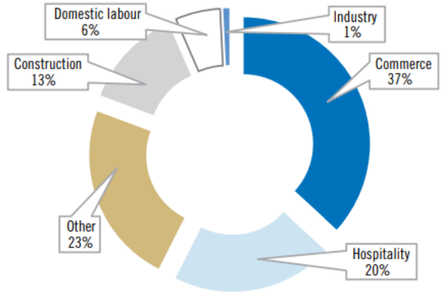


Figure 58: Breakdown of Venezuelan workers in Roraima, by sector. (Source: Simões, 2018)
Source: https://www.ilo.org/sites/default/files/2024-07/Livelihoods%20for%20migrants%20and%20refugees%20in%20Brazil.pdf

Figure 59: The Venezuelan Refugee Crisis
photo by: CSIS
Source: https://www.csis.org/analysis/venezuelan-refugee-crisis-view-brazil

Figure 60: A Venezuelan woman and child at Rondon 1, one of 11 migrant camps in Boa Vista, capital of Roraima state, Brazi
Source: https://www.theguardian.com/global-development/gallery/2018/dec/24/venezuelans-in-brazil-migrant-camps-in-pictures

3.4 Survey, Collective information from UNHCR, Brazilian Institutions

As mentioned in the introduction, Boa Vista in Roraima, Brazil, has been facing a serious population increase due to the arrival of many immigrants from Venezuela. Given the urgency of the situation and our focus on the ecovillage project, we knew it was important to connect with the local community early on. So, we reached by email to UNHCR and several Brazilian institutions.

We had prepared a survey intended for the target community, but it was difficult to reach and communicate with them directly, as we expected. However, our contact with UNHCR was very helpful and they shared useful links and information that gave us a much clearer picture of the current situation of venezuelian immigrants and refugees. This step played a key role in shaping our understanding and guiding our project.

Below is a summary of the information we gathered through this initial investigation.

3.4.1 Housing Conditions

1. What type of housing do you currently live in (e.g., shelter, rented house, informal settlement)?
▪Public shelters, tents, and informal dwellings (e.g., spontaneous settlements) are widely reported as current housing for Venezuelans in Roraima.

2. Do you have access to:

▪Clean water?
60% of children/adolescents reported no access to filtered drinking water, and 45% lacked water for cooking/hygiene —but household-level details are not provided.

▪Sanitation (toilets)?
Sanitation issues identified in 20% of shelter dwellings

▪Electricity?
Lack of electricity noted in 24% of shelter households

3. What is your biggest concern regarding your current housing?
▪Key reported issues: roof leakages (49%), internal water leaks (20%), sanitation issues (20%), lack of ventilation (76%), lack of electricity (24%), unsafe structure (10%)

3.4.2 Income and Employment

4. Do you currently have a job?
▪Mixed employment types: among households in shelters or host community, employment included formal (17%), uncontracted/steady (34–38%), informal/day labor (32–57%)

3.4.3 Access to Services

5. Do you or your family members have access to healthcare? If not, why?
▪Partial: 70% of children/adolescents reported access to health services
▪6,000 health referrals made in Roraima for respiratory/gastrointestinal symptoms; 70,000 medical screenings took place

6. Do your children attend school? If not, why?
▪63.5% of children surveyed do not attend school; for ages 5-17, 59%, and for 15-17, 76% are out of school.
▪1,244 children received help enrolling in Boa Vista shelters, with 252 still awaiting vacancies

7. Are you receiving any support from humanitarian organizations (food, cash, shelter, legal aid, etc.)?
▪Yes: support includes hygiene/cleaning kits (~32,958 people), medical screenings, nutritional assessments, vaccination campaigns in shelters and informal settlements

3.4.4 Future Plans and Perceptions

8. What would be the most important improvement to
▪your living conditions?
What would be the most important improvement to your living conditions (but direct preferences not documented.)

3.5 Design Location

3.5.1 Where is Boa Vista City

The site design context is Boa Vista City which is in the north part of Roraima state, in the municipality of Boa vista

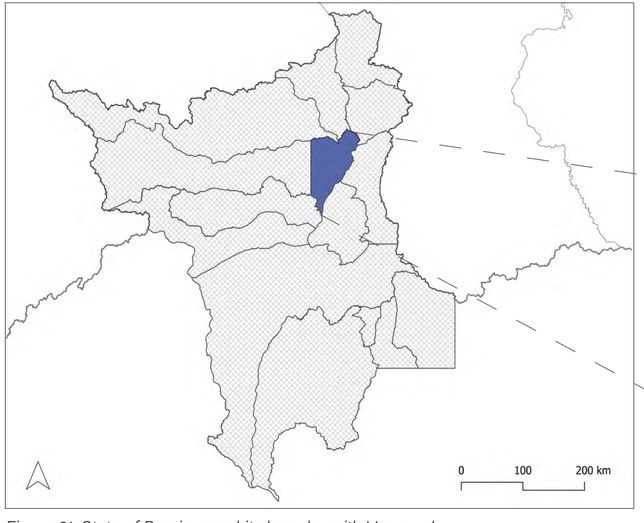


Figure 61: State of Roraima and its boarder with Venezuela
Illustrated by Authors

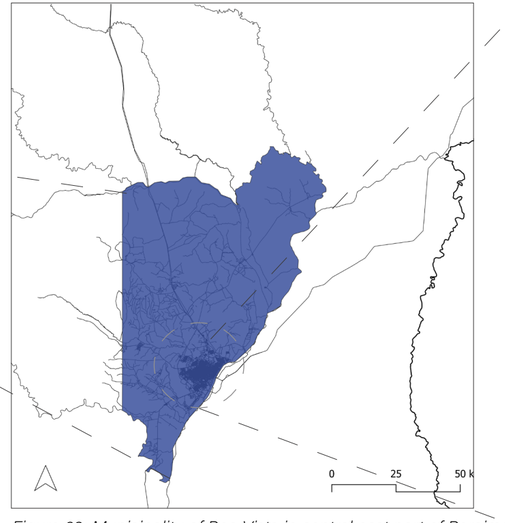


Figure 62: Municipality of Boa Vista in central east part of Roraima
Illustrated by Authors

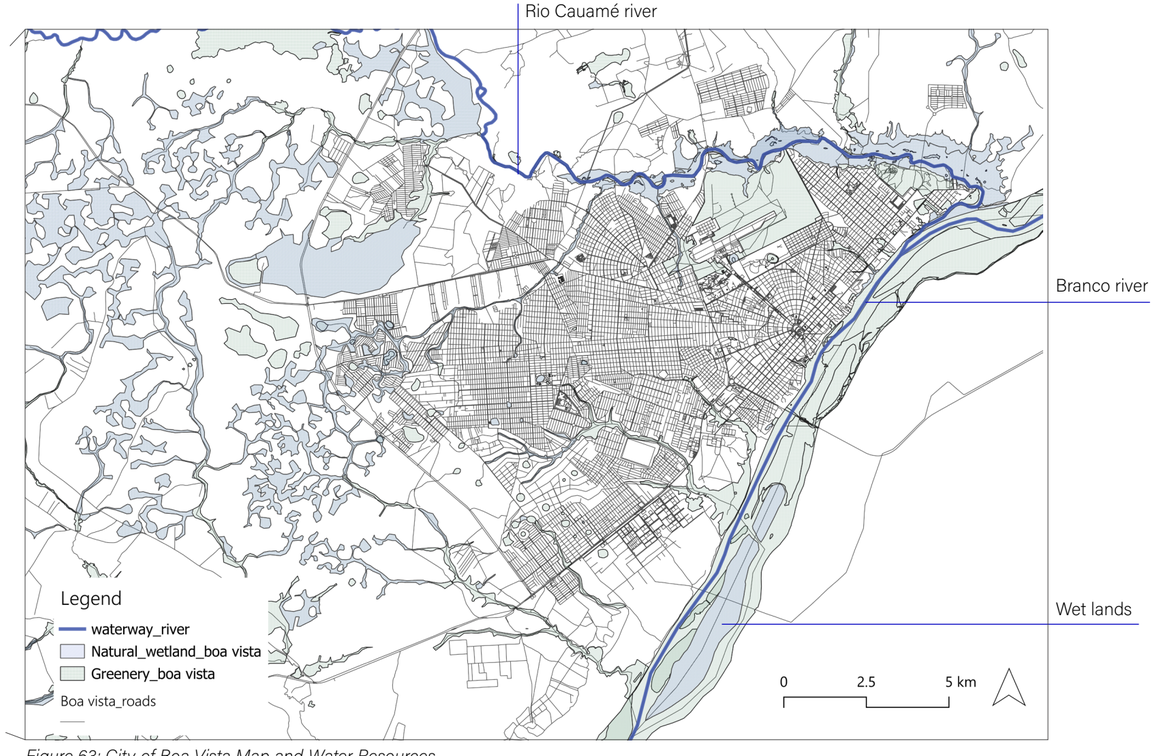


Figure 63: City of Boa Vista Map and Water Resources
Illustrated by Authors

Boa Vista - City reference map - Agust 2018

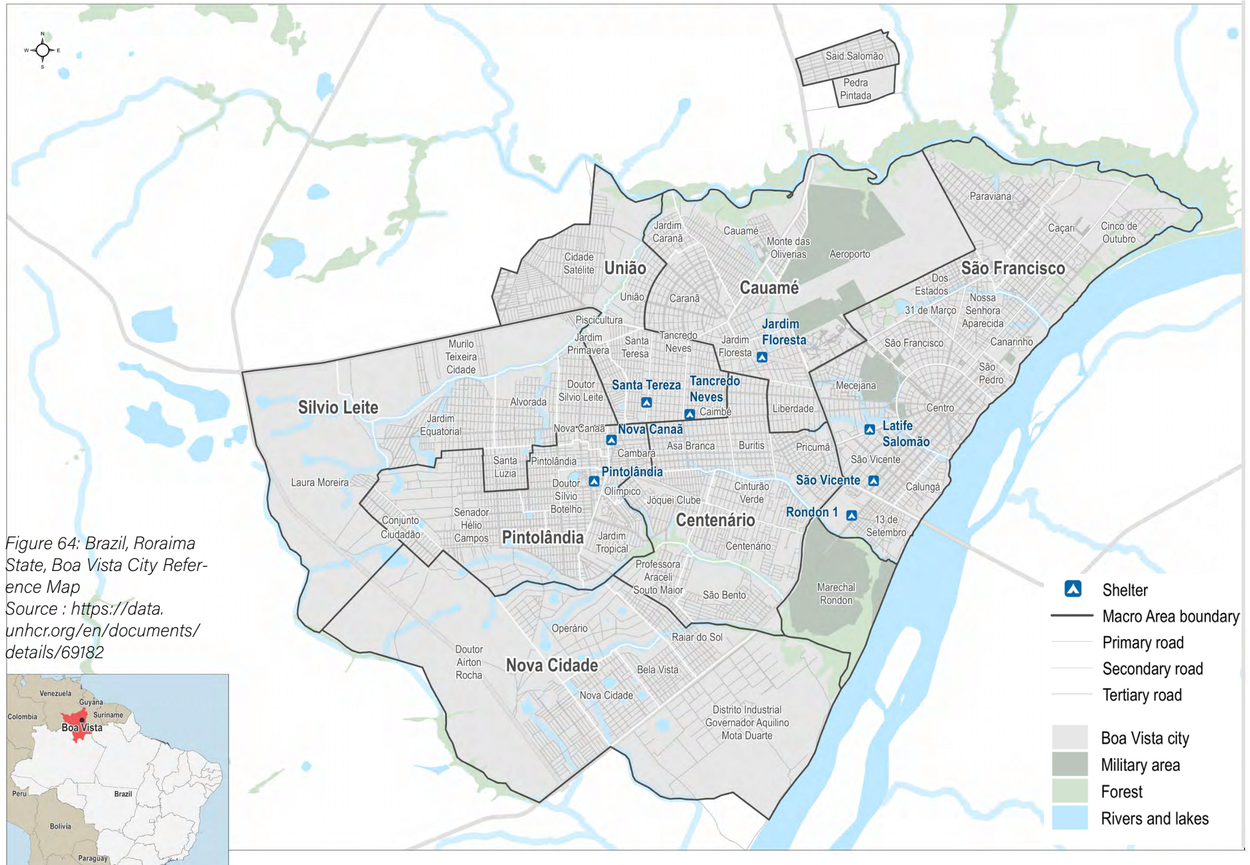


Figure 64: Brazil, Roraima State, Boa Vista City Reference Map
Source : https://data.unhcr.org/en/documents/details/69182

