



ASEAN  
DATA SCIENCE  
EXPLORERS



# Air pollution-free *areas*

empowering changes for clean air toward a  
sustainable future for the ASEAN community

TEAM TITANS - THAILAND

NAPATCHA KAEWKUMNERD & PHAKAWAN SUTHISOPHON

MATER DEI SCHOOL BANGKOK





Which side would you prefer?



Unhealthy levels of  
Air Quality Index (AQI)  
in Thailand

Source: Pattaya Mail



Good levels of Air Quality Index (AQI)  
in Australia

Source: Skyscrapercity

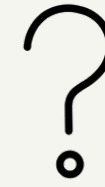
## Objectives

To mitigate **air pollution** in the ASEAN region by promoting sustainable alternatives, engaging communities, advocating for policy changes, and fostering long-term environmental impact by following SDGs goals 3, 11, and 13.





**What is happening in ASEAN?**



**Why?**

define problems



**How might we?**

recommendation

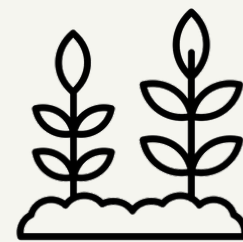


## Our project journey

**Problems resolved**



**What is the plan?**



- implementation plan
- partnerships cooperation
- stakeholder framework
- project scaling



# What is happening in ASEAN?



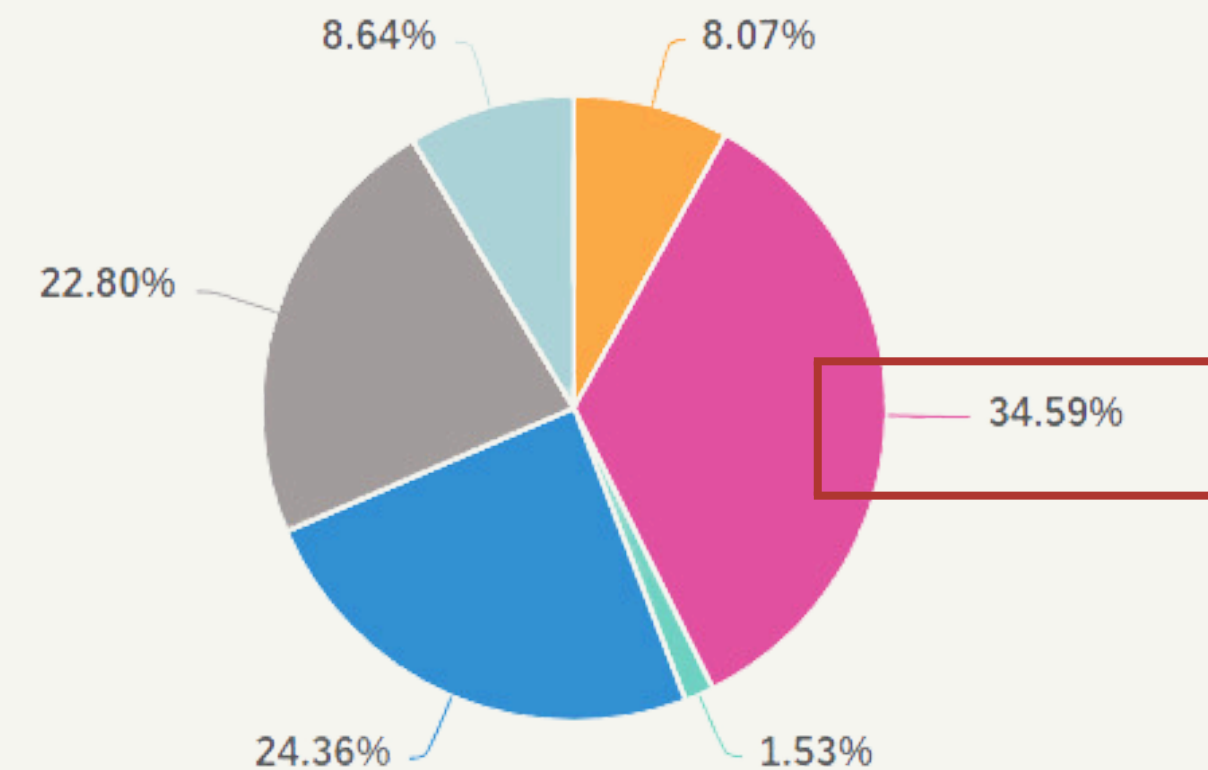
## How serious is air pollution , and how much of a dilemma is it?

more than  
**1/3**  
of global CO2 emissions  
is from Asia

total greenhouse gas emissions in CO<sub>2</sub> equivalents per Entity in each continents

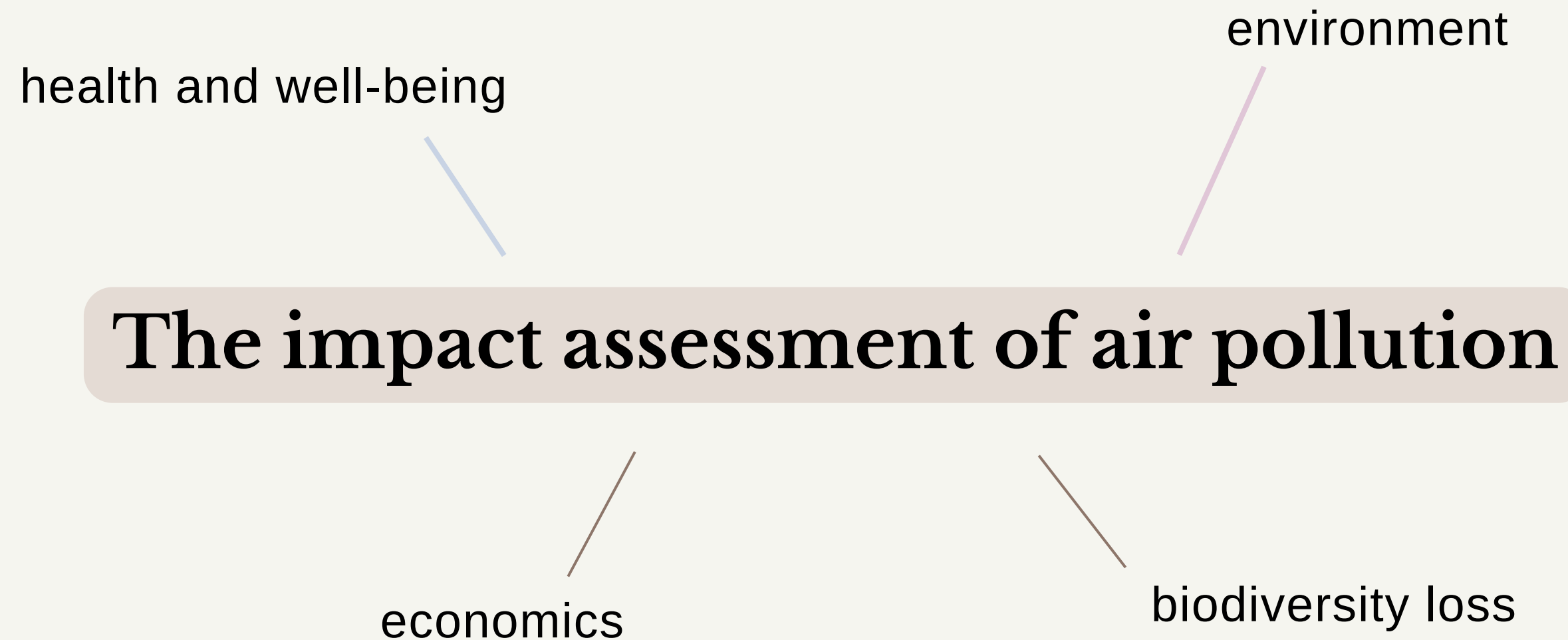
1 Filter

Africa Asia Australia Europe North America South America



The **Asia** region had **the greatest total gas emissions** compared to other continents.

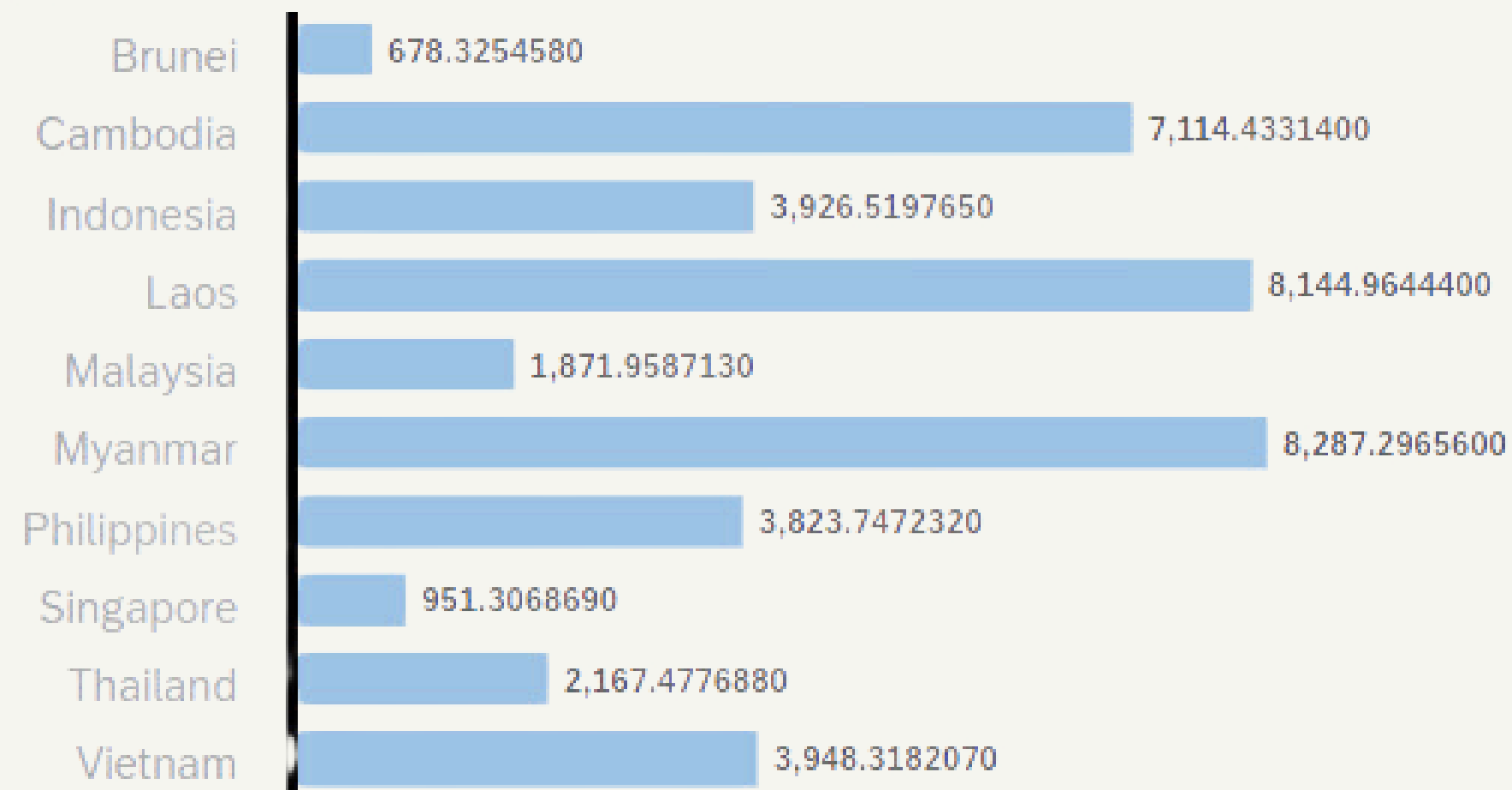




# 1 Health and Well-being

Deaths that are from all causes attributed to air pollution per 100,000 people, in both sexes aged age-standardized per Entity for Actual

