



ASEAN
DATA SCIENCE
EXPLORERS



WASTE TO WORTH: DRIVING SUSTAINABLE FOOD SYSTEM IN ASEAN COUNTRIES THROUGH FOOD WASTE REDUCTION

DONE BY:

Team Little EinScience

Awang Muhamad Ilyas @Muhamad Alli bin Haji Ismail

Dayang Nur Adila Puteri binti Irwan

BREAKING NEWS

Food Waste and its Links to Greenhouse Gases and Climate Change

Posted by Jean Buzby, USDA Food Loss and Waste Liaison in [Food and Nutrition](#), [Health and Safety](#)
Jan 24, 2022



Support the Guardian

Fund independent journalism with \$5 per month

Support us →

News

Opinion

Sport

Culture

Lifestyle

More ▾

Weatherwatch
Food waste

Jeremy Plester

Sat 4 Sep 2021 06.00 BST



25

How food waste is huge contributor to climate change

Food production, transportation and rotting waste all cause release of greenhouse gases



Food Waste and its Links to Greenhouse

[Print subscriptions](#) | [Sign in](#) | [Search](#)

Support the Guardian

Fund independence

Support us →

News

Weatherwatch
Food waste

Jeremy Plester

Sat 4 Sep 2021 06.00 BST



25

Menu

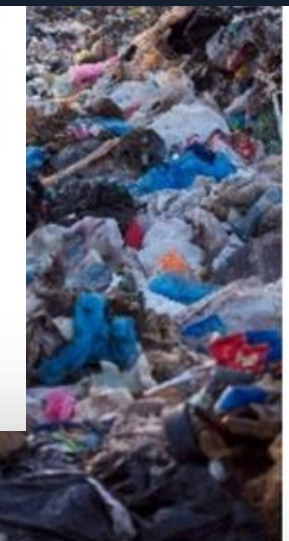


[Full Episodes](#) | [Podcasts](#) | [Newsletters](#) | [Live](#)



Food waste is contributing to climate change. What's being done about it?

Nov 26, 2022 5:30 PM EDT



Food Waste and its Links to Greenhouse

[Print subscriptions](#) [Sign in](#) [Search](#)

Support the Guardian

Fund independence

Support us →

PBSO
NEWS
WEEKEND

Menu



OUR WORK

GET INVOLVED

ABOUT US



DONATE +

ADOPT

News

Weatherwatch
Food waste

Jeremy Plester

Sat 4 Sep 2021 06.00 BST



25

Fight climate change by preventing food waste

A few simple steps could help reduce the environmental impacts of wasted food



THE PROBLEM

Food waste is a prevalent issue in ASEAN countries, primarily stemming from:

- ✚ **Irresponsible Consumption**
- ✚ **Production Practices**

Food waste exacerbates **Pollution Levels** and contributes to the escalation

- ✚ **Climate Change**
- ✚ **Global Warming**

Unsustainable Food System, coupled with Declining Economic Growth and heavy reliance on Non-Renewable Energy Sources, calls for immediate action to reduce food waste in order to support global food security and economic stability while mitigating environmental harm.



AIMS & OBJECTIVES



AIMS

1. To alleviate the SDG 7, SDG8, SDG11, SDG12, SDG13 – the issues related to Food Waste among ASEAN.
2. To increase public awareness about food waste in ASEAN countries through targeted campaigns, workshops, outreach programs, and social media.



GOAL

1. To conduct comprehensive research to identify the causes of food waste in ASEAN countries.
2. To recommend solutions to minimise the issue of food waste.
3. To propose an incentive program to reward and recognise individuals, businesses, and NGOs for their efforts in reducing food waste.

In ASEAN Countries,

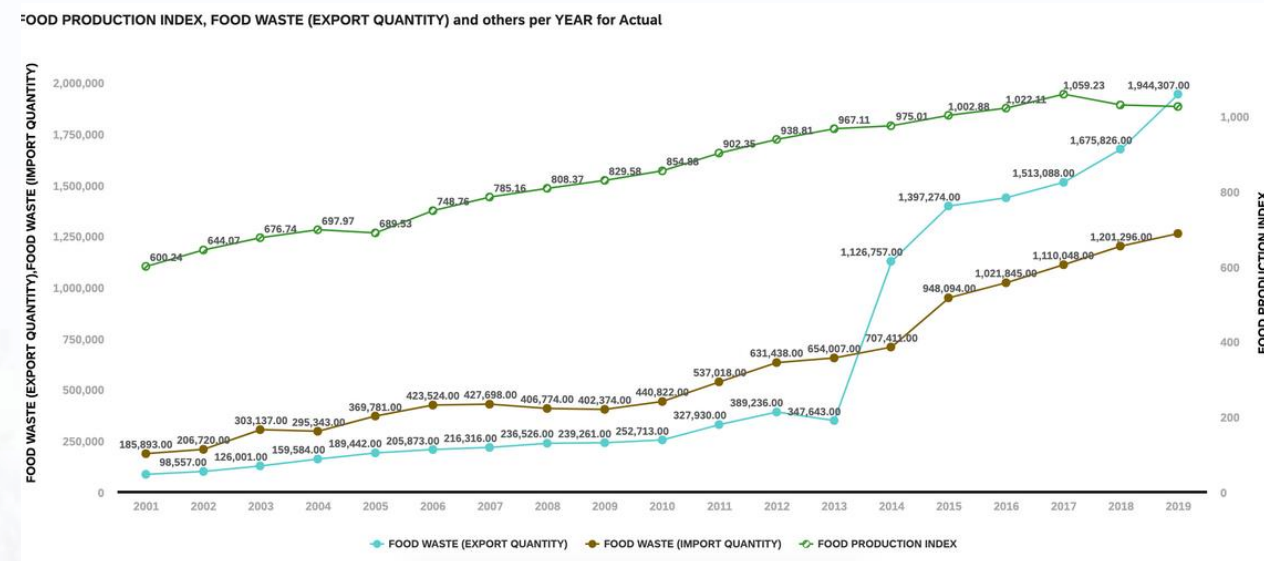
**15.5 million tons of
Food wasted**

**2,431 million tons of oil
as primary energy
consumption**

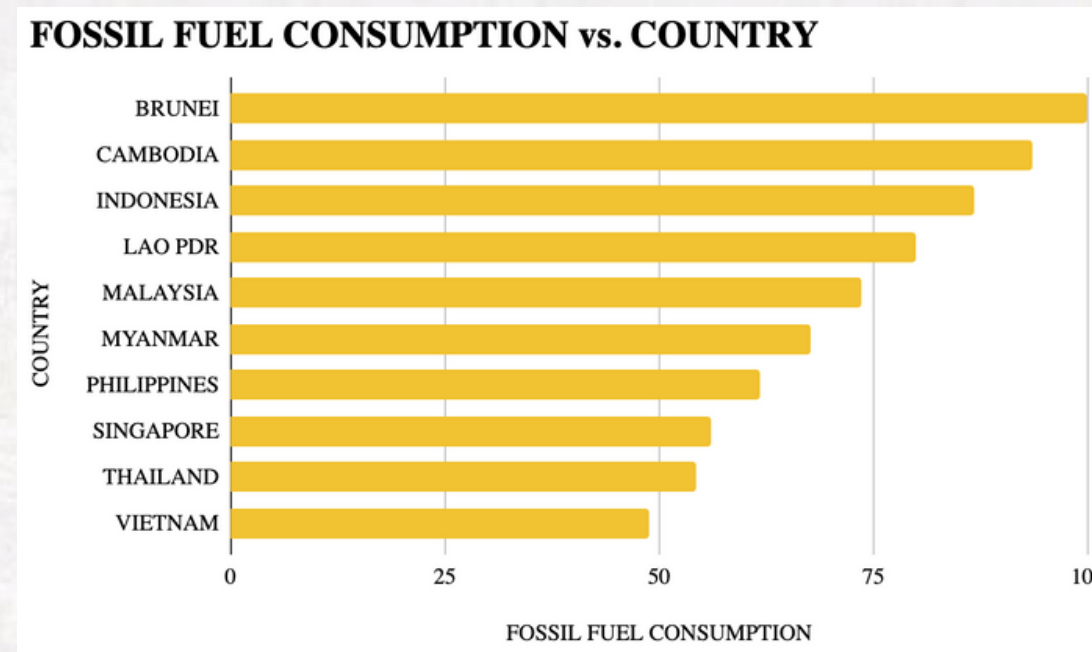
**Temperature increase
by 0.93°C to 2.50°C =
50% decline in rice yield**



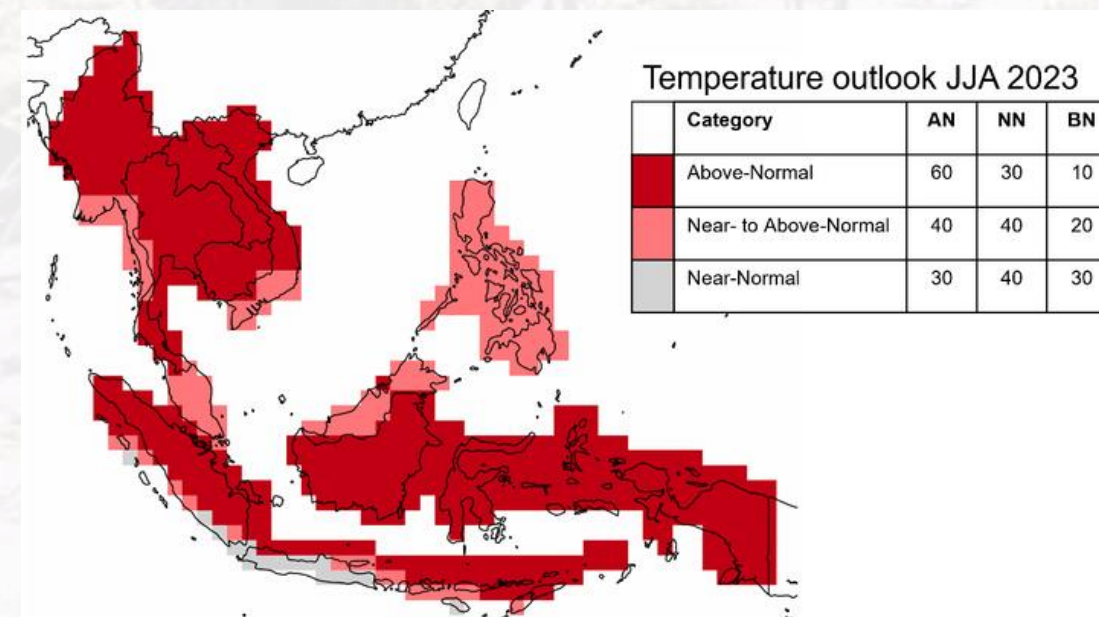
**15.5 million tons of Food
wasted**



**2,431 million tons of
oil as primary energy
consumption**



**Temperature increase by
0.93°C to 2.50°C = 50%
decline in rice yield**



In Brunei Darussalam,

**Municipal solid trash is
36% food waste.**

**The country's overreliance on oil
and gas, which contributed 66.8%
to GDP in 2015, is expected to end
by 2035.**

**Accounts for 55.9% of the
country's GHG emissions.**



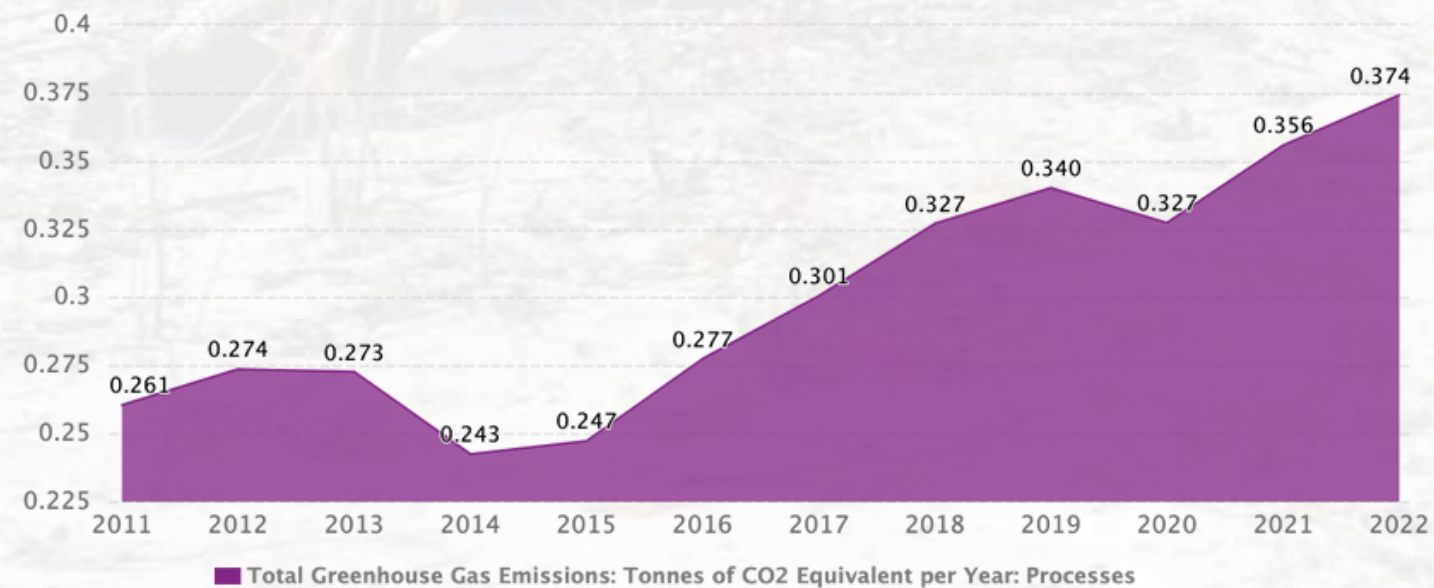
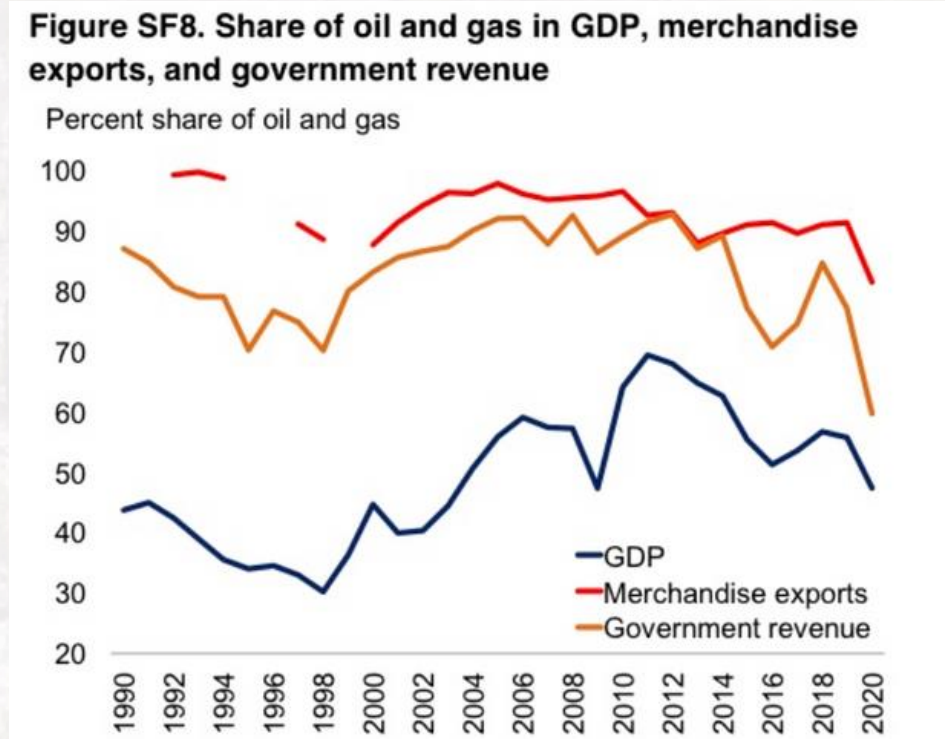
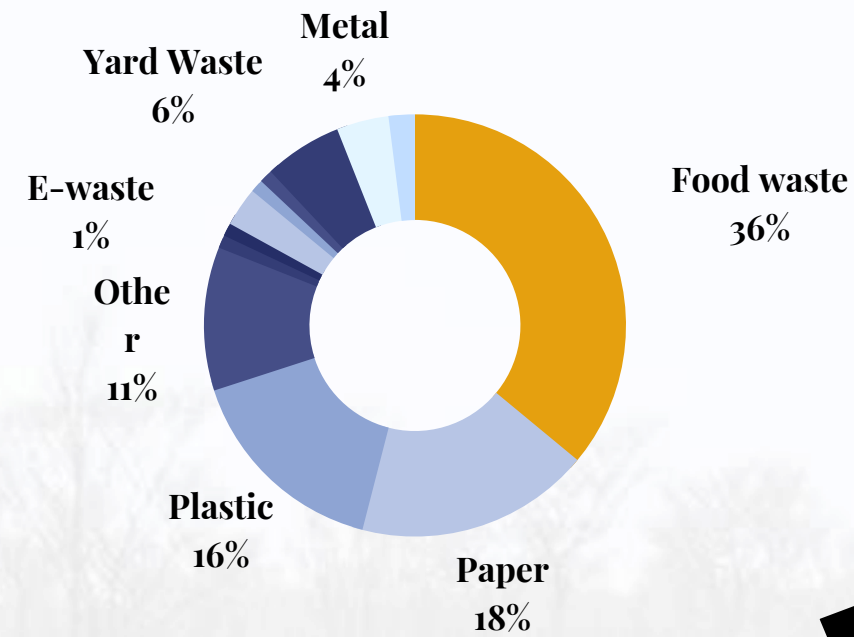
Municipal solid trash is 36% food waste.

Produce **1.4kg** of food waste per person per day

297,218 MT of food waste was produced in 2019.

The country's overreliance on oil and gas, which contributed 66.8% to GDP in 2015, is expected to end by 2035.

Accounts for 55.9% of the country's GHG emissions.

