

ECO SMART HOUSE

REQUEST FOR PROPOSAL



Table of Contents

Table of Contents.....	2
Administrative Section.....	4
1. Introduction and Background.....	4
2. Company Profile.....	4
3. Our Teams.....	5
4. Problem statement.....	5
5. Project Objectives.....	6
6. Definition of Scope and Approach.....	6
7. Regulations on Development.....	7
7.1 Regulation of Hybrid Electrical System.....	7
7.2 Regulation Regarding Waste Management.....	8
7.3 Regulation Regarding Groundwater Management.....	10
Technical Section.....	12
1. Housing Layout.....	12
2. Building Permit (Persetujuan Bangunan Gedung).....	13
3. State-of-the-Art Review.....	15
1. Samsung SmartThings (Smart Home System).....	16
1.1 Samsung SmartThings Home Monitor.....	17
1.2 Samsung SmartThings Cam.....	17
1.3 Samsung SmartThings Smart Bulb.....	18
1.4 Samsung SmartThings mesh Wi-fi Network.....	19
1.5 Samsung SmartThings Outlet.....	19
2. Eco-Friendly Features.....	20
2.1 Monocrystalline Solar Panels.....	21
2.2 Low-flow Water Fixtures.....	22
2.3 HEPA filter (Air Quality Control).....	23
2.4 Noise Management System.....	24



2.5 Greywater + Blackwater Septic tank (Waste Management).....	25
2.6 CSun-Mar Compact Self-Contained Composting Toilet (Waste Management).....	26
2.7 Rainwater Harvesting System (Water Treatment).....	27
4. Technical background.....	28
1. Samsung SmartThings Appliances.....	28
2. Off-grid Monocrystalline Solar Panels.....	28
3. Low-flow water fixtures.....	30
4. HEPA Air Quality Control.....	30
5. Noise Management System.....	31
6. Waste Management + Treatment.....	31
7. Water Treatment.....	33
5. Project description.....	34
5.1 Short Summary.....	34
5.2 Eco-Smart House Analysis.....	35
5.3 Location Analysis.....	36
6. Schedule of work/timeline.....	39
Financial Section.....	42
1. Budget.....	42
2. Qualifications.....	44
3. Conclusion.....	45
Works Cited.....	46

Administrative Section

1. Introduction and Background

The demand for housing in Indonesia has been rising linearly with the increase in the population. At the same time, the earth continues to face increasing environmental challenges, and we must promote sustainability in every aspect of our lives, including where we live. PT. Palapa Baru, or PALARU, is a five-year construction company offering home or residential construction in Indonesia. In this project, we aim to build an Eco Smart House in Kota Waingapu, the largest town in the eastern half of Sumba, East Nusa Tenggara. With a budget of not over 2 million Rupiah, we thrive on building a comfortable house with green energy features and practical design. Our smart eco houses can play a significant role in achieving environmental sustainability goals.

PT. Palapa Baru anticipated the Eco Smart House project to begin on or about January 16, 2023, and all contracts will terminate after the project is finished by May 2, 2023.

2. Company Profile

PT. Palapa Baru, or PALARU, is a construction company offering home or residential construction in Indonesia. PALARU was created in 2018, and within four-year of its journey, in 2022, the company recorded a revenue of IDR 1 trillion. By the end of 2023, PALARU hopes to have about 30 employees, up from the company's workforce of 14. The company is located in L'Avenue Building, Jl. Raya Pasar Minggu, Jakarta Selatan, 12780.

PALARU has worked with several national and international construction companies and technology companies. Our management has collaborated with experts from Singapore, the USA, and Japan to provide a sustainable and environmentally responsible house. PALARU is committed to creating homes that are not only aesthetically pleasing but also energy-efficient, with a reduced carbon footprint. Modern living can be both



comfortable and environmentally responsible, and we strive to achieve this through our innovative smart house developments.

At PALARU, we are proud to be leaders in environmentally sustainable housing. With our team of experts, we are confident that we can create a smart, eco-friendly house that integrates seamlessly with modern technology, making them more efficient, convenient, and comfortable for homeowners. Our company comprises a team of experienced architects, designers, and engineers passionate about creating environmentally sustainable housing solutions.

3. Our Teams

Muhammad Ikhsan Effendy - Head of Finance

Ryufath Alief Adhyaksa Putera Soepeno - Head of Technology

Oryzea Sativa Ilham - Head of Research

Noorfi Azizah Rahim - Head of Development

Nadhief Amadda Arieq - Head of Design

4. Problem statement

Kota Waingapu has a population of about 39,690 in 2021 estimates and a population density of about 537,80 people/km². According to Badan Pusat Statistik Sumba Timur, a shortage of skilled workforce and trained professionals in Kota Waingapu challenges the city's development. The circumstances made it difficult for the area to draw investment and maintain high-quality standards in the region. Due to the limited workforce for construction around the area, there are many poor road and transportation networks and restricted access to basic healthcare and education.

Moreover, Kota Waingapu faces various environmental challenges due to its geographical location and climate change effects. According to Badan Pusat Statistik Provinsi Nusa Tenggara Timur (2018), there were 20 cases of earthquakes and 28 cases of typhoons in 2018 alone. High cases of earthquakes and typhoons can disrupt the local economy and damage



infrastructure, challenging sustainable development. Another challenge is the humidity levels. Kota Waingapu's dry season is longer than the rainy season. Therefore, when the rainy season happens, the humidity level in East Sumba is very high. While health experts suggest that the ideal humidity level is around 45 to 64 percent, the average shows that the humidity level in the East Sumba area was 74% in September last year, with the highest being 94% (Umbu Mehang Kunda Meteorological Station 8). High humidity levels can affect the house and the homeowner's condition and health. These challenges can disrupt the local economy and damage infrastructure, challenging sustainable development.

5. Project Objectives

The main objective of PALARU is to build an eco-friendly smart housing system that implements advanced technology that is efficient, convenient, and comfortable with a source of green energy. This initiative aims to provide a comfortable and healthy living environment that can adapt to future challenges for the residents of Waingapu. The design and construction of smart eco houses prioritize using sustainable materials and energy-efficient systems that ensure a high level of indoor air, water quality, and thermal comfort. In addition, the development of smart eco houses in Waingapu provides a positive economic impact due to the use of renewable resources, which reduces the cost of energy. This project objective aligns with the global sustainability goals of reducing carbon emissions, conserving resources, and promoting sustainable economic growth.

6. Definition of Scope and Approach

The scope of this eco-smart house project is a huge advancement of smart living and environmentally friendly housing integrated with the newest technology despite building in a rural area. We aim to create an 18-meter x 15-meter building that is comfortable, aesthetically pleasing, and environmentally friendly. The scope of our project includes preparing for administration matters, analysis of technical and technological aspects of the house, and financial planning.



+62 822-5765-8346
+62 878-1469-4015



contact@palaru.com
www.palaru.com



L'Avenue Building,
Jl. Raya Pasar Minggu,
12780

Our team has devised the best approach for this project, the waterfall method. The waterfall method allows us to set a clear timeline that involves a fixed due date, expectations of the clients, and progress of the task. Our team works together determinately to give only the best services, from preparing documents needed for designing, implementing, and financial planning. Through this approach, our team will focus on each aspect of the project, provide high-quality work, and be open to client feedback.

During the preparation and implementation of the design, we expect several questions and concerns will arise from the homeowner or the regulator, which means that the people involved are interested in realizing the goal of this eco-smart house project.

7. Regulations on Development

7.1 Regulation of Hybrid Electrical System

According to Local Regulation East Sumba District No. 12 of 2010 about East Sumba Regency Spatial Plan for 2008 - 2028. Hybrid-electrical are one of the goals of the local government.

- BAB III, Bagian Kedua: Strategi Penataan Ruang Wilayah Kabupaten. Pasal 6
 - f. strategi pengembangan prasarana energi / listrik
 - 2. strategi perluasan jangkauan listrik sampai ke pelosok desa.
 - a) meningkatkan jaringan listrik pada wilayah pelosok;
 - b) pengkajian dan pengembangan sistem interkoneksi jaringan tegangan menengah; dan
 - c) pengkajian dan pengembangan listrik Hybrid untuk wilayah-wilayah yang secara teknologi-ekonomis tidak layak untuk diinterkoneksi dengan jaringan listrik PLN.
 - 3. Strategi peningkatan kapasitas dan pelayanan melalui sistem koneksi antar wilayah kabupaten.



- a) menjalin kerjasama dengan kabupaten sekitar untuk menunjang pembangunan sistem interkoneksi Tegangan Tinggi Pulau Sumba;
- b) pengkajian dan pengembangan pembangkit listrik Hybrid untuk wilayah-wilayah yang secara teknologi-ekonomis tidak memungkinkan untuk diinterkoneksi dengan jaringan listrik PLN;
- Energy Network System Development Plan. Pasal 23
 - (3) Rencana pengembangan sumberdaya energi akan memberikan masukan (supply) energi listrik di Wilayah Kabupaten Sumba Timur.
 - (4) Rencana pengembangan energi baru dan terbarukan oleh pemerintah kabupaten yang meliputi PLTD, PLTMH, PLTU, PLTA, Mikrohidro, PLTB, PLTS ataupun sistem Pembangkit gabungan (Hybrid) sesuai dengan potensi energi yang ada di daerah setempat;

7.2 Regulation Regarding Waste Management

Regulations regarding waste management are written in Law Number (No). 18 of 2008 on Waste Management.