1 Filter



# 99%

of population in ASEAN live in areas where air pollution exists

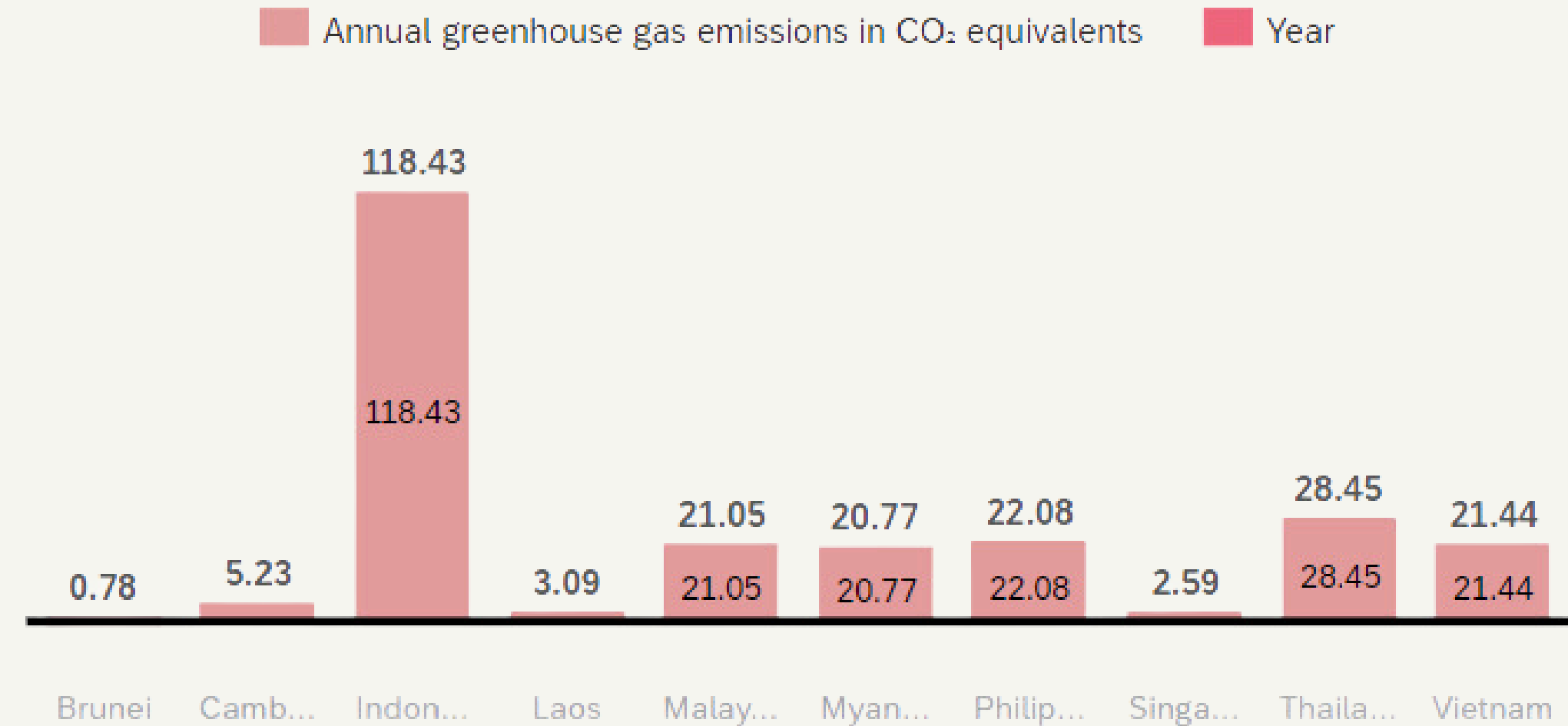
37  
40 most polluted cities in the world are located in Southeast Asia



2 Environmental

Annual greenhouse gas emissions in CO<sub>2</sub> equivalents, Year per Entity for Actual

in Billion | 1 Filter

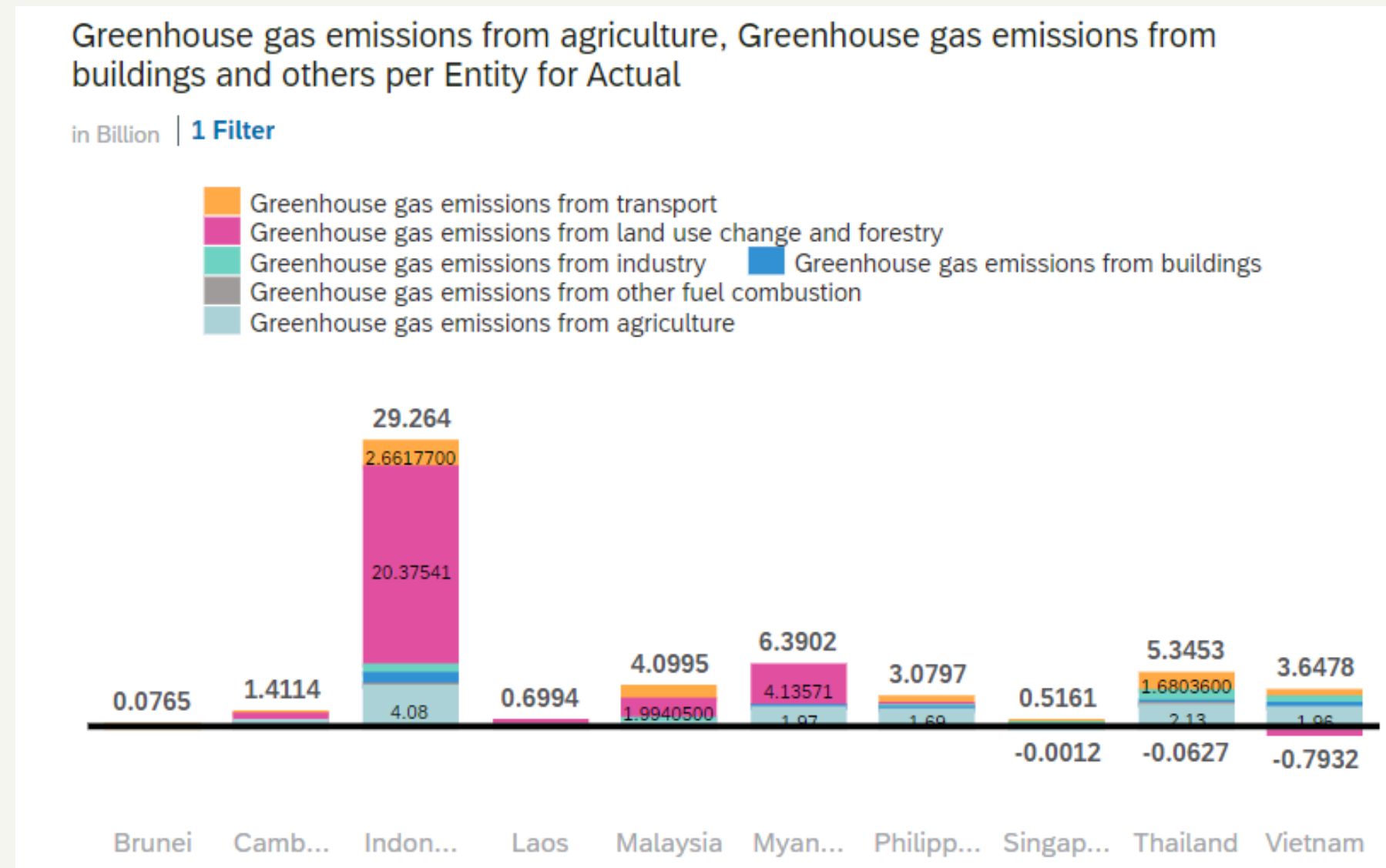


**What have been the circumstances  
of air pollution in ASEAN?**

?



## What is ASEAN's main contributor to GHG emissions?

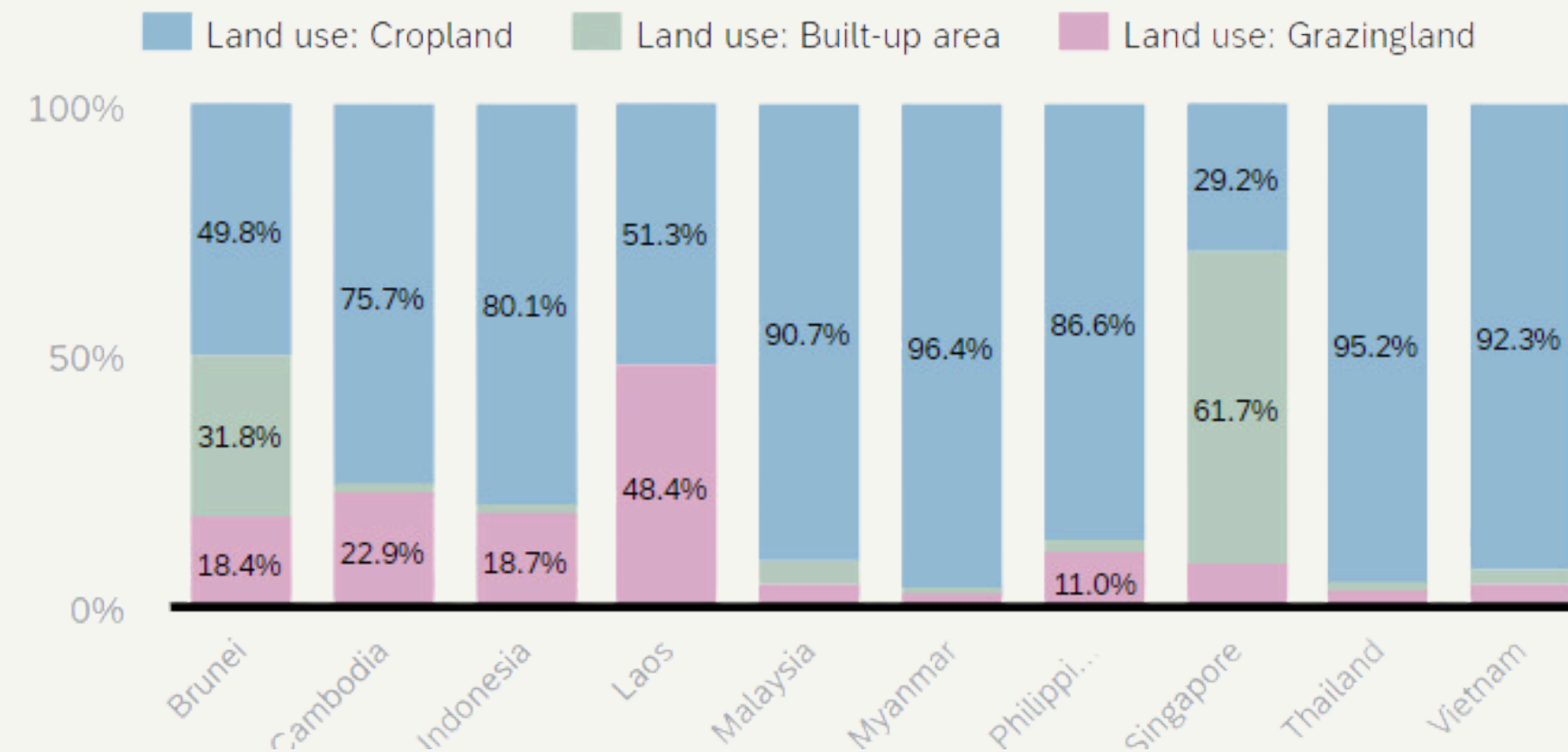


The main contributor is **land use change and forestry** which are contributing to **severe air pollution**.

