PIVE
Poverty Impact and Vulnerability Estimator

Brown Bag Meeting with ADB

June 9th, 10:30
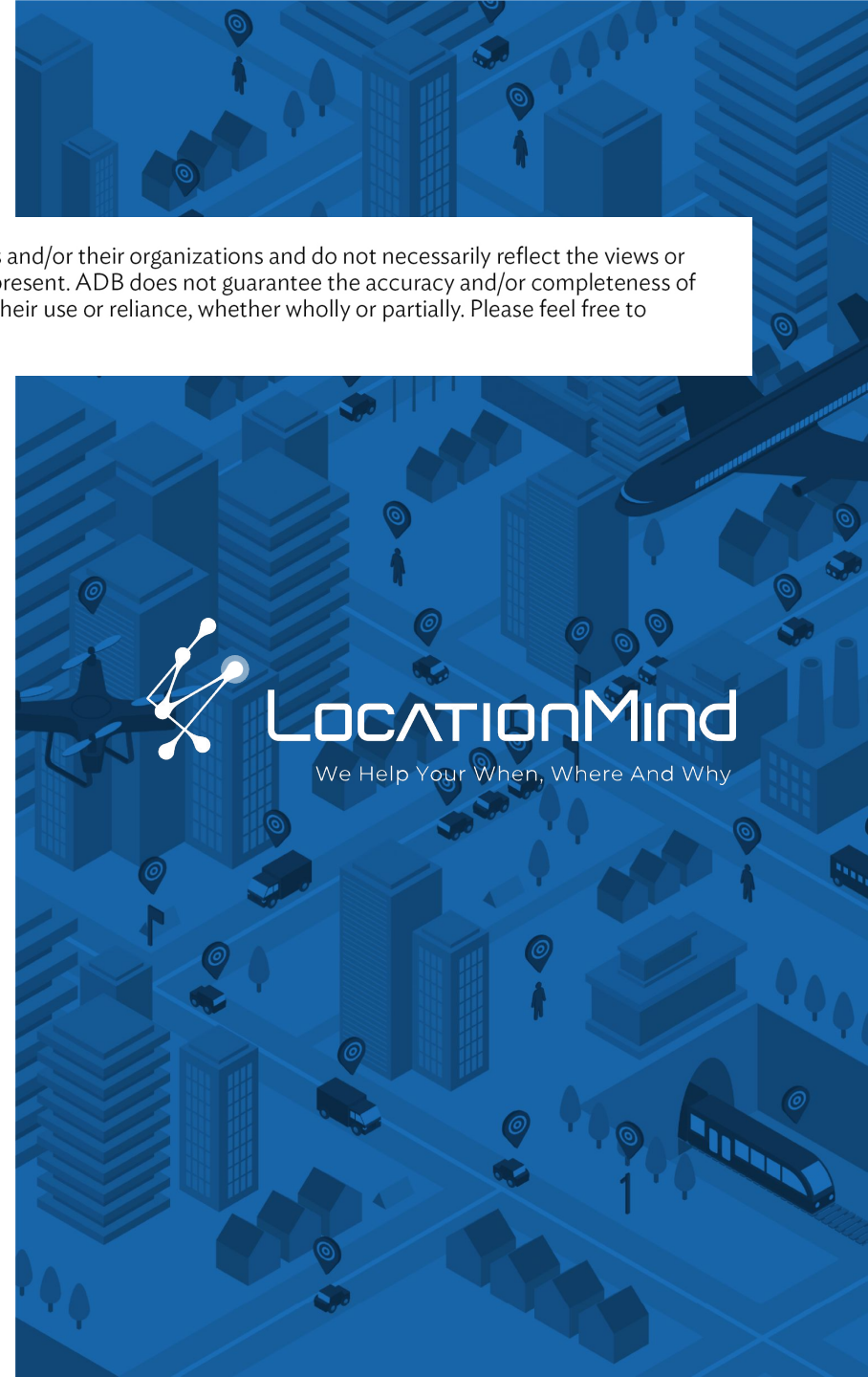
Introduction of PIVE TEAM MEMBERS

PIVE is designed and developed together with Philippines local stakeholders and members having diversified expertises. The project involves NPOs related to traffic investigation and social agenda, IT development members with experience in developments with university teams, and a startup company.

Deepanshu Agarwal
PMO
LocationMind

Ryosuke Shibasaki
Product owner
LocationMind

Satoshi Miyazawa
PMO
LocationMind

Mariko Shibasaki
PMO
LocationMind

Shoji Ueta
GPS data development
LocationMind

Hiroyuki Miyazaki
Satellite data development
Glodal Inc.

External partners	LocationMind
Hong Soo Lee Senior Urban Specialist (Smart Cities) &team Asian Development Bank (ADB)	Hiroshi Kanasugi Lead Dashboard development
Timothy Alconga Director Salt Payatas Foundation	Mathieu Margolle Dashboard development
Noriel Tiglao CTO, Mobile application development SafeTravelPH / University of the Philippines	Hideki Kaji Dashboard development
Erris Sanciangco PMO, Mobile application development SafeTravelPH	Saurav Ranjit GPS data development
Apichon Wi Chatbot development Thammasat University	Izumi Murata PMO
Shreyas Bharule Consultant Indian Institute of Technology Kharagpur	

Index

MAPPING THE SPATIAL DISTRIBUTION OF POVERTY USING SATELLITE IMAGERY IN THE PHILIPPINES

MARCH 2021

- ❏ Satellite imagery provide rich data that can be used to complement traditional sources of poverty data.
- ❏ Computer vision techniques and machine-learning algorithms can be used to process unstructured data from images.
- ❏ **More granular poverty data can be used for targeting intervention programs**

REFERENCES

MAPPING POVERTY THROUGH DATA INTEGRATION AND ARTIFICIAL INTELLIGENCE
A Special Supplement of the Key Indicators for Asia and the Pacific 2020
SEPTEMBER 2020
ASIAN DEVELOPMENT BANK

A GUIDEBOOK ON MAPPING POVERTY THROUGH DATA INTEGRATION AND ARTIFICIAL INTELLIGENCE
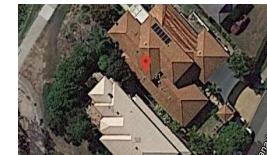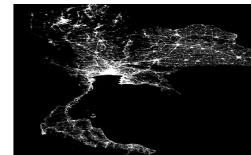APRIL 2021
ASIAN DEVELOPMENT BANK

MAPPING THE SPATIAL DISTRIBUTION OF POVERTY USING SATELLITE IMAGERY IN THE PHILIPPINES
MARCH 2021
ASIAN DEVELOPMENT BANK

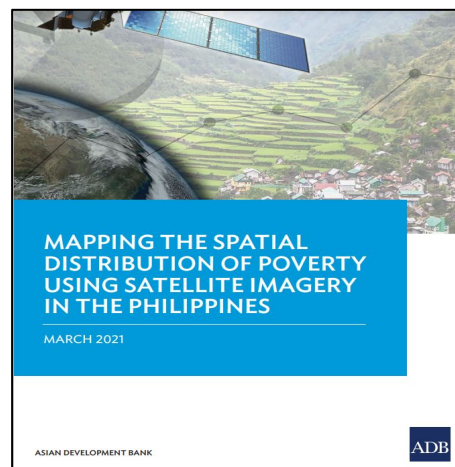**MAPPING THE SPATIAL DISTRIBUTION OF POVERTY USING SATELLITE IMAGERY IN THAILAND**
APRIL 2021
ASIAN DEVELOPMENT BANK

54114-001: Using Frontier Technology and Big Data Analytics for Smart Infrastructure Facility Planning and Monitoring | Asian Development Bank (adb.org)