Boa Vista - Distribution of Public Services - June 2019

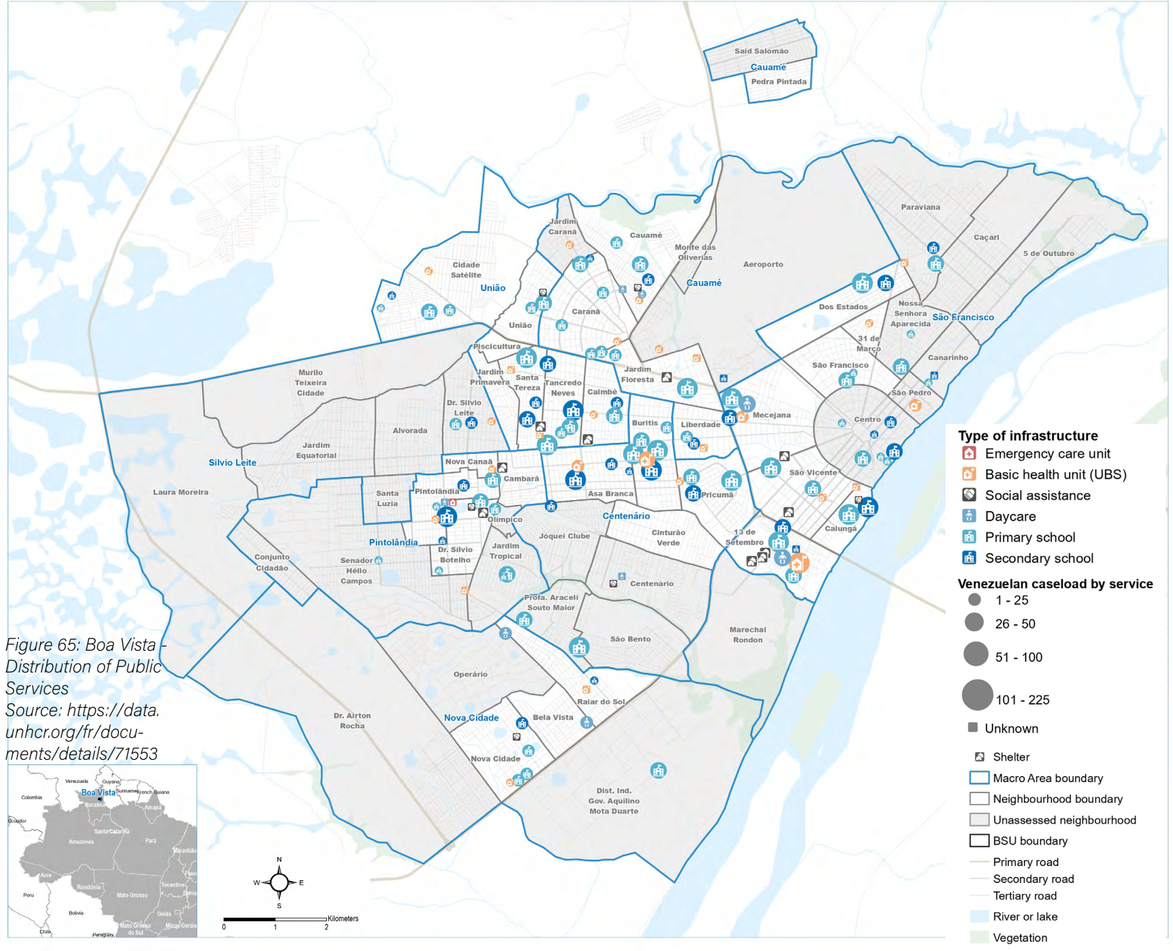


Figure 65: Boa Vista - Distribution of Public Services
Source: https://data.unhcr.org/fr/documents/details/71553

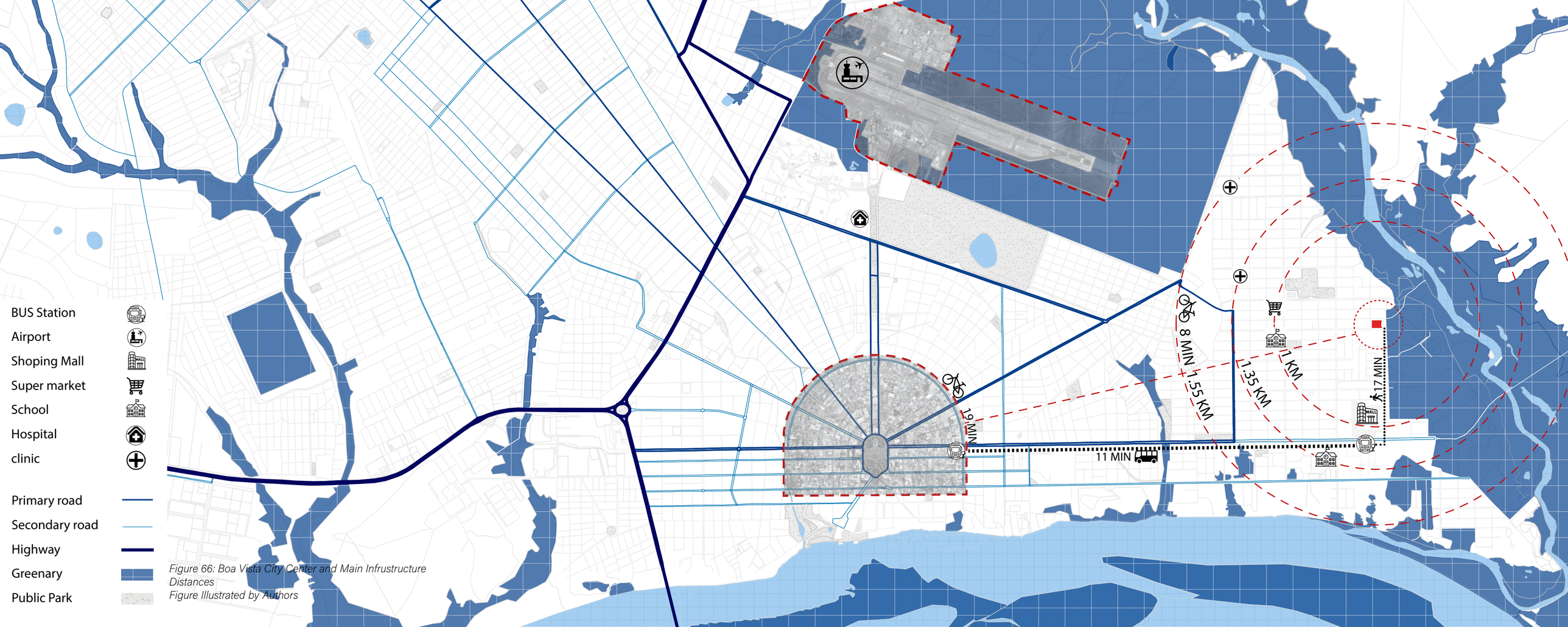


Figure 66: Boa Vista City Center and Main Infrustructure Distances
Figure Illustrated by Authors

3.5.2 Historical Maps

Figure 67: City of Boa Vista 2002
Source: Google Earth , Immage @2025 Maxer Technologies

Figure 68: City of Boa Vista 2010
Source: Google Earth , Immage @2025 Maxer Technologies

Figure 69: City of Boa Vista 2015
Source: Google Earth , Immage @2025 Maxer Technologies

Figure 70: City of Boa Vista 2020
Source: Google Earth , Immage @2025 Maxer Technologies

3.5.3 Site Location views

The design of the Boa vista city, as it was discussed before, was based on the principles of garden city design and circular city which as illustrated in Figure 50, Most of the city's infrastructures, cultural facilities, and public building are placed in the central zone of the city.
Consequently, our design location which is nearly 5.20 kilometers apart from the center, has difficulties for accessing these infrastructures. For instance The nearest hospital in 5 kilometers apart and it takes 1 hour to reach by bus. On the other hand this city design approach leads to use automobile as the primary mode of transportation in addition poor public transportation condition make accessibility also intensify the dependency on private vehicles.

Here we are giving closer lookk at the design location which has 9715 km² area and where we are trying to study who the missed facilities could be design in the site which are both the answer to eco-village principles reducing the needs for using transportation and also the answer to the need of our community who are refugees.

Figure 71: Design land's Properties and Dimentions
Site area - 9715 sq.m
Height Restrictions - 10 meters
Ground Coverage - 50%
Setbacks (as per CAD plan) Coordinates - 2°51'42.0"N60°39'03.5"W

KEY for Site Images

Figure 72: Key for Site Images
Illustrated by Authors
Source: Points Allpcation From Competition Website

View Number 1

Figure 73: Site View From Point 1
Source: Image Provide by UNI.xyz to people Who Attended to the Competiton

View Number 2

Figure 74: Site View From Point 2
Source: Image Provide by UNI.xyz to people Who Attended to the Competiton

View Number 3

Figure 75: Site View From Point 3
Source: Image Provide by UNI.xyz to people Who Attended to the Competiton

View Number 4

Figure 76: Site View From Point 4
Source: Image Provide by UNI.xyz to people Who Attended to the Competiton

View Number 5

Figure 77: Site View From Point 5
Source: Image Provide by UNI.xyz to people Who Attended to the Competiton

View Number 6

Figure 78: Site View From Point 6
Source: Image Provide by UNI.xyz to people Who Attended to the Competiton

3.5.4 Site Morphology

Figure 79: Selected Zones to Show Architectural and Urban Morphology Near the Ecovillage Design Location
Illustrated by Authors