## Specifying land use change and forestry

Land use: Built-up area, Land use: Cropland and others per Entity for Actual

1 Filter

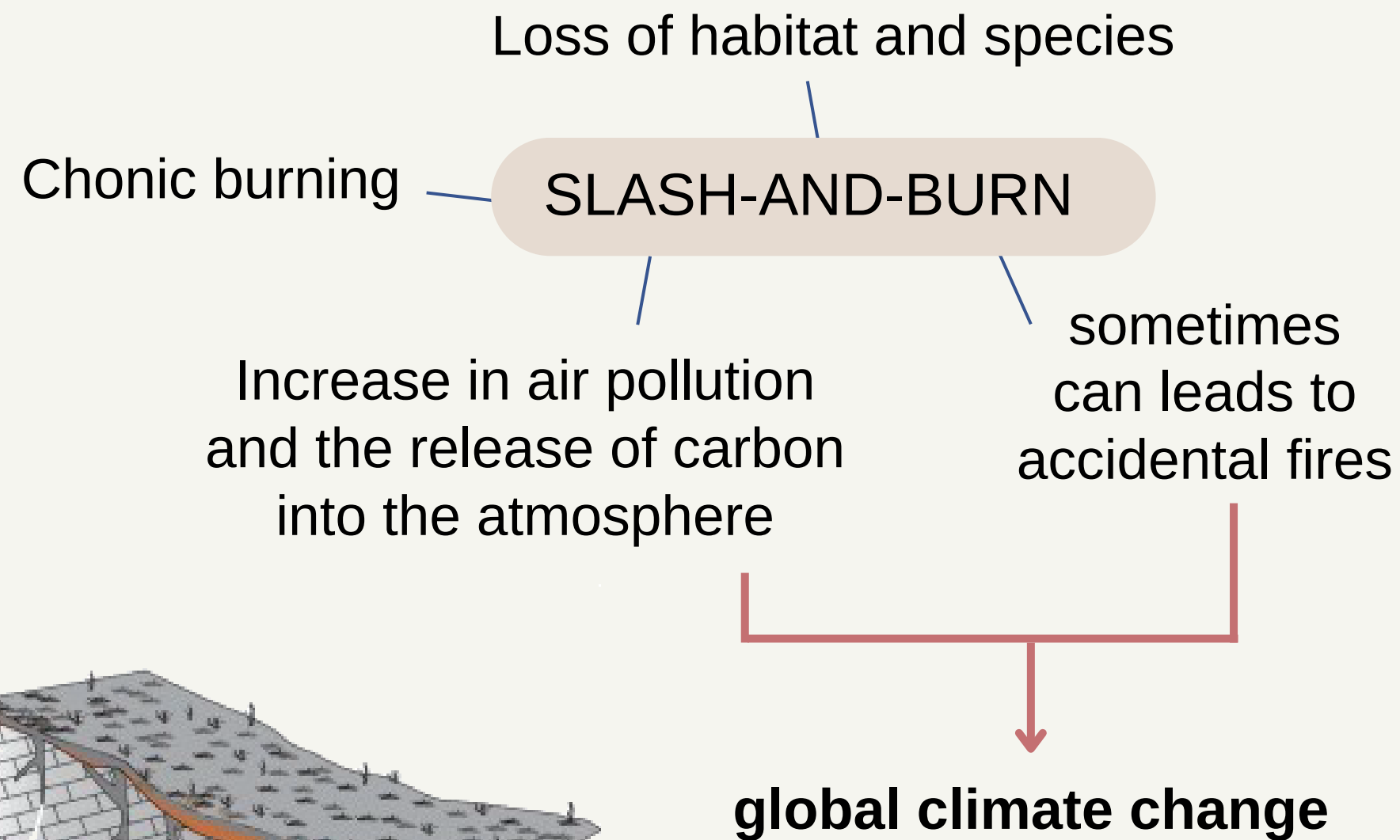


The bar graphs indicate that **cropland** covers most land use area in the ASEAN region, utilized for **agricultural purposes**.

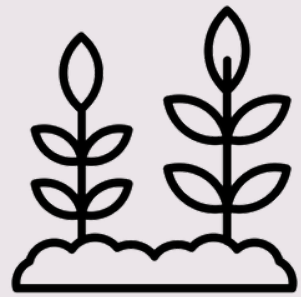
# SLASH-AND-BURN

(known as Agricultural Burning)

SLASH-AND-BURN is a farming method that involves burning forests and emptying spaces for planting.



# Why SLASH AND BURN considered as a big problem in Asean's air pollution?



**Agriculture** is one of the **key players** in the ASEAN.

There is **more occurrence** of SLASH AND BURN compared to other regions.



**Chronic Burning**



**Widespread**

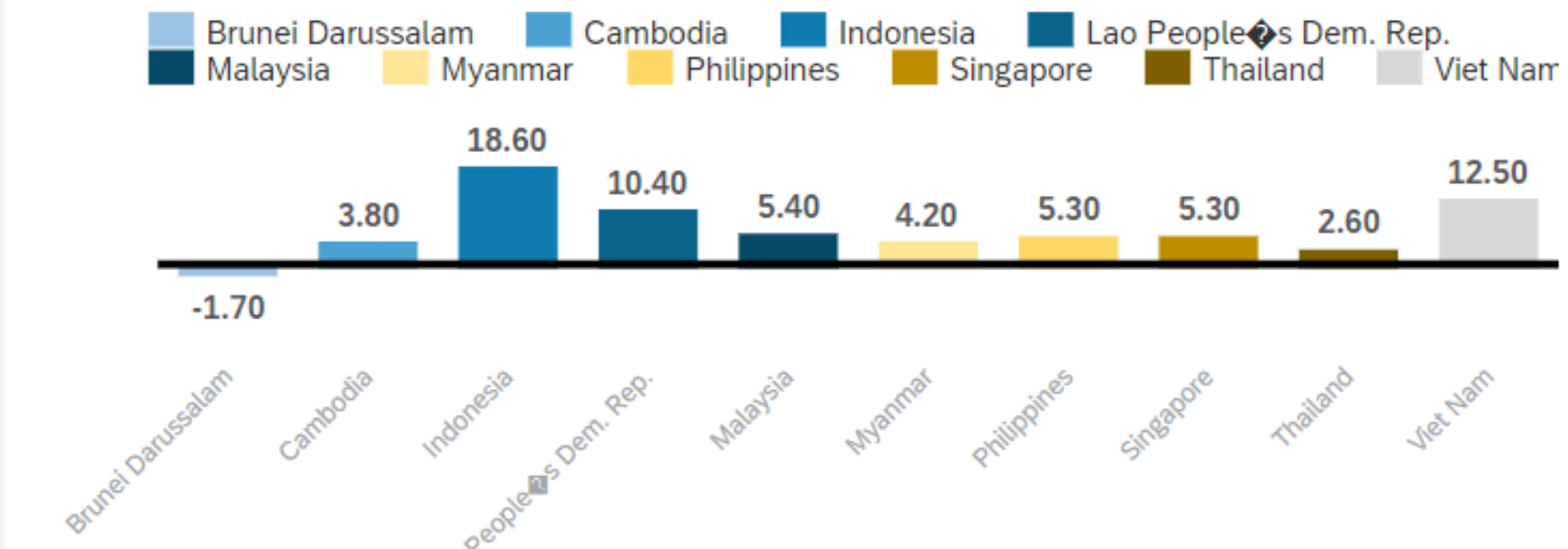


# SLASH-AND-BURN

In recent years, with an increasing worldwide awareness of environmental issues, SLASH-AND-BURN in tropical forest areas has been identified as **a significant contributor to deforestation** and is considered a problem.

Agriculture growth per Regional Member for Actual in 2020

1 Filter

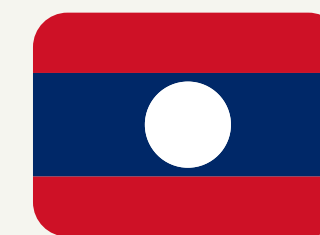


**Agriculture in ASEAN is valued highly**  
in comparison to other regions.

The top 3 countries with **the highest** percentage of Agriculture in the ASEAN region.



Indonesia



Laos



Vietnam

# Why SLASH AND BURN considered as a big problem in Asean's air pollution?



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### Chronic Burning

The SLASH AND BURN technique has been practiced for a long time with **unresolved impacts**.