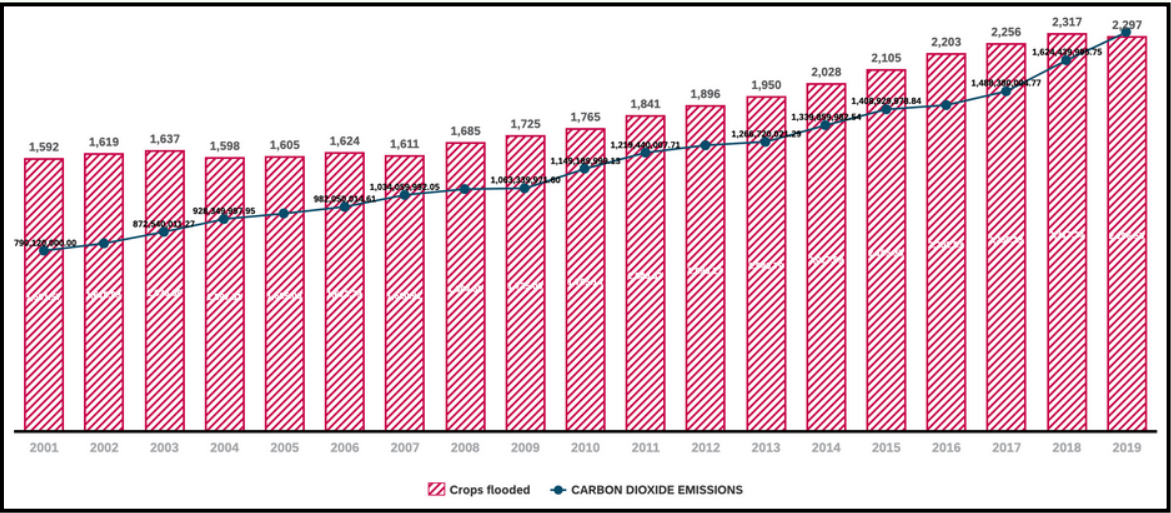


(Brunei Climate Change Secretariat, 2016; BP World Energy Outlook, 2021; ASEAN Centre, 2022; CEIC Data, 2023)

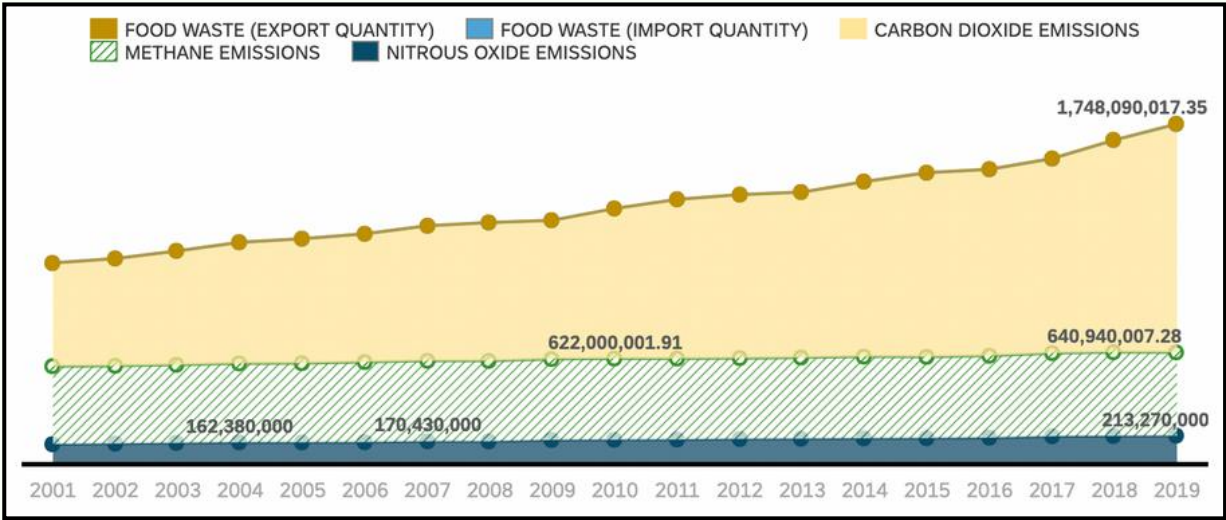
FOOD WASTE & CLIMATE CHANGE

A never-ending loop of environmental impact.

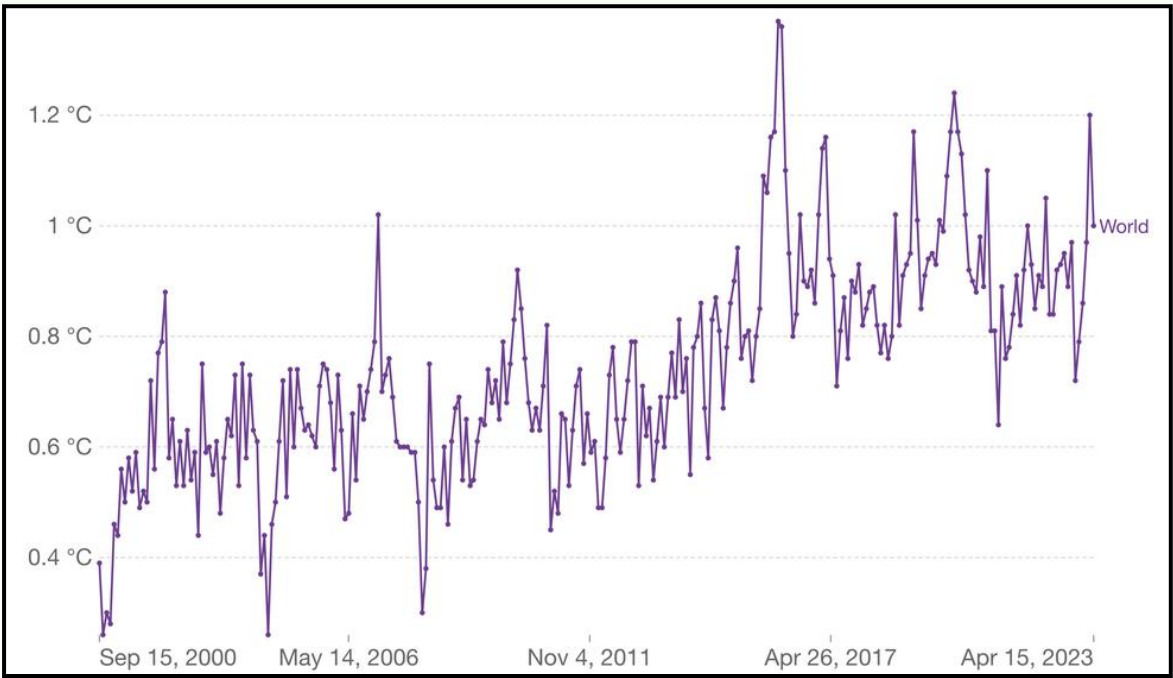
Correlation between Carbon Dioxide Emissions with Crops Flooded per year



Correlation between Carbon dioxide Emissions with Food Waste & others per year



Global Warning: Monthly Temperature Anomaly





**So, what can we do to make
this better?**



OUR RECOMMENDATION: WASTEFYX

ABOUT OUR COMPANY

We are on a mission to drive far-reaching changes in the field of waste management and energy production. Hence, we aim to pursue these goals through 2 innovative approach:

- ✦ Biofuel (sustainable energy conversion from food waste)
- ✦ Wastefyx App (a platform to encourage community engagement)

WASTEFYX'S VISION

We are passionate in shaping a sustainable future where waste is minimized, energy is harnessed efficiently, and our environment thrives.

COMPANY'S MISSION

- ✦ We're dedicated to substitute non-renewable energy with clean biofuel from food waste, while simultaneously combating climate change and fostering sustainability.
- ✦ Our approach benefits everyone, as we provide enticing rewards and incentives to our customers who share our vision for a greener planet.

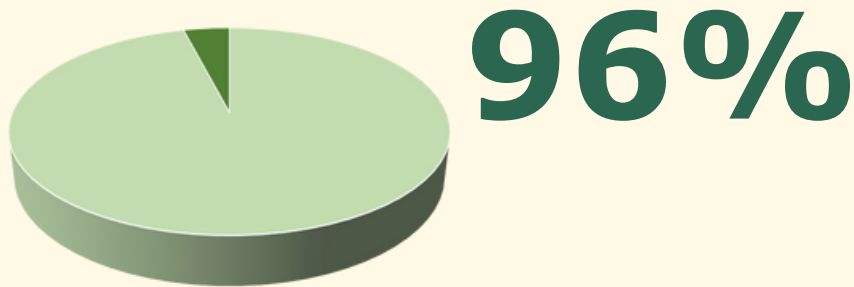


WASTEFYX: WHY BIOFUEL?

Biofuels can provide up to
of world transportation fuel by 2050.

27 ↑
%

Biodiesel is safe to use, biodegradable, and
has been shown to cut down on harmful
waste by as much as



It also degrades when it comes in touch
with water.

Biodiesel production, compared to petroleum
diesel production, reduces wastewater

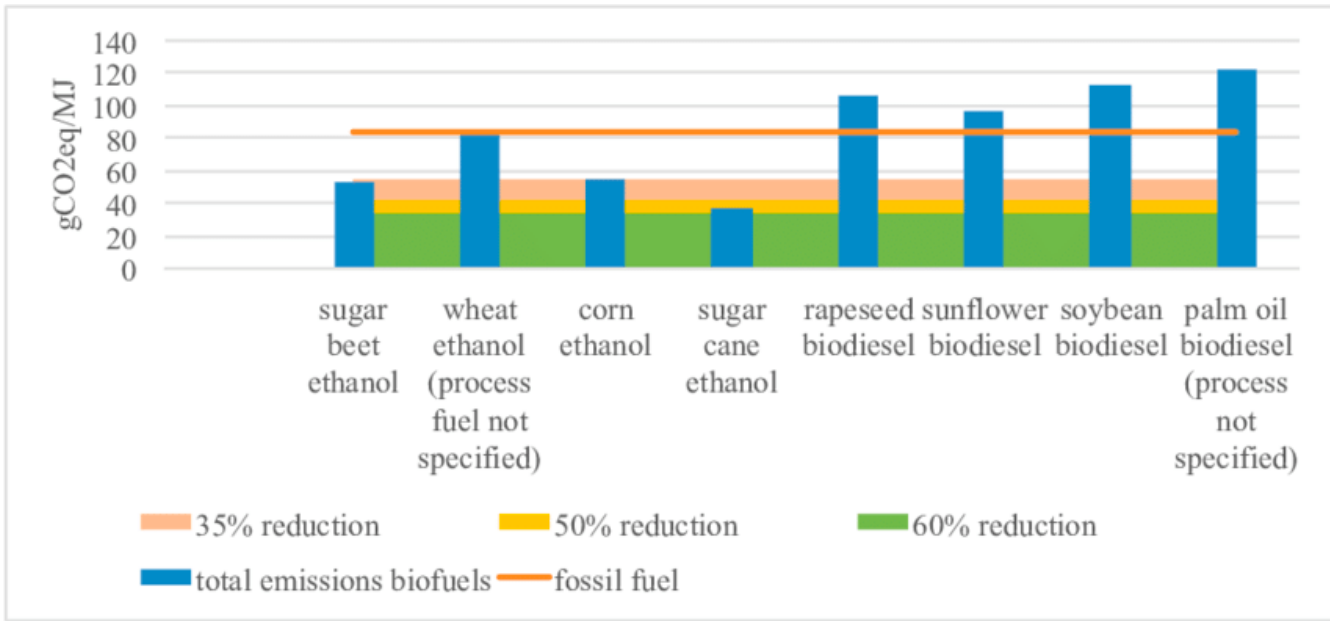
by up to + ↑ 79%

By using biofuel, greenhouse gas
emissions can be cut by

56-

the environmental equivalent of growing 1.9
billion trees. Comparing it to petroleum
diesel, it can reduce global
warming pollutants by

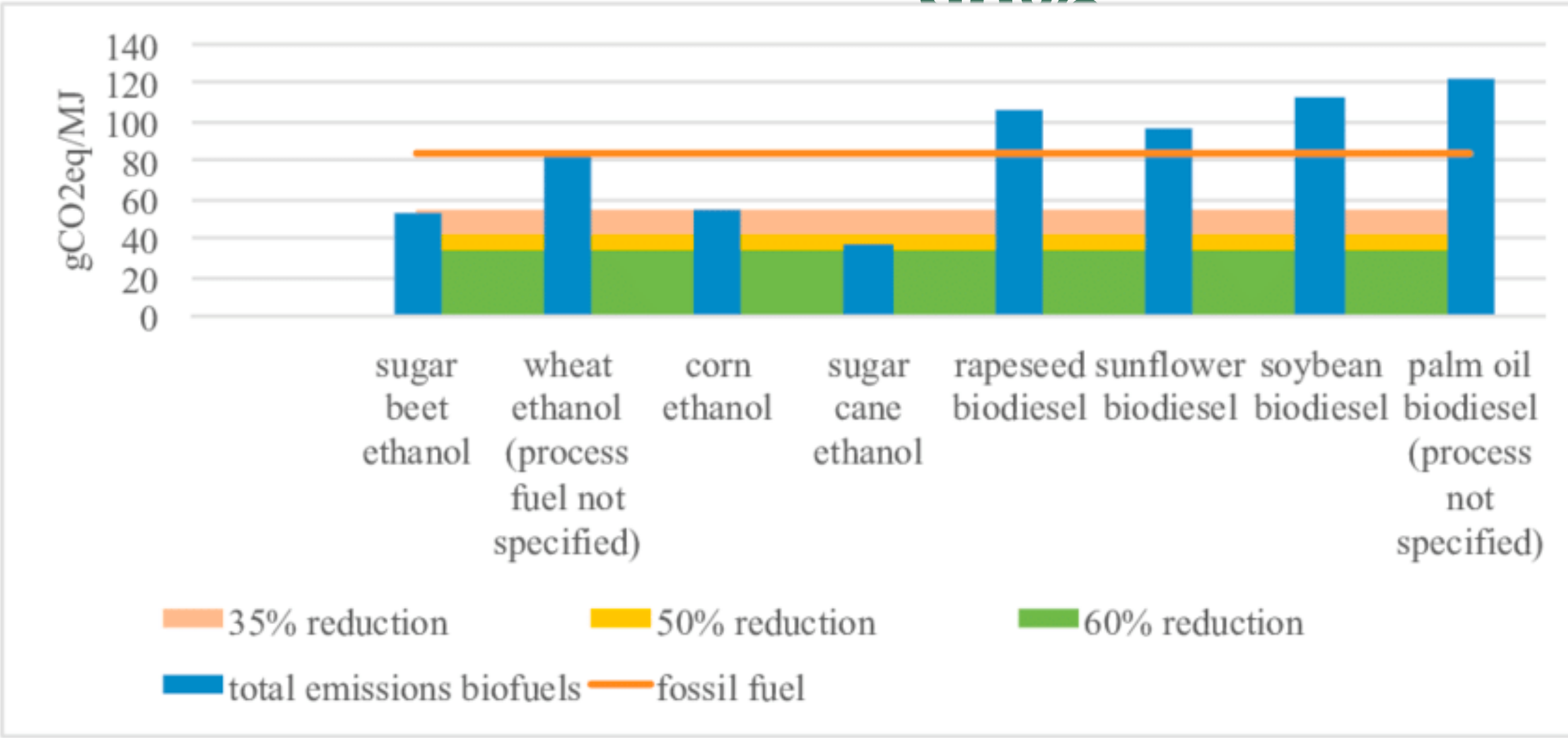
96%
80-



Producing biofuels domestically could reduce
dependence on imports of fossil fuels

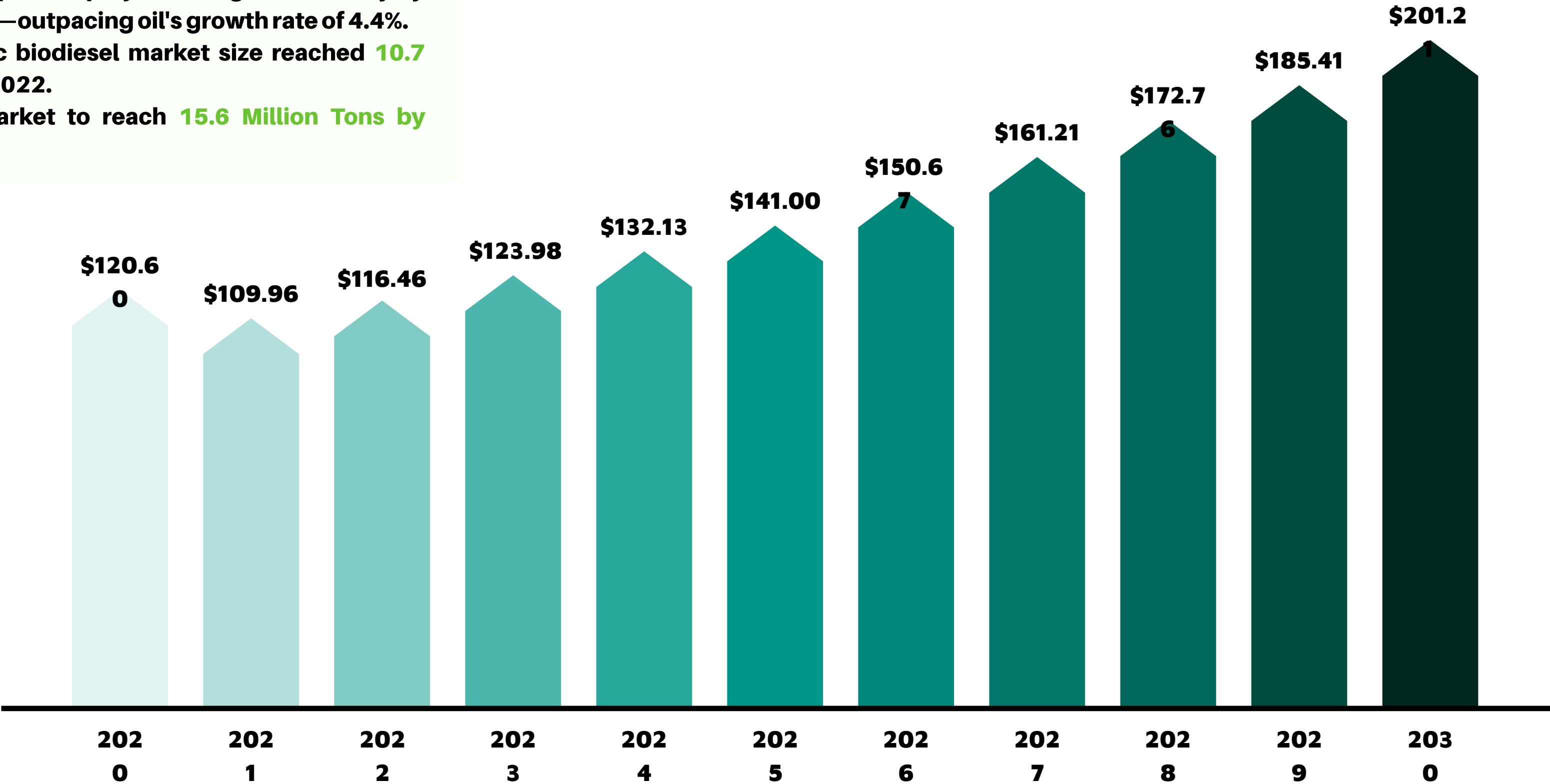
WASTEFYX: WHY BIOFUEL?

By using biofuel, greenhouse gas emissions can be cut by **56-96%**
the environmental equivalent of growing 1.9 billion trees. Comparing it to petroleum diesel, it can reduce global warming pollutants by **80-90%**



BIOFUELS MARKET SIZE (USD BILLION)

- Biofuel consumption is projected to grow annually by **4.7%** until 2050—outpacing oil's growth rate of 4.4%.
- The Asia Pacific biodiesel market size reached **10.7 Million Tons** in 2022.
- Expects the market to reach **15.6 Million Tons** by **2028**.