3.6 Climatically Features

3.6.1 Temperature and Heat map

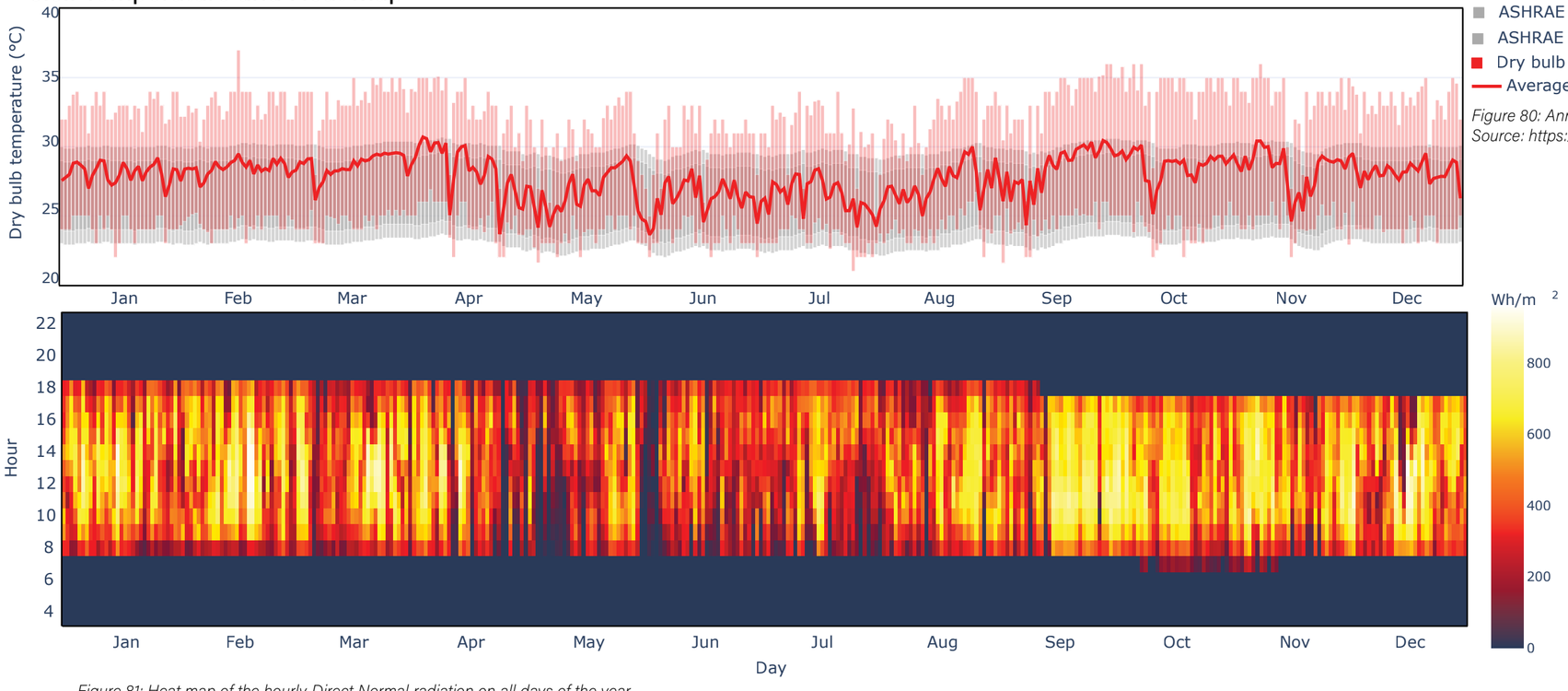


Figure 81: Heat map of the hourly Direct Normal radiation on all days of the year,
Source: https://clima.cbe.berkeley.edu/sun

Figure 80: Annual Dry Bulb Temperature
Source: https://clima.cbe.berkeley.edu/t-rh

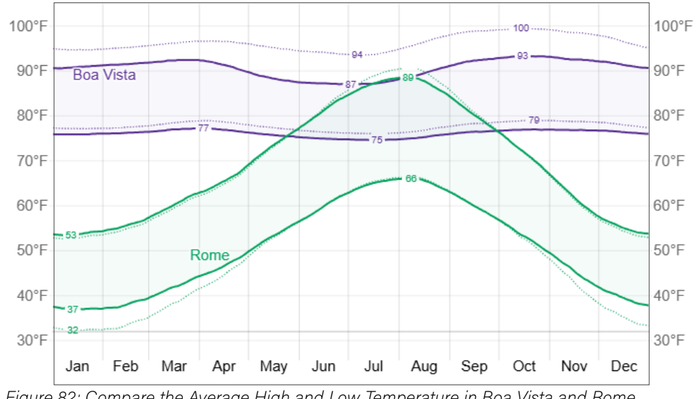
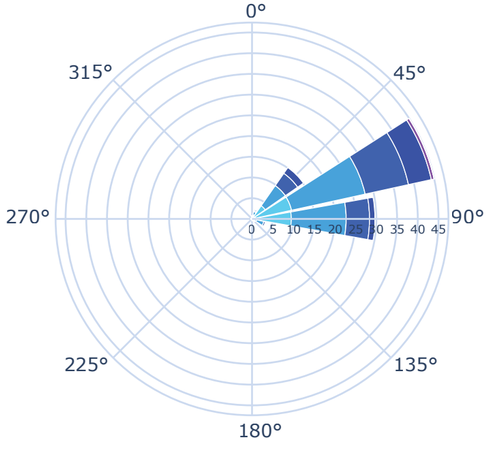


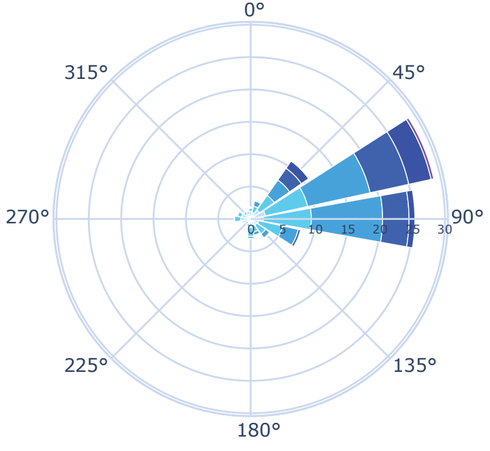
Figure 82: Compare the Average High and Low Temperature in Boa Vista and Rome
Sorce: https://weatherspark.com/compare/y/28818_71779/Comparison-of-the-Average-Weather-in-Boa-Vista-and-Rome

As the chart shows, Boa Vista is much hotter than Rome throughout the year. Rome only reaches similar high temperatures during its hottest months (July–August), while Boa Vista stays consistently warm all year round. Even the lowest average temperature in Boa Vista is around 24°C, showing how steady and stable the heat is there.

3.6.2 WIND WHEEL

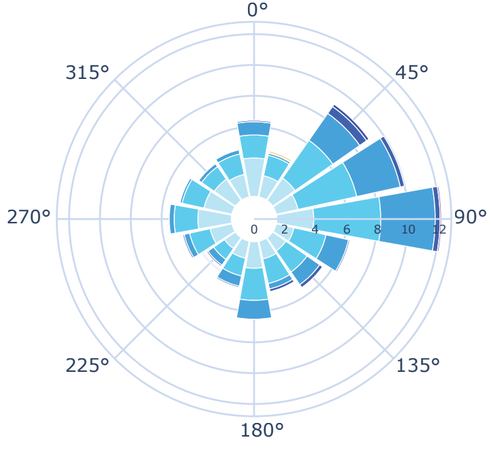


Observations between the months of Dec and Feb between 01:00 hours and 24:00 hours. Selected observations 2160 of 8760, or 24 %. 60 observations have calm winds.

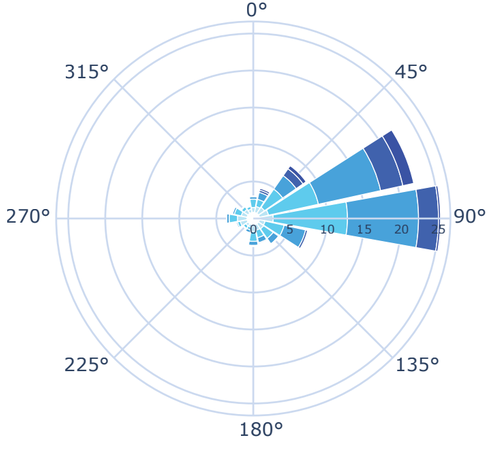


Observations between the months of Mar and May between 01:00 hours and 24:00 hours. Selected observations 2208 of 8760, or 25 %. 157 observations have calm winds.

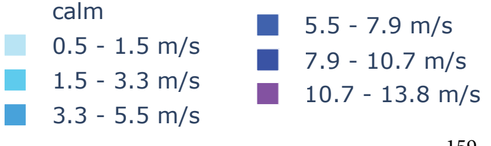
Figure 83: Seasonal Wind Rose
Source: https://clima.cbe.berkeley.edu/wind



Observations between the months of Jun and Aug between 01:00 hours and 24:00 hours. Selected observations 2208 of 8760, or 25 %. 521 observations have calm winds.



Observations between the months of Sep and Dec between 01:00 hours and 24:00 hours. Selected observations 2928 of 8760, or 33 %. 396 observations have calm winds.



3.6.3 Relative Humidity and Humidity Comfort Levels

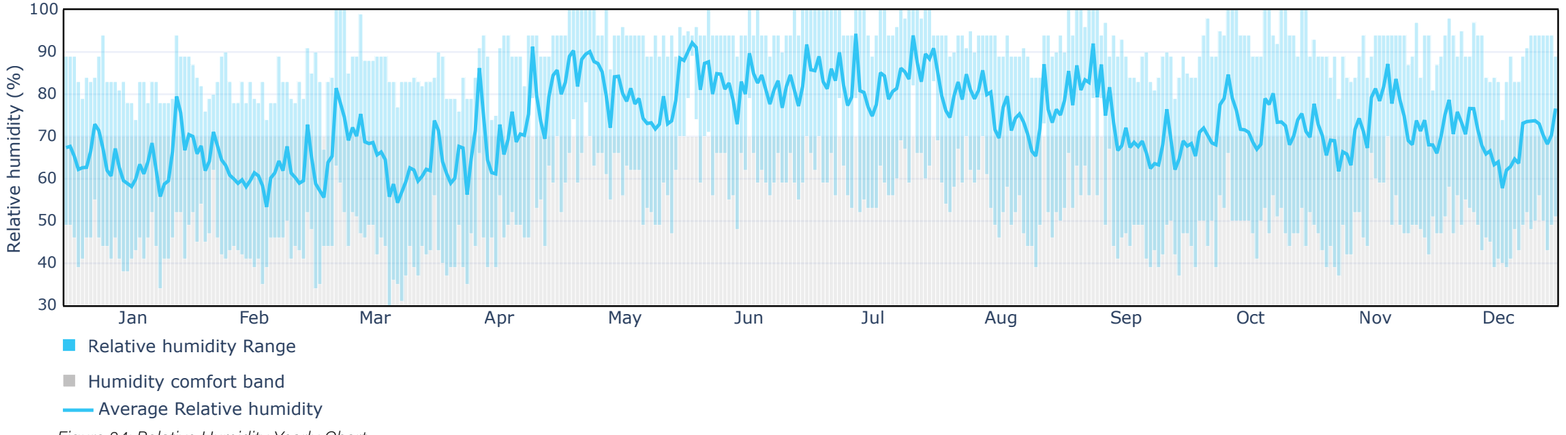


Figure 84: Relative Humidity Yearly Chart
Source: https://clima.cbe.berkeley.edu/t-rh

Average Monthly Rainfall in Boa Vista

Rainfall in Boa Vista is pretty low at the start of the year, then suddenly increases around May, peaking in early June (about 11.3 inches). After that, it drops back down by September and stays low for the rest of the year

Humidity Comfort Levels in Boa Vista (2024)

Humidity in Boa Vista stays high almost all year, especially from April to September. Midday hours are the most humid, and the pattern is very consistent—lots of pinks and reds show it's mostly uncomfortable during the day for many months.