55242-001: Development of New Statistical Resources and Building Capacity in New Data Sources and Technologies | Asian Development Bank (adb.org)

https://www.adb.org/news/events/webinar/asian-impact

https://development.asia/insight/using-machine-learning-satellite-images-map-poverty
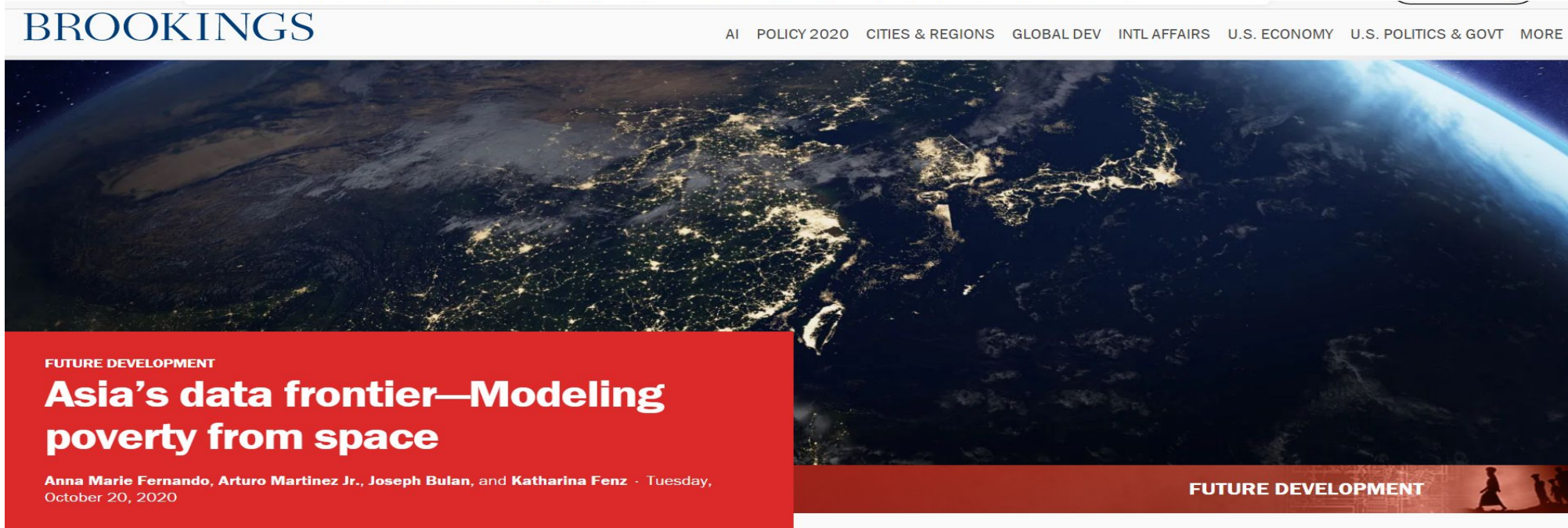
https://blogs.adb.org/blog/here-s-how-we-used-satellite-data-to-map-poverty-in-thailand-and-philippines

https://www.brookings.edu/blog/future-development/2020/10/20/asias-data-frontier-modeling-poverty-from-space/

What is PIVE?

The **'Poverty Impact and Vulnerability Estimator' (PIVE)** pilot technology collates, quantifies, and analyses data relevant to indicating poverty and estimating vulnerability for better informed decision making to make cities more inclusive.

Poverty Impact & Vulnerability Estimator	Identifies	Quantifies	Collates	Informs	Supports
	Vulnerable population	Activities and mobility	Field survey data	Decision-makers and Stakeholders	Planning and Aid efforts

Mobile GPS

citydata

Government Statistics

Crowdsource

Field Survey Data

Chatbots

Remote Sensing

data integration

PIVE
'Tool for Data Driven Decisions'

information

USERS

National Government

Provincial Government

Local Government Units

Barangays

NGOs / NPOs

Aid Orgs

> **Objective: Develop a robust tool for poverty monitoring and vulnerability estimation at a metropolitan scale.**

PIVE focus mapping out the vulnerable groups of people in hazard prone and poverty ridden areas. The aspects PIVE will measure & visualize are as follows:
- Living environment conditions (Pre-disaster conditions & Post-disaster damage reporting)
- Populations living in disaster prone areas (**Disaster** prone mapping etc.)
- Growth/changes in informal settlement (**Informal Settlement** Mapping)
- Inter Barangay & Intra Barangay Movement (People **Mobility Patterns**)
- Visualizing the **transportation/mobility** services for the people.
- **PIVE-bot** (chatbot) collecting individual qualitative data.

Users

Government

- National Government
- Provincial Government
- Local Government Units
- Barangays

Civic Society

- NGOs / NPOs

Aids & Grants Orgs

- Microfinance Agencies
- International Orgs

Indicator

- Poverty Indicator
- Mobility Indicator
- Disaster hotspots identifier
- Socio-economic Indicator

PIVE Data Processing

Statistics & Field Data

Statistics
- Census
- Survey Information
- CBMS
- Activity Record Data

Satellite and Crowdsource information

Crowd source
- Informality map
- Chatbot
- Geotagged information from crowd survey

Maps Data

Satellite Maps
- OSM Data
- POI Info
- Hazard Map
- Barangay scale map

Mobility Field Data

Mobility Insights
- OD Trips
- Stay/Move pattern
- Travel mode estimation

Data

- Census Data
- Field Survey Data
- Satellite Maps
- Chatbots
- Mobile GPS data

For Government: The PIVE tool visualizes mobility information integrated with CBMS data, providing insights for targeted interventions in planning projects. By leveraging the tool, the government can identify the most vulnerable areas during disasters, preplan relief efforts, and efficiently allocate resources.

For NGOs/NPOs: The PIVE tool provides NGOs with dynamic mobility information that complements the static database, such as CBMS, enabling targeted interventions and project planning. Disaster vulnerability maps and feedback collection support inclusive development and effective aid delivery.
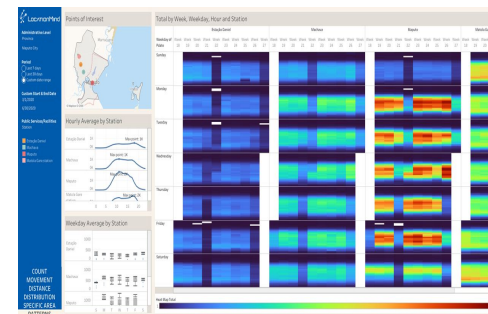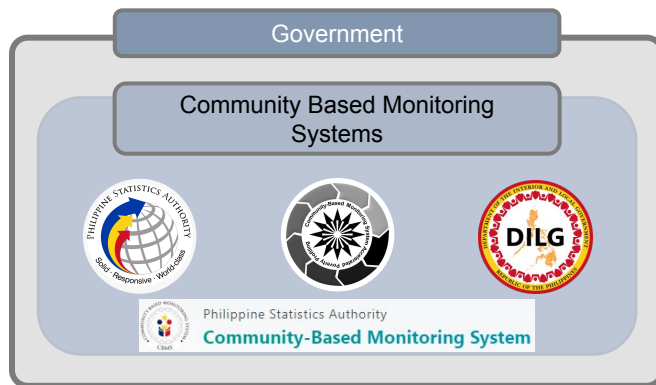
People activity patterns

How will PIVE serve them?
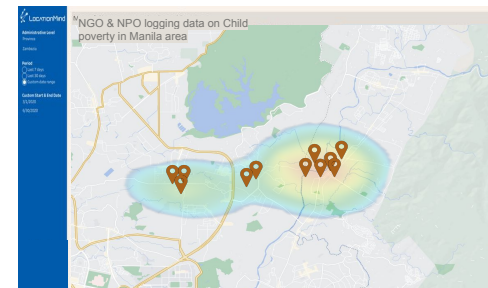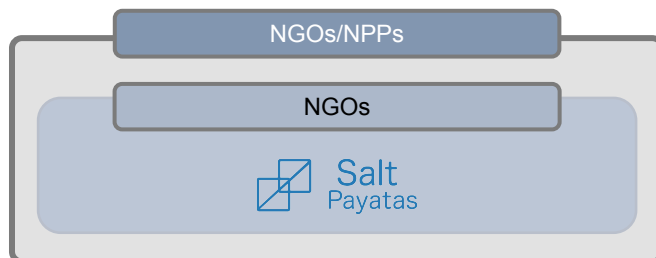
The PIVE tool presents the outputs in the form of a multi-layer dashboard, visualizing ground-truths and enabling better informed decision-making to augment inclusiveness at the metropolitan level.

| PIVE Features | Informality Maps | Disaster impact estimations | People flow visualization | Smart Field data and Feedback collection | Field & Census data fusion |