- Pasal 3

Pengelolaan sampah diselenggarakan berdasarkan tanggung jawab, asas berkelanjutan, asas manfaat, asas keadilan, asas kesadaran, asas kebersamaan, asas keselamatan, dan asas nilai ekonomi.

 - (c) memperoleh informasi yang benar, akurat, dan tepat waktu mengenai penyelenggaraan pengelolaan sampah;
 - (e) memperoleh pembinaan agar dapat melaksanaan pengelolaan sampah secara baik dan berwawasan lingkungan



- Pasal 12
 - (1) Setiap orang dalam pengelolaan sampah rumah tangga dan sampah sejenis sampah rumah tangga wajib mengurangi dan menangani sampah dengan cara yang berwawasan lingkungan.

- Pasal 19

Pengelolaan sampah rumah tangga dan sampah sejenis sampah rumah tangga terdiri atas:

 - a. Pengurangan sampah; dan
 - b. Penanganan sampah.

- Pasal 20
 - (1) Pengurangan sampah sebagaimana dimaksud dalam pasal Pasal 19 huruf a meliputi kegiatan:
 - a. pembatasan timbulan sampah;
 - b. pendauran ulang sampah; dan/atau
 - c. pemanfaatan kembali sampah.

- Pasal 22
 - (1) Kegiatan penangan sampah sebagaimana dimaksud dalam Pasal 19 huruf b meliputi:
 - a. pemilahan dalam bentuk pengelompokan dan pemisahan sampah sesuai dengan jenis, jumlah, dan/atau sifat sampah;
 - b. pengumpulan dalam bentuk pengambilan dan pemindahan sampah dari sumber sampah ke tempat penampungan sementara atau tempat pengolahan sampah terpadu;
 - c. pengangkutan dalam bentuk membawa sampah dari sumber dan/atau dari tempat penampungan sampah sementara atau dari tempat pengolahan sampah terpadu menuju ke tempat pemrosesan akhir;



- d. pengolahan dalam bentuk mengubah karakteristik komposisi, dan jumlah sampah; dan/atau
- e. pemrosesan akhir sampah dalam bentuk pengembalian sampah dan/atau residu hasil pengolahan sebelumnya ke media lingkungan secara aman.

7.3 Regulation Regarding Groundwater Management

Regional Regulation of the Province of East Nusa Tenggara No. 11 of 2018 on Groundwater Management.

Paragraf 5, Pengembangan, Pasal 29

- (1) Pengembangan Air Tanah dilakukan pada cekungan Air Tanah yang terintegrasi dengan air permukaan pada wilayah sungai.
- (2) Pengembangan air tanah diutamakan untuk memenuhi kebutuhan pokok sehari-hari dan pertanian rakyat.
- (3) Pengembangan air tanah hanya dapat dilaksanakan selama potensi air tanah masih memungkinkan diambil secara aman serta tidak menimbulkan kerusakan Air Tanah dan lingkungan hidup.
- (4) Pengembangan Air Tanah diselenggarakan berdasarkan rencana pengelolaan Air Tanah dan rencana tata ruang wilayah.
- (5) Pengembangan Air Tanah wajib mempertimbangkan:
 - a. daya dukung aquifer terhadap pengambilan Air Tanah;
 - b. kondisi dan lingkungan Air Tanah;
 - c. kawasan lindung Air Tanah;
 - d. proyeksi kebutuhan Air Tanah;
 - e. pemanfaatan Air Tanah yang sudah ada;
 - f. data dan informasi hasil inventarisasi pada cekungan Air Tanah;



- g. ketersediaan air permukaan;
- h. potensi Air Tanah;
- i. fungsi kawasan;
- j. jumlah dan sebaran penduduk; dan
- k. kepentingan masyarakat dan pembangunan.

(6) Pengembangan Air Tanah sebagaimana dimaksud pada ayat (3), dilakukan melalui tahapan kegiatan

- a. survei hidrogeologi;
- b. eksplorasi air tanah melalui penyelidikan geofisika, pengeboran, atau penggalian eksplorasi;
- c. pengeboran atau penggalian eksploitasi;
- d. kajian sosial, ekonomi dan budaya; dan
- e. pembangunan kelengkapan sarana pemanfaatan Air Tanah.

- Pasal 30

- (1) Pengembangan Air Tanah dilakukan setelah melalui konsultasi publik.
- (2) Pengembangan Air Tanah dapat dilakukan secara perorangan, badan usaha dan badan usaha tertentu tanpa merusak keseimbangan lingkungan hidup.



Technical Section

1. Housing Layout



+62 822-5765-8346
+62 878-1469-4015



contact@palaru.com
www.palaru.com



L'Avenue Building,
Jl. Raya Pasar Minggu,
12780

2. Building Permit (Persetujuan Bangunan Gedung)

Each building's retribution price amount (step 6) is determined according to Local Regulation or Peraturan Daerah Kabupaten Sumba Timur No.12 of 2011, Pasal 7 dan 8, regarding certain licensing fees.

(1) Besarnya tarif retribusi untuk bangunan permanen ditetapkan sebesar Rp200,000,-/izin.

The calculation to count building permit (IMB) is:

$$\text{Retribution Fee} = \text{Area of the house} \times \text{TJB} \times \text{TPJ} \times 1\%$$

TJB = Tarif Jenis Bangunan (building type fee)

TPJ = Tingkat Penggunaan Jasa (multiplication of several coefficients)

The calculation for the retribution fee of the building permit is:

$$\text{Area of the house} = 15 \text{ meter} \times 18.7 \text{ meters}$$

$$= 280.5 \text{ m}^2$$

$$\text{TJB} = \text{Rp}200,000,- \text{ (according to Chapter 7)}$$

According to Local Regulation No. 12, Chapter 3, Clause 5 about Building Permit Licence (Retribusi IMB), the coefficients are:

Factor	Coefficient
Building with area < 500 M ²	2.50
1 floor building	1.00
Residential building	1.00



$$\begin{aligned}
 \text{TPJ} &= 2.50 \times 1.00 \times 1.00 \\
 &= 2.50
 \end{aligned}$$

The total is:

$$\begin{aligned}
 \text{Retribution Fee} &= \text{Area of the house} \times \text{TJB} \times \text{TPJ} \times 1\% \\
 &= 280.5 \times \text{Rp}200,000 \times 2.50 \times 0.01 \\
 &= \text{Rp}1,402,500,-
 \end{aligned}$$

Required documents for a building permit:

1. Copy of identity card (KTP)
2. Copy of TIN (Taxpayer Identification Number) or NPWP
3. Copy of SPPT and Proof of Payment of Land and Building Tax (PBB)
4. Copy of land certificate
5. Power of Attorney (if the management of the IMB is transferred to another party)
6. Declaration of land ownership.

Below is the Standard Operating Procedure (SOP) for Building Permits.
The process will take around 30 days after all the documents are complete.



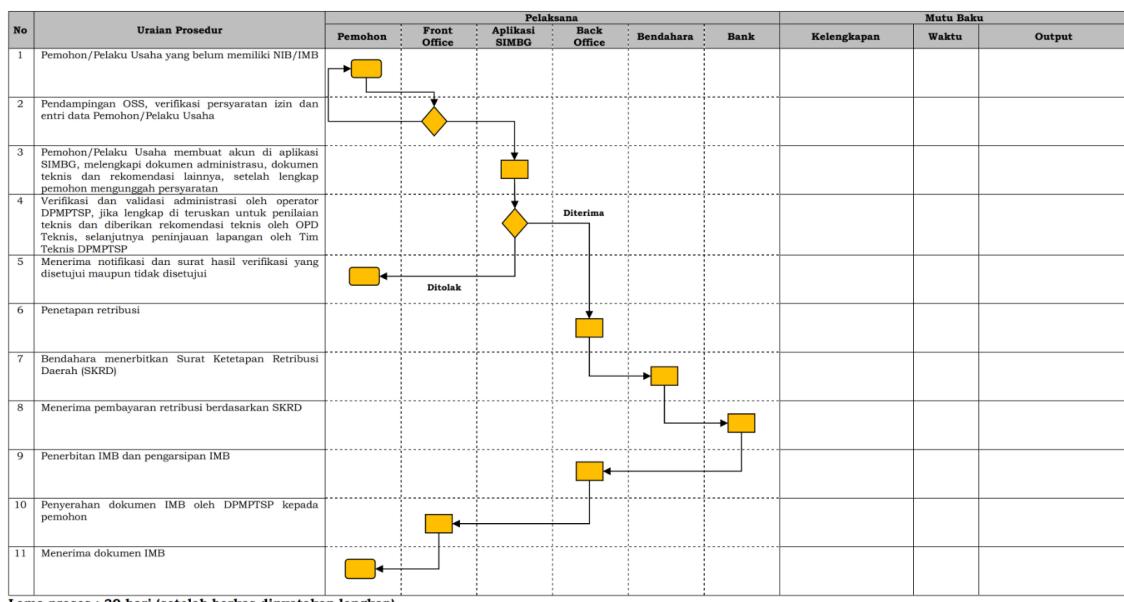
+62 822-5765-8346
+62 878-1469-4015



contact@palaru.com
www.palaru.com



L'Avenue Building,
Jl. Raya Pasar Minggu,
12780

SOP PELAYANAN IZIN MENDIRIKAN BANGUNAN (IMB)

Source: DPMPTSP West Sumba Region

3. State-of-the-Art Review

An Eco-Smart House is a sustainable and energy-efficient residence designed to minimize its environmental impact while providing a suitable living space for its occupants. These homes are outfitted with cutting-edge technologies and systems that permit the efficient use of energy, water, and other resources, thereby reducing costs and waste. In this evaluation, we will examine the current state of Eco-Smart House design, focusing on the most innovative and effective features of these homes.