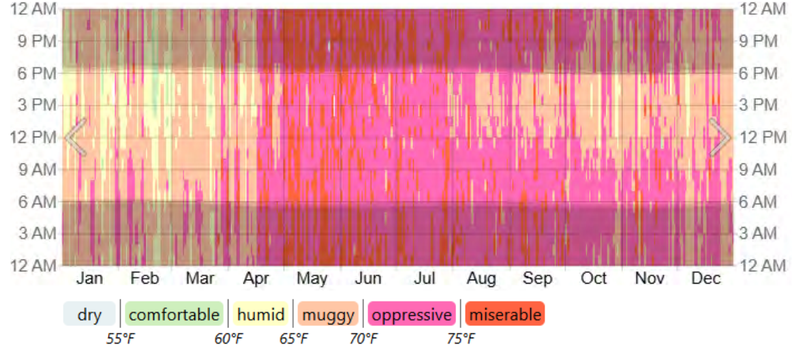


Figure 85: Humidity Comfort Levels in 2024 in Boa Vista
Source: https://weatherspark.com/h/y/28818/2024/Historical-Weather-during-2024-in-Boa-Vista-Roraima-Brazil#Figures-Rainfall

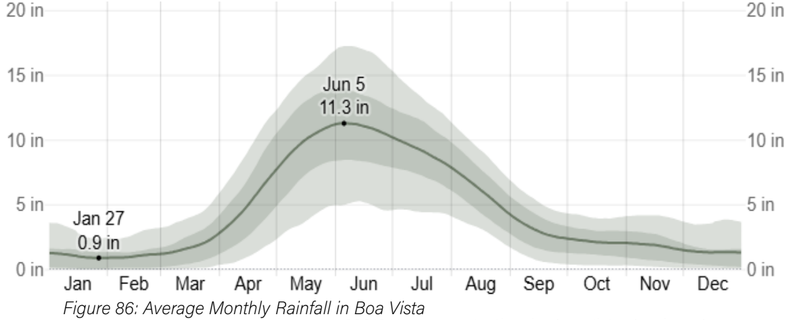


Figure 86: Average Monthly Rainfall in Boa Vista
Source: https://weatherspark.com/y/28818/Average-Weather-in-Boa-Vista-Roraima-Brazil-Year-Round#Figures-Temperature

Chapter 04

Design Process

04

. Assessing the integration of tourism within Boa Vista Eco-Villag
. Functions and area
. Modularity
. Modules structure
. Modules composition and blocks
. Flexibly; possible scenarios
. Geographically sustainable strategies
. Buildings and landscape development
. Render and views

Design Process

Ecovillages Defining

Emergency and Urgency Solutions

Emergency

Urgency

Boa Vista

Geographical properties

Social Challenges

Site Morphology

Survey Information collection

Main Principals

Social Collaboration

Cultural Diversity

Ecological Design

Architectural Design

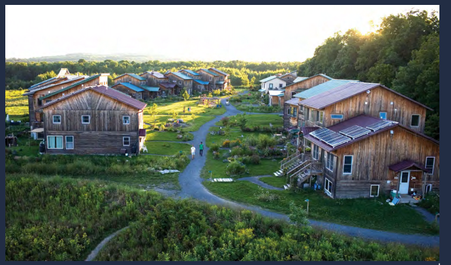
Socially Inspired

Economy

CaseStudy

Ecovillage at Ithaca

1. Create a site plan based on balancing the needs of the natural environment
2. Preserve 80 percent to 90 percent of the site as open space.
3. Integrate organic agriculture into the plan.
4. Build passive solar and/ or very energy efficient homes.
5. Create pedestrian streets where children can play and adults can chat.
6. Create common houses or community centers where people can interact. Integrate small businesses and encourage home offices.



WHAT WE PICK !

- Possible Implementatin in Architectural properties, landscape design, and functions
- How to Deal with Tourism in Boa Vista Eco Village

Figure 88: Review chaptures to proceed Design Process Steps
Illustrated by Authors

4.1 Assessing the Integration of Tourism within Boa Vista Eco-Villag

4.1.1 Reflection Of Tourism on Boa Vista Community, Geography, Economy

As gathered from your discussion, eco-villages have emerged over the years around the globe, inspired and motivated by various factors, more often than not, by a temptation of sustainable life modes or economic contributors to the local settings. This emergent tourism direction has indeed unveiled reasonable possibilities for revenue and ecological awareness, though not holistically applicable. Regarding Boa Vista, the capital of Roraima, unique problems with the environment, social issues, and lack of infrastructure all suggest that Eco-village tourism is probably not a wise development strategy for this area in the short term.

4.1.1.1 Social Dynamics and Migration Issues

One of the most important issues for Boa Vista is the presence of immigrants, particularly from Venezuela. Consequently, this caused an important displacement for political and economic instability; migration, at any rate, provides a new social setting which needs to be protected, by providing shelters, security, and scenes of belonging. Tourism often requires resources that are specifically aimed at the external visitor, and these can indeed clash with the humanitarian objectives of the camps. According to Sharpley (2000), the commodification of spaces for tourism within a community dilutes the social and cultural intentions of the community risk quite relevant in this case.

4.1.1.2 Balancing Community Goals and Tourism

The main goal of Ecovillage in Boa Vista should be building resilience, encouraging social cohesiveness, and attending to the urgent needs of inhabitants. While tourism has the potentially can improve the economical aspects, it depends on a strong infrastructure and a healthy social structure to be sustainable.
Boa Vista's current situation indicates that tourism may take focus and funding away from these fundamental objectives. For example, the planning and investment needed to provide resources and infrastructure required by tourists, including accommodation, transportation, and waste management, may not align with the goals of the community at present (Jackson & Svensson, 2002).

4.1.1.3 Preserving Community Identity

The risk here is always going to be with commodification, something that turns some aspect of the identity or value of a community into a commercialized product. Here, it's the experiences of both the migrants and natives that are molding the ecovillage in Boa Vista; its identity has to come before business.
Tourism needs to become complementary and reinforcing of the overall principles of society, rather than controlling. Designing tourism development should be within a participatory approach for residents to stand in decision-making involvement on tourism issue matters. In this regard (McIntosh & Zahra, 2007).

4.1.1.4 Hydrological and Ecological Challenges

Boa Vista and other surrounding municipalities face a high degree of hydrological risk linked to scarcity and unpredictability because of variable climatic conditions. Such factors are accentuated by such ecological threats as deforestation, land degradation, and frequent fires.
It entails many facets that an ecovillage needs to handle with much care to be sustainable; thus, the introduction of tourism at an early stage of development may increase the ecological footprint. Increasingly water consumption, more energy demand, and higher waste generation may stretch the fragile ecosystem beyond its limit. As Smith and Richards (2013) have noted, tourism can often heighten the vulnerability of the environment, especially when improperly managed.

4.1.1.5 Agricultural Limitations

The region's limited agricultural productivity presents another obstacle. Due to soil degradation, droughts, and challenges associated with sustainable farming practices, ecovillages in Boa Vista may struggle to achieve self-sufficiency in food production. Introducing tourism would likely increase demand for food and other resources, creating additional pressure on the community's capacity to provide for both residents and visitors.
Sustainable agriculture, should be prioritized and stabilized before considering tourism as a viable option (Dawson, 2006).

4.1.1.6 Economic Considerations

Admittedly, tourism brings economic stability and provides jobs for residents of an ecovillage. In Boa Vista, however, these financial gains will have to be checked against the real cost. Gains in a short period regarding

4.1.2 Not a wise option for The moment

Considering the peculiarities of Boa Vista, tourism should not be an option for the moment but rather as a long-term goal; with time, when the ecovillage has already acquired some sustainable practices that include better infrastructure and solving internal problems of the residents, it may become ready for guests. The above-mentioned is in line with Saarinen's (2006) statement on the importance of planning and gradual development within the frames of sustainable tourism, referencing Clarke's (1997) framework of sustainable tourism.

4.1.2.1 Building Infrastructure and Capacity

Ecovillages in Boa Vista are supposed to be setting the base for feasible ways of managing the visitors in the future. That means constructing eco-friendly lodgings, establishing methods of waste management, and making the community self-sufficient in aspects like energy and food production. By adopting best practices from established ecovillages like Findhorn and Auroville, Boa Vista can create a blueprint for integrating tourism in a way that supports its ecological and social goals (Dawson, 2006; Jackson & Svensson, 2002)

4.1.3 Conclusion; Future Prospects for Tourism in Boa Vista

Indeed, in the longer term, once the ecovillage has consolidated and overcome many of its ecological and social challenges, tourism could be a valuable strategy for economic development and intercultural exchange. Thus, education-based tourism-like workshops on renewable energy could offer a clientele that has developed a genuine interest in the ecovillage model of sustainable living. This approach should be aligned with the ecovillage movement's main goals, by ensuring that tourism contributes, rather than diminishes, its mission.

Ecovillage tourism is extremely promising in both environmental education and financial and economic gains; however, it is a sensitive balancing act. Based on the social, ecological, and infrastructural issues Boa Vista, Roraima has at present, tourism would be an unwise decision at this time. The attention must be focused on the needs of the residents to begin minimizing environmental concerns and building a resistant, self-sufficient community.

In our Project proposal, we will not consider tourism as one of the functions to be implemented in our architecture, economy, or as a possible function. Here, as discussed, we believe it is not a wise decision and has greater disadvantages than its benefits in Boa Vista Eco-village.

4.1.4 Possible features to Implement in Boa Vista Ecovillage

Designing an ecovillage in Boa Vista, Roraima, offers a unique opportunity to blend local resources, traditional practices, and modern sustainable methods. The following plan draws from the lessons of Ecovillage at Ithaca (EVI) and tailors them to Boa Vista's context, considering local materials, population needs, investment strategies, and agricultural opportunities.

4.1.4.1 Architectural Design and Materials

Boa Vista's climate and natural resources provide an excellent foundation for sustainable architecture. Wood from renewable local sources could be a primary material, given its abundance and low environmental impact. Bamboo, a fast-growing and durable material, is another viable option for structural elements and interior features. Compressed earth blocks (CEBs) and adobe, made from locally available clay and soil, could be incorporated for walls to enhance thermal insulation and minimize embodied energy.

Roofing may employ clay tiles or locally available thatch material, and still provide adequate insulation and ventilation for heat comfort. The application of passive solar design concepts, like large windows to let in sunlight and cross-ventilation, would minimize the use of energy. Rainwater harvesting systems and green roofs can add to sustainability.

4.1.4.2 Population and Layout

For a community of 50 families, with an average of 4 people each, the village would locate approximately 200 individuals. The arrangement would be clustered homes that are in smaller neighborhoods of 10–15 houses each, surrounding shared community spaces to foster interaction while preserving privacy. Each family could have a private residence of approximately 70–100 square meters, with access to communal facilities like kitchens, laundry areas, and recreational spaces.

Centralized infrastructure, such as a community center, childcare facilities, and co-working spaces, would minimize the need for redundant private investments and promote a sense of belonging.

4.1.4.3 Investment Estimates

The total investment would depend on local material costs, labor availability, and infrastructure requirements. Assuming an average construction cost of $400 per square meter (considering sustainable materials and techniques), each home could cost approximately $28,000–$40,000. For 50 homes, the residential construction cost alone would range from $1.4 million to $2 million.

Additional infrastructure—such as community buildings, renewable energy systems, water management, and agricultural fields—could add another $1.5–$2 million, bringing the total estimated cost to approximately $3–$4 million. Investment calculations would also need to account for ongoing operational costs, which could be offset by income-generating activities.

Funding sources could include government grants for immigrant resettlement, international aid, microloans, and community-driven contributions. Income-generating activities, such as workshops, organic produce sales, or eco-tourism, could also support long-term sustainability.

4.1.4.4 Agriculture and Food Systems

Roraima's history of agricultural practices provides a strong basis for designing sustainable food systems. Allocating 30–40% of the land to agriculture would ensure a balance between food production, residential areas, and natural habitats. Fields could employ modern ecological farming techniques, such as agroforestry, permaculture, and regenerative agriculture.

Drip irrigation methods could optimize water efficiency, and rainwater collection and storage tanks could help alleviate seasonal water scarcity. Growing local produce such as cassava, corn, and beans in addition to fruits and vegetables could help the community reach a proper degree of food self-sufficiency. Composting

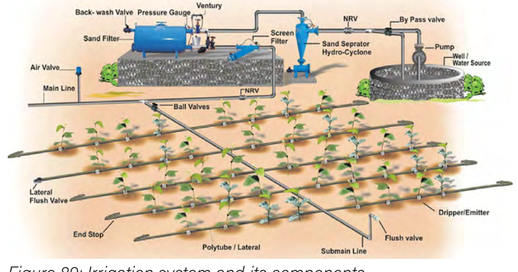


Figure 89: Irrigation system and its components.
Source: Celik, H. K., Karayel, D., Caglayan, N., Rennie, A. E., & Akinci, I. (2011). Rapid prototyping and flow simulation applications in design of agricultural irrigation equipment: case study for a sample in-line drip emitter: the paper is to study CFD and RP application samples on the design issues associated with agricultural irrigation equipment. Virtual and Physical Prototyping, 6(1), 47-56.