(Precedence Research, 2022; The 7th ASEAN Energy Outlook - ASEAN Centre for Energy, 2022)

OUR RECOMMENDATION: WASTEFYX APP

WHAT IS THE WASTEFYX APP?

A mobile application is proposed in an attempt to:

- Reduce food waste and loss.
- Utilise carbohydrate-rich food waste for sustainable energy.
- Encourage community involvement through our offer of various incentives.

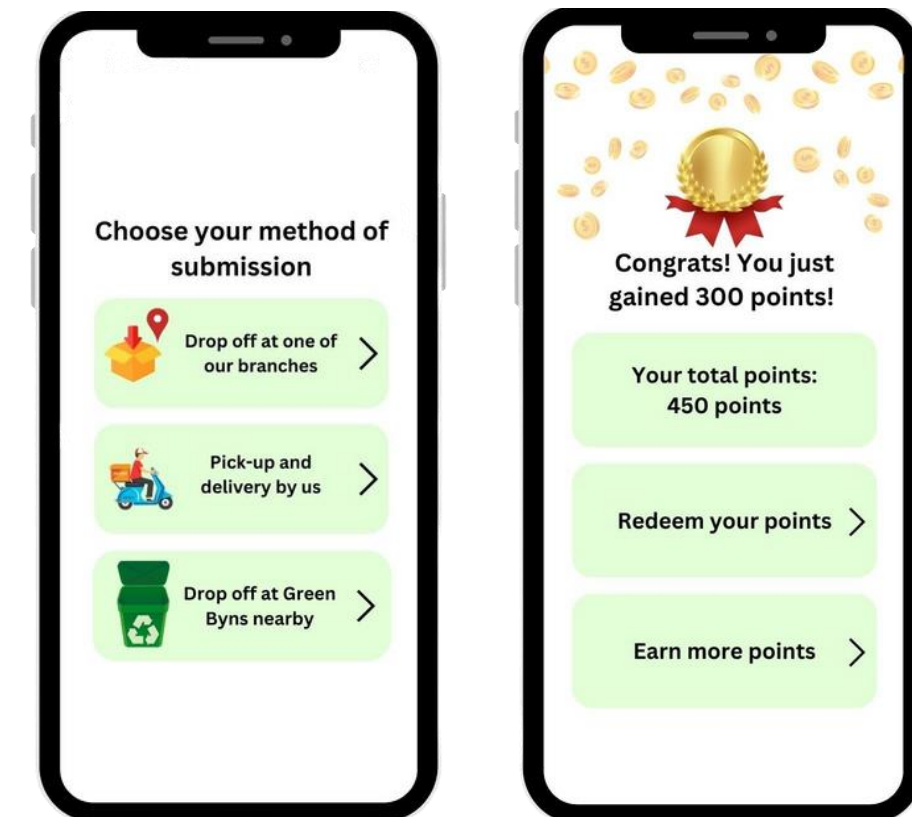
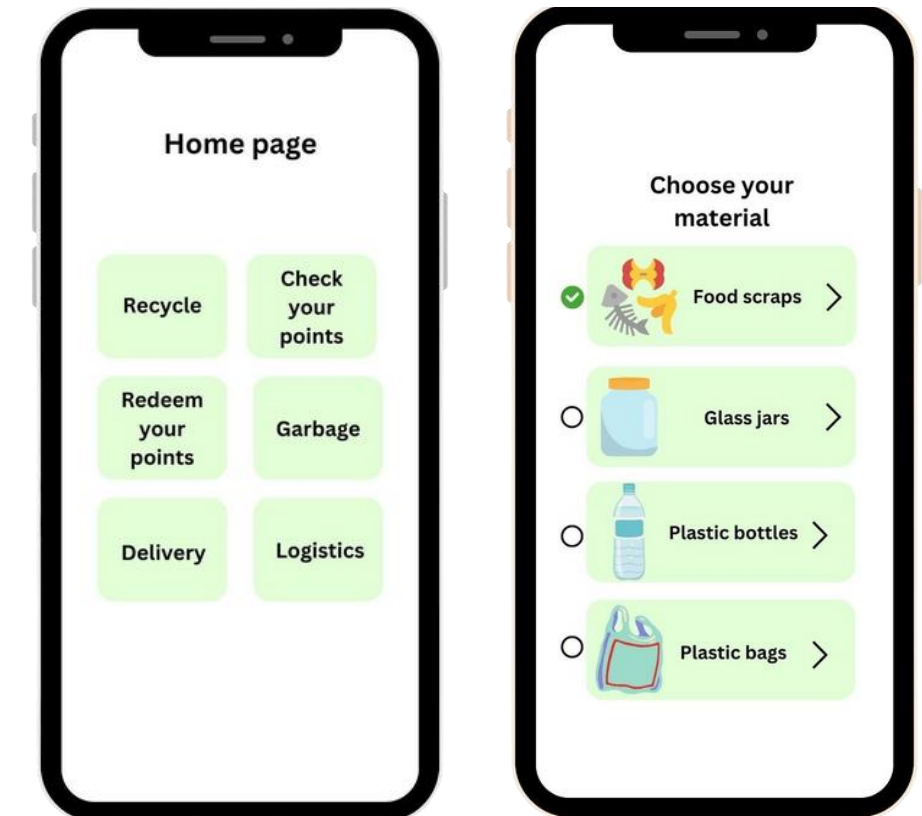
APPLICATION FEATURES

Submission Methods:

- "Green Byns"
- Directly to Wastefyx Company
- Delivery service for pick up at users' homes with varying charges depending on the area.

Reward System:

- 100 reward points per kilogram of food waste
- Reward points can be redeemed as real money (e.g., 300 points = \$3) or as vouchers and prizes.



* Media above is for illustration purposes only.

OUR RECOMMENDATION: WASTEFYX APP

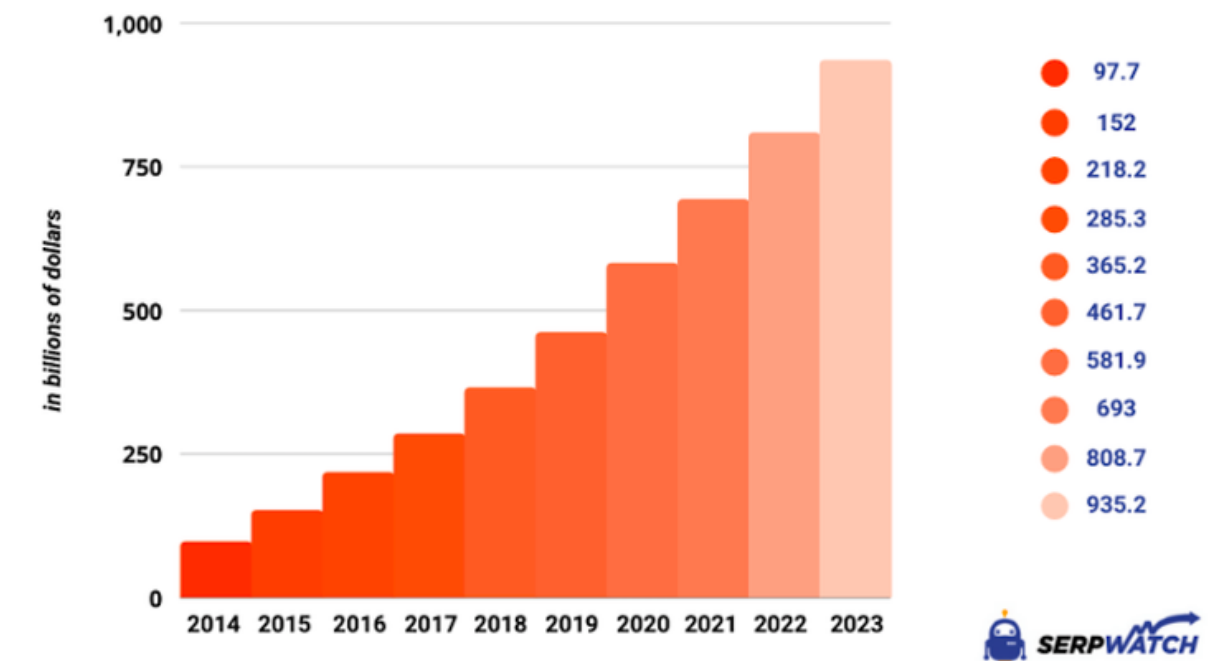
WHY WASTEFYX APP?

Mobile app downloads were at **230 billion downloads in 2021**, a **5.5% increase** from the year prior. Overall, global app downloads have grown by **63.4% between 2016 and 2021**.

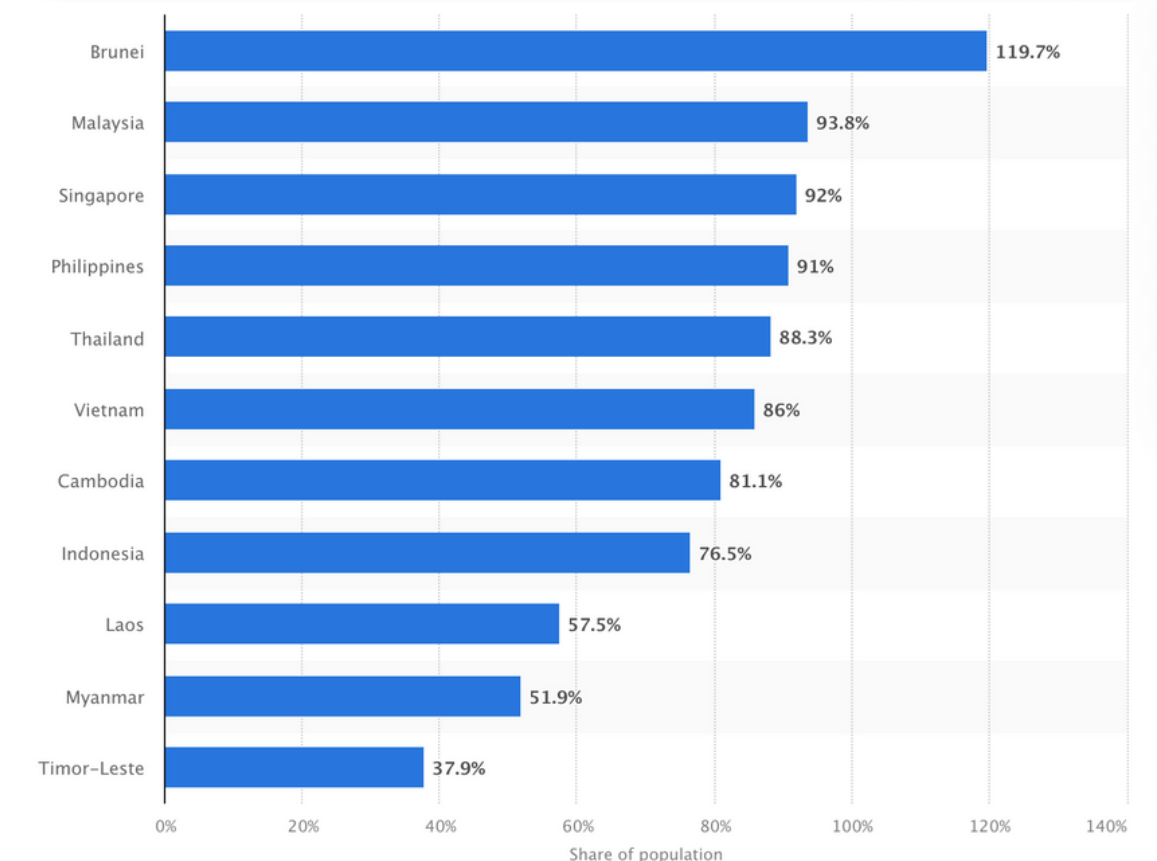
Brunei has the greatest internet penetration rate in Southeast Asia in 2022 at over **119%** due to consumers having numerous subscriptions.

ASEAN.org reported **80%** Internet penetration in 2022 for over **460 million Southeast Asians**.

Mobile Apps Revenue, 2014-2023



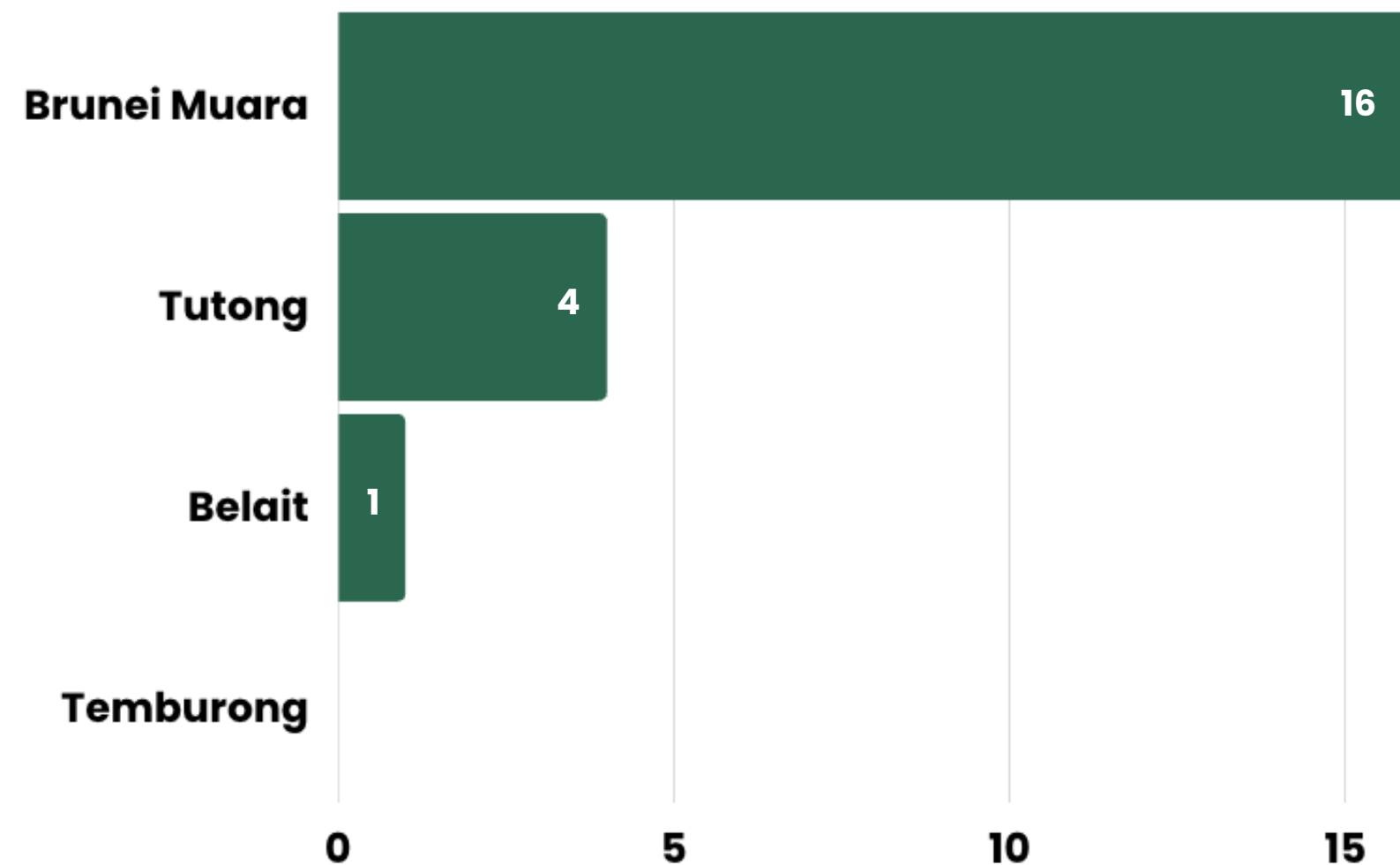
Internet penetration in Southeast Asia as of July 2022, by country



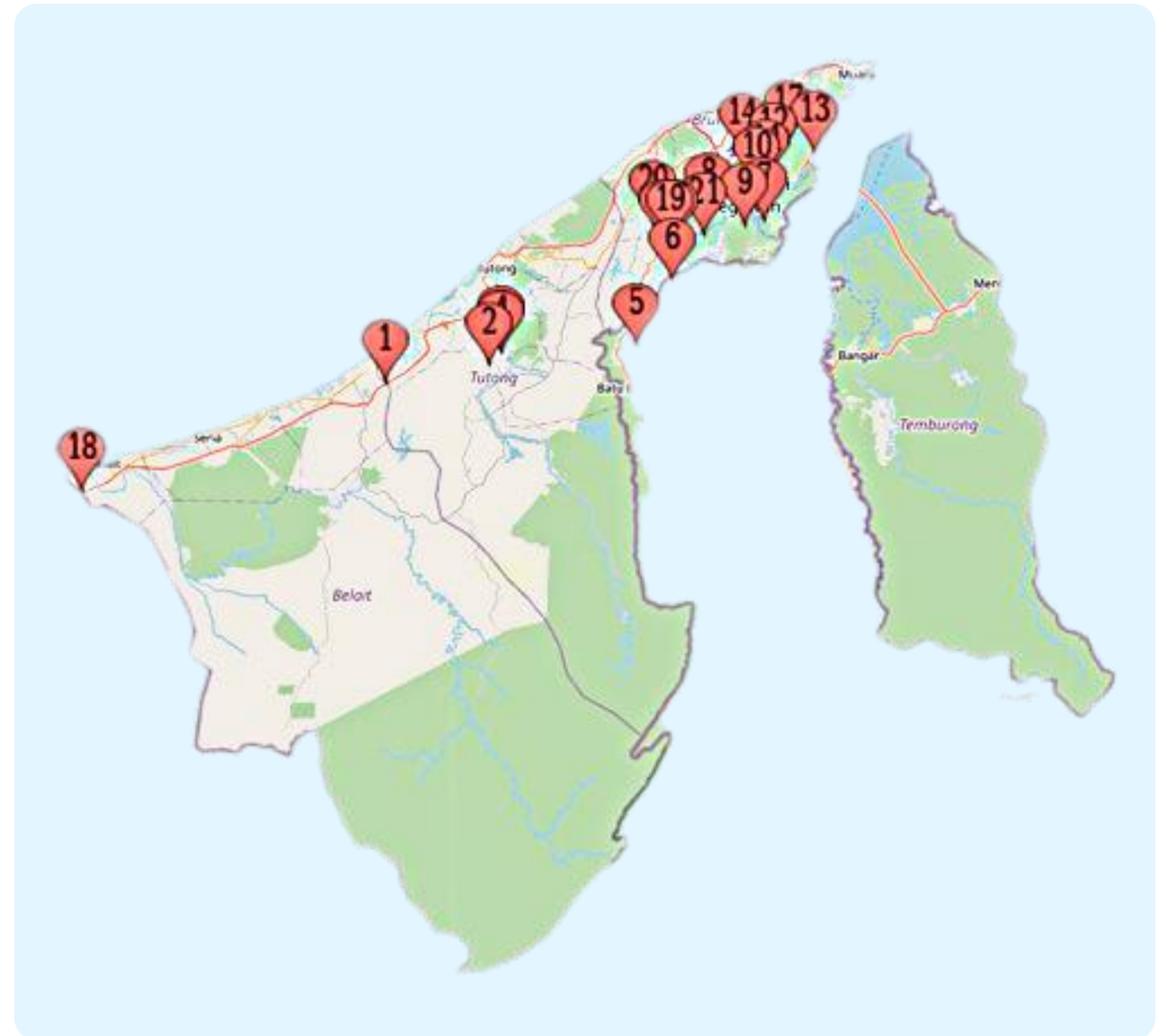
(Patel, 2022; Statista, 2022)

WASTEFYX: "GREEN BYNS" PLACEMENT

Our version of garbage bins, "Green Byns" will be located in these existing garbage dump locations for convenience as well as in more disperse areas.