In PT PALARU, we use "SMART" home technology which is environmentally friendly and energy efficient. Some of the technologies used by PT PALARU in carrying out this project are smart home system, home monitor, smart bulb, Wi-Fi network, geothermal heat pump system, air quality control, and many more. Each of these technologies fulfills the need for a sustainable eco-friendly smart home that includes solar (hybrid) power systems, waste management systems, water treatment systems, and noise management systems.



+62 822-5765-8346
+62 878-1469-4015



contact@palaru.com
www.palaru.com



L'Avenue Building,
Jl. Raya Pasar Minggu,
12780

1. Samsung SmartThings (Smart Home System)



Figure: Samsung SmartThings features ("One Simple")

Samsung SmartThings, a popular and effective home automation system, is the best option for householders who wish to construct an eco-friendly and environmentally friendly home. The system provides households in Waingapu, Sumba, Indonesia with an easy-to-use and sustainable option for reducing their environmental impact and saving money on their electricity bills, thanks to its extensive selection of compatible devices and automated protocols. Because of its adaptability, interoperability, and automated routines, the system offers a sustainable, user-friendly solution for reducing energy consumption and saving money on electricity bills. Their device features that can be monitored via mobile devices include air conditioners, speakers, culinary appliances, washers, televisions, thermostats, CCTV, home garages, and other Samsung products that can be installed and programmed via the app.

In Indonesia, the market for smart home systems is anticipated to grow significantly over the next few years, as an increasing number of homeowners seek eco-friendly and energy-efficient methods to power their homes ("SmartThings"). Samsung SmartThings will assist in meeting this need due to its compatibility with a variety of smart devices, including smart lighting, thermostats, and energy-efficient appliances.



1.1 Samsung SmartThings Home Monitor

The Samsung SmartThings Home Monitor is an intelligent security device that enables homeowners to monitor and control their homes via smartphones and tablets. Users of the Home Monitor can view live footage from their cameras to view what is happening in real time and receive alerts and messages when any activity, such as motion or movement, is detected.

The Samsung SmartThings Home Monitor is suitable for an eco-friendly home in Waingapu, Sumba, Indonesia because it provides a simple and effective method for monitoring and securing a home's premises. Homeowners may feel more at ease knowing that their residence is secure and that they can respond quickly to any potential threats, thereby safeguarding their family and property.

1.2 Samsung SmartThings Cam



Figure: Samsung SmartThings Camera ("One Simple")

Customers can remotely access and manage their home security system with the Samsung SmartThings Camera by using the SmartThings app. The two variations of the SmartThings Camera are the indoor and exterior cameras. Both cameras have a video resolution of 1080p HD, motion detection, and night vision.

In an eco-friendly home in Waingapu, Sumba, Indonesia, the SmartThings Camera may be beneficial for enhancing home security and monitoring energy consumption. SmartThings app users can receive real-time alerts on their smartphones or tablets when motion is detected in or around their homes, allowing them to respond



appropriately. Regardless of the lighting conditions, the camera's night vision feature allows for continuous surveillance. The SmartThings Camera is an environmentally responsible option for homes due to its energy-efficient design, which also reduces its environmental impact.

1.3 Samsung SmartThings Smart Bulb



Figure: Samsung SmartThings Smart Bulb ("One Simple")

Samsung SmartThings offers a variety of connected bulbs that can be controlled via voice commands or the app. These lights are energy-efficient and can be programmed to turn on and off based on schedules or when a person enters or exits a room. In addition, they offer a range of color options, allowing homeowners to create distinct moods and ambiances in their residences.

The home automation system for an eco-friendly home in Waingapu, Sumba, Indonesia, can benefit greatly from the inclusion of these smart lights. These bulbs use energy-efficient LED technology, which can aid in lowering energy use and electricity costs. Furthermore, because they can be operated remotely, homeowners may switch off lights when they're not in use, even if they forget to do



+62 822-5765-8346
+62 878-1469-4015



contact@palaru.com
www.palaru.com



L'Avenue Building,
Jl. Raya Pasar Minggu,
12780

so before leaving the house. Also, this can lower prices and conserve energy.

1.4 Samsung SmartThings mesh Wi-fi Network



Figure: Samsung SmartThings 3-pack mesh Wi-fi Network (“One Simple”)

The mesh Wi-Fi network from Samsung SmartThings is a strong and dependable way to maximize Wi-Fi coverage across your house. You can guarantee that your devices remain connected even in places with poor Wi-Fi signal strength by using a mesh network. With several access points working together to offer a seamless Wi-Fi experience, the SmartThings Wi-Fi system enables you to build up a network that spans your whole house.

Since it can deliver reliable and steady connectivity in an area with varied topography and difficult surroundings, the SmartThings Wi-Fi system is especially well suited for Waingapu, Sumba, Indonesia. Mesh networks are perfect for smart homes with many connected devices since they can manage many devices and huge data flows. The SmartThings Wi-Fi system is eco-friendly and energy-efficient, assisting you in lowering your energy usage and carbon impact. The SmartThings app, which includes a variety of tools for monitoring and controlling your network, makes it simple to set up and operate the system.

1.5 Samsung SmartThings Outlet

With the Samsung SmartThings Outlet, you can use the SmartThings app to remotely control your electrical appliances. It may transform your standard household appliances into smart appliances, giving you easy and effective control over them.



+62 822-5765-8346
+62 878-1469-4015



contact@palaru.com
www.palaru.com



L’Avenue Building,
Jl. Raya Pasar Minggu,
12780

The SmartThings Outlet may be a brilliant addition to the smart home system in an eco-friendly home in Waingapu, Sumba, Indonesia. You may save money on your power bill and minimize energy consumption by automating the use of electrical appliances. For instance, you may program your devices to turn on and off at predetermined intervals or to remotely switch them off while not in use. The SmartThings Outlet can also track your devices' energy usage, providing you information about your usage trends and assisting you in making energy-saving decisions.

When the solar panels are installed, you can use Samsung SmartThings to reduce your energy use by programming routines to switch on appliances when there is an abundance of solar energy and turn them off when there is a shortage. By doing this, you can use solar energy more effectively and rely less on the grid.

2. Eco-Friendly Features

Eco-friendly appliances are a key feature of eco-friendly houses. They are designed to use less energy and resources than traditional appliances, helping homeowners to reduce their environmental impact and save money on their utility bills. They can benefit homeowners in minimizing their negative environmental effects and save money on their electricity costs. Homeowners may have a significant influence on the environment and take advantage of the newest appliance technology by purchasing eco-friendly equipment.



+62 822-5765-8346
+62 878-1469-4015



contact@palaru.com
www.palaru.com



L'Avenue Building,
Jl. Raya Pasar Minggu,
12780

2.1 Monocrystalline Solar Panels



Figure: Monocrystalline Solar Panels outlined by Redarc

Monocrystalline solar panels are made out of a single crystal of high-grade silicon, giving them a more uniform look and a greater efficiency rate than other forms of solar panels. They are popular for home and commercial solar systems due to their durability, efficiency, and endurance as a hybrid electricity source.

Due to its consistent composition and structure, monocrystalline solar panels have a high efficiency. This ensures they can produce more power per unit area of the solar panel, making them a more cost-effective solution over time (Sulaiman et al. 1280). Moreover, monocrystalline solar panels have a longer lifespan than other types of solar panels, making them a more cost-effective solution over time. Their tolerance for high temperatures and low light conditions, which are typical in Waingapu, Sumba, Indonesia, is an advantage, especially that their areas are marsh and narrow. Monocrystalline solar panels convert sunlight into energy more efficiently at high temperatures, and they also perform better than other types of solar panels in low light conditions, such as overcast days or rainstorms.



+62 822-5765-8346
+62 878-1469-4015



contact@palaru.com
www.palaru.com



L'Avenue Building,
Jl. Raya Pasar Minggu,
12780

They are also extremely resilient, effective, and ideal for hot climates and dim lighting. According to a study done in Malaysia, monocrystalline solar panels produce more energy and operate better in low light than polycrystalline solar panels (Othman et al. 8). Therefore, monocrystalline solar panels would be the ideal choice since they are very efficient and outperform other types of solar panels in hot and dim environments.

2.2 Low-flow Water Fixtures



Figure: A shower with low-flow fixture (“Be Water Smart”)

Low-flow water fixtures are plumbing fixtures like showerheads, toilets, and faucets that consume less water while delivering the very same degree of performance and comfort as regular fixtures. They assist to preserve water and energy while saving households money on their utility costs. Homeowners are capable of reducing their water use, save their utility costs, and contribute to the preservation of the local water supply by installing low-flow fixtures like showerheads, toilets, and faucets in an eco-friendly home. Using low-flow fixtures is crucial in locations like Waingapu where water supplies may be scarce. These may help households save money on their water bills, and many local utilities will give incentives for the installation of low-flow faucets. According to the Environmental Protection Agency (EPA), low-flow water fixtures may cut water use by up to 50%, as for example low-flow toilets use just 1.6 gallons every flush compared to standard toilets that can use up to 6 gallons per flush. By using less water, households may also reduce their energy usage, which can help lower the emissions of greenhouse gasses from energy production.