Design Process

Ecovillages Defining

Main Principals

CaseStudies

Emergency and Urgency Solutions

Boa Vista

Geographical properties

Social Challenges

Site Morphology

Survey Information collection

Emergency

Urgency

Temporary Tents

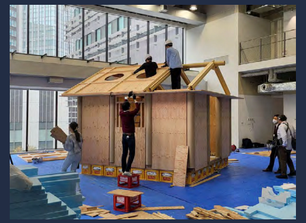
Light-weight Transitional Housing

Transitional Collective Communal Housing

Permanent Housing

UNHCR TENTS

Paper Log Houses



Quinta Monroy

WHERE WE ARE!

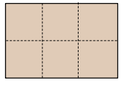
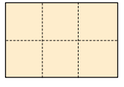
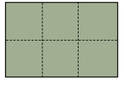
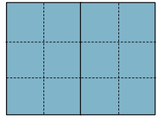
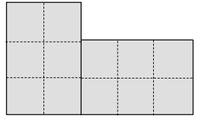
Modularity
Expantion
Flexsibility
Socialization
Dignity

Case Studies With
Same Needs
Same Pathway

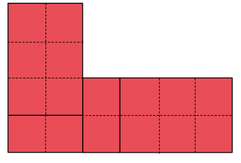
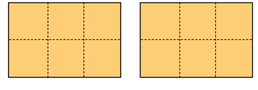
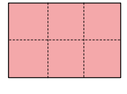
- BREMEN CONTAINER VILLAGES
- Concrete Shelter
- Wohnheim für Gefl üchtete

Figure 90: Review chaptures to proceed Design Process, Steps 2
Illustrated by Authors

4.2 Functions and Area

Functional spaces	Areas	Capacity	Reasoning	Modularity
Living Units	65.34 m^2	4 persons	Based on the competition needs, we had to build 50 units for 50 families, but since we had followed modularity in our design approach, we designed 64 units with the possibility of expansion in their size.	
Agricultural Lots	981.15 m^2		**Local food production** is one of the eco-village principles. In addition, by considering the local agriculture potential, we have designed the farming land for the community to produce their own needs and sell the surplus, so it would be a source of **income** as well.	
Gathering Center	65.34 m^2	50 persons	Basically, eco villages are based on community **decision-making**, so we have a community center to serve as a place of meeting and gathering. In addition, we tried to promote a **sense of belonging** to a community as immigrants.	
Workshop Center	130.68 m^2	60 persons	By contacting **UNHCR** and reviewing the papers and links they provided, we learned that a considerable portion of the immigrant population faces challenges such as **unemployment** and the risk of **recruitment by criminal groups**. This led us to create practical spaces to serve the educational needs of both adults and youth. These spaces are used for classes such as language learning, technical training, and **vocational** education.	
Study room and Library	130.68 m^2	20 persons	While almost half of the population of our community is youths, and the importance of **studying and facilities for education** is missed in the current condition of the region, mostly in the immigrant community, it was important to have spaces as a library and studying area	

Functions and Area

Functional spaces	Areas	Capacity	Reasoning	Modularity
Kindergarden	174.24 m^2	30 persons	Kindergarten could be a place to educate, language learning, and protect children who are changing their country and need **adaptation and learning**. Also, while expecting parents to work, there is a need to provide a **safe space** for children.	
Bulk area	65.34 m^2		As a storage for l**ocal food production** and also locals' comfort to maintain their surplus and **equipment.**	
Playing and sport field	184.50 m^2		Mostly to design the inside spaces for sports and activities. Increase the greenery and open playing fields in the region with climatic properties.	
Bar and bicycle repair shop	65.34 m^2	20 persons	Since Boa Vista has high precipitation but faces **surface water loss** and **drought** risk, collecting rainwater for agricultural use could be an effective mitigation solution.	
Irrigation tanks			Small spaces for both the function of repairing bicycles and having a break, and a time spending area inside the eco-village.	

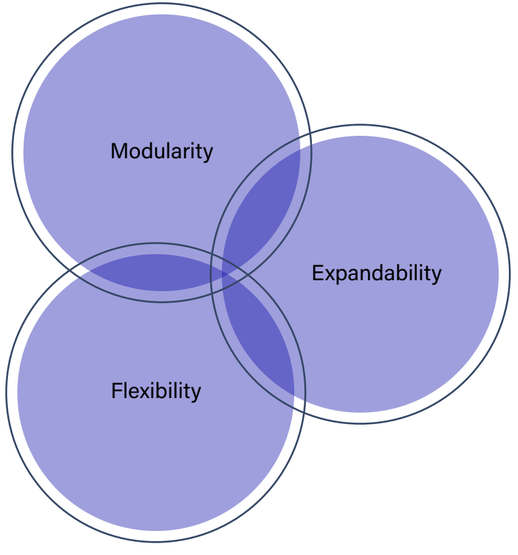
4.3 Modularity

4.3.1 Pathway to Modularity: Project Exploration

Combination of the case studies reviewed in the first chapture which were initioal steps to define emergency and urgency solutions, leads us to define first border of our project. As we illustrated in the Figure 60. in terms of facing crisis we are standing aproximately on transitioanl communal houses. However it is the first step and further we will add other factors which are connecting this house typology to an eco-village principals and project site properties.

Initially the most important alignment which facilitate answering to urgent condition such as immigrant's rapid need of accomodation, is finding the way to be Fast, Flexible, Expandable, and as Afordable as possible. Modularity needs investigating built projects, strutural properties, local existed materials and possible variations for grids.

Firstly, here we are exploring projects which helped us to move forward in designing a modularity framework.
Secondly, we move to explore structural properties and our choices.
At the last step we will illustrate project grid sizing and modularity.



Modularity

The size of each module serves as a reference for the scale of all other design components. This standardized dimension enables the creation of a cohesive settlement, where different blocks can be combined and interchanged to meet specific functional and spatial requirements.

Expandability

Within the framework of the block or master plan, expandability provides the opportunity to increase housing capacity and construction volumes without altering the core structure. Service facilities, infrastructure, and community spaces must therefore be strategically designed to support future growth and the integration of additional residential unit.

Flexibility

The adaptable residential section typology allows the organizational grid of buildings to be modified based on site conditions, user needs, and configurations, providing suitability for a variety of layouts.

4.3.1.1 Case studies

01 . BREMEN CONTAINER VILLAGES

Figure 91:Outside View, Container Villages
*Source: *Making Heimat* ("Container Villages Bremen," n.d.), http://www.makingheimat.de/en/refugee-housing-projects/database/container-villages-bremen*

Figure 92: Main accesse and Inside Connectios, View, Container Villages
*Source: *Making Heimat* ("Container Villages Bremen," n.d.), http://www.makingheimat.de/en/refugee-housing-projects/database/container-villages-bremen*

Figure 93: odular Containers in Villages
*Source: *Making Heimat* ("Container Villages Bremen," n.d.), http://www.makingheimat.de/en/refugee-housing-projects/database/container-villages-bremen*

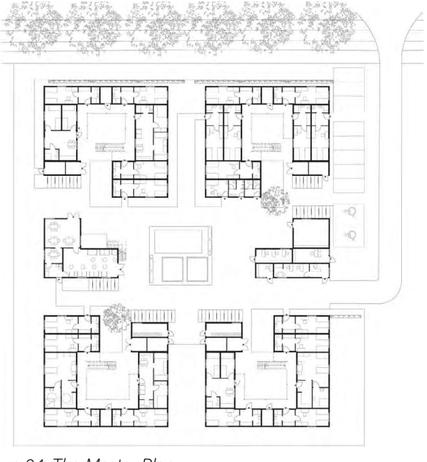


Figure 94: The Master Plan
*Source: *Making Heimat* ("Container Villages Bremen," n.d.), http://www.makingheimat.de/en/refugee-housing-projects/database/container-villages-bremen*

Temporary housing with alternate longer-term use
Depending on the site, two- to three-story buildings arranged in courtyard configurations are built with 3x3x9 m individual.
Steel frame and metal modular containers. They provide independent living units of 24 sq m for two people and 48 sq m for four people, each with a private kitchen and a bathroom. Each building has a laundry, private kitchens and bathrooms, and a laundry and drying room shared among residents of the same building.
Houses are designed in courtyards to facilitate integration and communication among residents.

Three sites with temporary homes were constructed on municipal land and approved for five years. While buildings are intended for an initial 5-year lifespan, the high architectural quality of the design allows them to last for an estimated further 15 to 20 years

4.3.1.2 Refugee hostel – Gundelfinger Straße

Figure 95: Courtyard View of Hostel
Source: Photography: Miguel Babo
https://franzundgeyer.de/projekte/wohnheim-fuer-gefluechtete/

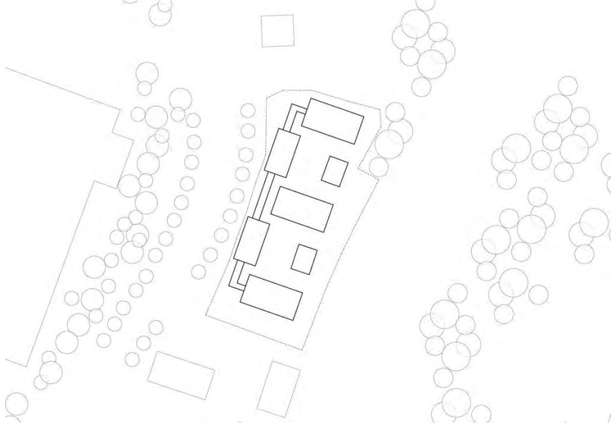


Figure 96: The Master Plan
Photo by Miguel Babo
Source: https://franzundgeyer.de/projekte/wohnheim-fuer-gefluechtete/

Client: City of Freiburg
Location: Freiburg
Performance phases: 1-8
Gross floor area (GFA): 10,790m²

The city of Freiburg must expand its refugee accommodation capacity within a very short timeframe. After approximately nine months of planning and construction, this pilot project will create accommodation for a total of 1,000 refugees at three locations. The jury of the Hugo Häring Prize recognized the project as an "excellent example of a welcoming culture that fosters identity."

Figure 97: Construction Process
Photo by Miguel Babo
Source: https://franzundgeyer.de/projekte/wohnheim-fuer-gefluechtete/

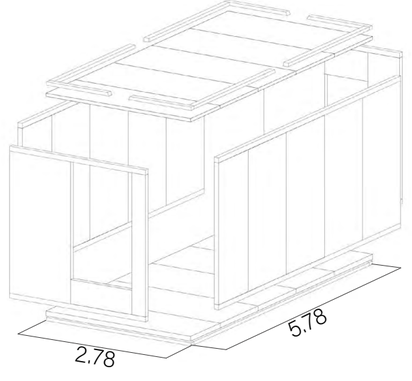


Figure 98: Modules Dimentios, Gundelfinger Straße Hostel
Photo by Miguel Babo
Source: https://franzundgeyer.de/projekte/wohnheim-fuer-gefluechtete/

To meet the tight timeframe, three architectural firms will join forces to form the "ARGE Architects." The interdisciplinary planning team will develop an alternative to the steel container using a cross-laminated timber construction.
The flexible and interconnectable basic module has a floor area of 16 square meters. The structure is being built with the help of local craftsmen.

4.3.2 Pathway to Modularity: Construction; Tecverde Company

Since 2009, the Brazilian company Tecverde has been transforming the construction industry by introducing industrialized building methods. Their goal has always been to make faster, more efficient, and more sustainable construction process.
Today, they are noune in Latin America for off-site construction, while keeping the high quality, completing projects in nearly half the time of conventional methods. A key development was their 2020 merger with the Chilean company E2E SA, part of the Arauco Group. This move combined Tecverde's local building knowledge with international technology and innovation expertise.
Using advanced building systems based on global best practices, Tecverde now handles a wide range of projects, from residential communities to large commercial structures. In essence, they are making construction in Brazil and elsewhere faster, smarter, and more sustainable.