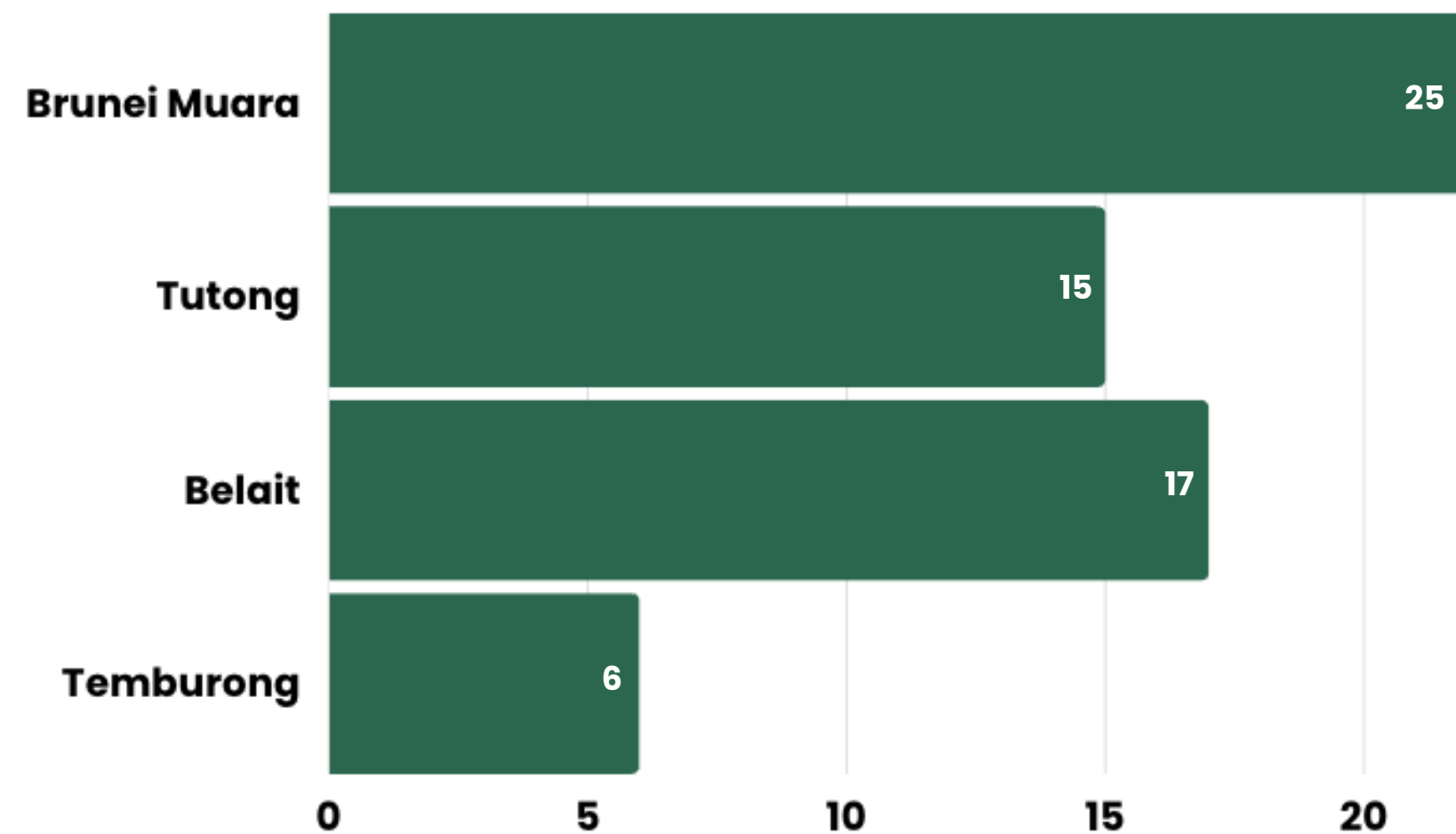
TOTAL = 21 LOCATIONS



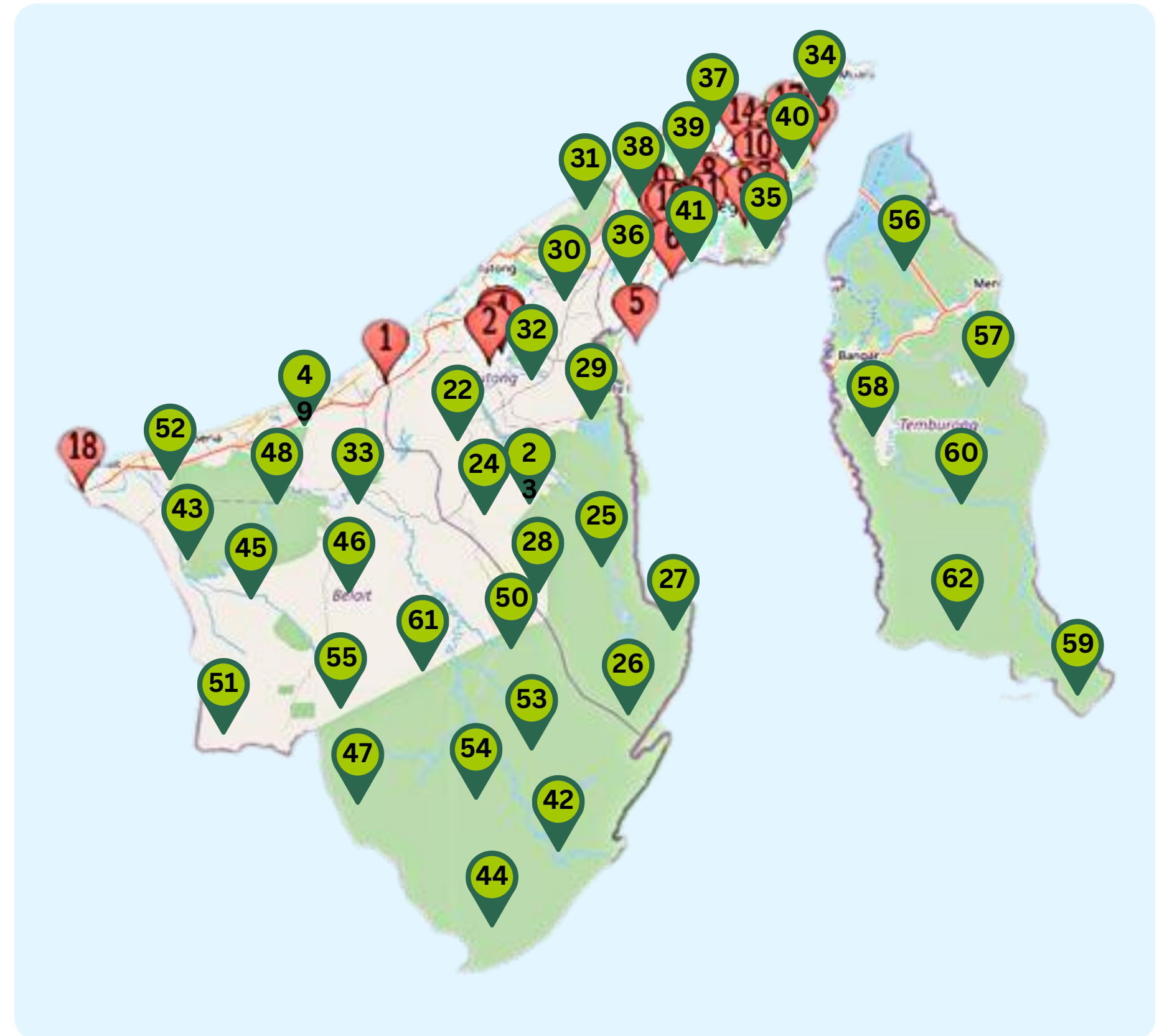
* Media above is for illustration purposes only.

"GREEN BYNS" PLACEMENT - BY 2035

By 2035, "Green Byns" will triple the location of existing garbage dump locations for greater accessibility for all users in the country.

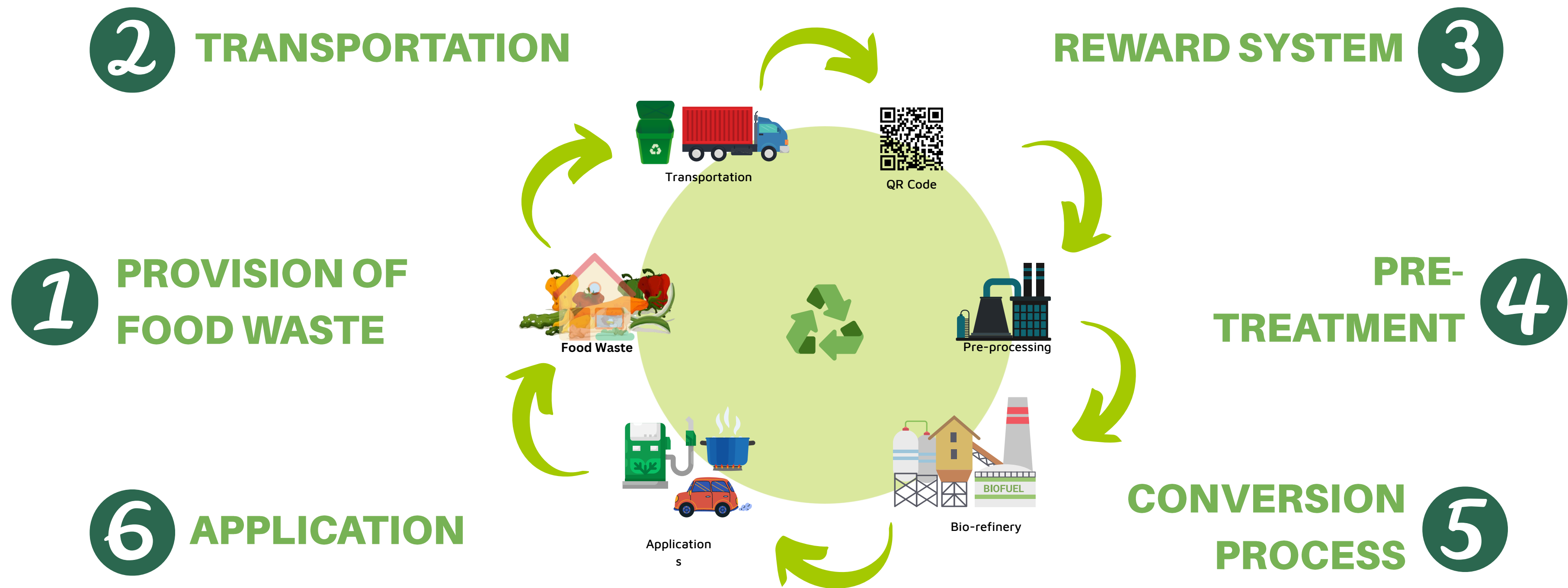


TOTAL = 63 LOCATIONS



* Media above is for illustration purposes only.

WASTEFYX: PROCESS ELABORATION



WASTEFYX: REWARDS POOL

STUDENTS

1



Educational Data Plan

2



Cafe / Meal Coupons


3



Bookstore Vouchers


COMPANIES

1



Cut in Corporate Tax


2



Discount on Necessities Bill


PUBLIC USERS

1




Discount on Necessities Bill

2



Grocery Package

3



Store / Restaurants Vouchers

WASTEFYX:
STRATEGIC COLLABORATIVE PARTNER



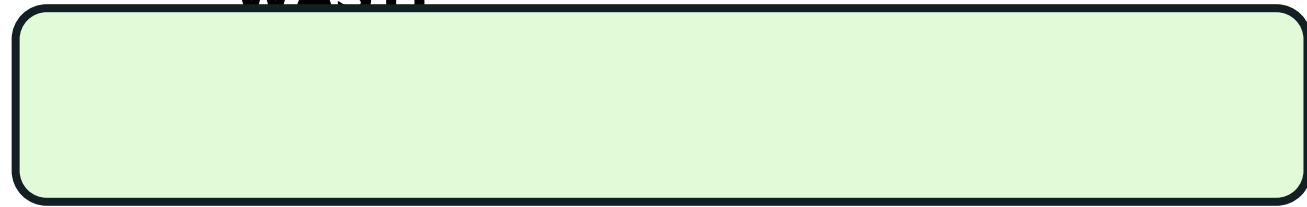
CORE

**RESTAURANTS,
FOOD OUTLET,
HOTELS,
HOUSEHOLDS**

SECONDARY



**GOVERNMENT
(MOH, MOFE, MOE)**



**BUSINESS &
BRANDS**

ASEAN STRATEGIC COLLABORATIVE PARTNERS



Company Name: Indonesia Biofuel Producer Association (APROBI)
Headquarter: Jakarta, Indonesia
Product: Biodiesel
Source: Palm Oil

Company Name: Vance Bioenergy Sdn. Bhd.
Headquarter: Johor, Malaysia
Product: Biodiesel (Used Cooking Oil Methyl Ester)
Source: Vegetable Oil



Company Name: Bangchak Corporation Public Company Limited
Headquarter: Bangkok, Thailand
Product: Biodiesel & Ethanol
Source: Vegetable Oil

Company Name: Bangchak Corporation Public Company Limited
Headquarter: Manila, Philippines
Product: Biodiesel (Coconut Methyl Ester)
Source: Coconut Oil



WASTEFYX: STARTUP COST STRUCTURE

OPERATING EXPENDITURE (ANNUALLY)

COST	AMOUNT (USD)
Server & Software Fees	180,000
Maintainance (App & Machineries)	50,000
Consultancy & Professional Services	30,000
Research & Development	50,000
Marketing & Advertisement	50,000
Overheads (Electricity, Fuel & Etc)	100,000
Salaries & Benefits	300,000
Contingency (10%)	76,000
TOTAL	836,000

CAPITAL EXPENDITURE

COST	AMOUNT (USD)
Permit & Licensing	25,000
Building & Infrastructure	1,100,000
Transportation & Logistics	50,000
Technology & Equipment	400,000
App Development	15,000
TOTAL	1,590,000

ESTIMATED TOTAL =

USD 2,426,000

(Finmodelslab, 2023; Space Technologies, 2023; App, 2023)

WASTEFYX: VALUE PROPOSITIONS



COMMUNITY ENGAGEMENT

The Wastefyx App fosters a sense of community and engagement by rewarding users for their waste reduction efforts, making it a collective and enjoyable endeavor.



ACCESSIBILITY

Given Wastefyx App is made to have a universal design, users of various background are able to access information and services anytime, anywhere.



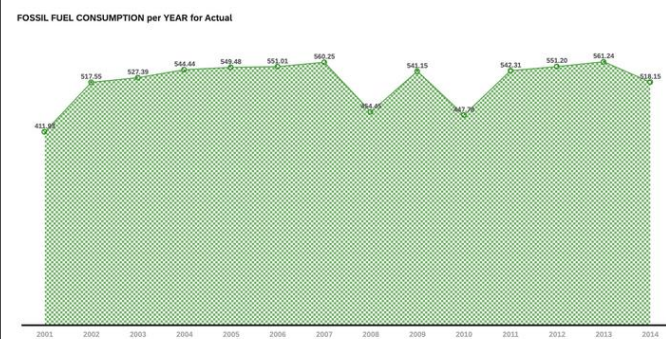
ENVIROMENTAL FRIENDLY


Wastefyx focuses on combating greenhouse gas emissions by reducing food waste and converting it into biofuel, contributing significantly to environmental conservation.

WASTEFYX: SOLUTION & UN SDGs



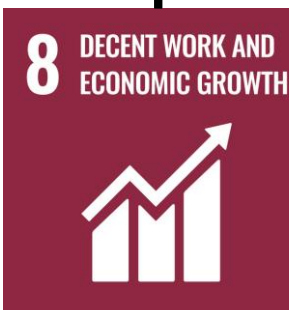
In place of fossil fuels, biofuel are derived from organic materials such as agricultural scraps, algae, or garbage. Unlike fossil fuels, these sources can be regenerated through sustainable agriculture. They emit lesser amounts of greenhouse gas and toxic particulates such as sulfur dioxide.



 Food waste to biofuel conversion can boost waste management, bioenergy, and related jobs.

Rewarding or incentivise food waste collection can boost local economic development and help low-income communities. Individuals can spend their rewards locally, helping local businesses and the economy.

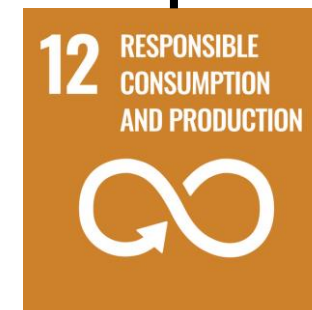
Economic globalisation leads to an exchange of biofuel technologies between developing countries through technology transfer.



Food waste conversion into biofuel aligns with sustainable waste management techniques in cities. It supports the development of more sustainable and resilient cities and communities and lessens the negative effects of waste disposal on the environment.



The production of biofuel from food waste encourages responsible patterns of consumption and production. It uses valuable resources that would otherwise be wasted and reduces food waste, a major global problem. This helps utilize resources in a more sustainable and effective way.



Food waste decomposition in landfills emits greenhouse gases, especially methane. By diverting food waste from landfills and using it for biofuel production, methane emissions will be reduced, thus promoting a low-carbon, circular economy.

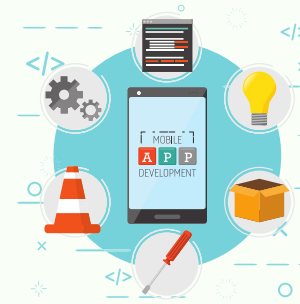


WASTE FYX: IMPLEMENTATION TIMELINE



IDEA INITIATION (2023)

Initiate the plan & application idea through the ASEAN Data Science Explorer Competition.