PIVE Dashboard Mockup

Potential Users
- National Government
- Local Government
- International Organizations
- NGOs & NPOs
- Startups & Enterprises
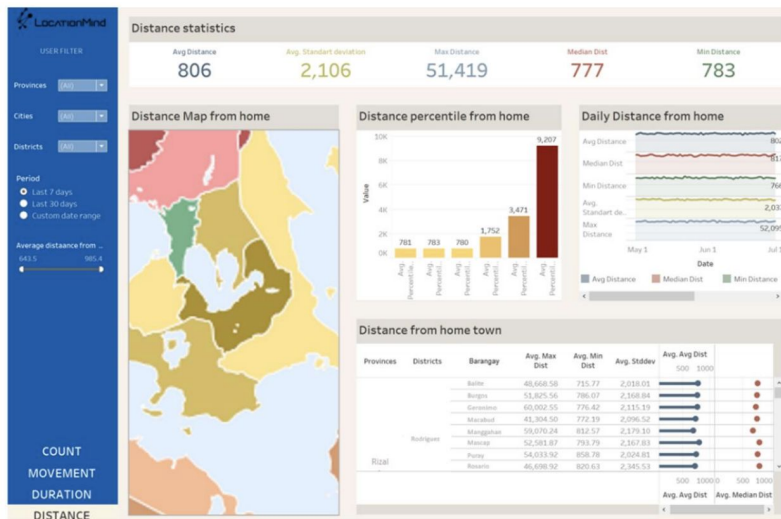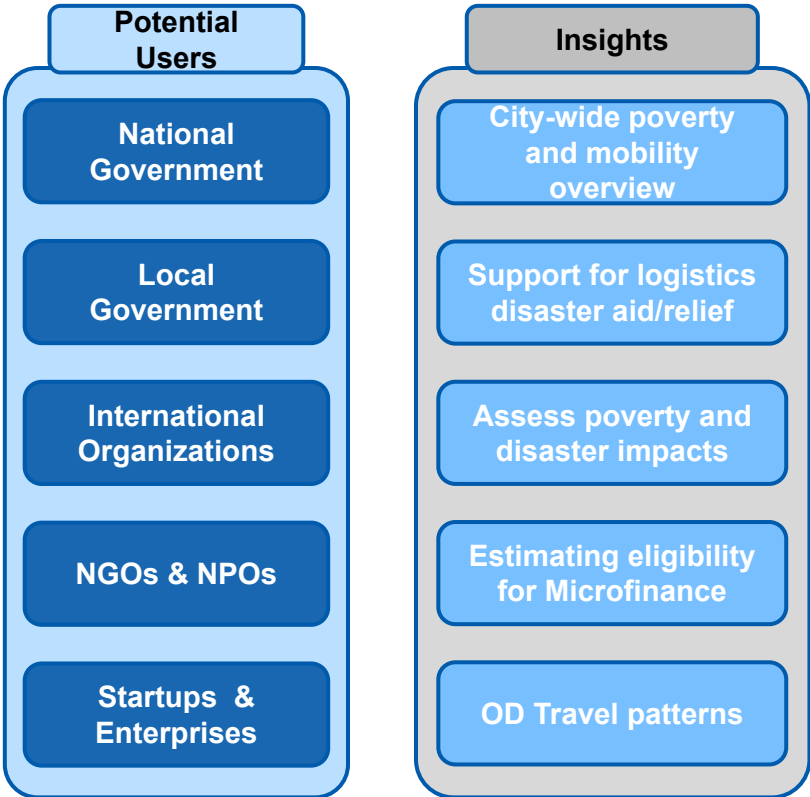
Insights
- City-wide poverty and mobility overview
- Support for logistics disaster aid/relief
- Assess poverty and disaster impacts
- Estimating eligibility for Microfinance
- OD Travel patterns

PIVE is co-developed by many stakeholders. PIVE supports supplementing national census and existing social investigations mutually, as well as creating a trustworthy geospatial information database.
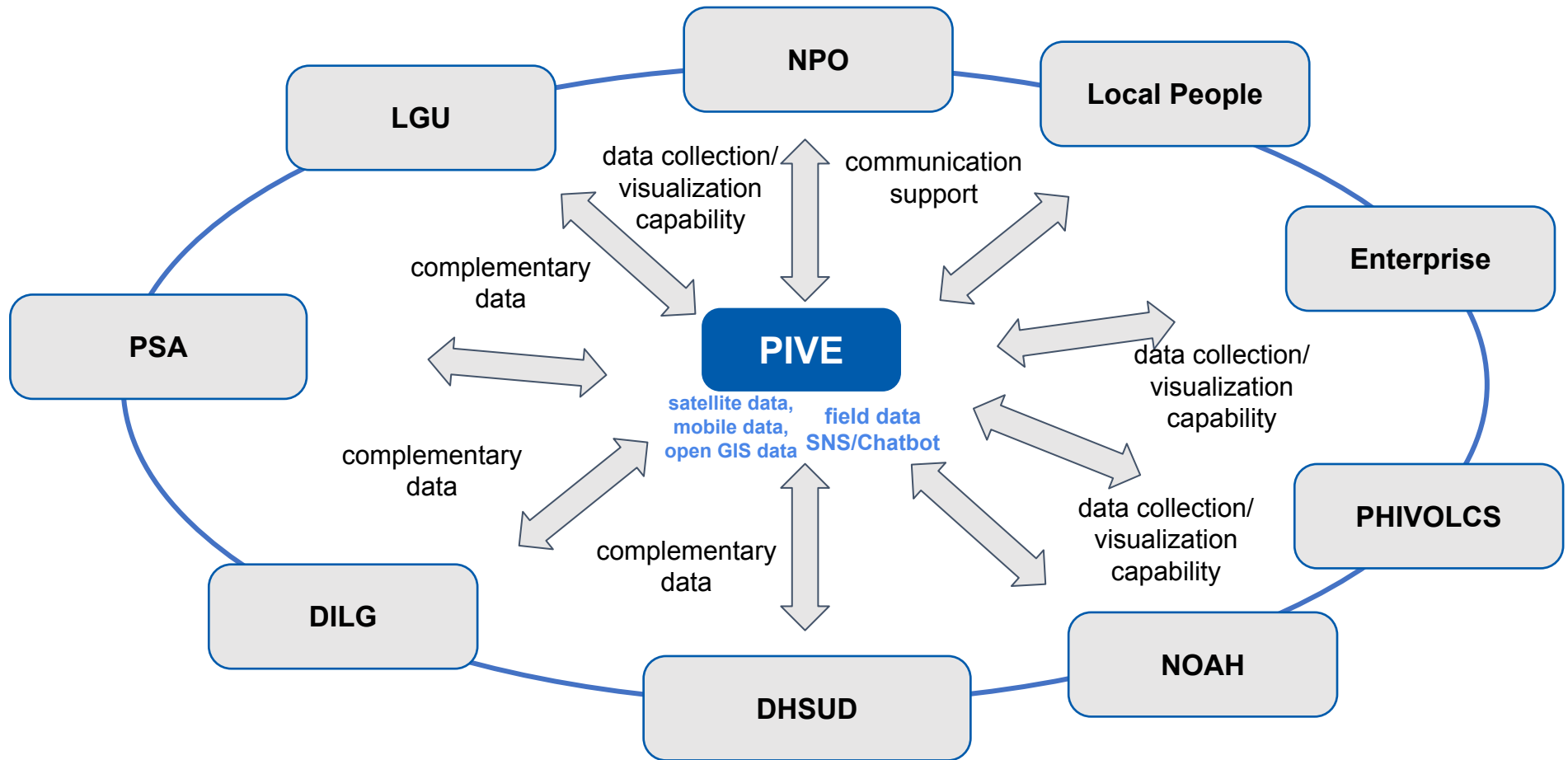
US-1 Disaster Preparedness

Develop population hazard map with routes for migration on top of the existing hazard map. This map will not only provide information about hazardous areas but will also take into account the movement of population during times of hazard events.

US-2 Socioeconomic mapping

Developing a socio-economic map identifying the mobility accessibility, household income level, health and medical care, education accessibility, sanitation conditions, and infrastructure condition

US-3 Amidst and post disaster
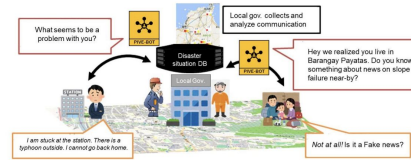
PIVE-BOT chatbot rapidly and efficiently acquire information from disaster victims so that the response team can respond to their needs and alleviate their suffering.

US-4 Transport Infrastructure

Transport Mode

Understanding transport infrastructure and services vs transport needs will be crucial in transport infrastructure planning and policy in the region