**Widespread**

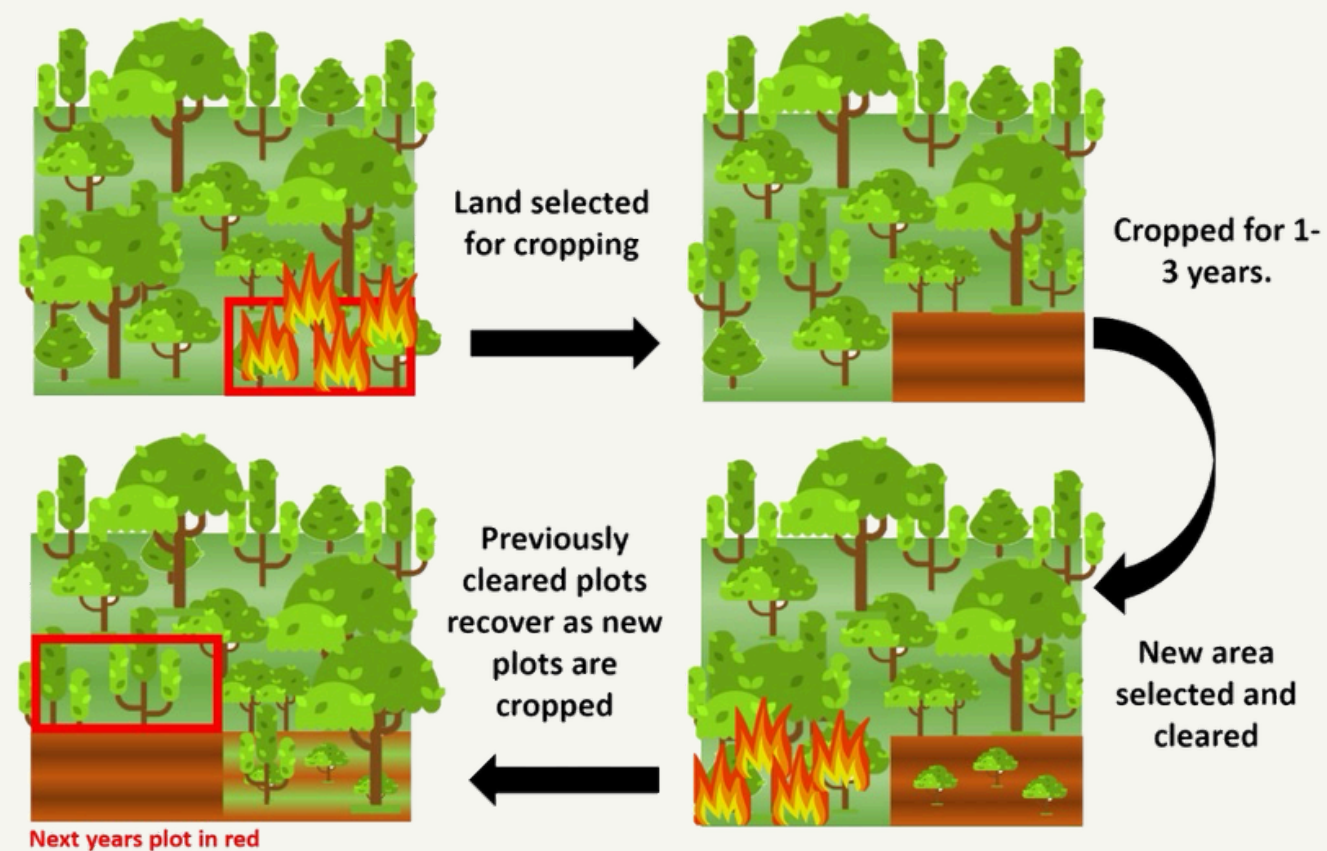
# SLASH-AND-BURN

"Slash-and-burn continues the same process, repeating the loop repeatedly."

**SLASH-AND-BURN has not been solved over the recent years**

## Reasons

- 1 Economic pressures
- 2 Lack of awareness
- 3 Policy gaps



# Why SLASH AND BURN considered as a big problem in Asean's air pollution?



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**Widespread**

The Haze that is created can spread so far as to **affect all** ASEAN member countries.



### Case Study

#### Situation

**The haze** from SLASH-AND-BURN in Kalimantan and Sumatra, Indonesia.



resulted in

**Blanketed large parts** in Indonesia, Thailand, Singapore, Brunei, Philippines, and Malaysia. (Which was worsened by the El Niño effect)

#### News

**Singapore Cooperation with Indonesia in Combating the Haze: Mitigating Forest Burning for Cultivation**



**Indonesian forests are burning, and Malaysia and Singapore are choking on the fumes**

Climate & Energy | Climate Change

**Indonesia defends haze-fighting effort after Malaysia urges action**

By Ananda Teresia

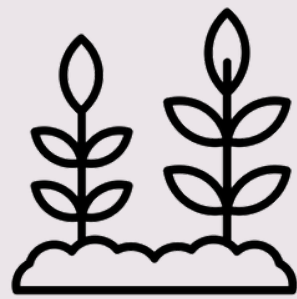
October 6, 2023 1:51 PM GMT+7 · Updated 8 months ago



From this situation, it can be concluded that:

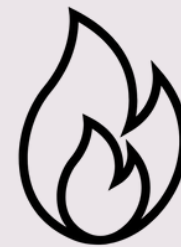
The Haze from SLASH-AND-BURN spread so far as to **affecton all ASEAN member countries.**

## Why SLASH AND BURN considered as a big problem in Asean's air pollution?



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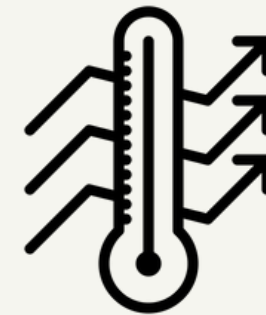


**Widespread**

The Haze that is created can spread so far as to **affect all** ASEAN member countries.

### Air pollution problems nowadays are worsen by the El Niño effect

The El Niño effect is a climate pattern moving to Asia from the Pacific, which brings hot and dry conditions to Southeast Asia.



**How are we going to resolve these issues?**





## Introducing “CarbonSeeker”

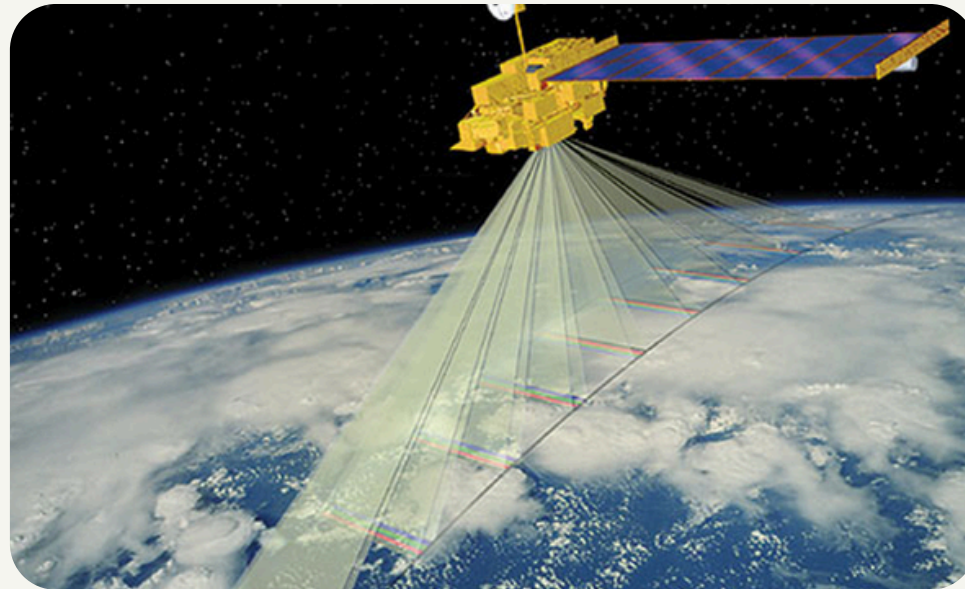


“CarbonSeeker” is an application designed to **monitor** haze pollution from SLASH-AND-BURN activities, while also providing tools and healthcare services to **support** the farmer community.

# Technologies Used in Fire Detection

## Satellite

### Successful case sample

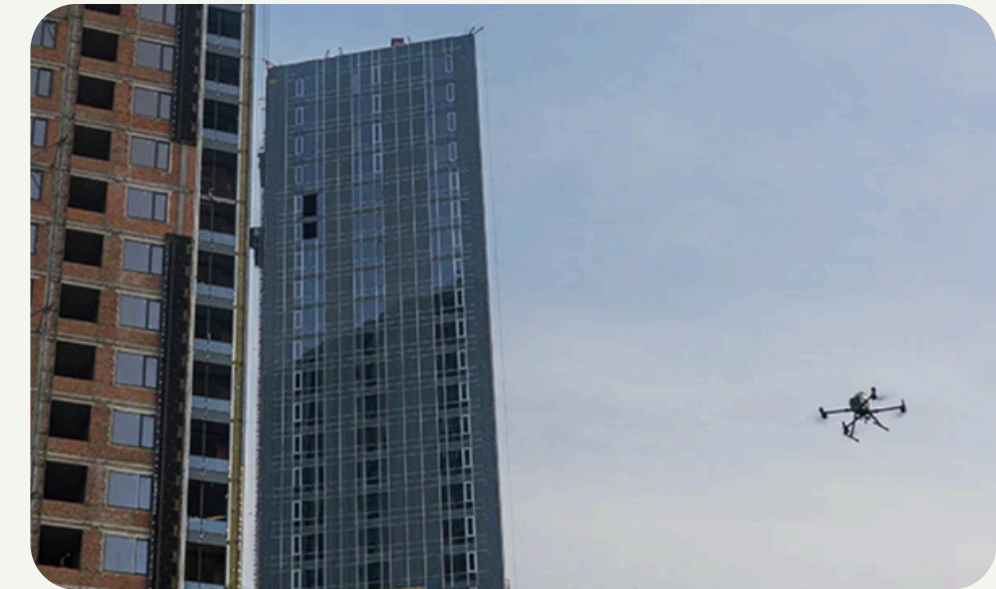



### NASA's MODIS

- They use to monitor **wildfires** across the globe.
- The satellite's **infrared sensors** detect thermal anomalies

## Drone

### Successful case sample



 Ukraine, Kiev

They measured air quality with the support of a equipped with **gas sensors**.

Satellite	Carbon Detectors	Drone
<b>Delayed Data Transmission</b>	real-time detection and data transmission	real-time detection and data transmission
Large coverage area	<b>Small coverage area</b>	Targeted Monitoring in Remote Areas
<b>Infrequent Passes</b>	frequent data updates	frequent data updates
CO <sub>2</sub> , NO <sub>2</sub> , ozone, surface temperature, broad imagery	CO <sub>2</sub> , greenhouse gases, particulate matter (PM2.5, PM10)	air pollutants (CO <sub>2</sub> , CH <sub>4</sub> , PM), location, and photographic evidence

# Why CarbonSeeker uses drones as a data collector?

Detailed and specific data are essential for real-time **monitoring particular locations** for comprehensive wildfire detection and rapid response.



making **drones**

**highly suitable** for CarbonSeeker application



drones

- **High-resolution data collection** (including air pollutants, GPS, and photographic evidence)
- **Real-time** monitoring
- Access to **Hard-to-reach areas** especially in rural and forested areas
- **Cost** effective
- Can measure **different pollutants** (e.g. PM2.5, PM10, CO2, SO2)



CarbonSeeker also **integrates data** from satellites into our system, creating a comprehensive solution.



By combining these technologies, these technologies ensure comprehensive wildfire detection, tracking, and rapid response.