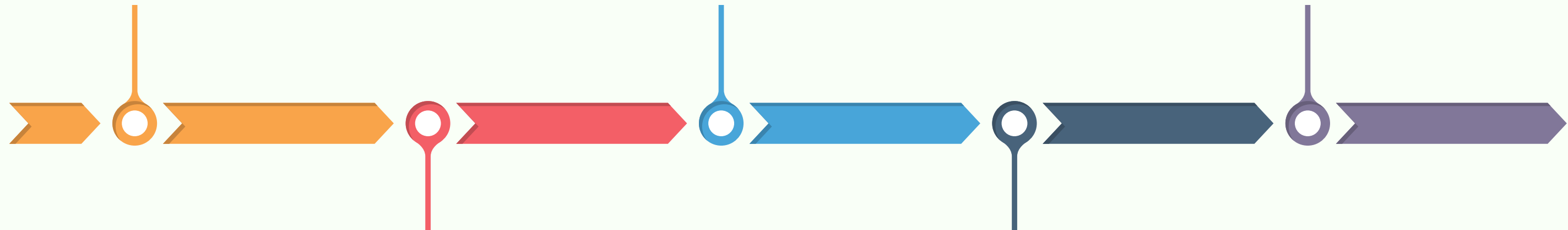
APP DEVELOPMENT (2024 - 2025)

App Design, Data Integration, Algorithm Development, Pilot Testing, Refinement & Scaling



OFFICIAL LAUNCHING & EXECUTION (2029)

The initial launch of the application will occur at the national level, with "Green Byns" strategically placed at their respective designated locations.



FURTHER RESEARCH & FEASIBILITY (2023-2024)

Conduct further market research on the implementation of the app & develop marketable strategies



PARTNERSHIP & COLLABORATION (2026 -2027)

Collaborate with waste management & biofuel companies to expand resources. This will drastically lead to an optimised waste collection & efficient conversion process

DEMONSTRATION OF OUR WASTEFYX APP:





**THANK YOU FOR
LISTENING**

APPENDIX

BREAKING NEWS!



With a **99.9%** share or 889 MW from seven gas and one diesel power plant, the primary source of power in Brunei Darussalam is significantly dependent on fossil fuels and accounts for **55.9%** of the country's GHG emissions (ASEAN Centre, 2022).

An average of **1.4 kg** of garbage is produced daily in Brunei Darussalam, with **36%** of that being **food waste**, 18% being paper, and 16% being plastic (Dept. of Environment, Parks and Recreation Ministry of Development, 2015).



In Brunei Darussalam, the effects of the changing climate are undeniable. Our country is seeing a warming trend of 0.25°C and an increase in rainfall of 100mm per decade, which results in more frequent and severe flash floods, forest fires, high winds, and landslides, destroying crops, resources and food. Hence, more food waste (Brunei Climate Change Secretariat (BCCS), 2020).

By 2030, Brunei Darussalam intends to cut its greenhouse gas (GHG) emissions by **20%** compared to Business-as-Usual levels (Brunei Climate Change Secretariat, 2019).



FIRST OF ALL, HOW DID IT ALL HAPPEN?

Climate change and food waste is like a loop, they influence each other.

Climate change leads to food waste and food waste encourages climate change.



Shifts in growing conditions can affect agricultural productivity in various ways.



Loss in biodiversity can lead to poor ecosystem resilience; negatively affecting crop yields.



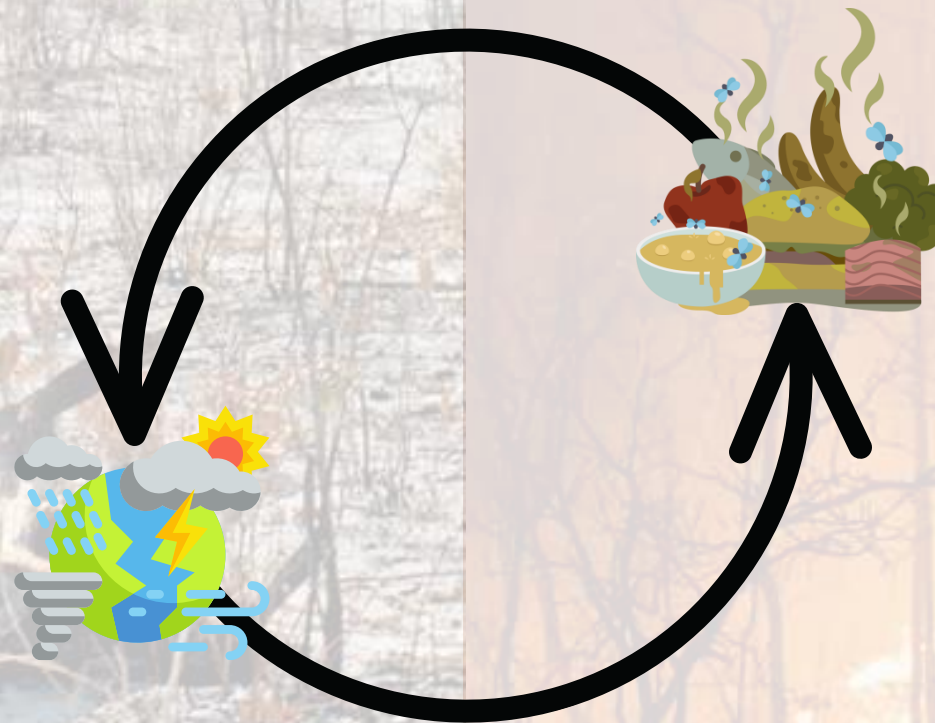
Inappropriate, non-adaptive storage and transportation infrastructure can lead to food spoilage and waste



Extreme Weather Events such as droughts, floods, and bush fire can destroy crops and raw materials.



Increase in spread and prevalence of invasive species and diseases can destroy food.



Wasted inputs used in producing, processing, transporting, preparing and even disposing the wasted food may include the land, water, labour, energy and so forth.



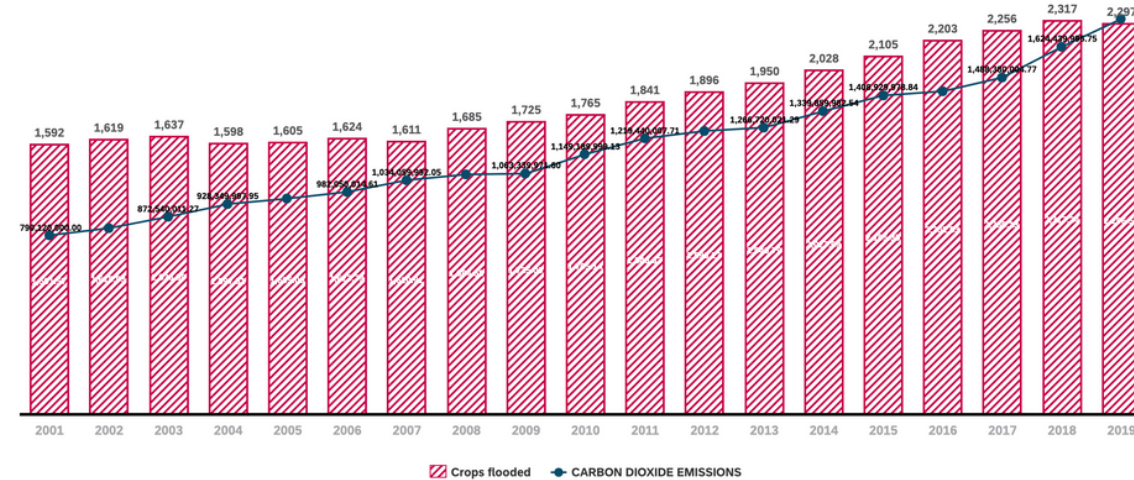
Methane and carbon dioxide emissions from solid waste landfills and decomposition of food waste contributes to global warming.



FIRST OF ALL, HOW DID IT ALL HAPPEN?

Climate change and food waste: a never-ending loop of environmental impact.

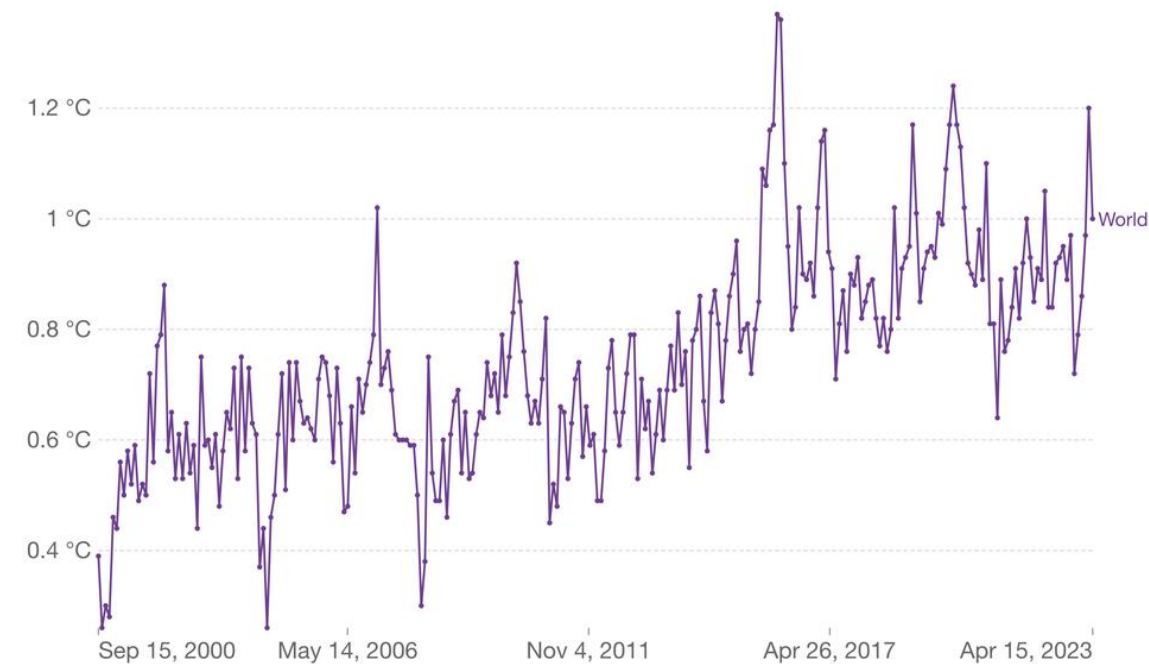
Correlation between Carbon Dioxide Emissions
with Crops Flooded per year



As crops flooded increases:

- Crop decomposition elevates CO2 levels.
- Rise in Greenhouse Gases (CO2 & CH4) are major drivers of global warming and climate change.
- Flood-damaged crops are often discarded, leading to food waste.

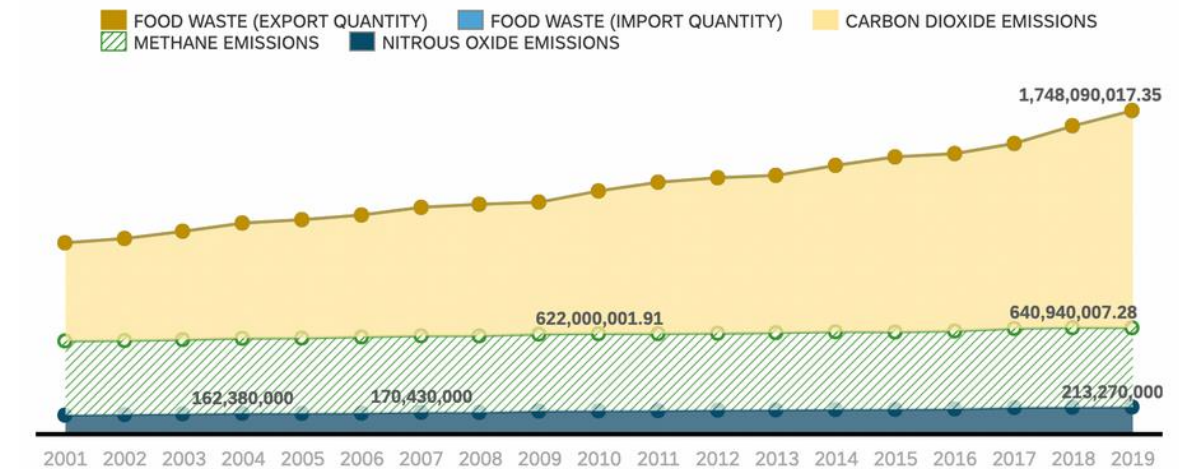
Global Warming: Monthly Temperature Anomaly



The graph indicates:

- Rising temperatures from global warming have become evident in recent years.
- This increase in temperature is linked to a surge in food waste, attributed to the effects of climate change.

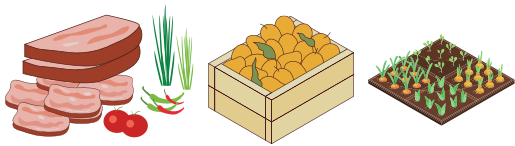
Correlation between Carbon dioxide Emissions
with Food Waste & others per year



The graph indicates:

- Food waste is on the rise, leading to increased greenhouse gas emissions.
- This connection highlights how food waste exacerbates global warming and contributes to climate change.

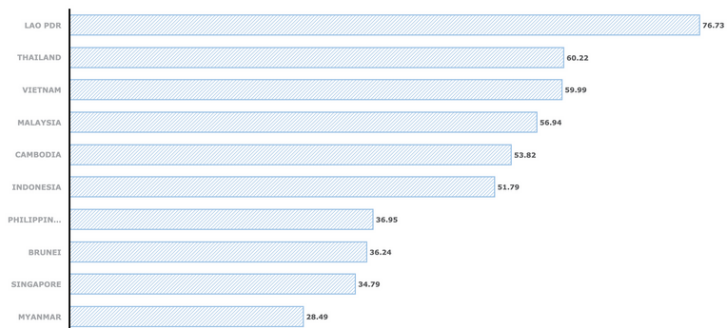
AND WHAT WORSEN CLIMATE CHANGE AND FOOD WASTE?



URBANISATION

- Urbanisation & related activities cause a raise in greenhouse gas emissions.
- Greenhouse gases drive global warming.
- Global warming induces climate change, including extreme temperatures and weather events.

URBAN DEVELOPMENT per COUNTRY for Actual



CORRELATION BETWEEN URBAN POPULATION AND GREENHOUSE GAS EMISSIONS

URBAN POPULATION CARBON DIOXIDE EMISSIONS METHANE EMISSIONS NITROUS OXIDE EMISSIONS

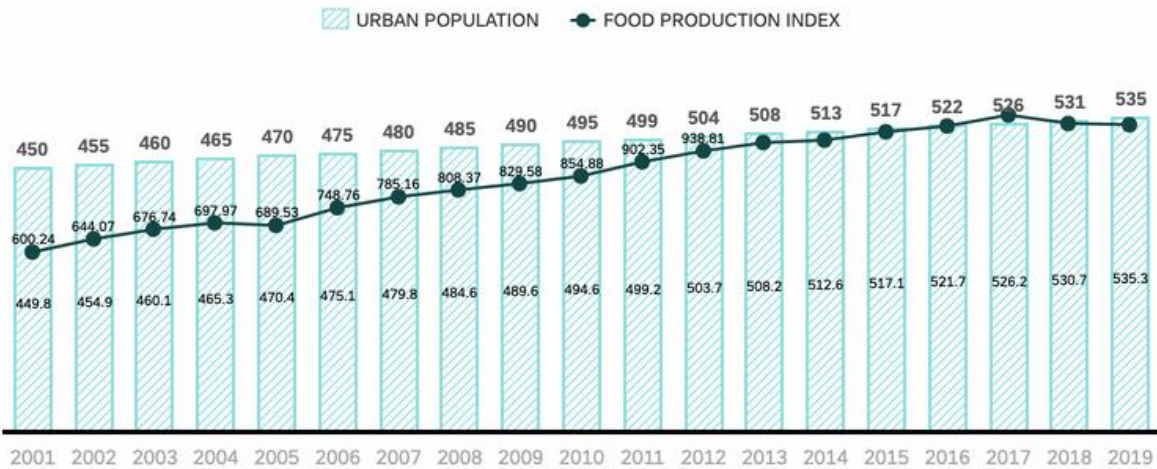


- 6/10 ASEAN countries have urban populations exceeding 50%.
- Carbon dioxide emissions are rapidly increasing in these countries in tandem with urban population growth.

HIGHER FOOD PRODUCTION INDEX

- Population growth spurs higher food production, as indicated by the food production index.
- This index assesses the agricultural sector's performance, including crops, livestock, and fisheries.
- Increased population prompts intensified agriculture, resulting in expanded cultivation, improved farming practices, and technological advancements, all contributing to greater food production.

FOOD PRODUCTION INDEX, URBAN POPULATION per YEAR

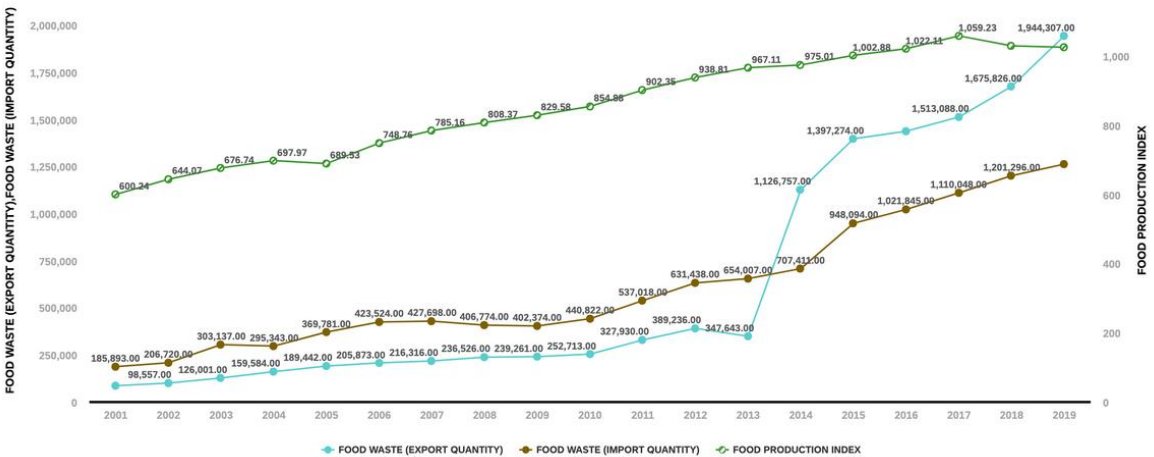


In the past, the level of food production index can be said to meet the increasing urban population. However, 2019 onwards, the level might not be secured enough for the population.

HIGHER FOOD WASTE

- A higher food production index signifies increased food output in the agricultural sector.
- This expansion, unfortunately, can result in food waste and inefficiency.
- Overproduction, stale inventory, & limited infrastructure and technology are amongst the contributing factors.

FOOD PRODUCTION INDEX, FOOD WASTE (EXPORT QUANTITY) and others per YEAR for Actual



- Exported food waste is a significant concern due to spoilage, damage, and losses within the supply chain.
- Inefficient supply chain management, including post-harvest handling, processing, and storage, contributes to these issues.