4.3.2.1 Some Similar Projects

01. Projeto Moradias

Figure 99: Locating Panels in Moradias Project
Source: https://www.tecverde.com.br/obras/projeto-moradias/

Location: Foz do Iguaçu (PR)
Units: 254 (divided into 3 lots)
Partners: Itaipu Parquetec; Itaipu Binacional; FozHabita
Construction Status: in progress

02. Condomínio Palácio De Turim

Figure 100 : Areal View of the Construction Site
Source: https://www.tecverde.com.br/obras/condominio-palacio-de-turim/

Figure 101: Assemble Different Panels
Source: https://www.tecverde.com.br/obras/projeto-moradias/

Localização: Ribeirão Preto (SP)
Unidades: 238
Tipo de Empreendimento: Casas
Parceiros: MRV
Conclusão da Obra: 2024

4.3.2.2 Tecverde Construction Steps

Construction system

What is the Tecverde Construction system like? The Tecverde process can be 2D (paneled) or 3D modular. To produce the frame, we use structural wood from planted forests, double-dried and treated with chemical preservatives, ensuring durability of over 50 years.

Panel Closing

Tecverde panels are sealed with structural panels coated with a water-repellent membrane and cement board on the outside. The interior is sealed with drywall sheets.

Mezzanine

The Tecverde System's subfloor is structural, consisting of treated wood sheets and beams. A mortar subfloor underlayment under steel mesh is placed over this, ensuring structural stability and acoustic comfort.

2D system on-site assembly

At the construction site for panelized solutions (2D), the Tecverde panels are lifted with safety devices by the Assembly Team and fixed to the foundation for ground floors and to the mezzanine floors for other floors.

Modular Assembly

Assembly takes place in a factory environment, away from harsh weather conditions and under strict quality control, ensuring fast and efficient execution. The industrialization of the process allows for precision and reduced errors.

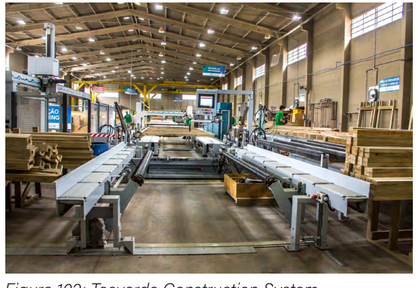


Figure 102: Tecverde Construction System
Source: Data and Pictures From Sistema construtivo (Tecverde, n.d.), https://www.tecverde.com.br/sistema-construtivo/

4.4 Modules Structure

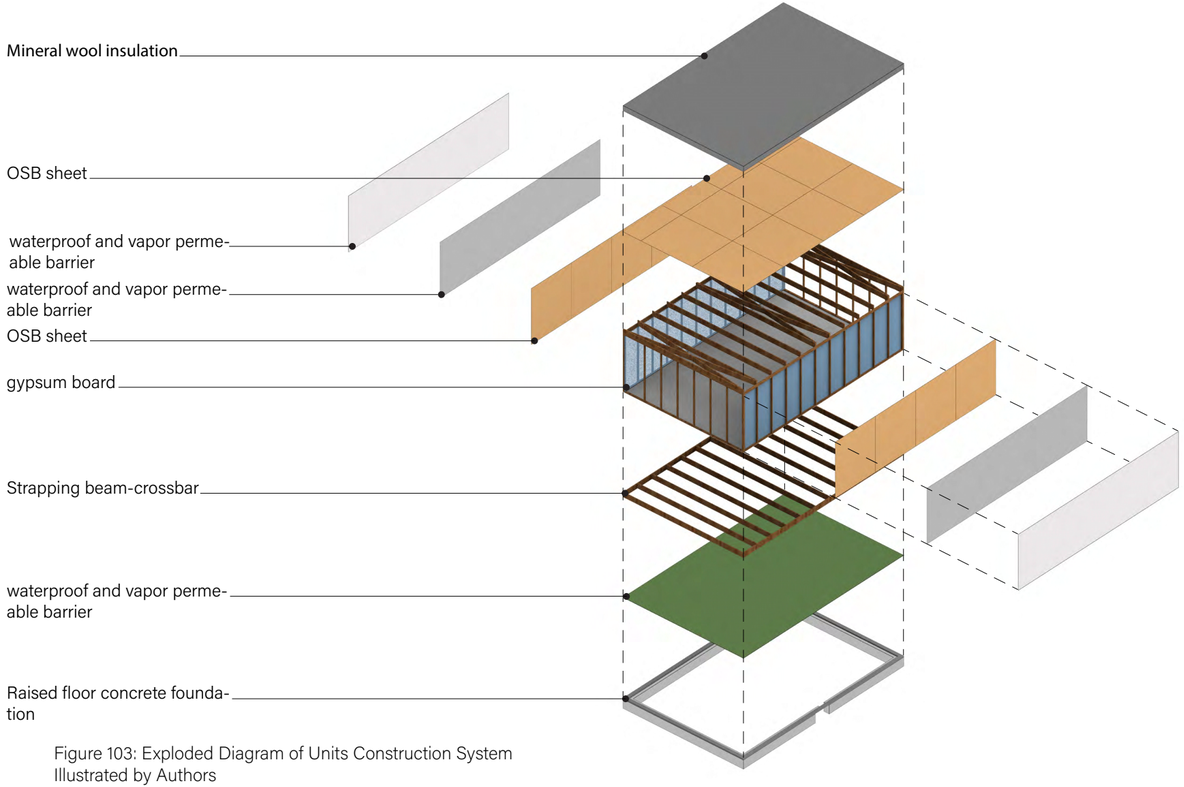


Figure 103: Exploded Diagram of Units Construction System
Illustrated by Authors

Main Structure

The wooden structure is made of pine from planted and certified forests. All parts are treated according to the NBR7190 standard , ensuring long-lasting durability. In addition to chemical treatment, all wooden parts are enclosed in sheets and membranes, never exposed to the elements and never giving off the appearance of a wooden house.

The thermal and acoustic insulation incorporated into all walls, slabs, and roofs makes the home much more thermally and acoustically comfortable. The insulation level of a wood-frame wall can be up to twice that of a conventional masonry wall. OSB sheets are installed on both sides of the walls and have several functions. These high-tech structural sheets provide great strength, meeting the same standards required for a brick house.

The use of structural wood panels in floor slabs, intended for wet areas (bathrooms with showers and uncovered areas), requires fungicidal and insecticidal treatment. For other wood components, such as closure panels, bracing panels, floors, and ceilings, the performance of the preservative treatment was verified through exposure of these pieces to tests (Tecverde, n.d.).

Pier Foundation

Raised floor to prevent moisture and allows air to pass through.

4.5 Moduls composition and Blocks

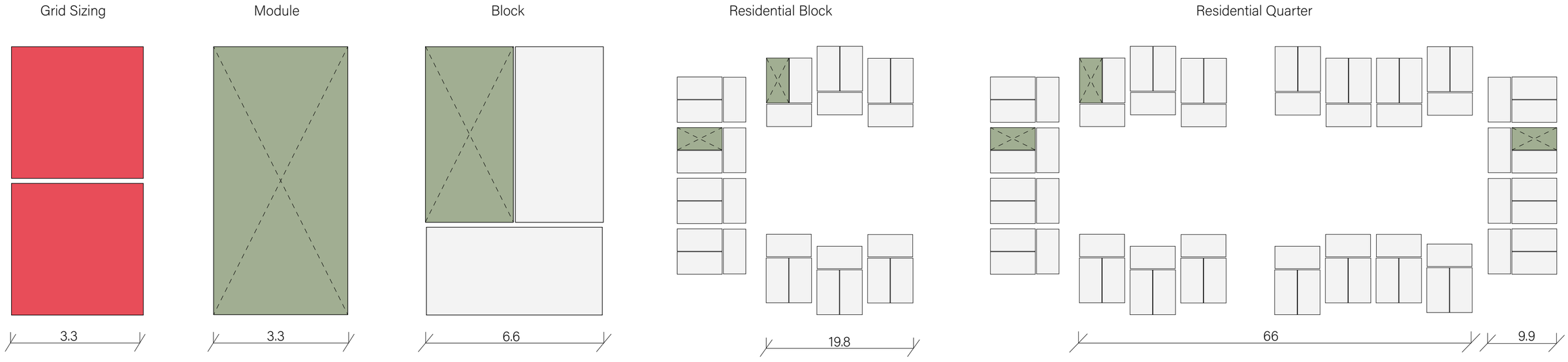


Figure 104: Defining Moduls and blocks, based on the 3.3 Grid Sizing
Illustrated by Authors

4.6 Flexibly; Possible Scenarios

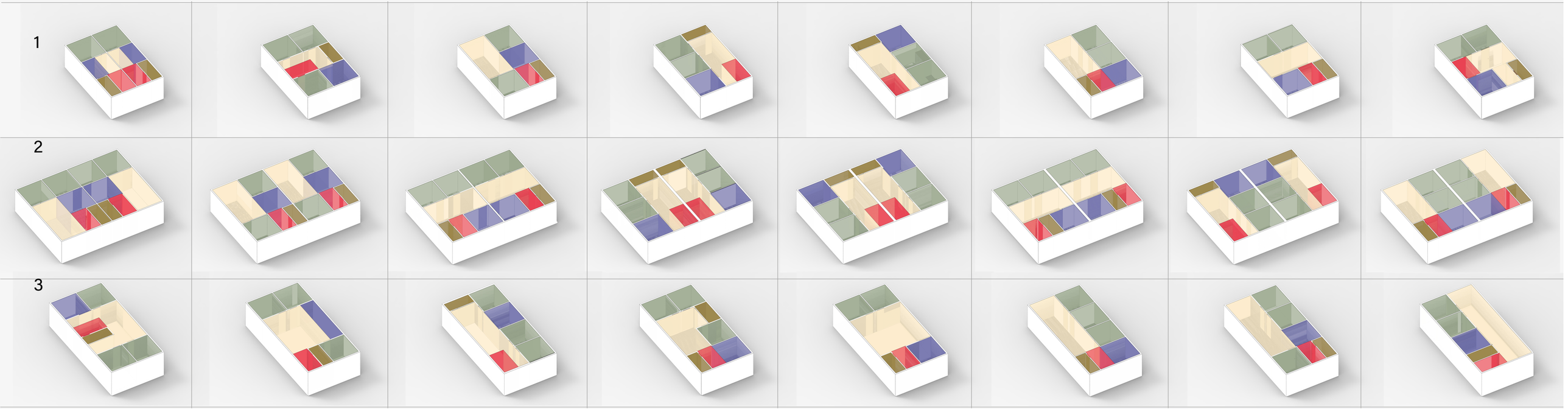


Figure 105: Scenarios Illustration, based on the module's explanation, different space allocations are examined.
Illustrated by Authors

4.6.1. How Does Scenarios Works

1 In First scenario, the units measure 9.9 x 6.6 meters and are designed with a flexible interior layout.
The interior walls can be reconfigured to suit different living arrangements, allowing users to select the most appropriate setup based on their privacy preferences and the number of occupants.This approach supports a variety of needs by offering:
- Customizable room divisions to increase or reduce privacy levels
- Adaptable layouts for individuals, couples, small families, or shared worker accommodations
- Efficient use of space, ensuring comfort without unnecessary construction

By providing multiple layout options within the same unit footprint, residents can personalize their space to match their lifestyle and changing circumstances..

2 In the second scenario, each unit measures 9.9 x 6.6 meters, with the possibility of extension.
Family units can be expanded by an additional 6.6 x 9.9-meters module to accommodate population growth over time. This allows for a phased expansion strategy, supporting long-term adaptability based on the evolving needs of the household.
Units are designed to consist of two completely private sections, each offering individual access and personal space, or be connected to each other with the common infrustructure for a family. This configuration ensures:
- Maximum privacy for each resident
- Efficient shared infrastructure
- Flexibility in occupancy, suitable for rotating or short-term workers.