# CarbonSeeker's Target Users



```
graph TD; A[CarbonSeeker's Target Users] --> B[Non-profit organizations]; A --> C[Farmers]
```


Non-profit organizations

Farmers

# Application Prototype

*\*Please note that this application is currently in the previewing state\**

sign in page



organization/farmers





Select option ▼



Phone number, username or email

Password

Sign in

organization page



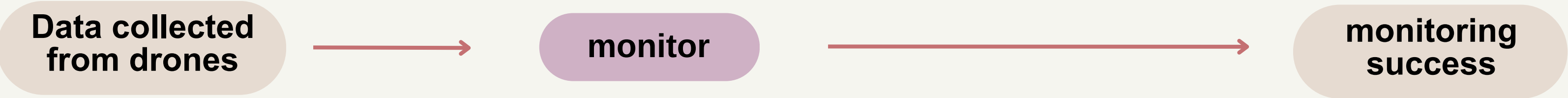
Real Time Data

Time Location

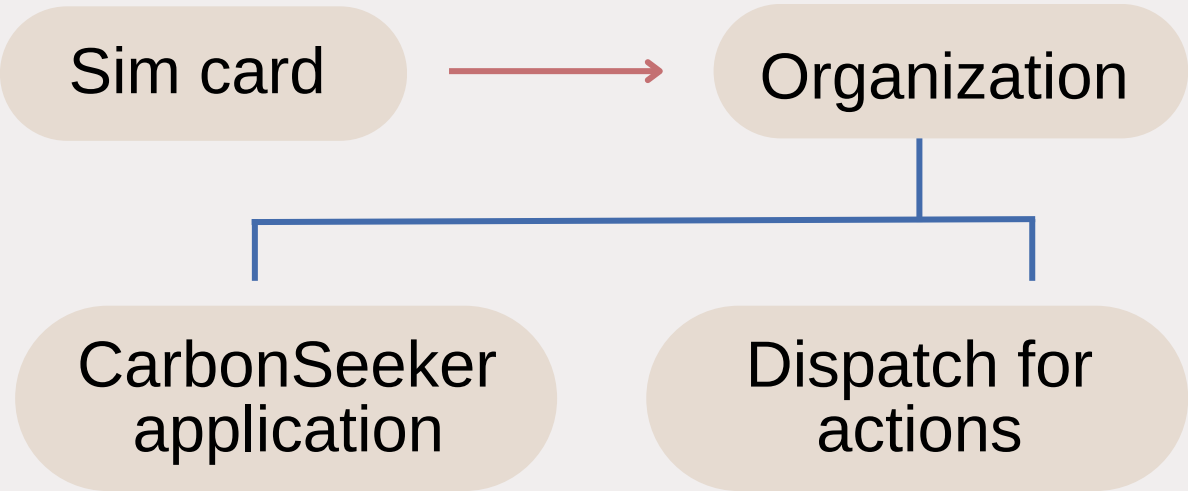
Temperatures Cardinal Direction

**Organization** can view **all insight data & collect them** from drones.

# CarbonSeeker's process for organization users (farmers)



- Step 1 : **Educate Farmers** on SLASH-AND-BURN impact and alternative ways of farming techniques.
- Step 2 : **Support System:** provide resources include tools and equipment for sustainable farming.
- Step 3 : **Apply Penalties and Incentive:**  
Enforce penalties for non-compliance




## Data collected from drones

- 1.Air pollutant concentrations  
2.Geospatial data  
3.Time series data
- 4.Meteorological data  
5.Infrared imaging  
6.Photographic evidence

# CarbonSeeker's process

for users (farmers)  
organization



User Persona Instance

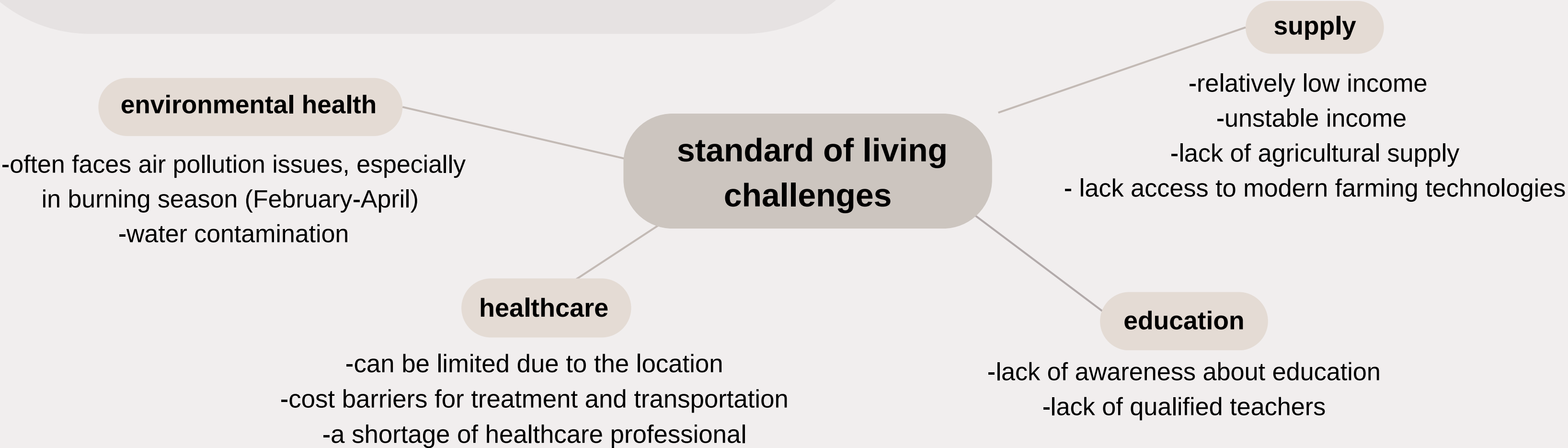
**aunt mhutoon**

age : 45

occupation : Sugarcane farmer

nationality : Thai

work place : Mueang Lop Buri, Thailand





## Case Study Area



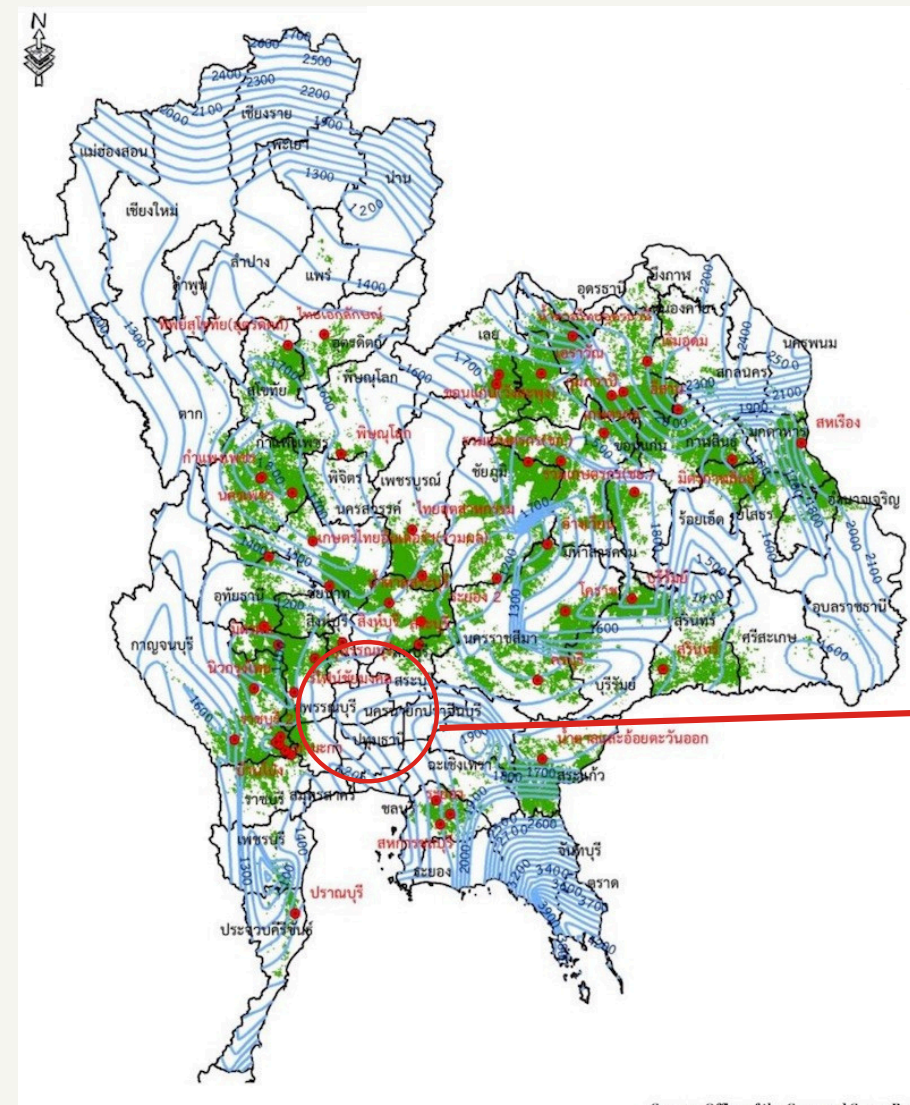
📍 Khok Salung, Phathana Nikhom District, Lop Buri, Thailand

56,000 hectare (350K rai)  
**20%**  
of total planted area

"Lopburi has sugarcane farmers who burn their sugarcane before harvesting across 200,000 rai."