Globally,

**1/3 of Annual Food
Production wasted**

=

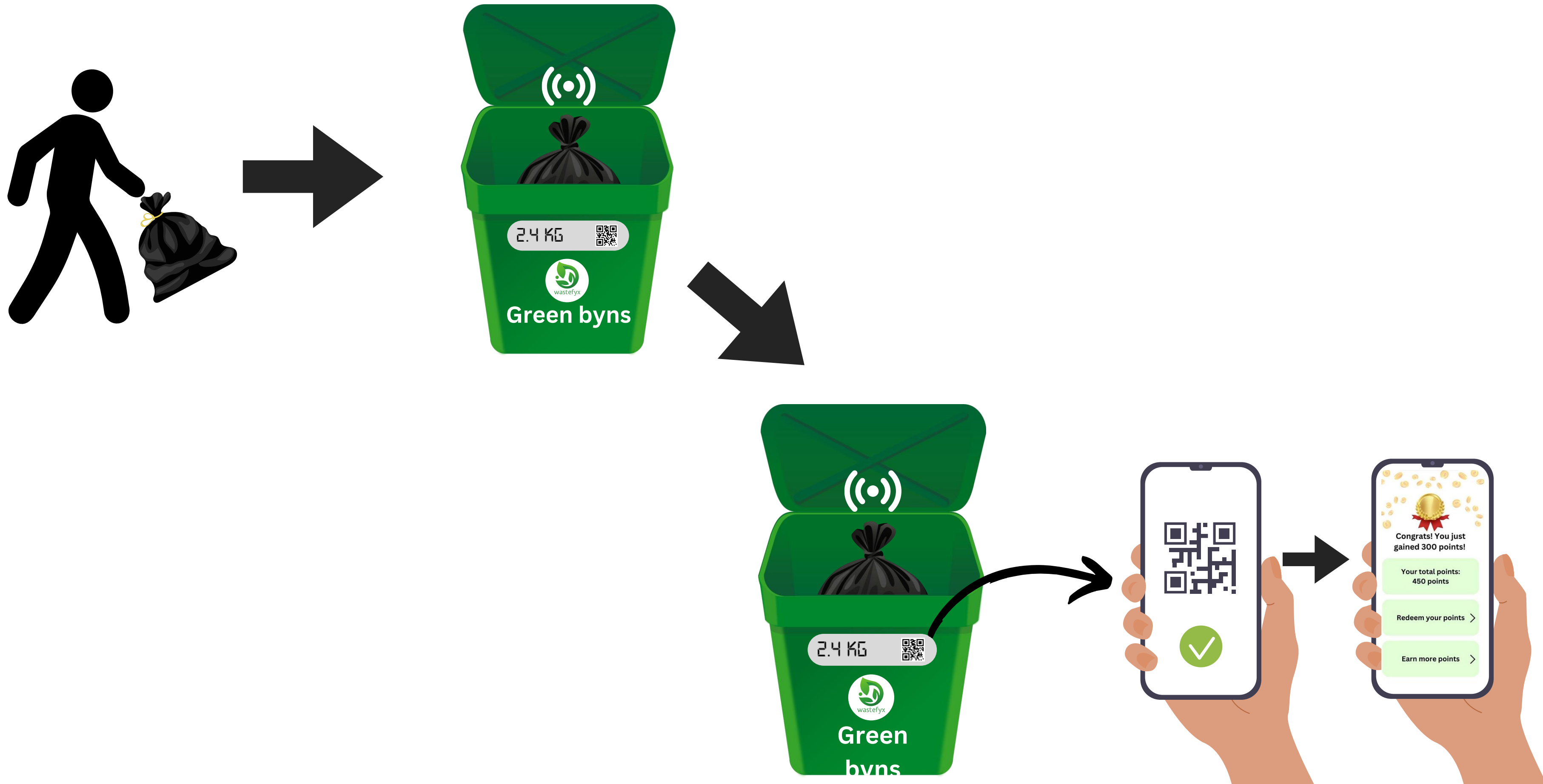
**1.3 Billion Tonnes
of food wasted**

=

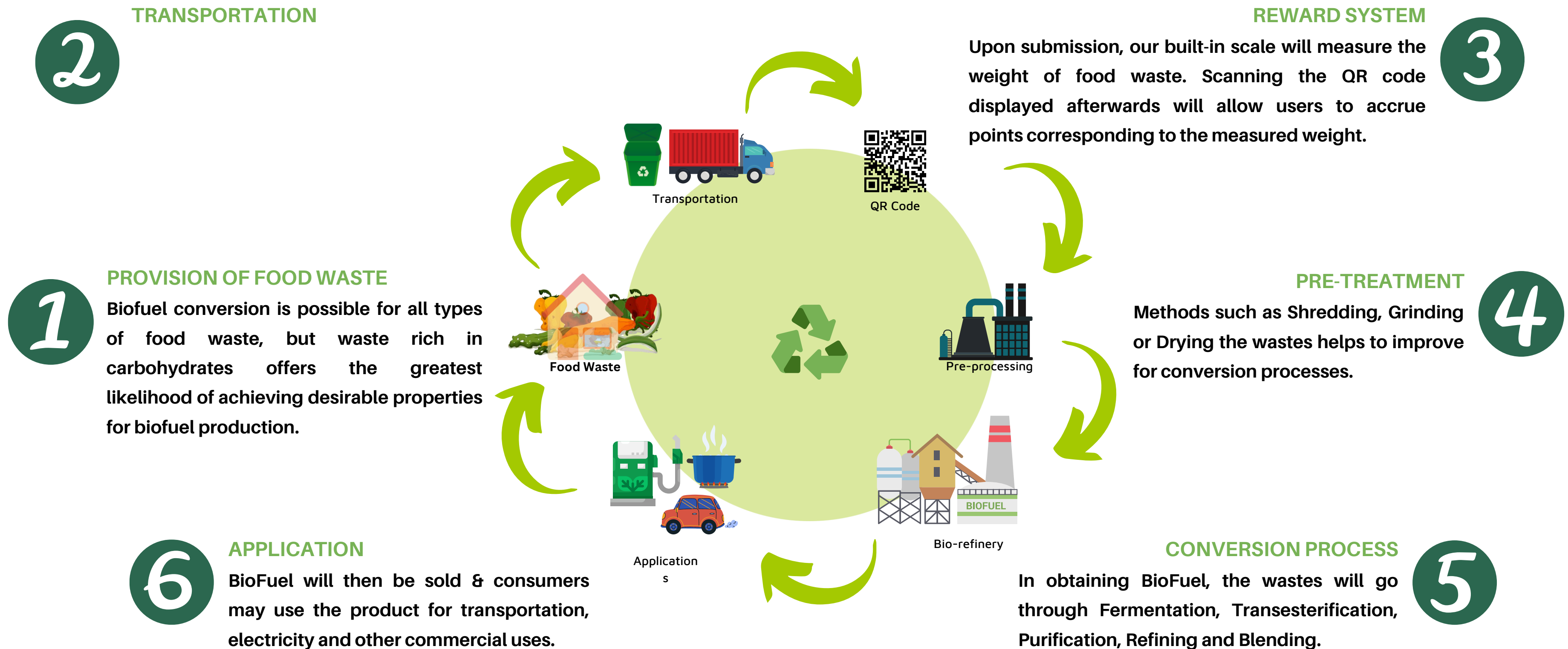
**USD 1.3 Trillion
lost**



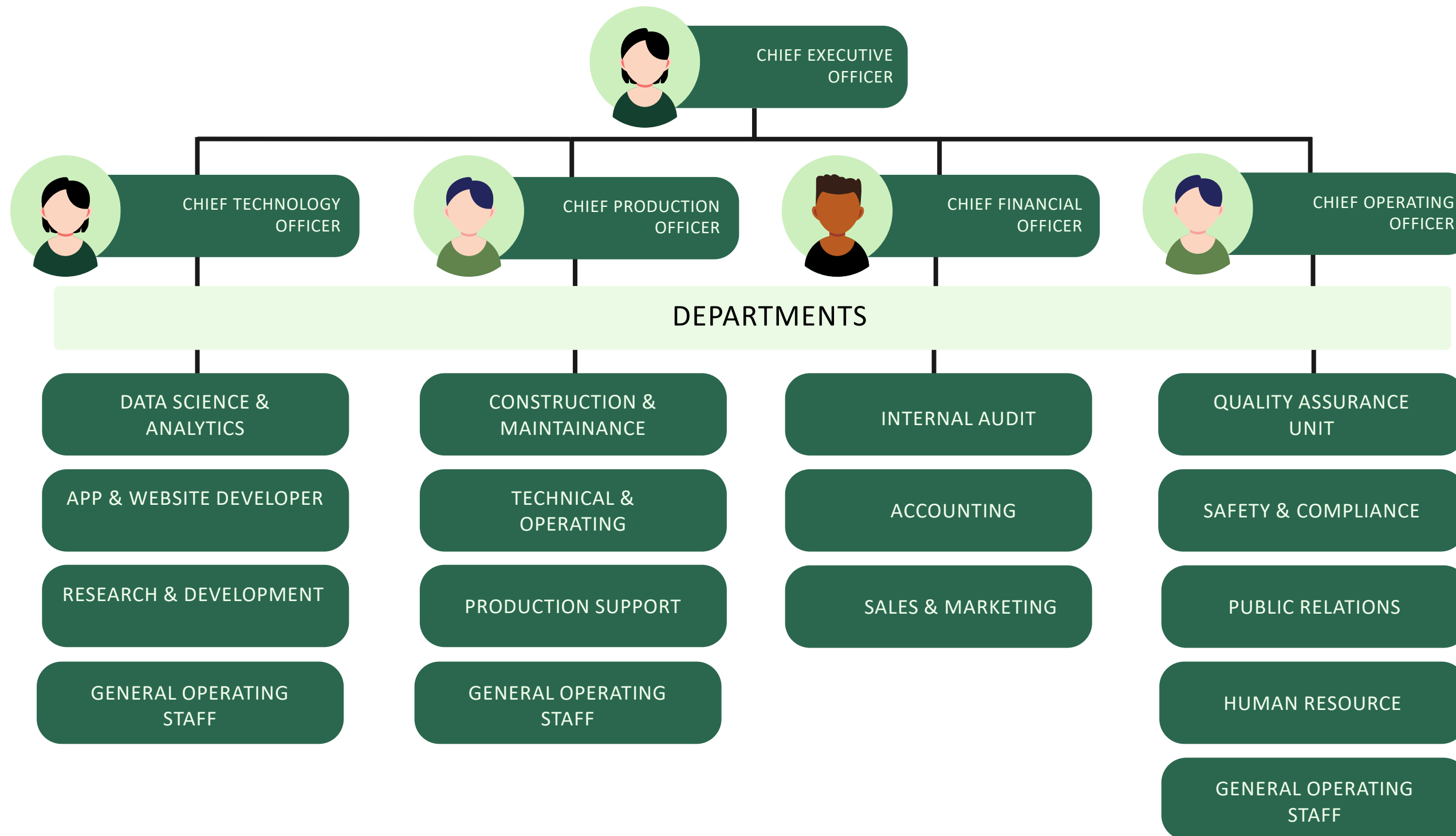
HOW GREENBYN WORKS



WASTEFYX: PROCESS ELABORATION



WASTEFYX: ORGANIZATIONAL CHART



WASTEFYX: SALES FORECAST

The forecast is for the year 2029 upon Wastefyx’s official launching.

Pricing is in line with global market averages and does not include government subsidies.

Sales are projected to increase by 5% in the second year, focusing on market stabilization and building public recognition.

A 10% sales increment is anticipated in the third year, driven by market adaptability, consistent public engagement, and the gradual adoption of sustainable practices in the community.

	PER UNIT (\$)	1ST YEAR (\$)	2ND YEAR (\$)	3RD YEAR (\$)
APPLICATION				
PREMIUM SUBSCRIPTIONS (\$)	5	3,600	3,780	4,158
BIOFUEL				
UNITS PURCHASED (PER LITRE)	5	90,000	94,500	103,950
TOTAL (\$)	10	93,600	98,280	108,108

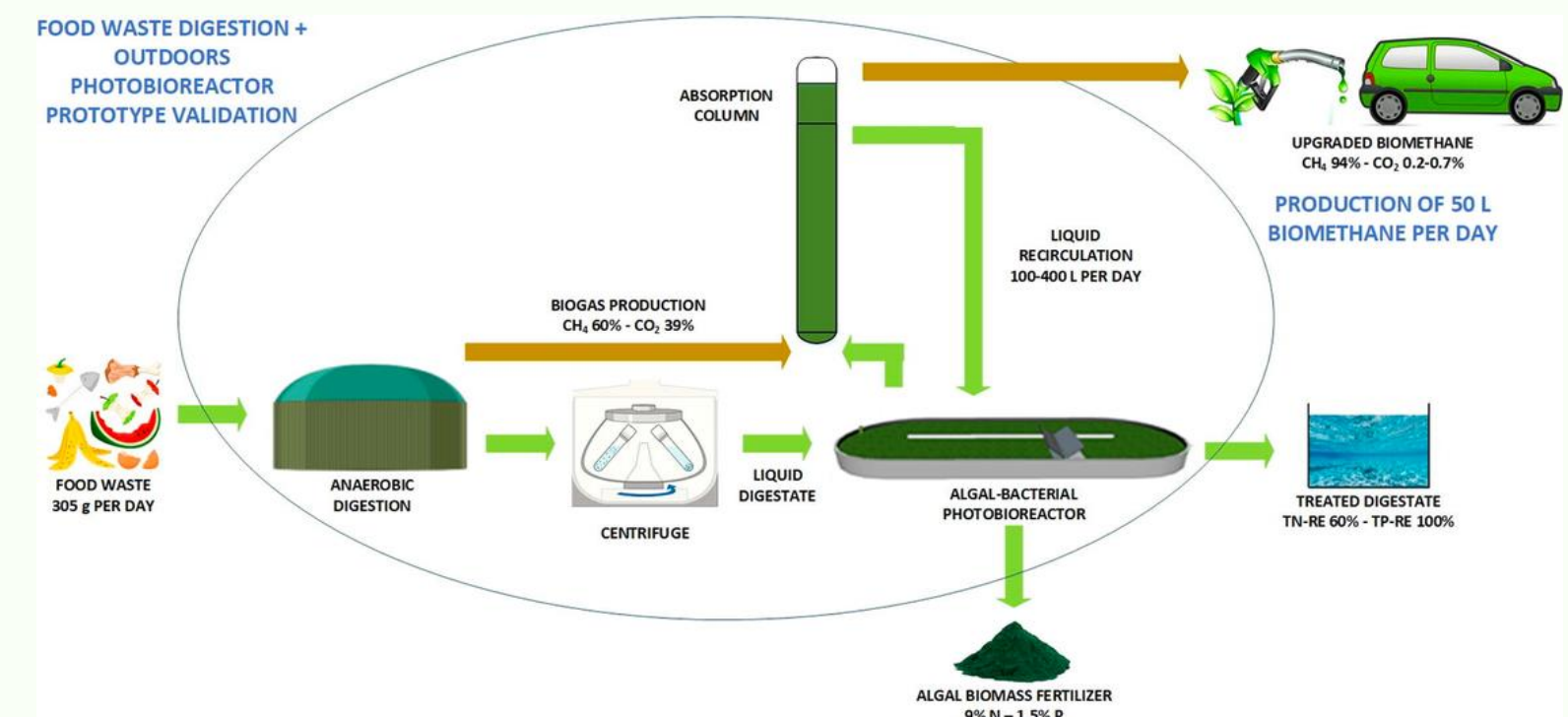
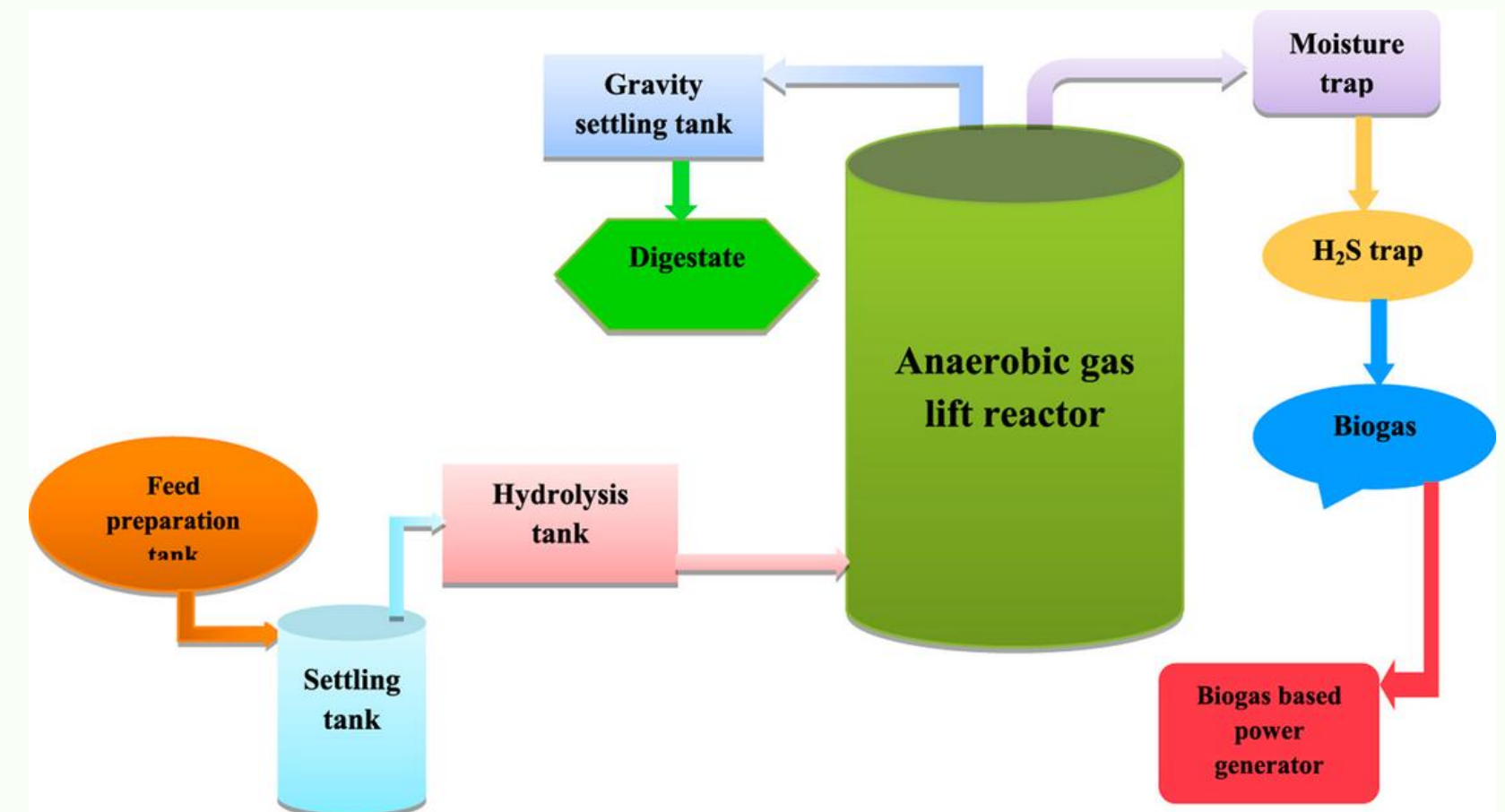
WASTEFYX PROCESS: ANAEROBIC DIGESTION

Conversion of food waste into biofuel

As an estimate, for every **1 kg** of the organic fraction of municipal food waste (OFMSW), its composition includes **586.3 g of starch**, **56.3 g of cellulose**, **64.5 g of lipid**, and **83 g of protein**. Theoretically, these components can be converted to **364 g of ethanol** or **383.2 L of methane** in an ideal process.