2.3 HEPA filter (Air Quality Control)



Figure: Samsung HEPA Filter ("One Simple")

Controlling air quality is critical for anybody trying to create an eco-friendly house in Waingapu, Sumba, Indonesia. Using a high-efficiency particulate air (HEPA) filter is one effective technique to enhance indoor air quality. HEPA filters can aid in the removal of dangerous airborne particles such as dust, pollen, and smoke. These filters are designed to trap 99.97% of particles with a diameter of 0.3 microns or more, making them an excellent tool for improving indoor air quality (Sandle).

Indoor air pollution may be harmful to one's health, especially if one has respiratory disorders such as asthma or allergies. In regions where there may be outside air pollution, such as Waingapu, installing an effective air filtration system may help limit exposure to dangerous particles and improve overall indoor air quality. The Samsung HEPA filters in particular are low-maintenance and use little energy, therefore making it a green solution for air quality control in Waingapu, where outdoor air pollution can be an issue.



+62 822-5765-8346
+62 878-1469-4015



contact@palaru.com
www.palaru.com



L'Avenue Building,
Jl. Raya Pasar Minggu,
12780

2.4 Noise Management System



Figure: Noise Management System Materials

Noise management system refers to the use of various techniques and technologies to control or reduce noise pollution in a given environment. These techniques can include the use of sound-absorbing materials, noise barriers, acoustic insulation, and other measures to minimize the impact of noise on human health and well-being (Loucks 755). The main goal of a noise management system is to create a more comfortable and safe environment for individuals who may be affected by excessive noise levels. Noise pollution is a major issue that affects the quality of life in urban areas, especially in islands located in cities such as Waingapu, where the rains and waves are louder than they are in other regions of Indonesia. To address this issue, a variety of noise management systems have been developed. Among these systems, the use of double-glazed windows, double-pane windows, and cellular concrete bricks have been identified as highly effective materials for noise reduction.

Double-glazed windows consist of two panes of glass separated by an air gap. This gap acts as an insulator, reducing the amount of noise that can penetrate the window. The use of laminated glass in double-glazed windows can also provide additional noise reduction benefits. Double-pane windows are similar to double-glazed windows but are designed to be more effective at reducing noise. These



windows consist of two panes of glass with a layer of air or gas between them. The air or gas layer provides additional insulation, reducing noise transmission. Cellular concrete bricks are another effective material for noise management. These bricks are made by mixing cement, water, and a foaming agent to create a lightweight, cellular material. The air pockets in the cellular material act as an insulator, reducing noise transmission.

The implementation of these materials in a noise management system can significantly improve the acoustic performance of a building. The use of double-glazed windows, double-pane windows, and cellular concrete bricks can reduce noise levels by up to 50%, providing a quieter and more comfortable living or working environment.

2.5 Greywater + Blackwater Septic tank (Waste Management)

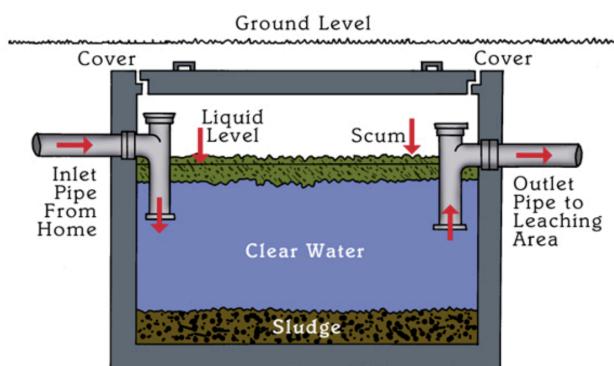


Figure: Septic Tank (News)

The Septic Tank treats blackwater and greywater using a combination of biological and mechanical filtration to make it suitable for reuse (Yoonus). After that, the treated water can be utilized for non-potable uses such as watering the garden or flushing toilets. Greywater is wastewater from sources such as sinks, washing machines, and showers whereas Blackwater is wastewater from feces sources secreted from toilets and oftentimes the bathtubs. This sort of waste management system is constructed to clean and reuse respectively and separately greywater and blackwater for uses such as watering plants and flushing toilets.



Because of its ease of installation and maintenance, as well as its low energy usage, the septic tank in particular is an ideal Wastewater Management Appliance for Waingapu. It is also tiny and can fit into small locations, making it suitable for eco-friendly houses with limited space.

2.6 CSun-Mar Compact Self-Contained Composting Toilet (Waste Management)



Figure: CSun-Mar Compact Self-Contained Composting Toilet ("Excel")

The CSun-Mar Compact Self-Contained Composting Toilet is an abrasive approach to environmentally responsible waste management. This composting toilet system is ideal for off-the-grid households like those in Waingapu, Sumba, Indonesia since it is made to function without any water or power.

As the CSun-Mar toilet is a self-contained device, there is no need to connect it to the sewage system. Instead, it separates the liquid and solid waste, and then turns the solid waste into a secure, nutrient-rich fertilizer through a natural composting process. Separate treatment is given to liquid waste, and any extra water is evaporated (Anand and Apul 330 - 332). It is indeed simple to install and maintain the CSun-Mar Compact Self-Contained Composting Toilet. Depending on usage, it only has to be emptied once or twice a year and requires minimum care. The unit's tiny size makes it a fantastic choice for houses with smaller bathrooms or for those with restricted bathroom space.



+62 822-5765-8346
+62 878-1469-4015



contact@palaru.com
www.palaru.com



L'Avenue Building,
Jl. Raya Pasar Minggu,
12780

The CSun-Mar composting toilet has environmental advantages, but it may also save households money on water bills and lessen the need for septic pumping services. It is a viable and economical method of handling human waste.

2.7 Rainwater Harvesting System (Water Treatment)

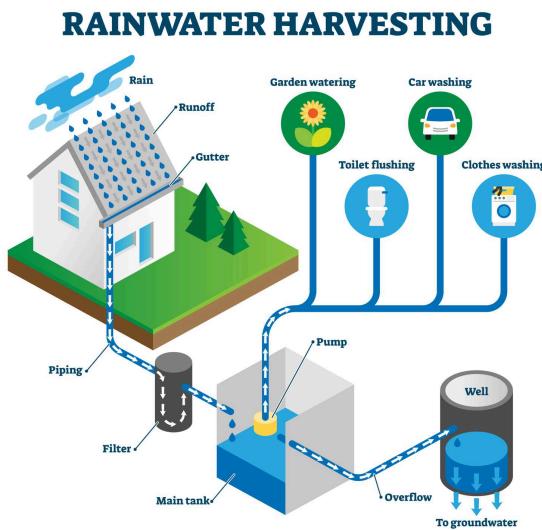


Figure: Rainwater Harvesting System from roof pipe (Vartan)

A rainwater harvesting system is a type of water management system that gathers and stores rainfall for later use. This technique has grown in popularity in recent years as people have become more concerned about water shortages and the necessity for long-term water management. Non-potable uses for rainwater collection systems include watering plants, washing clothing, and flushing toilets. It can also lower the demand for treated water and the discharge of stormwater runoff.

In Waingapu, Sumba, Indonesia, installing a rainwater harvesting system in an eco-friendly home will be an effective method to preserve water and ease the burden on the water treatment infrastructure already in place. Rainwater collection, according to Zhou et al. (103), can aid in the management of rural water resources and minimize reliance on groundwater sources. Waingapu lies on Sumba Island, which has a semi-arid environment and a distinct dry season,



making water supply a major problem. A sizable volume of water will have been gathered during the rainy season and as a result, there will be less reliance on groundwater resources, and the home's water supply will be sustainable.

4. Technical background

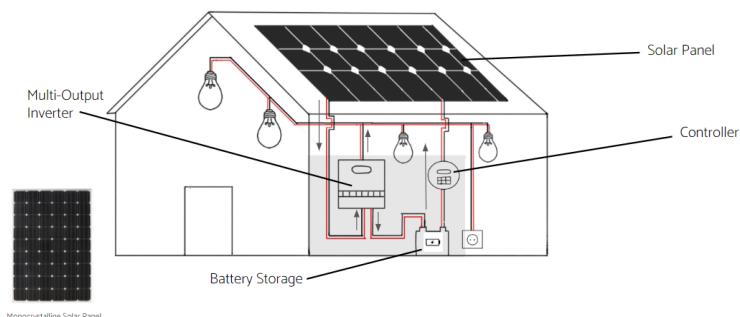
1. Samsung SmartThings Appliances

The Samsung SmartThings is a smart home application that provides homeowner comfort and easy access to automation.

Regardless of any brand name, the Samsung SmartThings accepts all smart devices, allowing homeowners to add and control any smart devices in the home. Samsung SmartThings requires homeowners to install SmartThings Hub to utilize the app fully. This hub can be connected to a wide range of devices such as smart locks, cameras, and sensors. The sensors then can be used for leak detectors and motion sensors for automation.