**-Settha Taweessin**

former Prime minister of Thailand



Green Area: Sugarcane farm  
**Thailand Sugarcane Map**

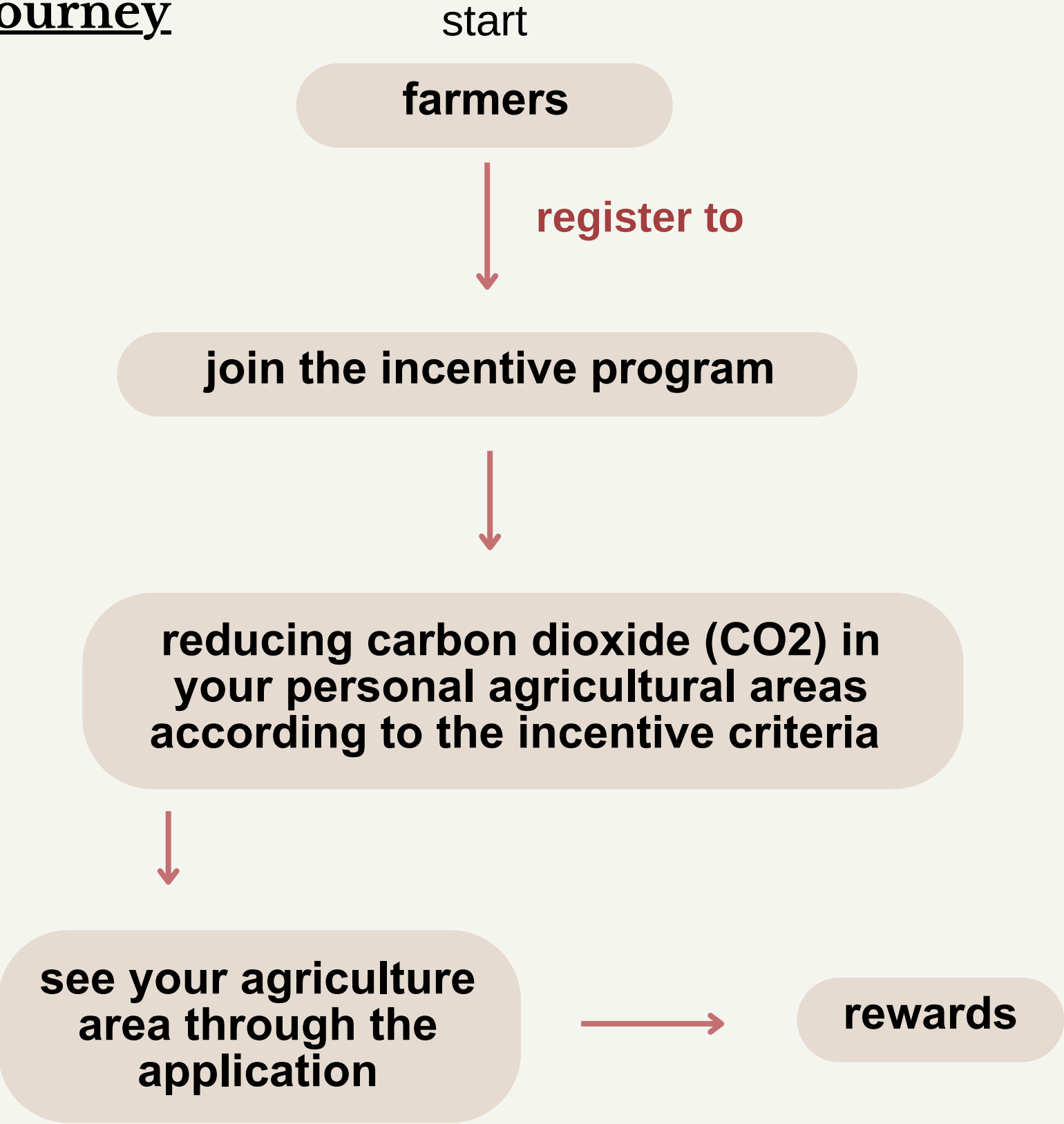


**Lop Buri Province Map**

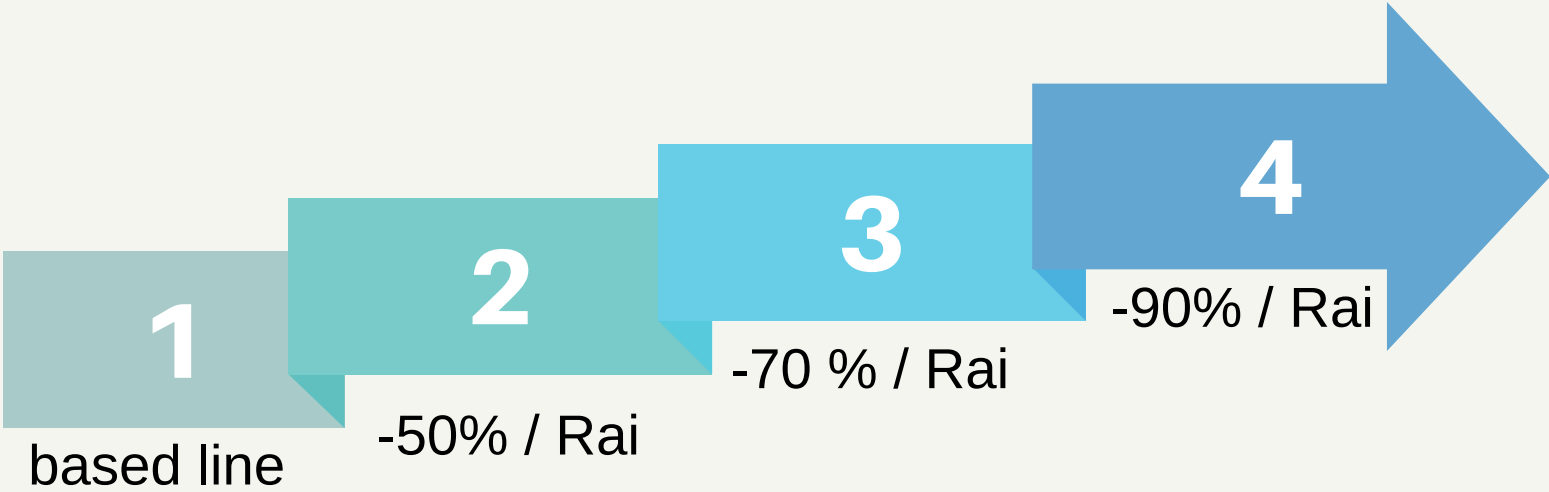
# CarbonSeeker's process

for users (farmers)  
organization

user journey



## Incentive Program Criteria



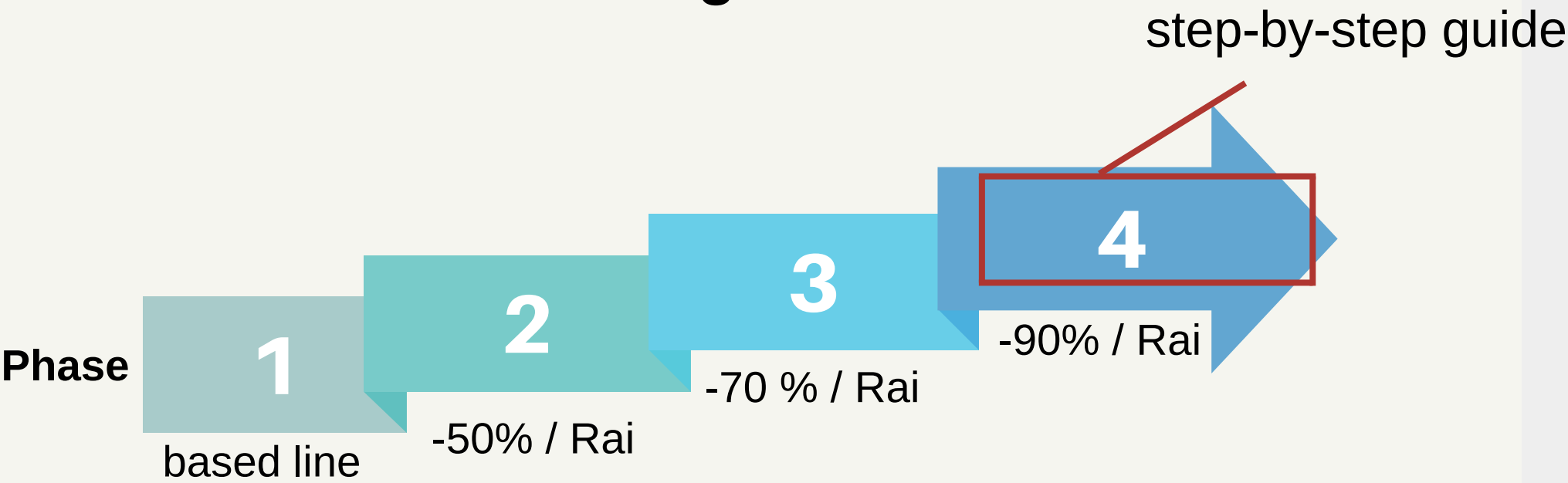
shows the target reduction of CO2 emissions that farmers should achieve over the period

1 Hectare (Ha) = 6.25 Rai

CarbonSeeker's process

for users (farmers) organization

Incentive Program Criteria



shows the target reduction of CO2 emissions that farmers should achieve over the period

1 Hectare (Ha) = 6.25 Rai

What will farmers get after completed incentive program?

Reward Steps			
1	Air pollution data and education resources	3	Partial financial aids
2	Online healthcare access	4	Full financial support



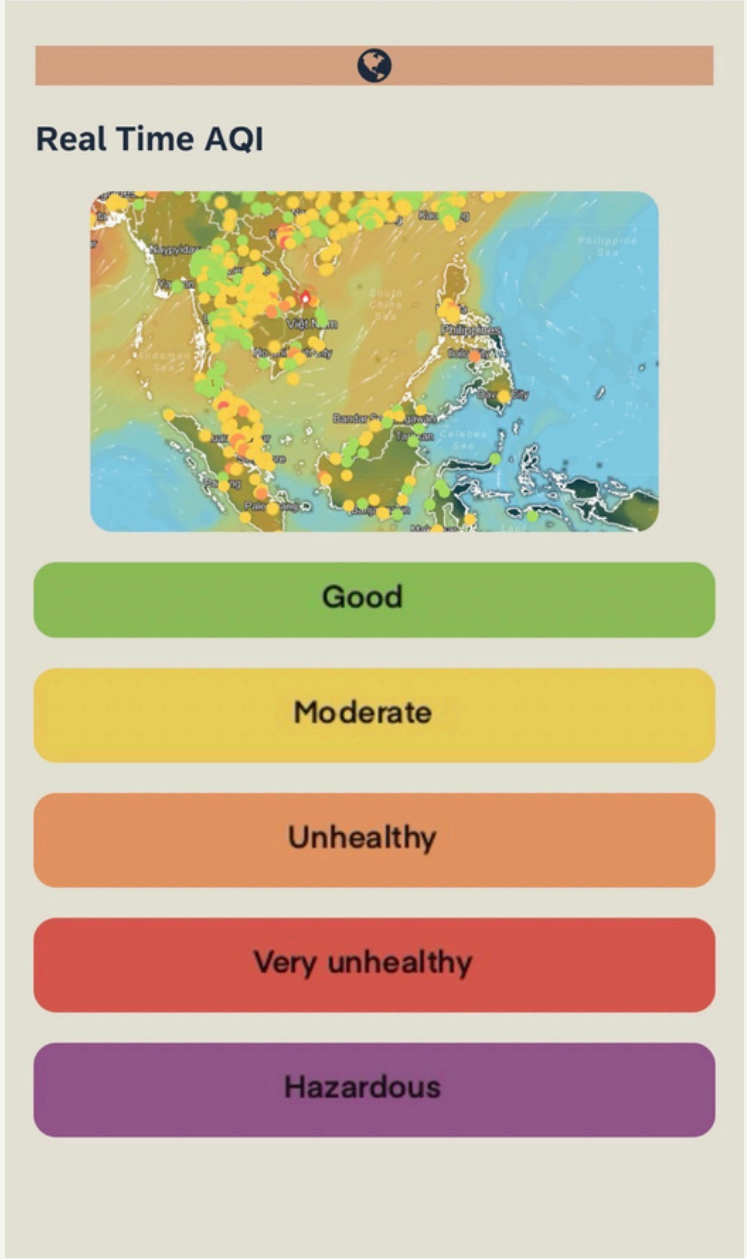
1

# Air pollution data & educational resources



Education resources encourage **understanding and awareness** of agriculture.

*\*Please note that this application is currently in the previewing state\**



**Farmers** can see the real-time **Air Quality Index (AQI)**, which includes air pollution in each agricultural areas.




2

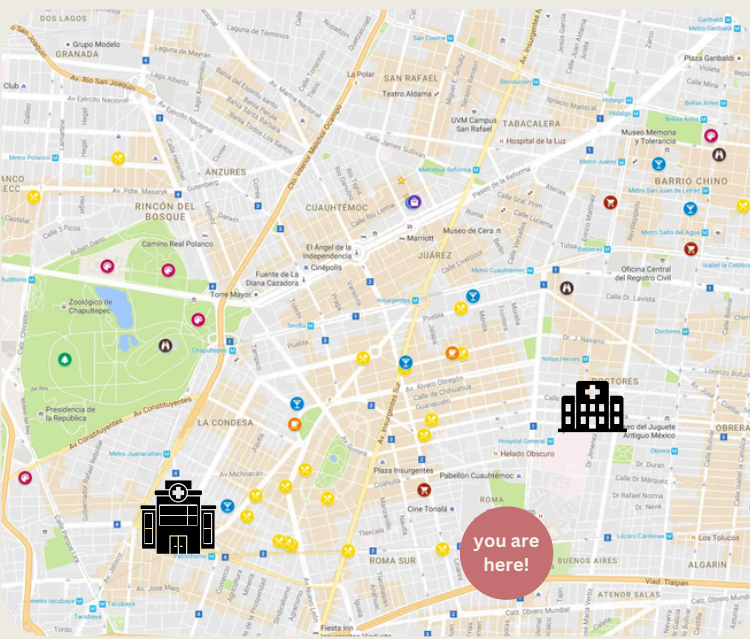
Online healthcare access


*\*Please note that this application is currently in the previewing state\**


Burning is a way of putting your own health at risk!

  
need help?