Use Case 1

Use Case 1: Disaster Preparedness

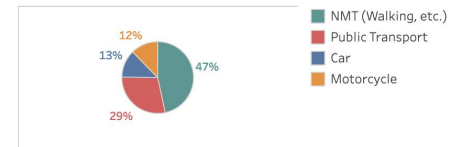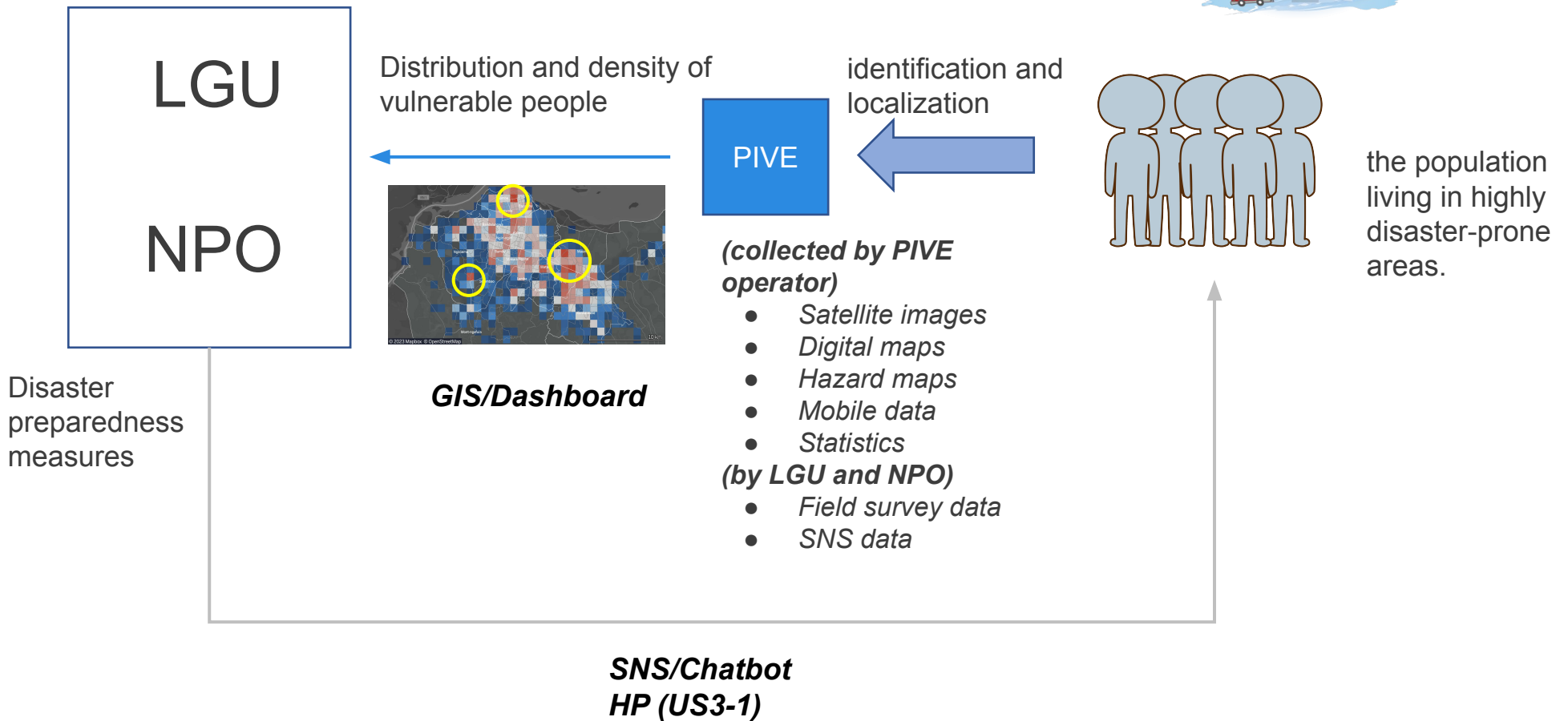| User	User story	Value
Local Government Units(e.g. Quezon City) NPO (e.g. Salt Payatas)	**US 1-1 Identification of Population in Highly Disaster-Prone Areas** 1. Users would like to identify the population living in highly disaster-prone areas. 2. This will be achieved by using satellite data and hazard maps to quantify the number of households living in high-risk areas. 3. By understanding the population density in these areas, we (NPO/GOV) can plan and implement appropriate disaster preparedness measures to reduce the impact on vulnerable communities.	Better and more interactive Communications on disaster planning with vulnerable populations by Chatbots and Survey App More accurate and up-to-date to identify areas with higher susceptibility to disasters More information to proactively prepare for disasters and support vulnerable populations.
Local Government Units (e.g. Quezon City)	**US1-2 Assessing Accessibility of Essential Services for vulnerable population** 1. Users would like to assess the accessibility of essential services to vulnerable populations living in high-risk areas. 2. This will be achieved by conducting surveys using questionnaires, and by using satellite data and hazard maps. 3. Understanding the availability and accessibility of essential services, such as safe houses, medical aid, emergency foods, and transport networks for evacuation, will enable us to plan and implement disaster preparedness measures that meet the needs of these communities.	Better information to assess the Accessibility of Essential Services for vulnerable population
Local Government Units (e.g. Quezon City)	**US 1-3 Utilizing Chatbots for effective communication for enhancing disaster preparedness information dissemination** 1. Users would like to communicate with individuals to relay information about the disaster preparedness implementation plan. 2. This will be achieved by using Chatbots, which will provide individuals with up-to-date information about the current situation and their needs. 3. By using Chatbots, we can provide timely and accurate information to individuals, which will help them understand the importance of disaster preparedness and what they need to do to stay safe.	Better and more effective communication for enhancing disaster preparedness information dissemination
Local Government Units (e.g. Quezon City)	**US 1-4 Real time disaster updates for citizens via Chatbots** 1. Users would like to send notifications regarding live updates of the disaster to all citizens. 2. This will be achieved by using Chatbots to provide necessary updates regarding the disaster's impact and help individuals prepare against it. 3. By sending notifications, we can ensure that all citizens are informed and prepared for the potential impact of the disaster.	Real time and more frequent disaster updates and information sharing with citizens via SNS

User	User story	Value
Local Government Units (e.g. Quezon City) NPO (e.g. Salt Payatas)	**US 1-1 Identification of Population in Highly Disaster-Prone Areas** 1. I would like to identify the population living in highly disaster-prone areas. 2. This will be achieved by using satellite data and hazard maps to quantify the number of households living in high-risk areas. 3. By understanding the population density in these areas, we (NPO/GOV) can plan and implement appropriate disaster preparedness measures to reduce the impact on vulnerable communities.	**Better and more interactive Communications on disaster planning with vulnerable populations by Chatbots and Survey App** **More accurate and up-to-date to identify areas with higher susceptibility to disasters** **More information to proactively prepare for disasters and support vulnerable populations.**

LGU

NPO

Disaster
preparedness
measures

Distribution and density of
vulnerable people

identification and
localization

PIVE

GIS/Dashboard

the population
living in highly
disaster-prone
areas.

(collected by PIVE operator)
- *Satellite images*
- *Digital maps*
- *Hazard maps*
- *Mobile data*
- *Statistics*

(by LGU and NPO)
- *Field survey data*
- *SNS data*

SNS/Chatbot
HP (US3-1)

User	User story	Value
Local Government Units (e.g. Quezon City) NPO (e.g. Salt Payatas)	**US 1-2 Assessing Accessibility of Essential Services for vulnerable population** 1. I would like to assess the accessibility of essential services to vulnerable populations living in high-risk areas. 2. This will be achieved by conducting surveys using questionnaires, and by using satellite data and hazard maps. 3. Understanding the availability and accessibility of essential services, such as safe houses, medical aid, emergency foods, and transport networks for evacuation, will enable us to plan and implement disaster preparedness measures that meet the needs of these communities.	**Better information to assess the Accessibility of Essential Services for vulnerable population**

Safe house/ shelters

Hospital

Access?

Emergency aid

Hotspots that have poor access to essential services

PIVE

(collected by PIVE operator)
- *Satellite images*
- *Digital maps*
- *Hazard maps*
- *Mobile data*
- *Statistics*

(by LGU and NPO)
- *Field survey data*
- *SNS data*

LGU

GIS/Dashboard

Better understanding of the risk

the population living in highly disaster-prone areas.

Supporting and distributing aids to vulnerable population

SNS/Chatbot HP (US1-3)

User Story 1-3: Utilizing Chatbots for effective communication for enhancing disaster preparedness information dissemination