Homeowners can start using the Samsung SmartThings by opening the app and registering the smart devices that are used in smart homes. Add a new device by tapping the + symbol at the upper right corner. There will be options such as "device" to add smart devices, "voice assistant" to help homeowners activate gadgets using voice assistant, "automations" to automate your smart devices such as lighting and AC to turn on/off whenever someone is in the home or outside the home.

2. Off-grid Monocrystalline Solar Panels



+62 822-5765-8346
+62 878-1469-4015



contact@palaru.com
www.palaru.com



L'Avenue Building,
Jl. Raya Pasar Minggu,
12780

Figure: Off-Grid Monocrystalline Solar Panel Plan (Erica)

Solar panels are devices that convert sunlight into electricity, multiple photovoltaic cells that capture the sun's energy and convert alternating current (AC) electricity received from sunlight into direct current (DC) electricity using a wall-mounted multi-output inverter, which can then be used to power the eco-friendly home, and the Samsung SmartThings features applied. Monocrystalline solar panels are therefore made of high-purity silicon that has a uniform and continuous crystal lattice structure, this allows them to be highly efficient at converting sunlight into electricity; and for the case of Sumba, which is surrounded by humid climates, silicon panels make them suitable for converting power and electricity from sunlight into eco-friendly households. They are commonly used in residential and commercial solar power systems due to their high efficiency and sleek appearance.

Apart from being a very eco-friendly, thus, revolutionary source of electricity, the sort of system Palapa Baru's Monocrystalline Solar Panels implements off-grid, therefore requires very minor dependence on a main power source grid such as electric poles, etc. Alternatively, the off-grid monocrystalline solar panel will store and save electricity sources converted and received from the sunlight using a battery placed in the storage room, added with a controller that can help homeowners manage and control how much electricity is used and saved that can suit conditions such as weather conditions, financial conditions, etc. If one implements a simple electricity system to their homes, with Rp. 60.000 they will only receive 100kWA/month, but with the revolutionary Off-grid Monocrystalline Solar Panel, homeowners can receive 280kWA/month under the same price.



3. Low-flow water fixtures

Low-flow water fixtures are essential for reducing water usage in an eco-friendly house. These fixtures are designed to limit the flow of water without compromising performance, saving significant amounts of water in the long run. They can be installed in faucets, showerheads, and toilets, reducing water consumption by up to 50%.

4. HEPA Air Quality Control

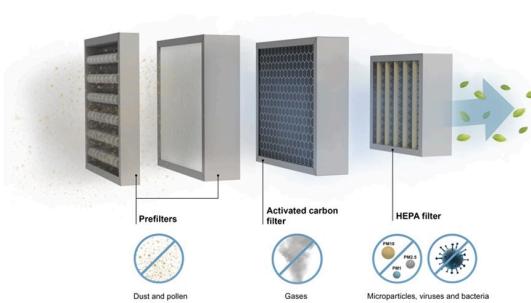


Figure: HEPA Filter Diagram (Erica)

A HEPA filter is an effective way of improving indoor air quality by removing allergens, pollutants, and other harmful particles from the air. This filter can be installed in the HVAC system and can improve overall air quality, reducing the risk of respiratory issues.

The HEPA filter consists of three different layers, first are the prefilters that filter polluted dusts, pollens, and harmful air particles that may endure in the climate and environment of Waingapu, the second are the Activated Carbon filter, which filter harmful thicker and stronger air such as smoke and plasma-related radiation, and the third would be the inner HEPA filter itself which eradicates remaining pollutants, mostly bacteria, into breathable air. Two HEPA filters will be installed in the household, oriented in opposite directions, primarily on the front entrance and backyard walls of the eco-friendly house, to achieve optimal and comprehensive air purification.



5. Noise Management System

A noise management system aims to reduce noise pollution in an environment by using different techniques and technologies such as sound-absorbing materials and noise barriers. The use of double-glazed windows, double-pane windows, and cellular concrete bricks have been found to be effective materials for noise reduction. Double-glazed windows consist of two panes of glass separated by an air gap or laminated glass, which reduces noise transmission. Similarly, double-pane windows have a layer of air or gas between two glass panes to provide additional insulation. Cellular concrete bricks are made by mixing cement, water, and a foaming agent, and the air pockets in the bricks act as an insulator to reduce noise transmission.

6. Waste Management + Treatment

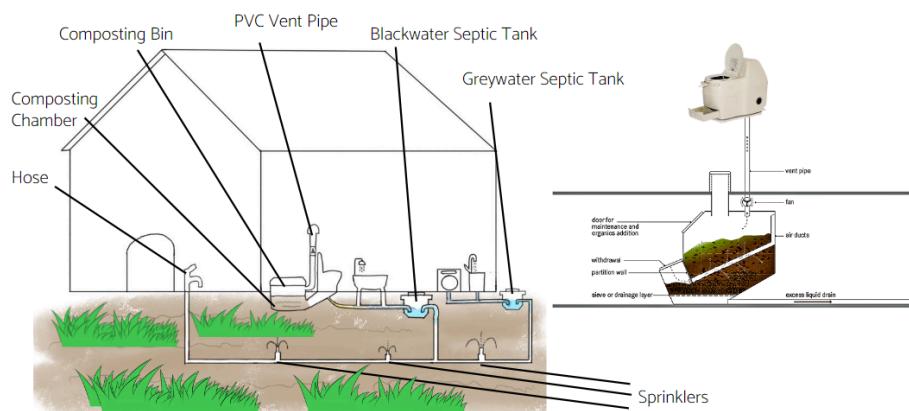


Figure: Waste Management Plan

Palapa Baru's ideal and effective waste management system involves filtrating blackwater and greywater which can be converted into clean water that can be used for hoses and water gardens. Without the Waste Management System, the average household would spend a water usage 20m³/month with a tariff of an estimation of Rp.99000/month spent. However, with this revolutionary Waste Management System, the homeowner will only spend 12m³/month with a tariff estimation of Rp/59400/month, and nonetheless benefit the environment cleanliness



of the house, and use wastewater for the benefit of the garden and other household water activities.

A Decentralized Composting System will be installed to process organic waste, which can then be used as a composted fertilizer for gardening or farming, with the help of the PVC pipe which boosts the composting system and is capable of generating the bacteria needed to boost the compost & harvest higher quality compost. This system can significantly reduce waste generation and promote sustainable gardening practices. Starting from the Composting System, a small inch pipe will be implemented in the bowl of the composting toilet that will transport liquid feces into the blackwater septic tank, while the larger and solid feces will go into the Composting Bin to create compost dirt. On the other hand, wastewater sources from kitchen sinks or washing machines will then be transported into the greywater septic tank. Both of these septic tanks are implemented under the land of the house - whether it will be placed indoors in the storage room or outdoors is upon the decision of the homeowner. The usable water filtered from the septic tanks will then be transported into outdoor uses such as hoses and sprinklers, nevertheless, it is not advisable to use the reusable water for indoor purposes like kitchen sinks or toilets as Palapa Baru's objective is to mitigate the risk of potential hazards for homeowners, and hence the reusable water should be utilized for outdoor applications instead.



+62 822-5765-8346
+62 878-1469-4015



contact@palaru.com
www.palaru.com



L'Avenue Building,
Jl. Raya Pasar Minggu,
12780

7. Water Treatment

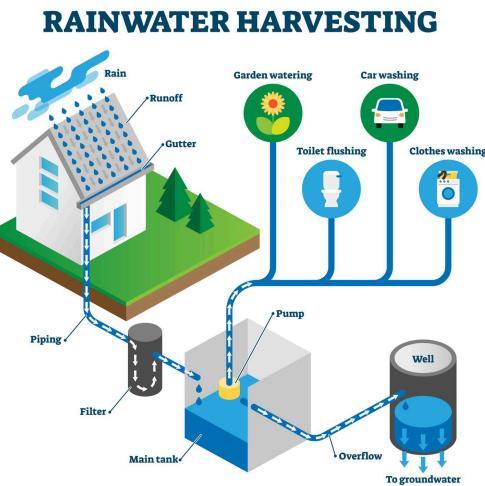


Figure: Rainwater Harvesting System from roof pipe (Vartan)

The Rainwater Harvesting System can be installed to collect rainwater for use in irrigation, flushing toilets, and other non-potable uses. This system can significantly reduce dependence on municipal water sources and promote sustainable water usage practices. With this harvesting system, homeowners can save and receive an extra 40% more water every month than the average household without the harvesting system.

The rainwater is first collected from the rooftops using runoff roofs. The rooftops are designed in such a way that the rainwater flows into the gutter. The gutters are then connected to the downspouts, which direct the water to the filter installed at the ground level. The filter is a crucial component of the rainwater harvesting system as it removes debris, sediment, and other contaminants from the water before it enters the storage tank. The filter can be made of various materials such as sand, gravel, and activated carbon. The size and type of filter used will depend on the size of the system and the quality of the water. Once the rainwater passes through the filter, it is collected in a storage tank. The tank can be made of various materials such as plastic, fiberglass, or concrete. The size of the tank will depend on the amount of rainwater that can be harvested and the intended use of the water.



The tank is also equipped with a pump that can be used to distribute the water to different parts of the household for various uses such as washing clothes, flushing toilets, and bathing. In addition to household use, rainwater can also be used for gardening and external watering. For this purpose, a well can be dug in the ground and connected to the storage tank. The well can be used to irrigate the garden and water plants in the yard.