Nearby healthcare centers



Titans Health Centre7km

Mhu Deng Hospital13km

Consult Telemedicine Services

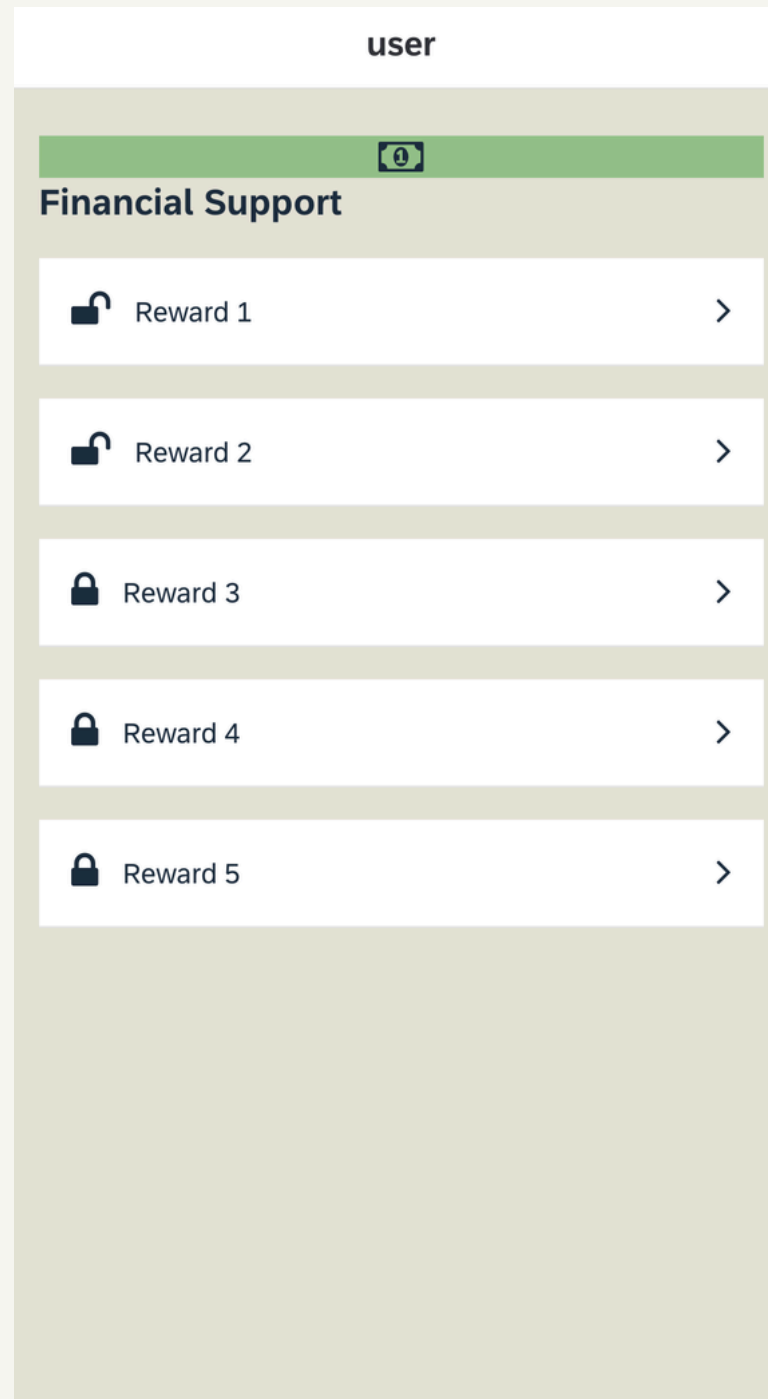
Farmers can consult healthcare professionals through telemedicine services.

Connect with Local Healthcare for Direct Support

Encourage farmers to engage with local healthcare centers.

### 3 Financial and tools support

*\*Please note that this application is currently in the previewing state\**



Funding support for farmers'  
**communities and farming** implements.

- Will be able to access affordable tools
- Reducing input costs for farmers

Provide support for farmers' transition to more sustainable and profitable methods.

# CarbonSeeker



## Root problems of SLASH-AND-BURN

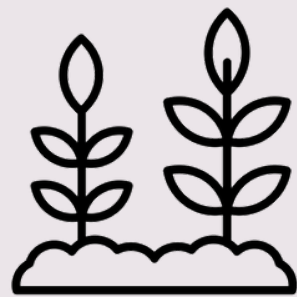
- 1
- Economic pressures
  - Low-cost farming
  - Poverty
- 2
- Lack of awareness
  - Limited knowledge
  - Lack of accessible education
- 3
- Policy gaps
  - Weak enforcement
  - Lack of incentives

## Why CarbonSeeker? solutions

- Funding support
  - Invest in sustainable farming tools and technology
- Accessible educational resources
  - Knowledge & awareness about agriculture
- Organizations
  - Get additional resources
  - Easier to connect and support farmers

**“As everyone in ASEAN collaborates by using our recommendation, we can reduce the widespread impact on neighboring countries as well”**

## Problems will be solved



**Agriculture** is one of the **key players** in the ASEAN.

There is **more occurrence** of SLASH AND BURN compared to other regions.



**Chronic Burning**

The SLASH AND BURN technique has been practiced for a long time with **unresolved impacts**.



**Widespread**

The Haze that is created can spread so far as to **affect all** ASEAN member countries.



# implementation plan

and partnerships cooperation



## implementation plan

Including phases to empower clean air and create a sustainable future for the ASEAN community

start

2025

### PHASE 1

Co-partnerships and funding with Non profit organization

### PHASE 2

Prototyping and testing on demo areas

2025-2027

### PHASE 3

Full scale areas in ASEAN

2027-2030

### PHASE 4

Worldwide Implementation

2030 onwards

## Implementation plan

## Partnerships cooperate

### Thailand



### ASEAN



ASSOCIATION  
OF SOUTHEAST  
ASIAN NATIONS

A COMMUNITY OF  
OPPORTUNITIES FOR ALL

ASEAN Ministers on Agriculture and Forestry  
(AMAF), ASEAN foundation







### Worldwide

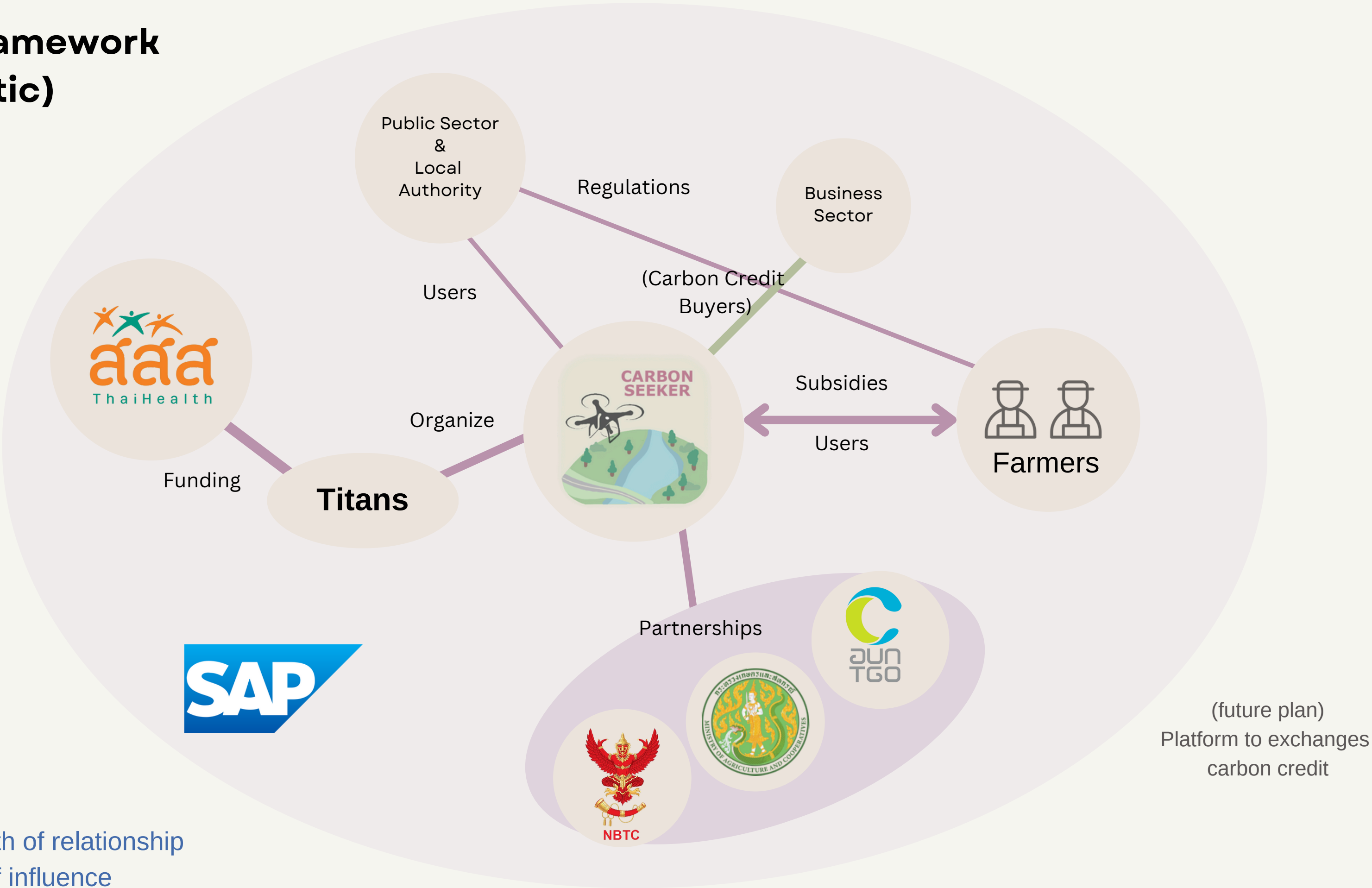


Better Air Quality,  
Livable Cities.