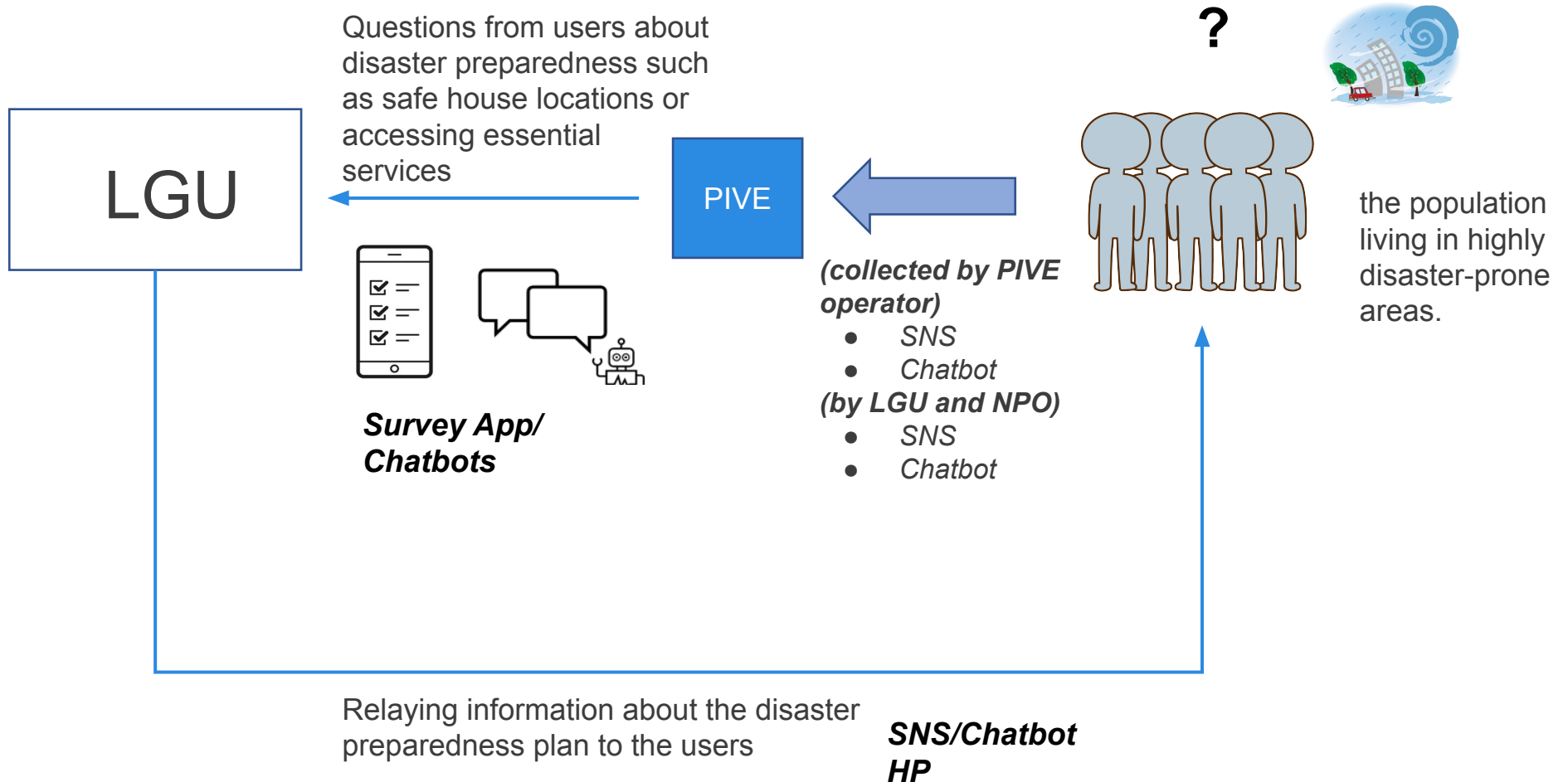| User	User story	Value
Local Government Units (e.g. Quezon City)	**US 1-3 Utilizing Chatbots for effective communication for enhancing disaster preparedness information dissemination** 1. I would like to communicate with individuals to relay information about the disaster preparedness implementation plan. 2. This will be achieved by using Chatbots, which will provide individuals with up-to-date information about the current situation and their needs. 3. By using Chatbots, we can provide timely and accurate information to individuals, which will help them understand the importance of disaster preparedness and what they need to do to stay safe.	**Better and more effective communication for enhancing disaster preparedness information dissemination**

User Story 1-3:Utilizing Chatbots for effective communication for enhancing disaster preparedness information dissemination

22

LGU

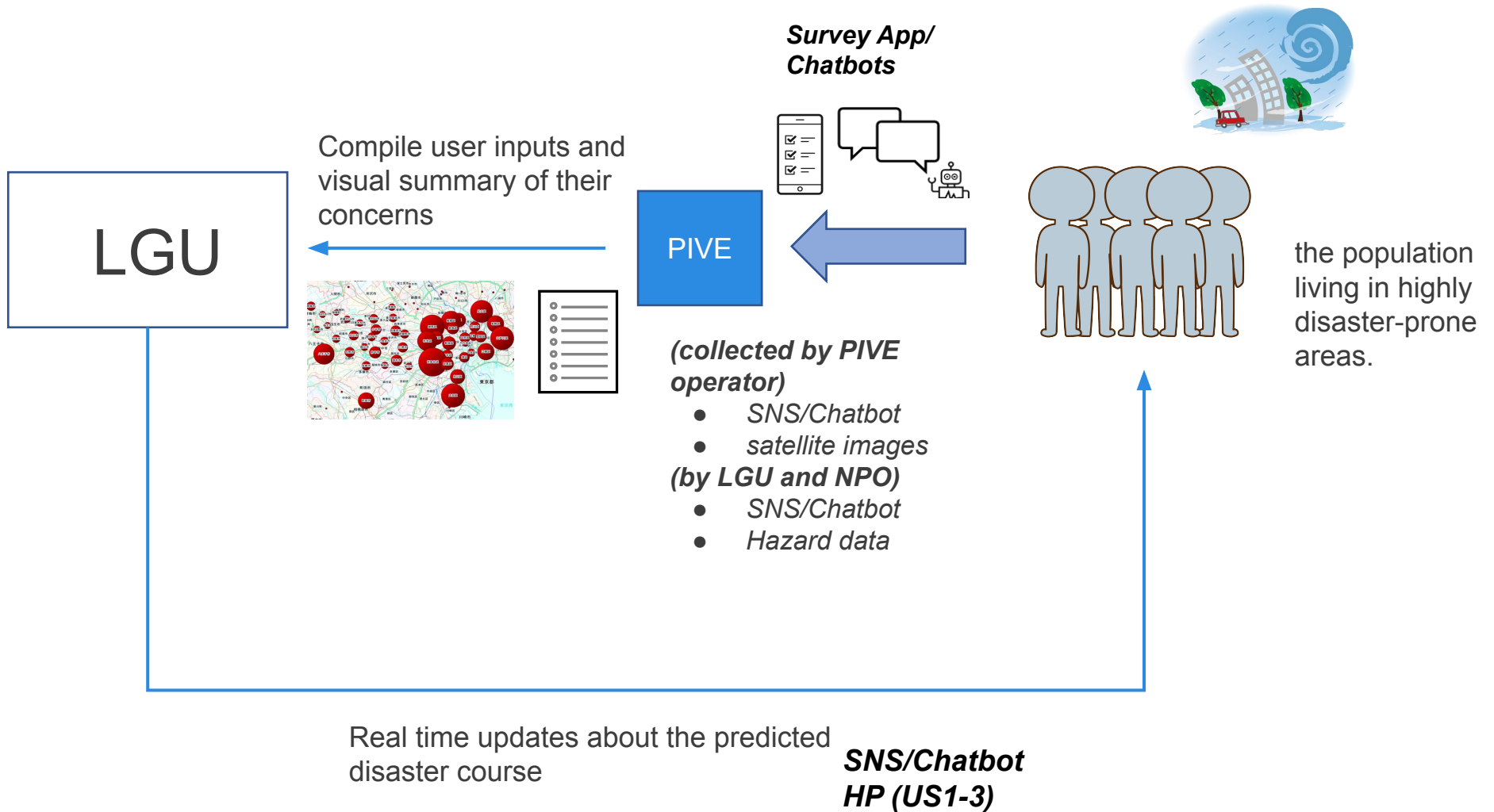Questions from users about disaster preparedness such as safe house locations or accessing essential services

PIVE

Survey App/ Chatbots

(collected by PIVE operator)
- *SNS*
- *Chatbot*

(by LGU and NPO)
- *SNS*
- *Chatbot*

?

the population living in highly disaster-prone areas.

Relaying information about the disaster preparedness plan to the users

SNS/Chatbot HP

User	User story	Value
Local Government Units (e.g. Quezon City)	**US 1-4 Real time disaster updates for citizens via Chatbots** 1. Users would like to send notifications regarding live updates of the disaster to all citizens. 2. This will be achieved by using Chatbots to provide necessary updates regarding the disaster's impact and help individuals prepare against it. 3. By sending notifications, we can ensure that all citizens are informed and prepared for the potential impact of the disaster.	**Real time and more frequent disaster updates and information sharing with citizens via SNS**

User Story 1-4: Real time disaster updates for citizens via Chatbots

Survey App/ Chatbots

Compile user inputs and visual summary of their concerns

LGU

PIVE

the population living in highly disaster-prone areas.