3 In the third scenario, family units are designed to be expandable.
Each unit begins with a base size of 9.9 x 6.6 meters, and both can be extended by an additional 3.3 x 9.9-meter module as needed. This approach offers maximum flexibility and adaptability for all user groups.
Family units can expand over time to accommodate growing household sizes or evolving spatial needs, improve privacy, or support shared living arrangements with more comfort.
By allowing expansion for all user, this scenario promotes a more inclusive, long-term housing solution, capable of responding to changes in:
- Household composition

Living standards
- User preferences and privacy requirements

This modular and scalable strategy supports a dynamic community structure where space can grow with the people who inhabit it.

4.6.2. Selected Room Unit Example

One Of the room template furnished to show how are the rooms and common spaces are decorated. The Room Dimention is 6.6 m to 9.9m as a regular unit dimention.

Figure 106: Furnished Room Template
Illustrated by Authors

Design Process

Ecovillages Defining

Principals

CaseStudies

Emergency and Urgency Solutions

Emergency

Urgency

Boa Vista

Geographical properties

▪ Temperature: It's mostly hot, with temperatures usually staying between 24°C and 34°C. It rarely gets colder than 22°C or hotter than 36°C

▪ Precipitation and Hydrology: Boa Vista has a very clear wet season from April to November and a dry season from December to March. Most of the rain falls between May and July. The city sits on the Rio Branco, a major river in the area.

▪ Humidity: The air is almost always humid, with the average humidity hovering around 69%. It feels especially sticky during the rainy season, when it can get up to 80%.

Social Challenges

The huge number of Venezuelan arrivals has rapidly increased Boa Vista's population, straining social services like healthcare and schools. Many migrants face unemployment and difficulty integrating due to language barriers and discrimination.
Integrating different cultures has been tough. Many migrants face prejudice and harmful stereotypes. The language barrier also makes it hard for adults to find work and for children to succeed in school.
The city has a major housing shortage. Many Venezuelans live in temporary, crowded shelters or makeshift homes in public spaces. This lack of affordable housing pushes people to the city's outskirts, where there's poor access to basic services.

Site Morphology

Survey Information collection

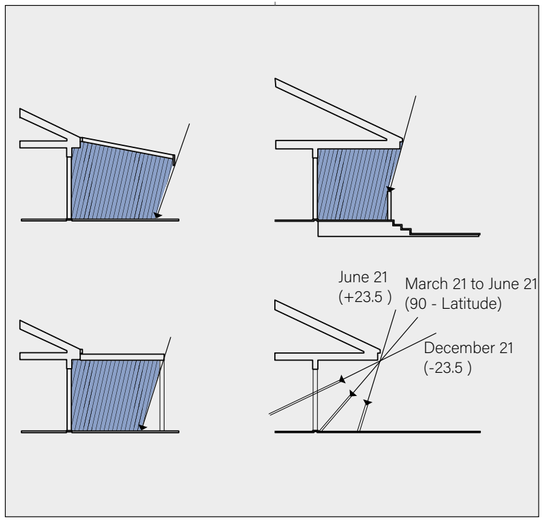
▪ Lack of appropriate accommodation
▪ Lack of clean water
▪ Sanitation issues
▪ 24 % of shelter households does not have electricity
▪ Overcrowding and unsafe structures flagged by about 11%
▪ ~ 63.5 % of children surveyed do not attend school.
▪ Employment issues.

Figure 107: Review chaptures to proceed Design Process, Step 3
Illustrated by Authors

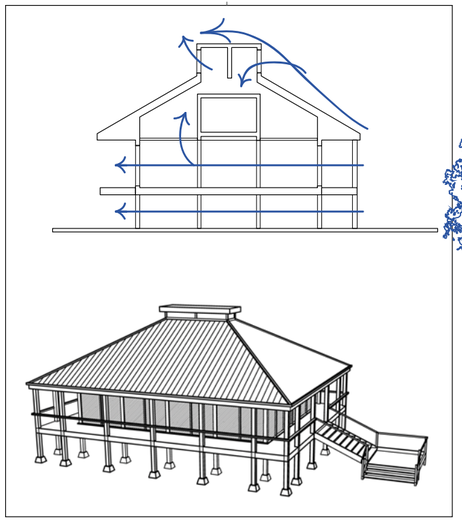
4.7 Geographically Sustainable Strategies

4.7.1 Architectural Strategies

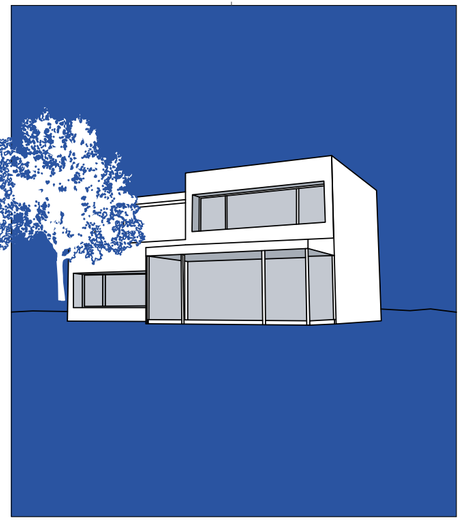
Architectural Strategies Based on Climatical Analysis



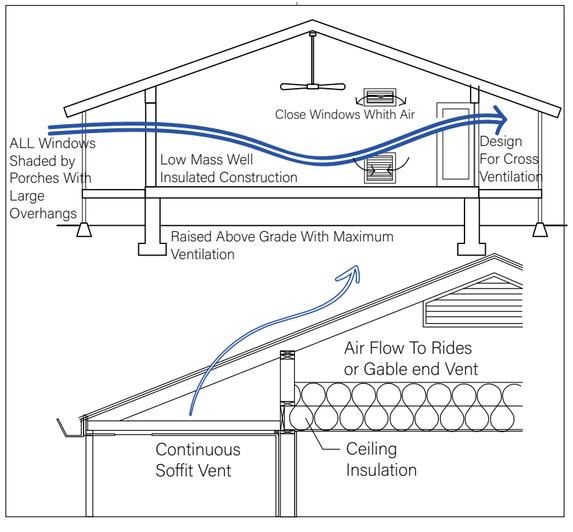
Window overhangs (designed for this latitude) or operable sunshades.



If soil is moist, raise the building high above ground to minimize dampness and maximize natural ventilation underneath the building

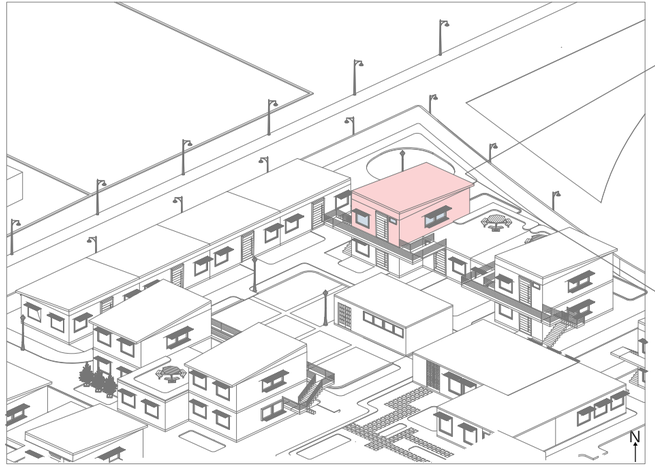


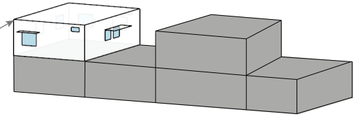
Screened porches and patios can provide passive comfort cooling by ventilation in warm weather and can prevent insect problems

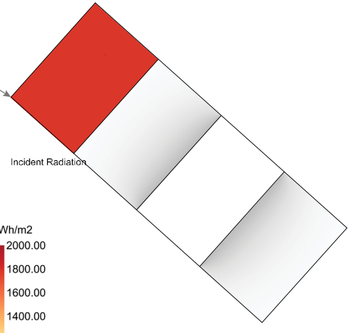


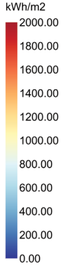
In this climate air conditioning will always be needed, but can be greatly reduced if building design minimizes overheating and be well ventilated

4.7.2 PV Panel Installation





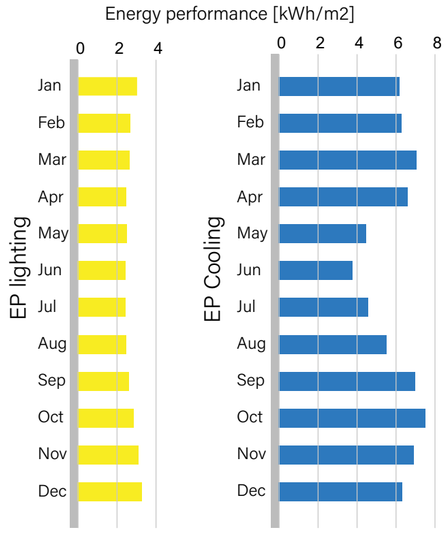




Solar Incident Radiation =
1779.665492 kWh/m²/y

Annual Energy Performance	
Lighting	30.79 (kWh/m²/y)
Cooling	67.99 (kWh/m²/y)
EPgl	98.75 (kWh/m²/y)

Primary energy uses



By considering these analyses, we realized that the largest amount of energy needed is for lighting and cooling units.
For cooling, besides the need for electronic fans, we found natural ventilation effective, and for this reason, we designed wide windows that are mostly openable and designed units in a direction that lets the air flow.

In addition, we realized that in Brazil, there is an ongoing investment in PV panel installation. The analysis we have done showed the lighting energy need is approximately 30.8 kWh/m²/y, so by calculating the total need of energy for each unit, and the standard solar panel power output, we reached nearly 3 panels for family houses.

The panels we have used has solar panel powr output between 0.36W-600 W in average 0.4 W, and the dimention of each units as we discused is 9.9m*6.6m.

Implementing solar panels to cover 30.79 (kWh/m²/y) lighting need

Calculate the total annual lighting energy need

Room Area: 6.6 * 9.9= 65.34 m²

Total Annual Lighting Energy:
30.79 (kWh/m²/y)*65.34 m²=2,011 (kWh/y)

Total Daily Lighting Energy:
2,011 (kWh/y)/ 365 days= 5.51 (kWh/day)

Calculate the Daily Energy Production of One Panel:

Panel Dimensions: 1.6 m x 1.134 m
Panel Area: 1.8144 m²

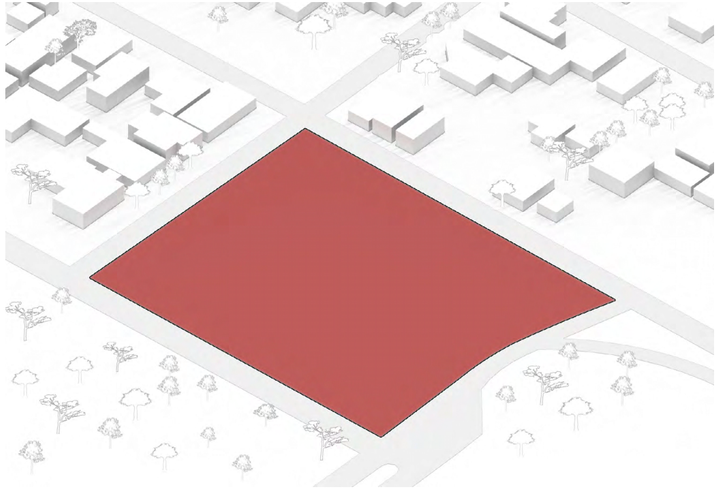
Daily Solar Incident Radiation =
1779.665492 kWh/m²/y / 365 days/y =
4.876 kWh/m²/day

performance ratio (PR) of 80%
Daily Panel Production =
4.876 kWh/m²/day * 1.8144 m² * 0.80 =
7.08 kWh/day