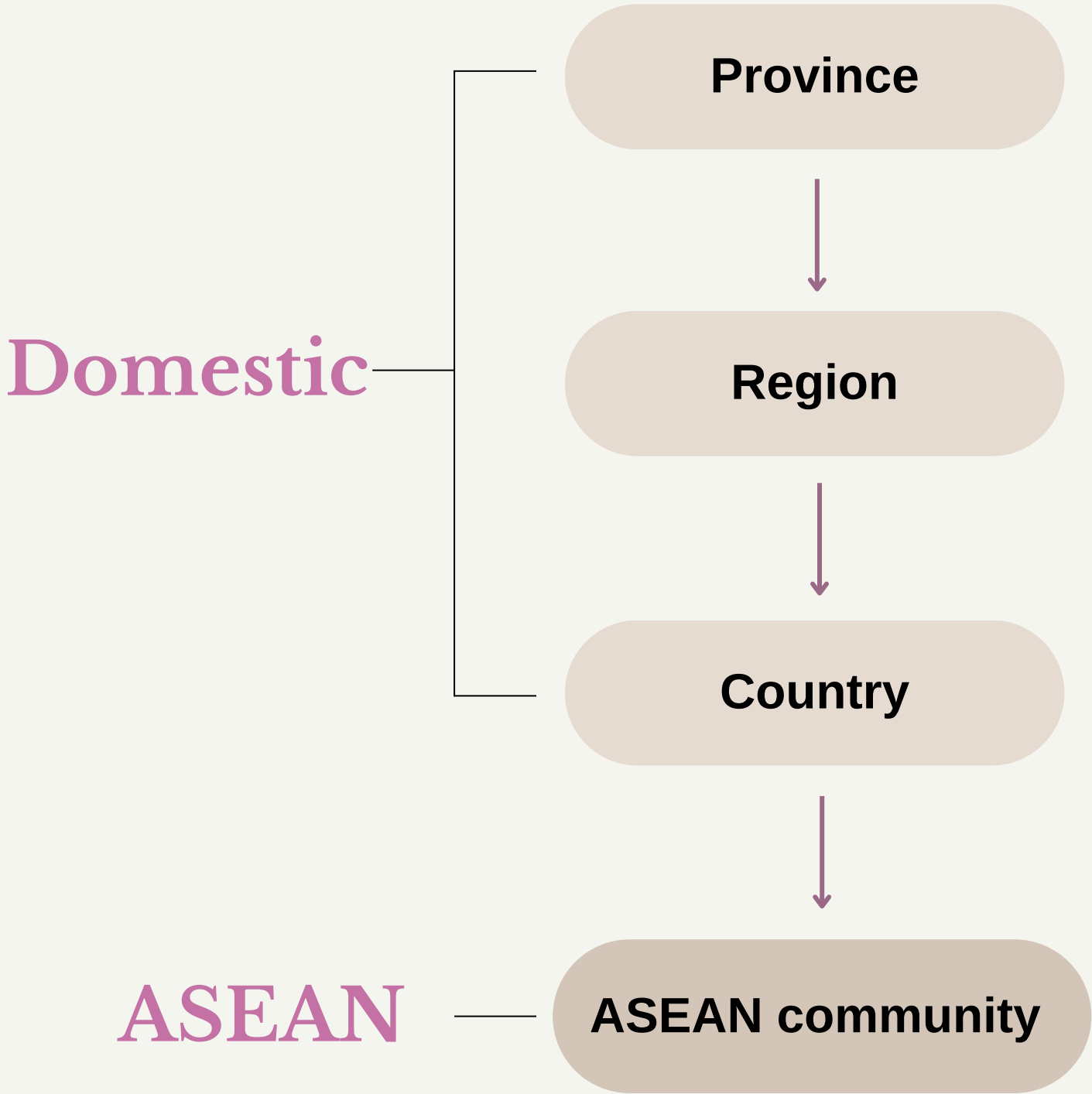
Partnership Cooperation  
(Domestic)

				
Organizations	Thai Health Promotion Foundation	Thailand Greenhouse Gas Management Organization	Ministry of Agriculture and Cooperatives	Office of The National Broadcasting and Telecommunications Commission
Will be contribute in?	<ul style="list-style-type: none"><li>• Provide financial support for the development and implementation</li><li>• Assist in scaling the project to cover broader regions</li></ul>	<ul style="list-style-type: none"><li>• Strengthened carbon footprint reduction.</li><li>• Data and expertise to enhance sustainability</li></ul>	<ul style="list-style-type: none"><li>• Access to real-time and historical agricultural and farmers data</li><li>• Collaborate with local authorities</li></ul>	<ul style="list-style-type: none"><li>• Ensure all drone activities</li><li>• Permission for Drone Usage</li><li>• drone licenses/permits.</li></ul>

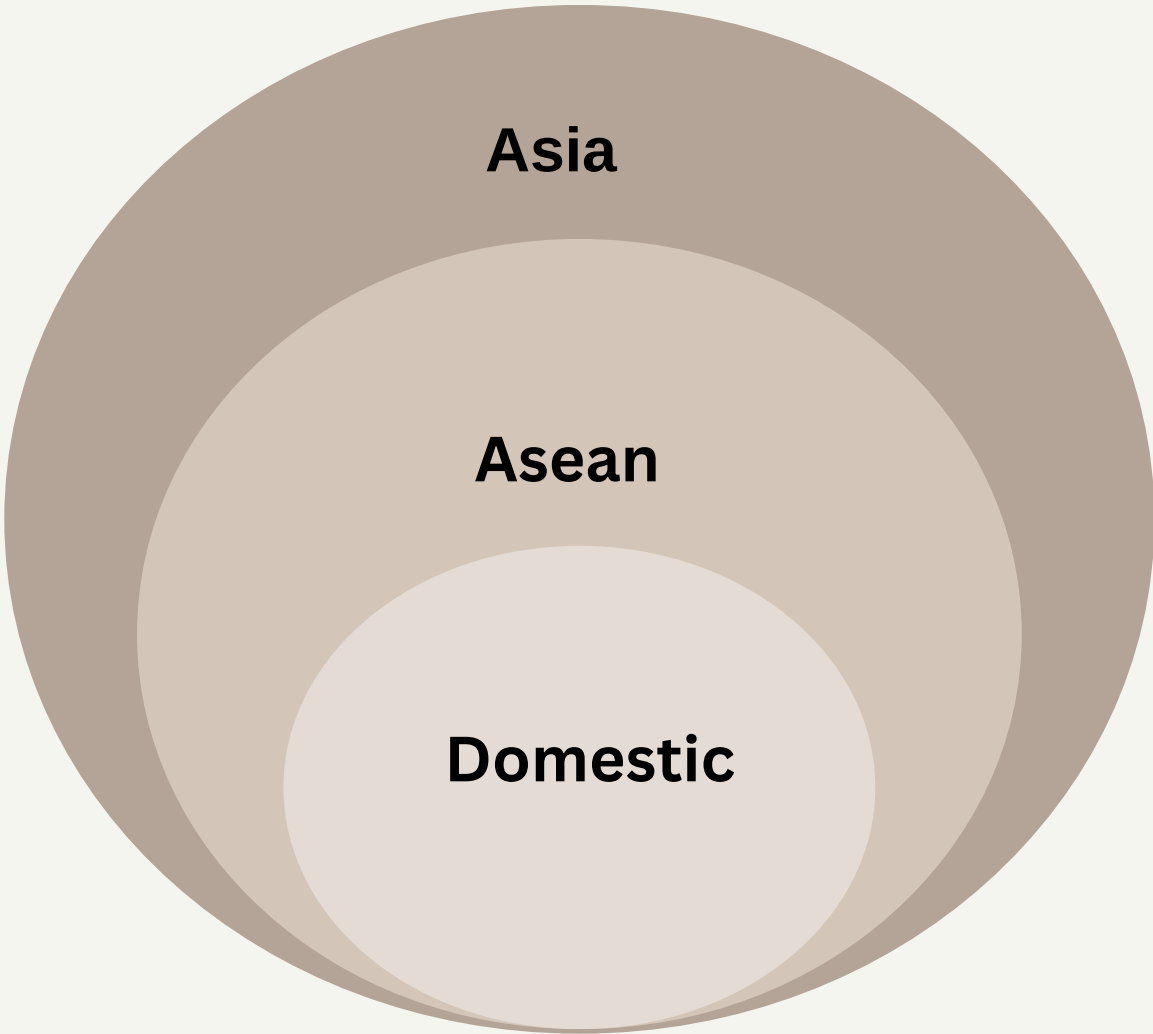
Ecosystem Framework  
(Domestic)



Work process



Project Scaling





By using our CarbonSeeker, problems stated **will be resolved**



**better air quality**



**famers' life quality**



**Reduce respiratory  
illnesses**



**economics improvement**



**meet the SDGs goals**

# THE RECOMMENDATION is strongly associated with:

## Sustainable Development Goals

## Our recommendation



### **Goal 3 : Good Health and Well-being**

Reduce illnesses and death from hazardous chemicals and pollution

### **CarbonSeeker application**



Promoting healthcare to lessen illness concerns and offer online access.



### **Goal 11: Sustainable Cities and Communities**

Reduce the environmental impact of cities

### **CarbonSeeker application**



Encourage individuals to be environmentally conscious in order to better their quality of life.



### **Goal 13: Climate Action**

Integrate climate change measures into policies and planning

### **CarbonSeeker application**




Promoting alternative way of farming methods instead of SLASH AND BURN which causes most of CO2 and GHG emission

THE RECOMMENDATION is strongly associated with:

Sustainable Development Goals

TARGET 3.9



**Reduce illnesses and death from hazardous chemicals and pollution**

By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination.


TARGET 11.6



**Reduce the environmental impact of cities**

By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management.


TARGET 13.2



**Integrate climate change measures into policies and planning**

Integrate climate change measures into national policies, strategies and planning.

ASEAN Economic Community Blueprint 2025




**C.5. Food, Agriculture and Forestry**

iv. Increase resilience to climate change, natural disasters and other shocks

ASEAN Socio-Cultural Community Blueprint 2025

**C.2. Environmentally Sustainable Cities**

iii. Promote coordination among relevant sectors to provide access to clean land, green public space, clean air, clean and safe water, and sanitation



# *Thank you*

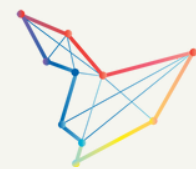


**"Together We'll Analyze and Explore,  
SAP Opens ASEAN's Door."**

**-Team Titans, Thailand**



**ASEAN FOUNDATION**



**ASEAN  
DATA SCIENCE  
EXPLORERS**



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## Appendix 1 : Partnership (AMAF)



ASEAN Ministers on Agriculture and Forestry  
(AMAF), ASEAN foundation

The Vision of the ASEAN Cooperation in the agriculture and food sector is to create “A competitive, inclusive, resilient and sustainable Food, Agriculture, and Forestry (FAF) sector

## Appendix 2 : Partnership (UN environment programme)



UNEP provides evidence-based data to inform policy decisions, collaborates with sectors for **low-carbon transitions**, provides climate finance mechanisms and aids countries in adaptation and mitigation efforts.

## Appendix 3 : Partnership (World Health Organization)



WHO leads global efforts to expand **universal health coverage**.  
We direct and coordinate the world's response to health emergencies.

## Appendix 4 : Partnership (Clean Air Asia)



Clean Air Asia is an international non-governmental organization leading the regional mission for **better air quality**, and healthier, more livable cities throughout Asia.

### Organization goals

Our mission is to reduce air pollution and greenhouse gas emissions in Asia and contribute to the development of a more sustainable.

## Appendix 5 : (Case study) DroneUA by ukraine, Kiev

### Feature

DJI Matrice 300 RTK aim for measuring the level of air pollution and verify whether air quality does indeed improve with altitude.

### Censoring

Equipped with gas sensors

### Duration

55-minute flight time

### Planning, workflow, and results



automatic flight was set to go

### WHY THE **DJI MATRICE 300 RTK** PROVED TO BE CRUCIAL IN MEASURING THE AIR QUALITY OF THE CITY OF KIEV

- Omni-directional Sensors**  
These warned the pilot of impending dangers and prevent the drone from colliding with obstacles even at night.
- Payload Versatility**  
Proved to be the most useful feature for it allowed frequent and seamless swapping between payloads.
- OcuSync Enterprise**  
Provided high quality transmission to maintain control of the drone at all times.
- 55-minute Flight Time**  
Uninterrupted flights and data collection with long stretches between battery swaps.
- 2.7 kg Lifting Capacity**  
Enabled the team to mount the Sniffer4D V2 gas sensor (500g).
- Weather Proof IP45 Rating**  
Although not required, this gave the team the confidence to operate due to the added layer of protection.