(collected by PIVE operator)
- *SNS/Chatbot*
- *satellite images*

(by LGU and NPO)
- *SNS/Chatbot*
- *Hazard data*

Real time updates about the predicted disaster course

SNS/Chatbot
HP (US1-3)

Use Case 2

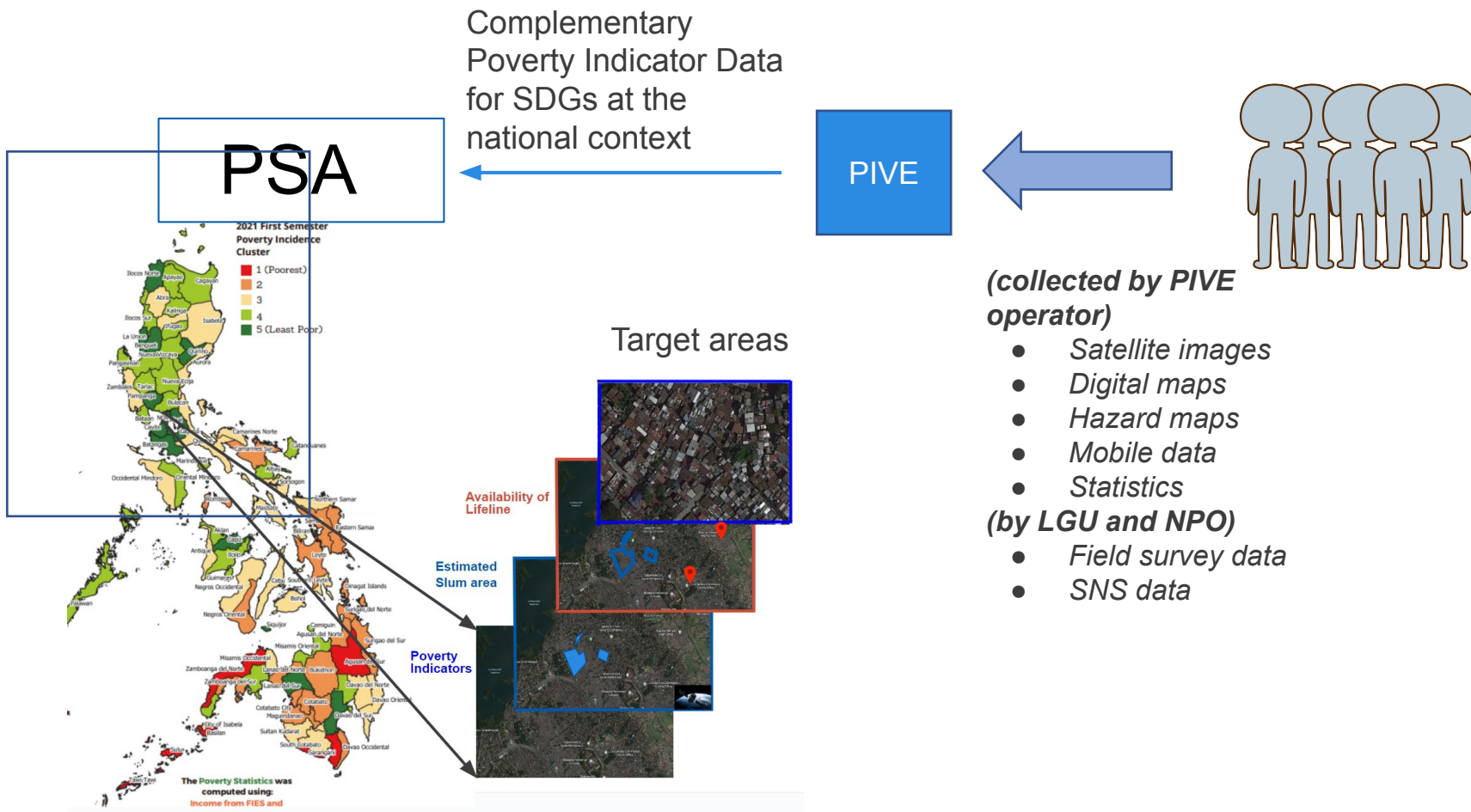| User	User story	Value
National Government Department (e.g. PSA,DILG)	**US 2-1** **To complement Poverty Indicator Data at the national context so that they align with SDG Indicator framework for poverty and vulnerability.** 1. To complement poverty indicators at the national context for SDGs 2. To complement or enhance indicators with other reliable data source or alternative indicators.(e.g. light at night seen from satellite image, accessibility to lifeline)	To understand socio-economic status with multidimensional and comprehensive perspective.
	US2-2 **To collect poverty and socio-economic status of people at finer granularity level.** 1. To grasp poverty data on specified area or social strata at much finer level. 2. To visualize poverty data on specified area or social strata at much finer level at much finer level.	More detailed and up-to-date complementary data can be obtained efficiently for better support of evidence-based policy-making/interventions.
National Government Department (e.g. PSA,DILG)	**US 2-3** **To help to decide a target area and to compare and examine intervention to the area.** 1. To provide complementary information in similar case or area. 2. To enable comparison socio-economic status among area	To identify a priority area for interventions. To design appropriate aid/ intervention with background of local community. To evaluate the impact of intervention on local community
	US2-4 **To identify what local community want from integrated objective data and subjective data like questionnaire to them.** 1. To identity what kind of essential services is necessary.	To tailor intervention in according to local circumstances. To implement aid/intervention that local community is convinced.

User Story 2-1: To complement Socio-economic Indicator in more specified social strata or on smaller area with more frequency

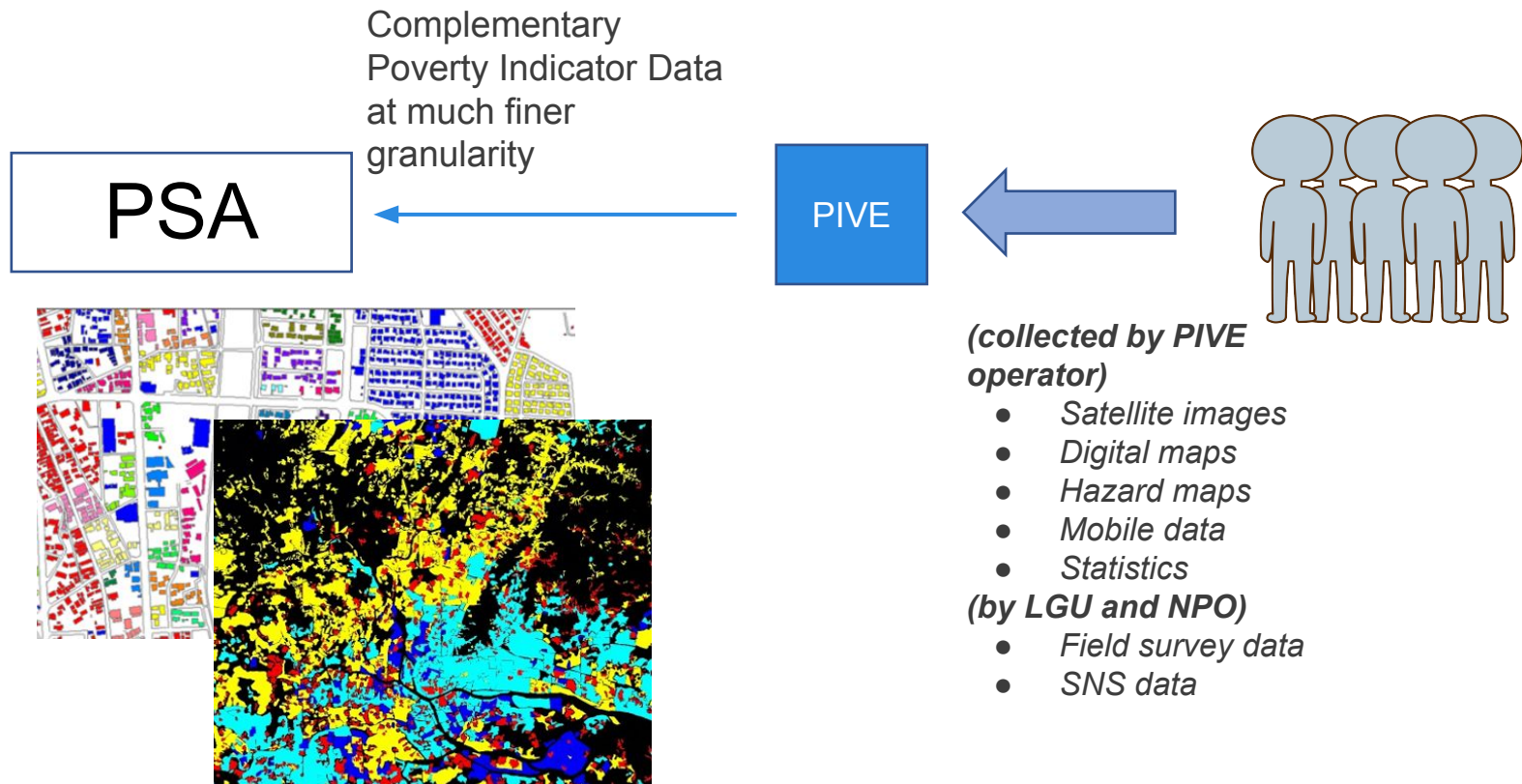| User	User story	Value
National Government Department (e.g. PSA,DILG)	**US 2-1** **To complement Poverty Indicator Data at the national context so that they align with SDG Indicator framework for poverty and vulnerability.** 1. To complement poverty indicators at the national context so that they align with SDG Indicator framework for poverty. 2. To complement or enhance indicators with other reliable data source or alternative indicators.(e.g. light at night seen from satellite image, accessibility to lifeline)	To understand socio-economic status with multidimensional and comprehensive perspective.