Each ton of food waste can produce **150 to 250 m³** of biogas through anaerobic digestion.

Methane has an energy content of **~55.5 MJ/kg** or **~35.8 MJ/m³**.



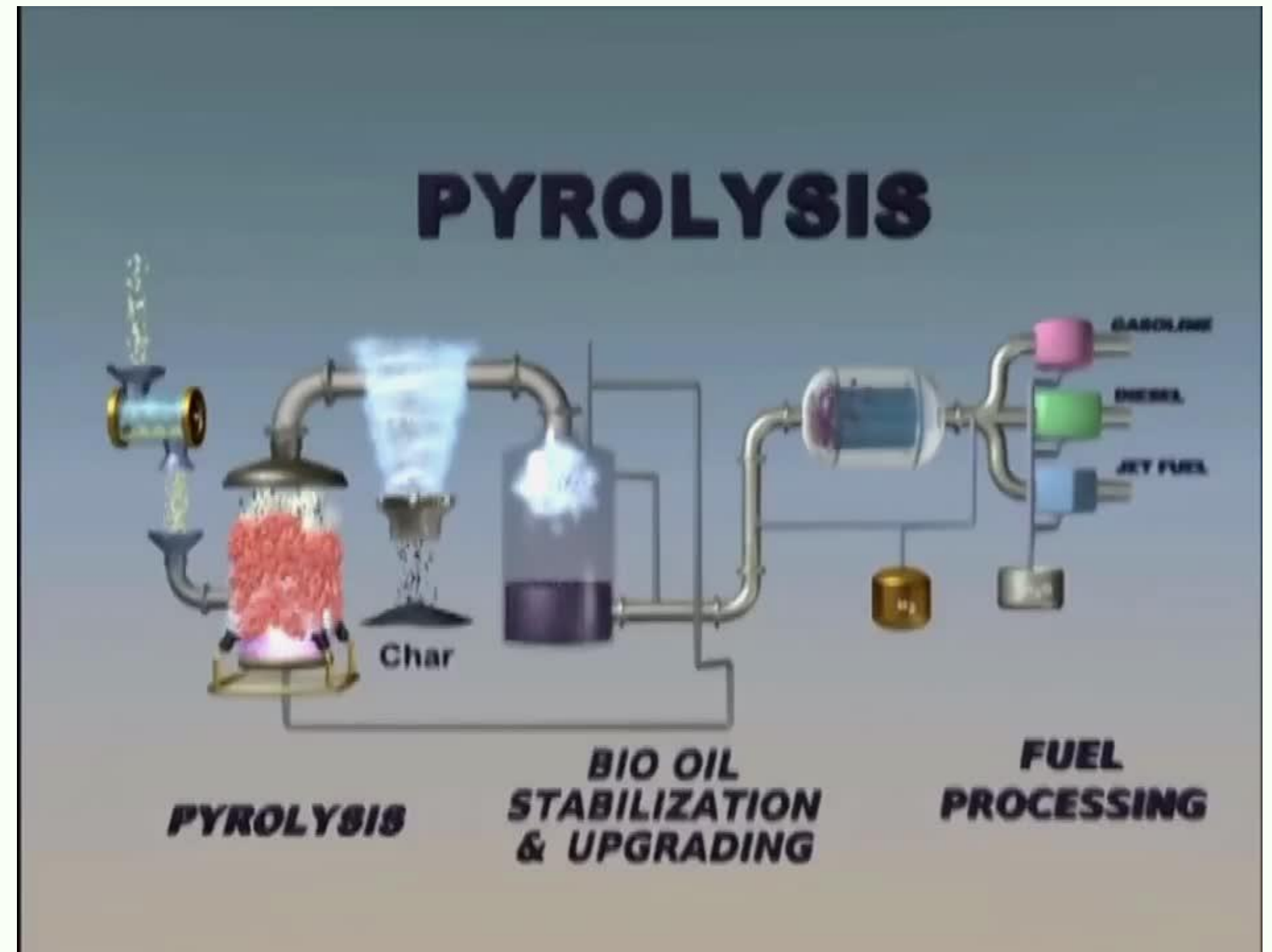
WASTEFYX PROCESS: PYROLYSIS

Conversion of food waste into biofuel

As an estimate, for every **1 kg** of the organic fraction of municipal food waste (OFMSW), its composition includes **586.3 g of starch, 56.3 g of cellulose, 64.5 g of lipid, and 83 g of protein**. Theoretically, these components can be converted to **364 g of ethanol or 383.2 L of methane** in an ideal process.

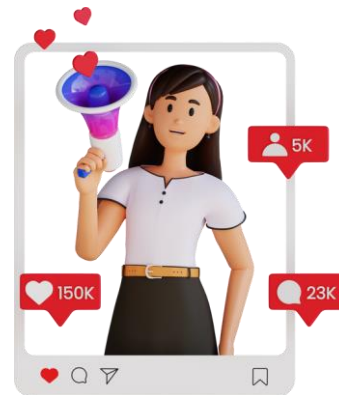
Each ton of food waste can produce 150 to 250 m³ of biogas through anaerobic digestion.

Methane has an energy content of ~55.5 MJ/kg or ~35.8 MJ/m³.



WASTEFYX: MARKETING CHANNELS

These functions help ensure that goods or services are efficiently delivered to the right customers, meet customer needs, and achieve business objectives.



Social Media Marketing:

- **Social Media:** Keep Tiktok, Facebook, Instagram, Taobao, Wechat etc. accounts active.
- **Sharing:** Post entertaining and informative food waste reduction, sustainability, and Wastefyx articles.
- **User Stories:** Encourage Wastefyx users to share their successes. User-generated content builds trust and attracts users.
- **Paid Social Media Advertising:** Target demographics and boost app downloads and engagement.

Collaborations and Partnerships:

Engage in cross-promotional opportunities for Wastefyx by collaborating with well-established companies, restaurants and enterprises. To encourage sign-ups, provide package deals or collaborative marketing.

Influencer Marketing:

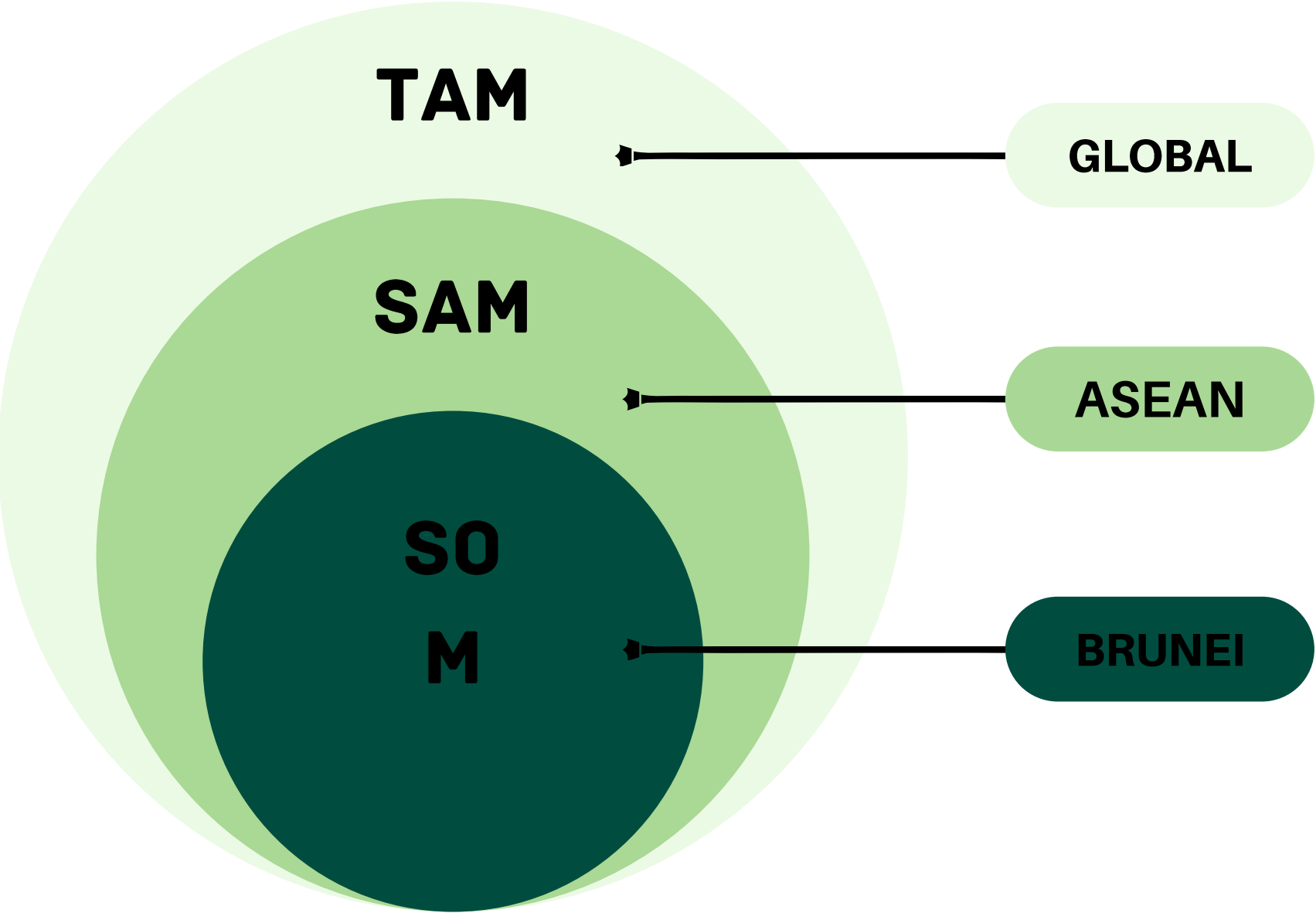
Work with local influencers, eco-bloggers, and sustainability advocates who support Wastefyx. Influencers can endorse the app and promote it to their followers.

Educational Webinars, Live Streams:

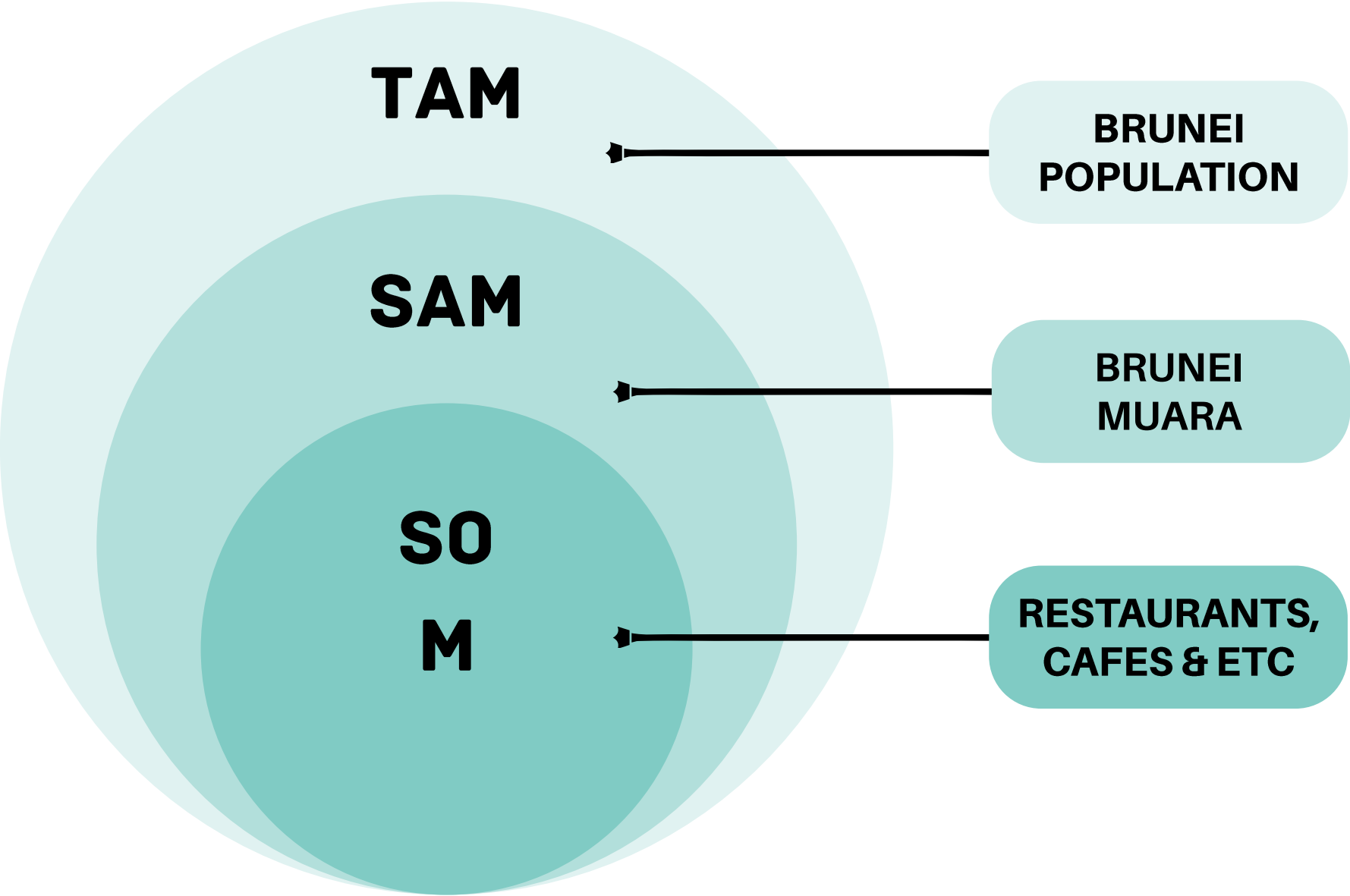
Host social media webinars or live streams to teach consumers about food waste reduction, biofuel production, and environmental effect and the benefits of Wastefyx. Potential collaboration with NGOs i.e. Green Brunei.

WASTEFYX: TARGET MARKET

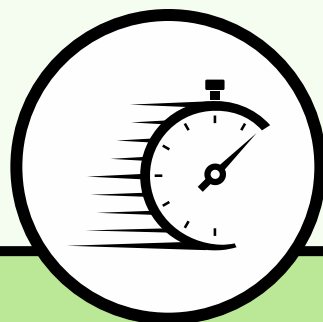
BIOFUEL MARKET



WASTEFYX APP MARKET



WASTEFYX: VALUE PROPOSITIONS

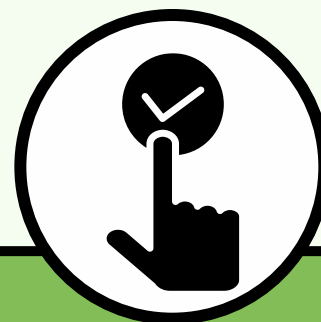


FAST & RELIABLE

App has easy-to-use design that walks users through the waste conversion process step by step.

Enables businesses to streamline waste management reporting and documentation by automated tracking processes.

Users are given transparent, timely feedback on the progress of their waste conversion due to real-time updates.



CONVENIENCE

Simple one-click away to convert their food waste to biofuel.

Pick-up system and green bins nearby from their place to reduce customer's transport cost

No need to look for and deal with trash disposal choices.



COST-SAVING

Businesses may be able to save money on traditional fees for waste disposal

Saves transportation costs due to pick-up system through the app

Users can get discounts and deals from partner companies with our reward system through the app.

WASTEFYX BENEFITS: SUSTAINABLE FOOD SYSTEM

3 main domains; Economically, Environmentally & Socially.

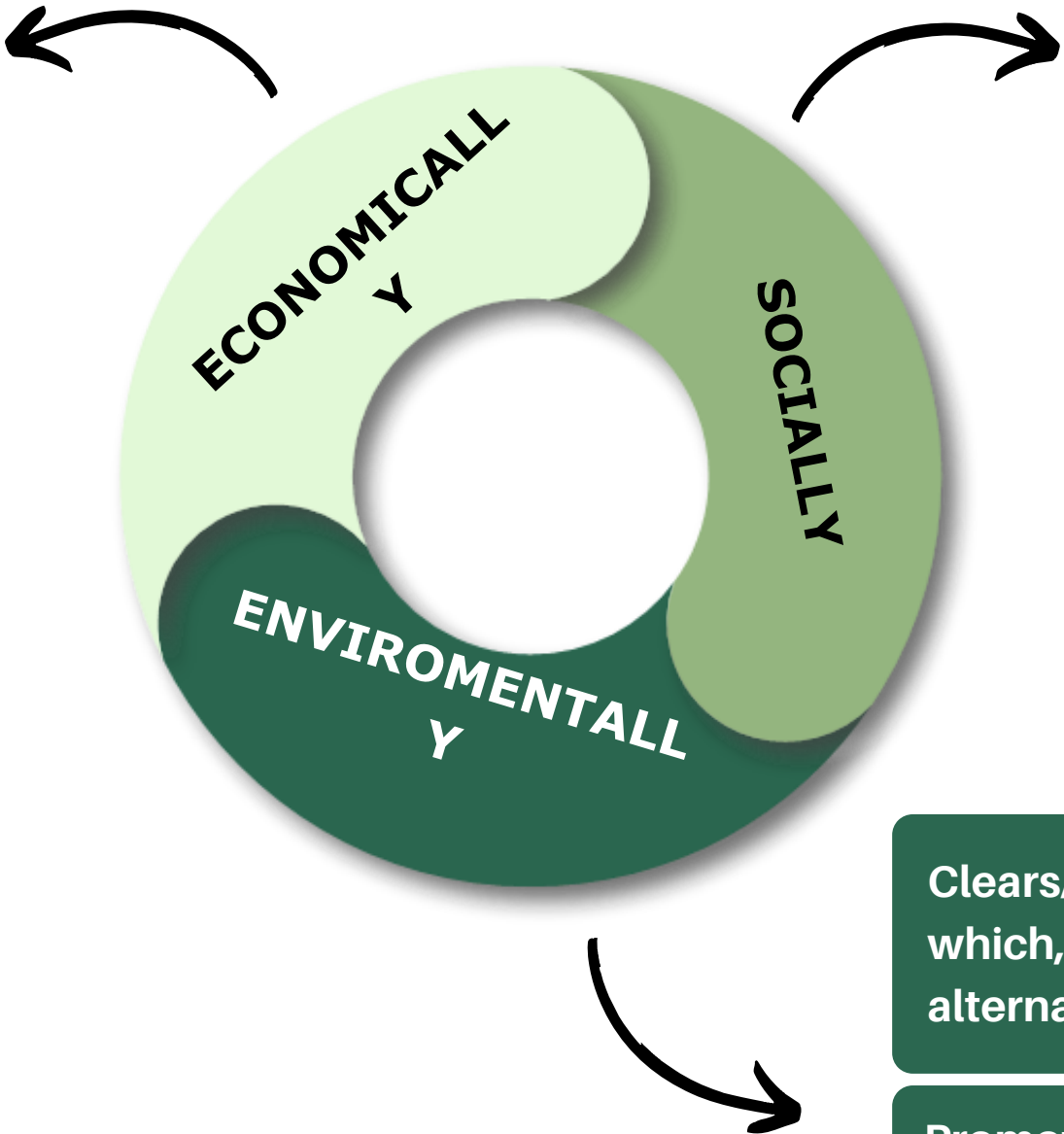
The incentivizing program can support low-income individuals and stimulate the local economy by providing assistance to companies, thereby creating a ripple effect.