5. Project description

5.1 Short Summary

Indonesia is experiencing the growth of green buildings. This effort is a form of commitment from the Paris Agreement in which Indonesia has two targets to reduce world gas emissions, namely unconditional reduction and conditional reduction. In terms of unconditional reduction, according to the Danish Energy Agency, Indonesia has voluntarily pledged to reduce 29% of its greenhouse gas emissions relative to the business as usual scenario by 2030 (11). In the meantime, under conditional reduction, Indonesia could increase its emission reduction contribution by up to 41 percent by 2030, contingent upon the availability of international support for finance, technology transfer and development, and capacity building (Danish Energy Agency, 11).

To achieve this target, PT PALARU seeks to contribute to the development of eco-smart houses in all parts of Indonesia. On this occasion, we took on the eco smart house project in East Nusa Tenggara. The proposed project will be implemented in Kota Waingapu, a quaint and underdeveloped island city situated on the northeastern shore of the Sumba Islands in East Nusa Tenggara, Indonesia. With a current estimated population of 39,690 and a population density of approximately 537.80 people per square kilometer, Waingapu presents an ideal location for the proposed project.



5.2 Eco-Smart House Analysis

It is expected that by 2050, households will be the greatest electricity consumers as its demand for electricity rises. Therefore, it is necessary to make residences more energy-efficient and sustainable. The newest iteration of eco-friendly smart home technology has the potential to maximize homeowners' energy savings. By incorporating these cutting-edge technologies, we can construct smarter, more energy-efficient, and environmentally-friendly homes, and thus contribute to a greener future.

PT PALARU has performed a thorough SWOT analysis of the Eco Smart House implementation in Indonesia, concentrating on the Waingapu region. This assessment evaluates the project's Strengths, Weaknesses, Opportunities, and Threats. The following is a summary of an Eco Smart House SWOT analysis.

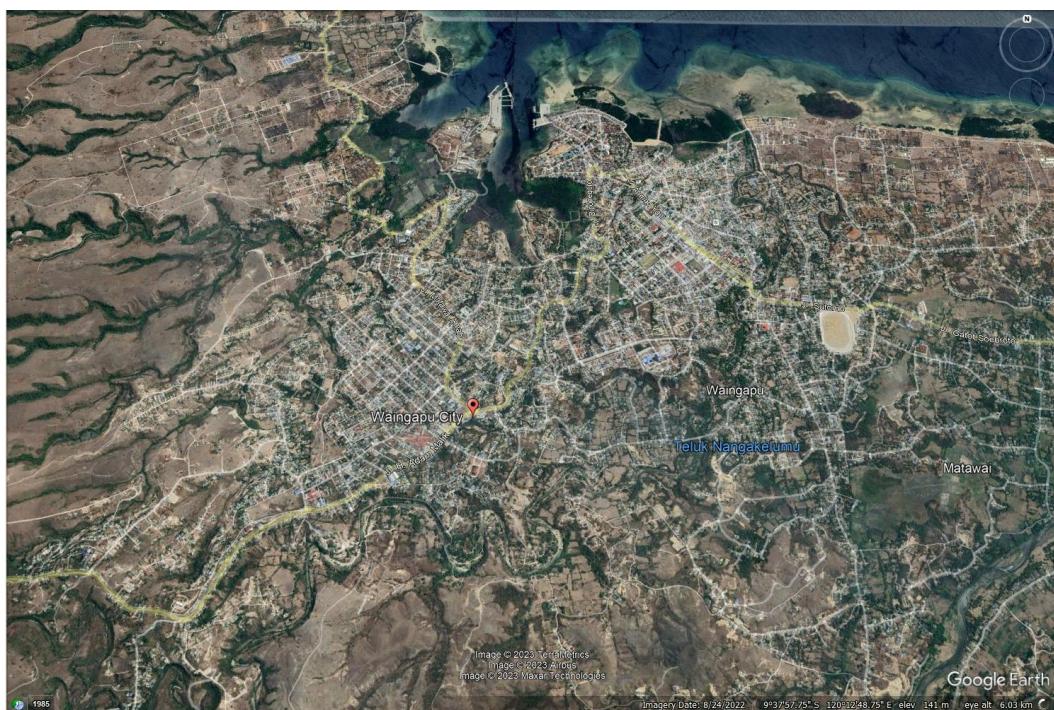
Strengths	Weaknesses
<ul style="list-style-type: none"> utilize recycled and non-toxic building materials, energy-efficient equipment, and renewable energy sources. can significantly reduce electric bills and other utility expenses. can be constructed to withstand natural disasters such as typhoons and earthquakes, assuring the inhabitants' safety. 	<ul style="list-style-type: none"> smart home devices are susceptible to assaults due to their special-purpose nature. the initial cost of building an eco-smart home may be higher. some individuals may find eco-smart dwellings' advanced technology difficult to operate and maintain.
Opportunities	Threats
<ul style="list-style-type: none"> the demand for eco-smart houses in Indonesia, specifically in <u>Jabodetabek</u> and Bali regions, is high and is expected to increase by up to 31% between 2019-2025. rapid technological advances in green technology can reduce the cost of building eco-smart homes and enhance their functionality and efficacy. effective government regulation and economic incentives 	<ul style="list-style-type: none"> lack of knowledge and awareness of current and potential benefits. building regulations and codes may not support eco-friendly homes.

Figure 4.2 SWOT Analysis of Eco Smart House



5.3 Location Analysis

Waingapu, located on the northeastern coast of the Sumba Islands, East Nusa Tenggara, has been chosen as the location for the Eco Smart House project initiative by PT PALARU. Kota Waingapu has a population of 39,690 individuals as of 2021. The area is home to a significant number of sailors and fishermen. This region is predicted to have a population density of approximately 537.80 people/km². Therefore, there is still an abundance of land in the region that can be utilized for the PT PALARU Eco Smart House project, making it simpler to pinpoint the ideal location. Here is the location chosen for the construction of the Eco-Smart home.



PT PALARU chose the location based on the results of the location SWOT analysis conducted.



+62 822-5765-8346
+62 878-1469-4015



contact@palaru.com
www.palaru.com



L'Avenue Building,
Jl. Raya Pasar Minggu,
12780

Strengths	Weaknesses
<ul style="list-style-type: none"> Strategic location and well-connected transportation network. Proper educational institutions until higher education level. Abundant natural resources that support tourism and agriculture with diverse and unique cultural heritage, scenic landscape, and fertile agricultural land. 	<ul style="list-style-type: none"> Infrastructure development is limited with poor road and transportation networks and limited access to basic services. Lack of skilled workforce and trained professionals that presents a challenge for attracting investment and maintaining high-quality standards.
Opportunities	Threats
<ul style="list-style-type: none"> The region's unique cultural heritage and diverse tourist attractions after significant potential for the tourism industry to grow and contribute to the local economy. Geographically consists of coastal area, hills, and savanna that can provide sun and wind for developing renewable energy sources. 	<ul style="list-style-type: none"> High cases of earthquake and typhoon that can disrupt the local economy and damage infrastructure, presenting a challenge for sustainable development. High level humidity that can degrade the quality of the house and affect the population's health over time.

Figure 4.3 SWOT Analysis of Waingapu

Concerning the economy of Waingapu, the ministry of maritime affairs and fisheries reports that over 70% of the population is involved in coastal activities and employment, with 109,416 productive workers holding permanent positions. According to BPS data, Kota Waingapu experienced a monthly inflation rate of 1.16 percent in January 2023, as measured by the Consumer Price Index (CPI) of 122.44. Increase economic opportunities that are capable of continued expansion.

Moreover, there are 49 educational institutions in Waingapu, according to data provided by Badan Pusat Statistik Sumba Timur, based on the total population of the region. It has been determined that Matawai and Hambala have convenient access to education.



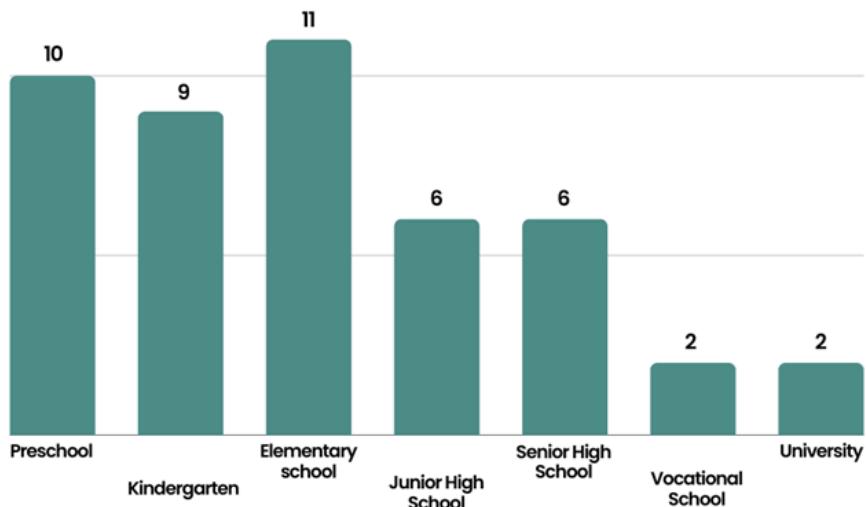


Figure 4.4 Educational Institutions in Waingapu

In conclusion, PT Palaru desires to contribute to the reduction of global greenhouse gas emissions, particularly in Indonesia, through the development of the Eco Smart House project. PT Palaru has analyzed the Eco Smart House development and the City of Waingapu as the intended location for the project at this time. As a consequence, Kota Waingapu has numerous advantages that can serve as good fortune and a source of strength for this undertaking. In the meantime, the deficiencies can be resolved by employing eco-friendly and smart technology. By incorporating green technologies and sustainable practices, it can promote energy efficiency, reduce carbon emissions, and mitigate the impact of natural disasters. Overall, an eco-smart house project can contribute to the sustainable development of Waingapu and set an example for other regions facing similar challenges.