User Story 2-1: To complement Poverty Indicator Data at the national context so that they align with SDG Indicator framework for poverty and vulnerability.

Complementary Poverty Indicator Data for SDGs at the national context

PSA

PIVE

Target areas

(collected by PIVE operator)
- Satellite images
- Digital maps
- Hazard maps
- Mobile data
- Statistics

(by LGU and NPO)
- Field survey data
- SNS data

User Story 2-2: Collect poverty and socio-economic status of people at finer granularity level.

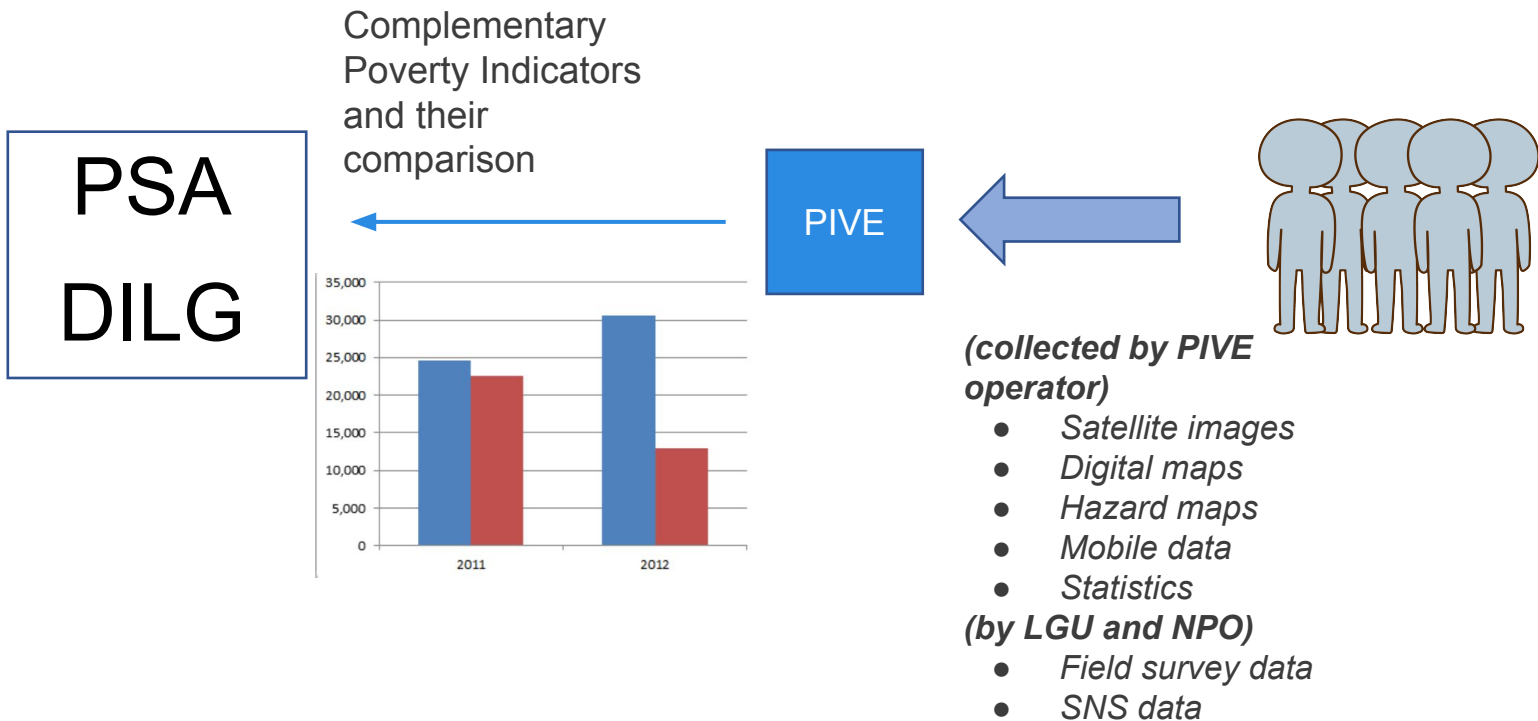| User	User story	Value
National Government Department (e.g. PSA,DILG)	**US2-2** **To collect poverty and socio-economic status of people at finer granularity level.** 1. To grasp poverty data on specified area or social strata at much finer level. 2. To visualize poverty data on specified area or social strata at much finer level	More detailed and up-to-date complementary data can be obtained efficiently for better support of evidence-based policy-making/interventions.

User Story 2-2: Collect poverty and socio-economic status of people at finer granularity level.

Complementary Poverty Indicator Data at much finer granularity

PSA

PIVE

(collected by PIVE operator)
- Satellite images
- Digital maps
- Hazard maps
- Mobile data
- Statistics

(by LGU and NPO)
- Field survey data
- SNS data

User	User story	Value
National Government Department (e.g. PSA,DILG)	**US 2-3** **To help to decide a target area and to compare and examine intervention to the area.** 1. To provide complementary information in similar case or area. 2. To enable comparison socio-economic status among area	To identify a priority area for interventions. To design appropriate aid/ intervention with background of local community. To evaluate the impact of intervention on local community

User Story 2-3: To help to decide a target area and to compare and examine intervention to the area.
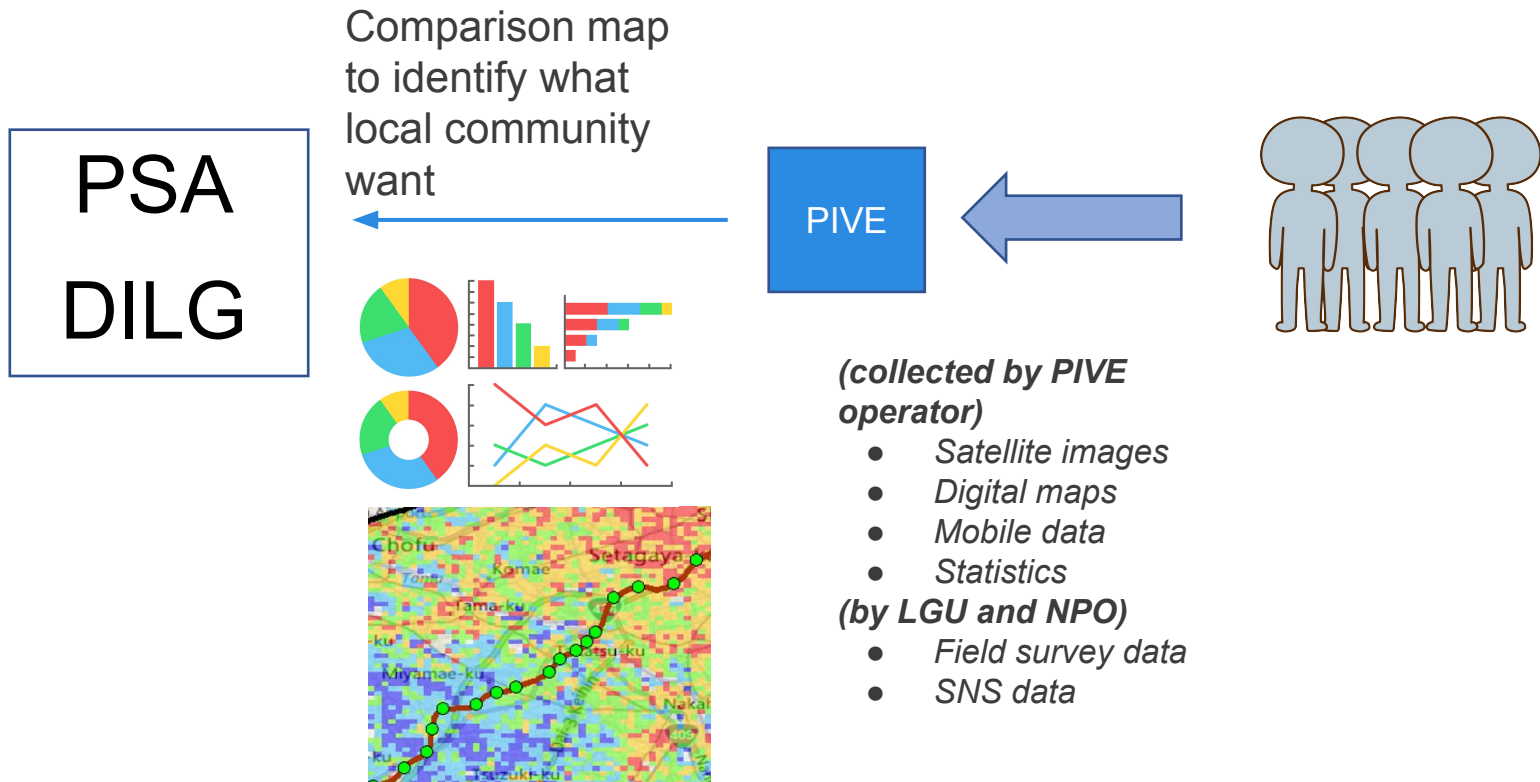
PSA