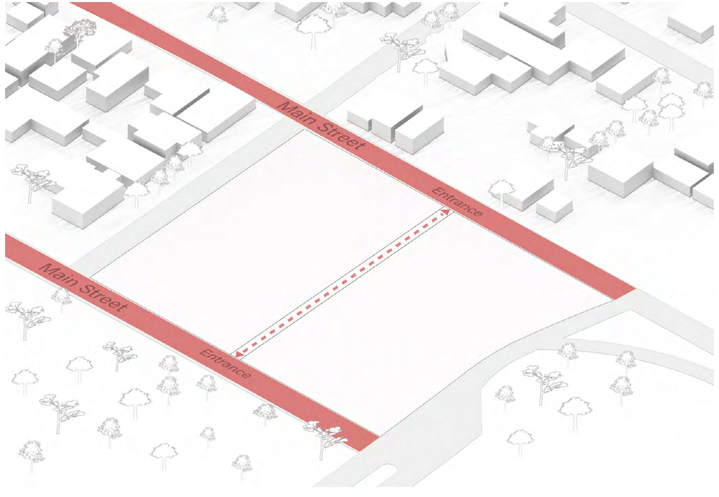
Determine the Number of Panels Needed for Each Units:
5.51 kWh/day / 7.08 kWh/day = 0.77 panels ~ 1 panel

4.8 Building and Landscape Development

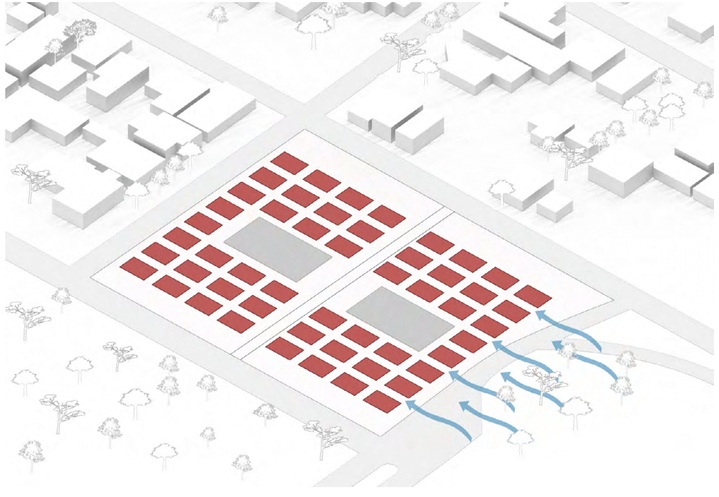
4.8.1 Concept Diagram



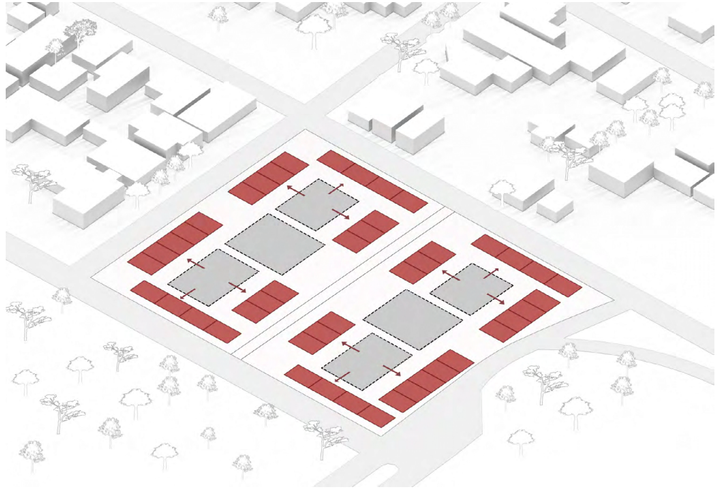
1. Site Location



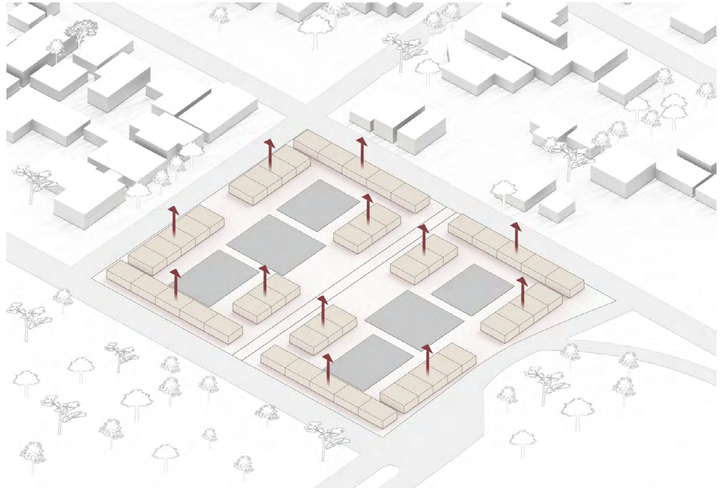
2. Main Access Line



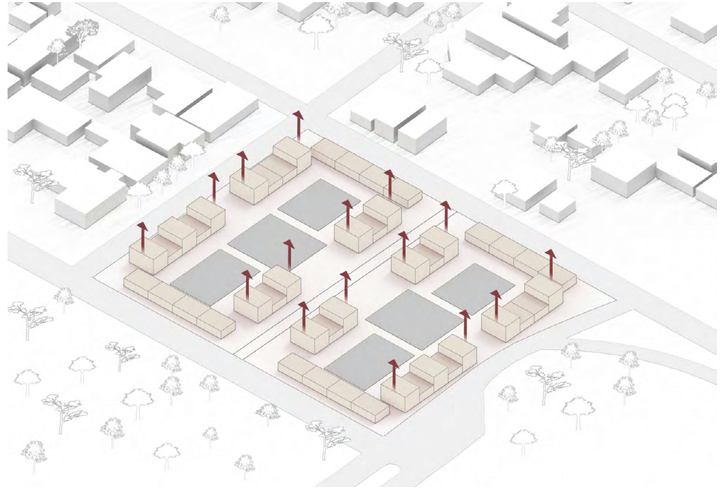
3. Units and Shared Spaces Oritation



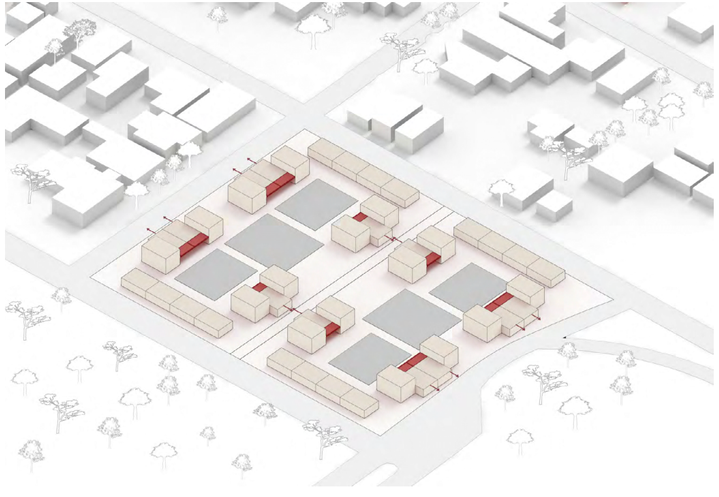
4. Units and Shared Spaces Distribution



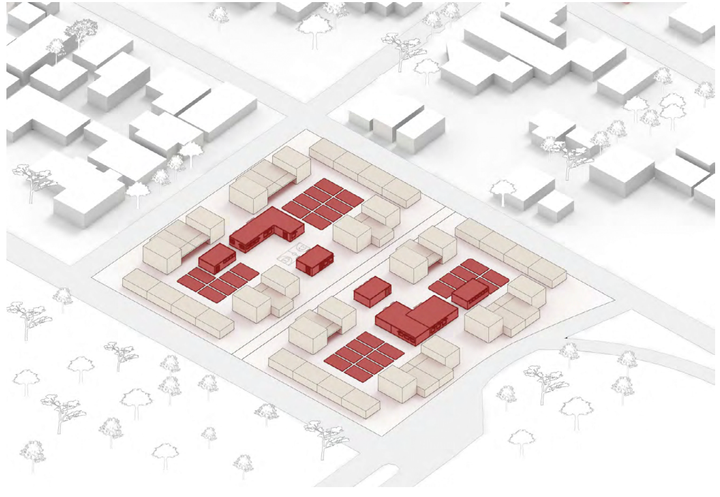
5. Volume Extrusion



6. Second level Extrusion



7. Possibilities to Have Expantions



9. Adding Common Spaces, Local Farms, Shares Spaces, Playing Fields, and Gatherin Areas

10. Final Form

4.8.2 Master Plan

Figure 108: Master Plan Design, Ecovillage of Boa Vista
Scale: 1:1000
Illustrated by Authors

4.8.3 Social Spaces Plan

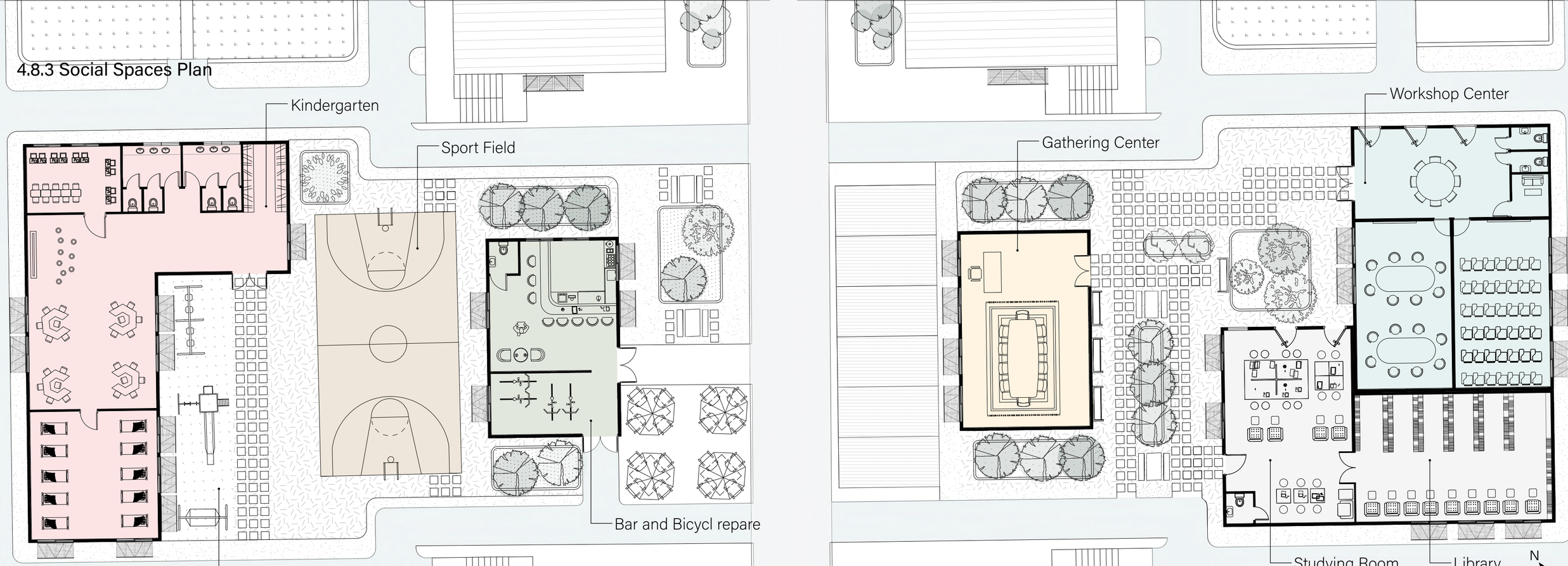


Figure 109: Master Plan
Scale 1:150

4.9 Render and Views

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