6. Schedule of work/timeline

Num	Task	Duration (days)	Start	End
1.	Administrative Work			
1.1	Building permit and administration	25	02/06/2023	10/07/2023
2.	Structural Work			
2.1	Lot clearance	2	11/07/2023	12/07/2023
2.2	Foundation excavation	3	13/07/2023	17/07/2023
2.3	Footings layouting	1	18/07/2023	18/07/2023
2.4	Footings digging and reinforcing installment	1	19/07/2023	19/07/2023
2.5	Footings' concrete pouring	7	20/07/2023	28/07/2023
2.6	Strap beam concrete pouring	5	31/07/2023	04/08/2023
2.7	Columns' concrete pouring	5	07/08/2023	11/08/2023
2.8	Wall framing	1	14/08/2023	14/08/2023
2.9	Wall building	30	15/08/2023	26/09/2023



3	Windows, Doors, Roof and Floor installation			
3.1	Windows & doors installation	2	27/09/2023	29/09/2023
3.2	Beam ring building	7	02/10/2023	10/10/2023
3.3	Roof framing	10	11/10/2023	24/10/2023
3.4	Roof installation	5	25/10/2023	31/10/2023
3.5	Floor installation	14	01/11/2023	20/11/2023
4	Plumbing and Electricity Installation			
4.1	Plumbing installation	7	21/11/2023	29/11/2023
4.2	Water system installation	6	30/11/2023	07/12/2023
4.3	Waste management installation	6	08/12/2023	15/12/2023
4.4	Electricity installation	25	18/12/2023	24/01/2024
5	Painting, Technology Installation and Finishing			
5.1	Painting	7	25/01/2024	02/02/2024
5.2	Finishing	3	05/02/2024	07/02/2024
5.3	Cleaning	3	09/02/2024	13/02/2024



5.4	Smart technology installation	7	14/02/2024	22/02/2024
5.5	Move-in	1	23/02/24	23/02/2024
	Total	183		



+62 822-5765-8346
+62 878-1469-4015



contact@palaru.com
www.palaru.com



L'Avenue Building,
Jl. Raya Pasar Minggu,
12780

Financial Section

1. Budget

No.	Job Description	Amount	Unit	Unit Price	Total Price
1	Administrative Work				
1.1	IMB Application	1	set	Rp 1.402.500	Rp 1.402.500
1.2	PLN Prepaid Electricity Application	1	set	Rp 2.372.200	Rp 2.372.200
1.3	Plumbing Application	1	set	Rp 6.000.000	Rp 6.000.000
	Total				Rp 9.774.700
2	Construction Work				
2.1	Head Builder	181	day	Rp 150.000	Rp 27.150.000
2.2	Lot Clearance	280,5	m ²	Rp 3.500	Rp 981.750
2.3	Lot Excavation	6,75	m ³	Rp 70.000	Rp 472.500
2.4	Foundation	18	point	Rp 150.000	Rp 2.700.000
2.5	Wall Building	185	m ²	Rp 30.000	Rp 5.550.000
2.6	Ceiling Installation	150	m ²	Rp 50.000	Rp 7.500.000
2.7	Roof Installation	193	m ²	Rp 120.000	Rp 23.160.000
2.8	Tile Installation				
2.8.1	40x40 Tile	118	m ²	Rp 30.000	Rp 3.540.000
2.8.2	20x20 Tile	86	m ²	Rp 25.000	Rp 2.150.000
2.8.3	50x50 Tile	19	m ²	Rp 32.500	Rp 617.500
2.9	Painting	621	m ²	Rp 25.000	Rp 15.525.000
2.10	Electricity Installation	15	day	Rp 150.000	Rp 2.250.000
2.11	Plumbing Installation	7	day	Rp 150.000	Rp 1.050.000
2.12	Samsung SmartThings Installation	7	day	Rp 250.000	Rp 1.750.000
2.13	Sewage Installation	6	day	Rp 150.000	Rp 900.000
	Total				Rp 95.296.750
3	Construction Material				
3.1	Foundation	18	point	Rp 192.000	Rp 3.456.000
3.2	Structure				
3.2.1	Strap beam	185	m	Rp 106.000	Rp 19.610.000
3.2.4	Column	2,5	m ³	Rp 4.000.000	Rp 10.000.000
3.2.3	Structural beam	185	m ³	Rp 200.000	Rp 37.000.000
3.3	Sound-Resistant Walls				
3.3.1	Cellular Concrete Brick	555	m ²	Rp 320.000	Rp 177.600.000
3.3.2	40kg Gypsum Mortar Covering	30	pc	Rp 165.000	Rp 4.950.000
3.4	Ceramic runoff roof	193	m ²	Rp 150.000	Rp 28.950.000
3.5	Floor				
3.5.1	40x40 Ceramic Tile	118	m ²	Rp 112.000	Rp 13.216.000
3.5.2	20x20 Ceramic Bathroom Tile	20	m ²	Rp 87.000	Rp 1.740.000
3.5.3	20x20 Ceramic Bathroom Wall Tile	66	m ²	Rp 87.000	Rp 5.742.000
3.5.4	50x50 Ceramic Terrace Floor	19	m ²	Rp 150.500	Rp 2.859.500
3.5.5	Cement	223	m ²	Rp 32.500	Rp 7.247.500
3.6	Paint				
3.6.1	Dulux Exterior Paint	366	m ²	Rp 156.000	Rp 57.096.000
3.6.2	Dulux Interior Paint	255	m ²	Rp 96.000	Rp 24.480.000
3.7	Electricity				
3.7.1	Single Switch	14	pc	Rp 11.600	Rp 162.400
3.7.2	Circuit Breaker	3	pc	Rp 55.000	Rp 165.000
3.8	Bathroom and Plumbing				



3.8.1	Toto Toilet Sink	4	pc	Rp	500.000	Rp	2.000.000
3.8.2	Toto Double-Mode Water Faucet	4	pc	Rp	429.000	Rp	1.716.000
3.8.3	Kitchen Sink Set	1	set	Rp	4.350.000	Rp	4.350.000
3.8.4	Toto Bathtub	2	pc	Rp	9.000.000	Rp	18.000.000
3.8.5	Toto Double-Mode Shower	4	pc	Rp	2.100.000	Rp	8.400.000
3.8.6	Floor Drain	4	pc	Rp	150.000	Rp	600.000
3.8.7	Toto Outdoor Faucet	2	pc	Rp	1.850.000	Rp	3.700.000
3.8.8	Penguin 1000L Water Tank	1	pc	Rp	1.500.000	Rp	1.500.000
3.8.9	Water pipe	220	m	Rp	80.000	Rp	17.600.000
3.9	Accessories						
3.9.1	Solid Wood Door Frame	8	pc	Rp	1.500.000	Rp	12.000.000
3.9.2	Double Solid Wood Door Frame	1	pc	Rp	1.900.000	Rp	1.900.000
3.9.3	Solid Wood Door	10	pc	Rp	2.500.000	Rp	25.000.000
3.9.4	Sliding Door	2	pc	Rp	1.250.000	Rp	2.500.000
3.9.5	Window Frame	8	pc	Rp	1.080.000	Rp	8.640.000
3.9.6	Double-Glazed Windows	8	pc	Rp	1.220.000	Rp	9.760.000
3.9.7	Fence	30	m	Rp	500.000	Rp	15.000.000
3.9.8	10 mm Tempered Glass Canopy	37	m ²	Rp	1.750.000	Rp	64.750.000
	Total					Rp	591.690.400
4	Samsung SmartThings Technologies						
4.1	Philips Smart Bulb	15	pc	Rp	140.000,00	Rp	2.100.000,00
4.2	Smart Cam	6	unit	Rp	1.500.000,00	Rp	9.000.000,00
4.3	Samsung 3-pack mesh Wi-fi Network	1	set	Rp	2.799.000,00	Rp	2.799.000,00
4.4	Samsung Smart Door Lock	1	unit	Rp	9.500.000	Rp	9.500.000
4.5	Garden Sprinkler System	3	set	Rp	250.000	Rp	750.000
	Total					Rp	24.149.000
5	Eco-friendly technology						
5.1	MY SOLAR Monocrystalline Solar Panel						
5.1.1	260 WP Mono Module	4	unit	Rp	2.600.000	Rp	10.400.000
5.1.2	Inverter	1	unit	Rp	4.624.840	Rp	4.624.840
5.1.3	Mount	2	unit	Rp	1.530.000	Rp	3.060.000
5.1.4	Accessories (Cable and Protector)	1	set	Rp	2.040.000	Rp	2.040.000
5.1.5	Delivery & installaltion	1	-	Rp	2.040.000	Rp	2.040.000
5.2	Rainwater Harvesting System						
5.2.1	4" Gutter	100	pc	Rp	62.250	Rp	6.225.000
5.2.2	Harvesting Kits PH-50	1	pc	Rp	220.000	Rp	220.000
5.2.3	Water Pump	1	pc	Rp	634.000	Rp	634.000
5.3	Waste Treatment System						
5.3.1	Biotech Greywater Septic Tank	1	pc	Rp	1.210.000,00	Rp	1.210.000,00
5.3.2	Biotech Blackwater Septic Tank	1	pc	Rp	1.300.000	Rp	1.300.000
5.3.3	CSun-Mar Compact Self-Contained Composting Toilet Composter						
5.3.3.1	Toilet	4	pc	Rp	20.776.400,00	Rp	83.105.600,00
5.3.3.2	Composter Chamber + Bin	3	unit	Rp	1.400.000	Rp	4.200.000
5.3.3.3	PVC Vent Pipe	4	pc	Rp	345.000	Rp	1.380.000
5.4	Geothermal Heat Pump						
5.4.1	Vane Pump	1	pc	Rp	4.000.000	Rp	4.000.000