Waste can be turned into Biofuel and sold for profit.

Encourages economic diversification, that involve many enterprises in multiple industries. This minimizes industrial dependence and boosts economic stability.

Provides jobs to mitigate rising unemployment.

Businesses pay corporate income tax, sales tax, and employment tax. These taxes fund government services, infrastructure, and other projects.



Better Public Health: reduce water and air pollution.

Promotes social and community responsibility as well as environmental consciousness by raising awareness of food waste's environmental impact and encouraging action.

Employment and higher living standards are provided by job creation.

Clears/Reduces waste disposal in existing landfills, which, in turn, makes more land available for alternative purposes.

Promotes a cleaner & healthier environment for the future generations.

Preservation of land & wild animal habitats.

RECOMMENDATION TOWARDS 2030 GOALS

- Promote solutions to reduce food waste, such as sustainable farming practices, efficient storage and transportation methods, responsible consumer behavior, and food donation initiatives.
- Advocate for the development and implementation of policies and regulations that incentivize and facilitate food waste reduction, including tax incentives, standardized labeling, and supportive regulations for food recovery.
- Foster collaboration among stakeholders to collectively address food waste challenges, share best practices, and implement effective solutions.
- Develop educational materials, training programs, and workshops to educate individuals, communities, and businesses on the impact of food waste and practical strategies for waste reduction.
- Support the adoption of innovative technologies and digital solutions that aid in tracking, measuring, and reducing food waste.
- Create a platform for knowledge sharing, collaboration, and best practice exchange among ASEAN countries regarding food waste reduction.

AND THIS CAN HOPEFULLY SUPPORT:



ASEAN SOCIO-CULTURAL COMMUNITY BLUEPRINT 2025

ENGAGES AND BENEFITS THE PEOPLE

A.2. Empowered People and Strengthened Institutions

INCLUSIVE

B.2. Equitable Access for All

SUSTAINABLE

C.1. Conservation and Sustainable Management of Biodiversity and Natural Resources

C.2. Environmentally Sustainable Cities

C.3. Sustainable Climate

C.4. Sustainable Consumption and Production

DYNAMIC

D.3. A Climate Adaptive ASEAN with Enhanced Institutional and Human Capacities to Adapt to the Impacts of Climate Change

D.5. Enhanced and Optimised Financing Systems, Food, Water, Energy Availability, and other Social Safety Nets in Times of Crises by making Resources more Available, Accessible, Affordable and Sustainable



ASEAN Economic Community 2025

COMPETITIVE, INNOVATIVE & DYNAMIC ASEAN

B.2. Consumer Protection

B.8. Sustainable Economic Development

ENHANCED CONNECTIVITY AND SECTORAL COOPERATION

C.3. E-Commerce

C.5. Food, Agriculture and Forestry

REFERENCES I

- Add a little <https://www.facebook.com/unep>. (2023). West Asian chefs take on fight against food waste. UNEP. <https://www.unep.org/news-and-stories/story/west-asian-chefs-take-fight-against-food-waste>
- Esterman, I. (2022, December 8). As waste-to-energy incinerators spread in Southeast Asia, so do concerns. Mongabay Environmental News. <https://news.mongabay.com/2022/12/as-waste-to-energy-incinerators-spread-in-southeast-asia-so-do-concerns/>le bit of body text
- Urbanization - Temperature | US EPA. (2015, December 29). US EPA. [https://www.epa.gov/caddis-vol2/urbanization-temperature#:~:text=Urbanization%20often%20results%20in%20increased,air%20temperatures\)%20near%20urban%20centers](https://www.epa.gov/caddis-vol2/urbanization-temperature#:~:text=Urbanization%20often%20results%20in%20increased,air%20temperatures)%20near%20urban%20centers).
- USDA. Food Waste and its Links to Greenhouse Gases and Climate Change. (2023). Usda.gov. <https://www.usda.gov/media/blog/2022/01/24/food-waste-and-its-links-greenhouse-gases-and-climate-change#:~:text=Food%20loss%20and%20waste%20also,even%20more%20potent%20greenhouse%20gas>.
- Chang, M. (2021, April 30). Food Waste and Climate Change, How They Influence Each Other. Ethical Choice | for Sustainable Future; Ethical Choice | For Sustainable Future. <https://myethicalchoice.com/en/journal/food-loss/food-waste-climate-change/>
- U.S. Energy Information Administration (EIA). Biofuels and the environment.(2023). Eia.gov. <https://www.eia.gov/energyexplained/biofuels/biofuels-and-the-environment.php#:~:text=When%20burned%2C%20pure%20biofuels%20generally,that%20do%20not%20contain%20biofuels>.
- Takefman, B. (2020, February 27). How Incentives Shape Economic Development | Research FDI. ResearchFDI. <https://researchfdi.com/resources/articles/how-incentives-shape-economic-development/>
- Key Indicators Database – Asian Development Bank. (2023). Key Indicators Database – Asian Development Bank. https://kidb.adb.org/explore?filter%5Bindicator_id%5D=2700008&filter%5Byear%5D=2000%2C2001%2C2002%2C2003%2C2004%2C2005%2C2006%2C2007%2C2008%2C2009%2C2010%2C2011%2C2012%2C2013%2C2014%2C2015%2C2016%2C2017%2C2018%2C2019%2C2020%2C2021%2C2022%2C2023&filter%5Beconomy_code%5D=AFG%2CARM%2CAZE%2CBAN%2CBHU%2CBRU%2CCAM%2CCOO%2CFIJ%2CFSM%2CGEO%2CHKG%2CIND%2CINO%2CKAZ%2CKGZ%2CKIR%2CKOR%2CLAO%2CMAL%2CMLD%2CMON%2CMYA%2CNAU%2CNEP%2CNIU%2CPAK%2CPHI%2CPLW%2CPNG%2CPRC%2CRM%2CSAM%2CSIN%2CSOL%2CSRI%2CTAJ%2CTAP%2CTHA%2CTIM%2CTKM%2CTON%2CTUV%2CUZB%2CVAN%2CVIE%2CAUS%2CJPN%2CNZL&grouping=indicators&showRegions=1
- Key Indicators Database – Asian Development Bank. (2023). Key Indicators Database – Asian Development Bank. https://kidb.adb.org/explore?filter%5Bindicator_id%5D=2700009&filter%5Byear%5D=2000%2C2001%2C2002%2C2003%2C2004%2C2005%2C2006%2C2007%2C2008%2C2009%2C2010%2C2011%2C2012%2C2013%2C2014%2C2015%2C2016%2C2017%2C2018%2C2019%2C2020%2C2021%2C2022%2C2023&filter%5Beconomy_code%5D=AFG%2CARM%2CAZE%2CBAN%2CBHU%2CBRU%2CCAM%2CCOO%2CFIJ%2CFSM%2CGEO%2CHKG%2CIND%2CINO%2CKAZ%2CKGZ%2CKIR%2CKOR%2CLAO%2CMAL%2CMLD%2CMON%2CMYA%2CNAU%2CNEP%2CNIU%2CPAK%2CPHI%2CPLW%2CPNG%2CPRC%2CRM%2CSAM%2CSIN%2CSOL%2CSRI%2CTAJ%2CTAP%2CTHA%2CTIM%2CTKM%2CTON%2CTUV%2CUZB%2CVAN%2CVIE%2CAUS%2CJPN%2CNZL&grouping=indicators&showRegions=1
- Key Indicators Database – Asian Development Bank. (2023). Key Indicators Database – Asian Development Bank. https://kidb.adb.org/explore?filter%5Bindicator_id%5D=2700010&filter%5Byear%5D=2000%2C2001%2C2002%2C2003%2C2004%2C2005%2C2006%2C2007%2C2008%2C2009%2C2010%2C2011%2C2012%2C2013%2C2014%2C2015%2C2016%2C2017%2C2018%2C2019%2C2020%2C2021%2C2022%2C2023&filter%5Beconomy_code%5D=AFG%2CARM%2CAZE%2CBAN%2CBHU%2CBRU%2CCAM%2CCOO%2CFIJ%2CFSM%2CGEO%2CHKG%2CIND%2CINO%2CKAZ%2CKGZ%2CKIR%2CKOR%2CLAO%2CMAL%2CMLD%2CMON%2CMYA%2CNAU%2CNEP%2CNIU%2CPAK%2CPHI%2CPLW%2CPNG%2CPRC%2CRM%2CSAM%2CSIN%2CSOL%2CSRI%2CTAJ%2CTAP%2CTHA%2CTIM%2CTKM%2CTON%2CTUV%2CUZB%2CVAN%2CVIE%2CAUS%2CJPN%2CNZL&grouping=indicators&showRegions=1

REFERENCES II


- **Key Indicators Database – Asian Development Bank. (2023). Key Indicators Database – Asian Development Bank.**
https://kidb.adb.org/explore?filter%5Bindicator_id%5D=2200004&filter%5Byear%5D=2000%2C2001%2C2002%2C2003%2C2004%2C2005%2C2006%2C2007%2C2008%2C2009%2C2010%2C2011%2C2012%2C2013%2C2014%2C2015%2C2016%2C2017%2C2018%2C2019%2C2020%2C2021%2C2022%2C2023&filter%5Beconomy_code%5D=AFG%2CARM%2CAZE%2CBAN%2CBHU%2CBRU%2CCAM%2CCOO%2CFIJ%2CFSM%2CGEO%2CHKG%2CIND%2CINO%2CKAZ%2CKGZ%2CKIR%2CKOR%2CLAO%2CMAL%2CMLD%2CMON%2CMYA%2CNAU%2CNEP%2CNIU%2CPAK%2CPHI%2CPLW%2CPNG%2CPRC%2CRMI%2CSAM%2CSIN%2CSOL%2CSRI%2CTAJ%2CTAP%2CTHA%2CTIM%2CTKM%2CTON%2CTUV%2CUZB%2CVAN%2CVIE%2CAUS%2CJPN%2CNZL&grouping=indicators&showRegions=1
- World Bank Open Data. (2018). World Bank Open Data. <https://data.worldbank.org/indicator/SP.URB.TOTL>
- World Bank Open Data. (2022). World Bank Open Data. <https://data.worldbank.org/indicator/SP.POP.TOTL>
- World Bank Open Data. (2014). World Bank Open Data. <https://data.worldbank.org/indicator/AG.PRD.FOOD.XD>
- World Bank Open Data. (2023). World Bank Open Data. <https://data.worldbank.org/indicator/SL.UEM.TOTL.NE.ZS>
- **FAOSTAT. (2023). Fao.org. <https://www.fao.org/faostat/en/#data/TCL>**
- **FAOSTAT. (2023). Fao.org. <https://www.fao.org/faostat/en/#search/flood>**
- **World Bank Open Data. (2014). World Bank Open Data. <https://data.worldbank.org/indicator/EG.USE.COMM.FO.ZS>**
- **Economics of Biofuels | US EPA. (2014, April 17). US EPA. <https://www.epa.gov/environmental-economics/economics-biofuels#:~:text=Replacing%20fossil%20fuels%20with%20biofuels%20has%20the%20potential%20to%20generate,in%20theory%2C%20be%20sustained%20indefinitely.>**
- IEA. (2023). Biofuels can provide up to 27% of world transportation fuel by 2050, IEA report says - IEA “roadmap” shows how biofuel production can be expanded in a sustainable way, and identifies needed technologies and policy actions - News - IEA. IEA. <https://www.iea.org/news/biofuels-can-provide-up-to-27-of-world-transportation-fuel-by-2050-iea-report-says-iea-roadmap-shows-how-biofuel-production-can-be-expanded-in-a-sustainable-way-and-identifies-needed-technologies-and-policy-actions>
- **Huang, Haixiao; Khanna, Madhu; Önal, Hayri; Chen, Xiaoguang (2013). Stacking low carbon policies on the renewable fuels standard: Economic and greenhouse gas implications. Energy Policy, 56(), 5–15. doi:10.1016/j.enpol.2012.06.002**
- **Subramaniam, Y., & Tajul Ariffin Masron. (2021). The impact of economic globalization on biofuel in developing countries. Energy Conversion and Management: X, 10, 100064–100064. <https://doi.org/10.1016/j.ecmx.2020.100064>**
- Team, F. (2023, March 24). Fuel Your Business Dreams: Biodiesel Manufacturing Startup Costs. Finmodelslab.com; FinModelsLab. <https://finmodelslab.com/blogs/blog/biodiesel-manufacturing-startup-costs>
- App. (2023, July 13). App Development Costs. Business of Apps. <https://www.businessofapps.com/app-developers/research/app-development-cost/#:~:text=Simple%20app%20development%20price%20tag,app%20developer%20~%24105%2C000%20%2F%20year>
- **BioenergyKDFChannel. (2012). Thermochemical Conversion of Biomass to Biofuels via Pyrolysis [YouTube Video]. In YouTube. https://www.youtube.com/watch?v=IvZFfx7XhQE&t=4s&ab_channel=BioenergyKDFChannel**
- **Mahmoodi, P., Karimi, K., & Taherzadeh, M. J. (2018). Efficient conversion of municipal solid waste to biofuel by simultaneous dilute-acid hydrolysis of starch and pretreatment of lignocelluloses. Energy Conversion and Management, 166, 569–578. <https://doi.org/10.1016/j.enconman.2018.04.067>**
- FAO. (2011). Food wastage footprint & Climate Change. <https://www.fao.org/3/bb144e/bb144e.pdf>
- Food and Agriculture Organization of the United Nations (FAO). (2011). Global food losses and food waste. Rome.
- **20th ASEAN COF (May 2023, Online) |. (2023). Asean.org. <http://asmc.asean.org/events-twentieth-session-of-the-asean-climate-outlook-forum-aseancof-20/>**
- <https://www.spaceotechnologies.com/blog/how-much-does-it-cost-to-maintain-app/>
- **ASEAN Food Security Information System (AFSIS), "ASEAN Food Security Outlook 2019," <http://www.aptfsis.org/asean-food-security-outlook-2019>**
- **ASEAN Centre for Energy (ACE), "ASEAN Energy Outlook 2019," <https://www.aseanenergy.org/asean-energy-outlook/>**
- **<https://www.apn-gcr.org/bulletin/article/climate-change-scenarios-over-southeast-asia/>**


REFERENCES III

- **Brunei Climate Change Secretariat, "Brunei Darussalam State of the Environment Report 2016,"** [Key Indicators Database – Asian Development Bank. \(2023\). Key Indicators Database – Asian Development Bank. https://kidb.adb.org/explore](https://kidb.adb.org/explore)
- BP World Energy Outlook. (2021). Statistical Review of World Energy 2021 (70). Retrieved from <https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2021-full-report.pdf>
- ASEAN Centre, 2022).
- Team, F. (2023, September 30). Discover the price to kickstart your very own #biofuel venture! Get insights on opening costs and launching... Finmodelslab.com; FinModelsLab. <https://finmodelslab.com/blogs/startup-costs/biofuel-startup-costs>
- <https://finmodelslab.com/blogs/startup-costs/biofuel-production-from-agricultural-waste-startup-costs>
- CEICdata.com. (2023). Brunei Total Greenhouse Gas Emissions: Tonnes of CO2 Equivalent per Year: Processes. Ceicdata.com; CEICdata.com. <https://www.ceicdata.com/en/brunei/environmental-greenhouse-gas-emissions-annual/total-greenhouse-gas-emissions-tonnes-of-co2-equivalent-per-year-processes>
- Bentivoglio, Deborah & Rasetti, Michele. (2015). Biofuel sustainability: Review of implications for land use and food price. REA. 70. 10.13128/REA-16975.
- Zhang, R., El-Mashad, H. M., Hartman, K., Wang, F., Liu, G., Choate, C., & Gamble, P. (2007). Characterization of food waste as feedstock for anaerobic digestion. Bioresource Technology, 98(4), 929-935.
- De Baere, L., & Mattheeuws, B. (2014). Anaerobic digestion of the organic fraction of municipal solid waste in Europe - Status, experience and prospects. Waste Management & Research, 32(4), 100-108.
- Stenmarck, Å., Jensen, C., Quested, T., & Moates, G. (2016). Estimates of European food waste levels. Stockholm: IVL Swedish Environmental Research Institute.
- Patel, S. (2022, August 5). Mobile App Usage and Growth Statistics for 2023 and Beyond. Mindinventory.com. <https://www.mindinventory.com/blog/mobile-app-usage-growth-statistics/>
- Sentian, J., Payus, C., Herman, F., & Wan, V. (2022). Climate change scenarios over Southeast Asia. APN Science Bulletin, 12(1), 102–122. <https://doi.org/10.30852/sb.2022.1927>
- Internet penetration rates in Southeast Asia 2022 | Statista. (2022). Statista; Statista. <https://www.statista.com/statistics/487965/internet-penetration-in-southeast-asian-countries/#:~:text=In%202022%2C%20Brunei%20recorded%20the,having%20multiple%20internet%20subscriptions%20simultaneously.>
-

JUDGING CRITERIA

Criteria	Weightage	Score (Scale of 1-10)
Presentation Delivery <ul style="list-style-type: none"> ▪ Demonstrates a comprehensive understanding of the storyboard ▪ Deliver the storyboard confidently ▪ Respond to judges’ questions confidently and properly 	20%	/10
Data and Visualisations <ul style="list-style-type: none"> ▪ Clear, assured delivery with suitable use of visual aids ▪ Most suitable charts used ▪ All of the data in the dashboard are accurate and not manipulated ▪ Credible references (complete links) to datasets are cited 	25%	/10
Analysis & Insights <ul style="list-style-type: none"> ▪ Problem statement is clear ▪ Capability to tell a compelling and engaging story that is logical and critical ▪ Use of clear, focused and quality visual analysis, compelling charts and graphs to depict the datasets and give viewers meaningful insights ▪ Graph(s) and storyboard are well structured and organized ▪ Specific UN-SDG Target(s) and Indicator(s) to achieve is/are explicitly stated ▪ Particular Characteristics, Elements and Strategic Measures of the ASEAN Socio-Cultural Community 2025 and ASEAN Economic Community 2025 to achieve are obviously declared 	30%	/10



Recommendation <ul style="list-style-type: none"> ▪ Recommendations are proposed on the basis of data analysis ▪ Recommendations are creative, feasible, specific, sustainable, original and impactful ▪ Scalable across more than one ASEAN member state ▪ Innovative solutions(s) are attainable with current technology and resources ▪ There is clear demonstration of the implementation of the solution (timeline, relevant stakeholders involved) 	25%	/10
--	-----	-----