5.4.2	1800mm Heat Collector Pipe (20 tubes)	1	set	Rp	2.300.000	Rp	2.300.000
5.5	Samsung HEPA Filter	2	pc	Rp	699.000	Rp	1.398.000
	Total					Rp	128.137.440
	Grand Total					Rp	849.048.290

2. Qualifications

Our company is dedicated to sustainable living and minimizing our carbon footprint. Our goal is to create functional, attractive eco-homes with minimal environmental impact. Our team has the skills, experience, and know-how to design and construct smart homes that are both environmentally friendly and technologically advanced.

Our team's qualifications include:

Expertise in sustainable design: We're well-versed in sustainable design principles and practices, such as reducing energy waste, minimizing waste production, and selecting eco-friendly materials. We're skilled in incorporating sustainable features such as green roofs, rainwater collection systems, and solar panels into our designs.

Smart technology proficiency: We stay current with the latest smart home technologies and can seamlessly integrate them into our designs. From security cameras and lighting systems to home automation, we can create connected eco-homes that are also convenient.

Proven project management skills: We've successfully managed numerous complex construction projects. We can coordinate various teams, manage timelines and budgets, and ensure that every aspect of the project is completed to the highest standards.

Extensive experience with eco-friendly building materials: We've worked with a wide range of eco-friendly materials and know the best sustainable, durable, and cost-effective options for each project. We can advise our clients on the best materials to use.



Customer-focused approach: We prioritize our client's needs and work closely with them throughout the design and construction process. We listen carefully to their goals and concerns and aim to exceed their expectations at every project stage.

Our team's experience and qualifications make us uniquely suited to design and construct eco-friendly, technologically advanced smart homes.

3. Conclusion

In conclusion, building a smart eco-home offers numerous benefits. In addition to reducing your environmental footprint, it can also enhance the comfort and convenience of your living space. You can achieve an eco-friendly, technologically advanced home by incorporating sustainable design principles and the latest smart home technologies.

Our team possesses the requisite skills, knowledge, and expertise to create custom eco-homes that cater to your unique requirements and objectives. We prioritize our clients' needs and work closely with them throughout the design and construction process to ensure that every aspect of the project is completed to the highest standards.

If you're looking for an environmentally friendly and innovative home, our team is available to assist you. Contact us now to learn more about our services and how we can assist you in bringing your dream home to life. Together, let's build a better, more sustainable future for all.



+62 822-5765-8346
+62 878-1469-4015



contact@palaru.com
www.palaru.com



L'Avenue Building,
Jl. Raya Pasar Minggu,
12780

Works Cited

Anand, Chirjiv K., and Defne S. Apul. "Composting Toilets as a Sustainable Alternative to Urban Sanitation – A Review." *Waste Management*, vol. 34, no. 2, 2014, pp. 329–343., <https://doi.org/10.1016/j.wasman.2013.10.006>.

Archatrak. "Elevated Green Roof Systems." *Archatrak*, 27 Oct. 2022, <https://www.archatrak.com/green-roof-decks/>.

BeCloud.com. "Biological Filters - Biofilters." *Degremont Suez*, www.suezwaterhandbook.com/processes-and-technologies/biological-processes/attached-growth-processes/biological-filters.

BCDC Relay Kit - REDARC.

<https://www.redarc.com.au/Content/Images/uploaded/Manuals/RK1260%20Instruction%20Sheet.pdf>.

Craven, et al. "Ground-Source Heat Pumps." *Ground-Source Heat Pumps / Building America Solution Center*, <https://basc.pnnl.gov/resource-guides/ground-source-heat-pumps>.

Dayal, A.M. "Environmental Concerns of Shale Gas Production." *Shale Gas*, 2017, pp. 137–144., <https://doi.org/10.1016/B978-0-12-809573-7.00008-1>.

Erica. "Kenali Filter Hepa Yang Jadi FITUR Andalan Pada Air Purifier." *Eraspace*, <https://eraspace.com/artikel/post/kenali-filter-hepa-yang-jadi-fitur-andalan-pada-air-purifier>.

Getter, K. L., & Rowe, D. B. "The role of green roofs in sustainable development." *HortTechnology*, vol. 16, no. 3, 2006, pp. 449–456., <https://doi.org/10.21273/horttech.16.3.0449>.

"Geothermal Heat Pumps." *US Department of Energy*, <http://www.energy.gov/energysaver/heat-and-cool/heat-pump-systems/geothermal-heat-pumps>.



Gubernur Nusa Tenggara Timur. Peraturan Daerah Provinsi Nusa Tenggara Timur Nomor 11 Tahun 2018 tentang Pengelolaan Air Tanah. Pemerintah Provinsi Nusa Tenggara Timur.

Iqbal, Shazia, et al. "Challenges and Opportunities Linked with Waste Management under Global Perspective: A Mini Review." *Journal of Quality Assurance in Agricultural Sciences*, 2021, pp. 9–13.,
<http://dx.doi.org/10.52862/jqaas.2021.1.1.2>.

Kabupaten Sumba Timur. Peraturan Daerah Kabupaten Sumba Timur Nomor 12 Tahun 2010 tentang Rencana Tata Ruang Wilayah Kabupaten Sumba Timur Tahun 2008 - 2028. Pemerintah Kabupaten Sumba Timur.

Li, X., Zhang, X., & Li, S. "Performance evaluation of extensive green roofs for reducing urban heat island effect in a subtropical climate." *Journal of Cleaner Production*, vol. 236, 2019, p. 1176.,
<https://doi.org/10.1016/j.jclepro.2019.117640>.

Loucks, Daniel P., et al. "Environmental Noise Management." *Journal of the Environmental Engineering Division*, American Society of Civil Engineers, Aug. 2020, pp. 753–803, <http://dx.doi.org/10.1002/9781118887417.ch9>

Nest. "Energy Savings with Nest." *Nest*, Nest Labs, Inc.,
<https://nest.com/energy-partners/energy-savings/>.

"One Simple Home System. A World of Possibilities." *SmartThings*,
<https://www.smarthings.com/>.

Othman, Mohd Yusof, et al. "Performance of Monocrystalline and Polycrystalline Silicon Photovoltaic Modules in a Tropical Environment." *International Journal of Photoenergy*, vol. 2017, 2017, pp. 1-9. <https://doi.org/10.1155/2017/5765152>.

Pemerintah Indonesia. Undang-Undang Republik Indonesia Nomor 18 Tahun 2008 tentang Pengelolaan Sampah. Lembaran Negara Republik Indonesia Tahun 2008 Nomor 69, Tambahan Lembaran Republik Indonesia Nomor 4851. Kementerian Hukum dan HAM RI. Jakarta.



Sandle, Tim. "Review of the Efficacy of HEPA Filtered Air to Control Coronavirus Risks in Cleanrooms." *EJPPS EUROPEAN JOURNAL OF PARENTERAL AND PHARMACEUTICAL SCIENCES*, 2020, <https://doi.org/10.37521/25203>.

"SmartThings Introduces 'Smartthings Edge', Allowing for Faster and Easier Home Automations." *SmartThings Blog*, 19 Aug. 2021,
<https://blog.smartthings.com/roundups/smartthings-introduces-smartthings-edgeallowing-for-faster-and-easier-home-automations/>.

Sulaiman, Mohd Yusuf, et al. "The Performance of Monocrystalline, Polycrystalline, and Thin-Film Solar Panels under Different Temperature Ranges in the Malaysian Environment." *Renewable Energy*, vol. 150, pp. 1276-1285.
<https://doi.org/10.1016/j.renene.2019.12.039>

Vartan, Starre. "A Beginner's Guide to Rainwater Harvesting." *Treehugger*, Treehugger, 8 Nov. 2022,
<https://www.treehugger.com/beginners-guide-to-rainwater-harvesting-5089884>.

Yoonus, Hamad, et al. "Environmental Performance of Building Integrated Grey Water Reuse Systems: Life Cycle Assessment Perspective." *World Environmental and Water Resources Congress 2020*, 2020,
<https://doi.org/10.1061/9780784482988.001>.

Zhou, Jingyang, et al. "An Unbalance-Based Evaluation Framework on Urban Resources and Environment Carrying Capacity." *Sustainable Cities and Society*, vol. 72, 2021, p. 103., <https://doi.org/10.1016/j.scs.2021.103019> .