DILG

Complementary Poverty Indicators and their comparison

PIVE

(collected by PIVE operator)
- *Satellite images*
- *Digital maps*
- *Hazard maps*
- *Mobile data*
- *Statistics*

(by LGU and NPO)
- *Field survey data*
- *SNS data*

User Story 2-4: To identify what local community want from integrated objective data and subjective data like questionnaire to them

33

| User	User story	Value
National Government Department (e.g. PSA,DILG)	**US2-4** **To identify what local community want from integrated objective data and subjective data like questionnaire to them.** 1. To identity what kind of essential services is necessary.	To tailor intervention in according to local circumstances. To allocate the resources accordingly

User Story 2-4: To identify what local community want from integrated objective data and subjective data like questionnaire to them


Comparison map to identify what local community want

PSA

DILG

PIVE

(collected by PIVE operator)
- *Satellite images*
- *Digital maps*
- *Mobile data*
- *Statistics*

(by LGU and NPO)
- *Field survey data*
- *SNS data*

User Story 2-5: To understand "experiences" of social vulnerable people and to identify barriers they face in accessing essential services.

User	User story	Value
NPO (e.g. Salt Payatas)	**US 2-5** **To understand "experiences" of social vulnerable people and to identify barriers they face in accessing essential services.** 1. To identify area with poor health and medical services. 2. To identify with poor sanitation conditions 3. To Identify areas with poor infrastructure conditions, including roads, transportation, and housing. 4. To identify the level of education accessibility in more detailed unit. 5. To identify transportation options available to community members, as well as any mobility-related barriers that may impact their ability to access essential services. 6. To identify the financial situation of households, and access to financial services provided the government.	**Serves as a trigger to cooperate with concerned organizations and service providers to improve access to local essential services** **Enables grasping accessibility to essential services on an individual household level** **Identifies information gap within a community so that necessary information and education resources can be supported more efficiently**

User Story 2-5: To understand "experiences" of social vulnerable people and to identify barriers they face in accessing essential services.

36
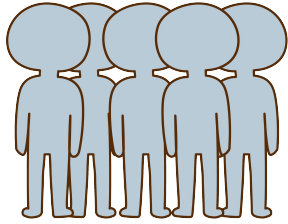
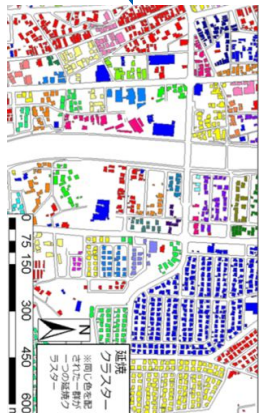**Accessibility to Essential service**
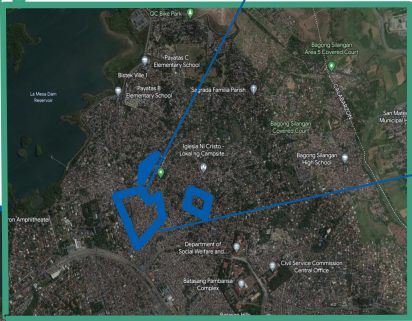
Estimated Slum area

Summary and mapping
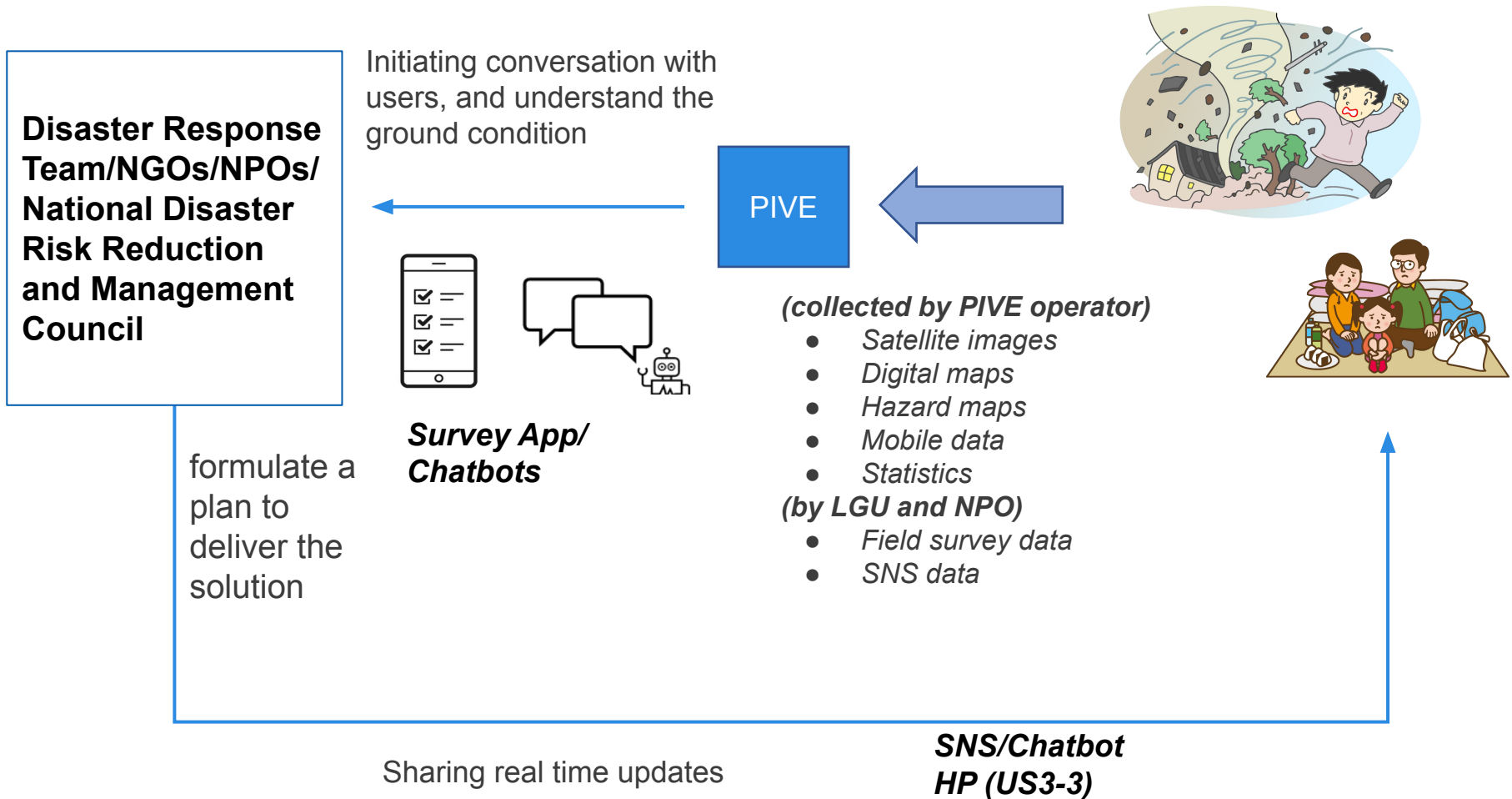
PIVE

Interview by **NPO**

Field survey app

To describe what residents are having trouble with.
To make a lobbying appeal.
To make support programs.

Data provision

PIVE

Use Case 3

Use Case 3: Amidst-disaster and post-disaster relief support

| User	User story	Value
Disaster Response Team/NGOs/NPOs/ National Disaster Risk Reduction and Management Council	**US 3-1 Engaging disaster-affected individuals** 1. I would like to initiate conversations with individuals affected by disasters, so that I can access their current situation by receiving information from them in various formats such as text, picture, and location. 2. This will enable me to better understand the type of issue they are facing and formulate a plan to deliver the solution to resolve it.I would like to identify the population living in highly disaster-prone areas.	**Understanding the needs of individuals affected by disasters**
Disaster Response Team/NGOs/NPOs/ National Disaster Risk Reduction and Management Council	**US3-2 Gathering insights and delivering targeted information** 1. I would like to gather information from at least 100 users to get a comprehensive understanding of the on-ground situation. 2. By collecting information from multiple users, I can relay relevant information to them based on their queries, such as moving to safe locations or accessing essential services. 3. This will ensure that the affected individuals receive accurate and timely information during a disaster.	**Better understanding of the on-ground situation during a disaster**
Disaster Response Team/NGOs/NPOs/ National Disaster Risk Reduction and Management Council	**US 3-3 Real time Disaster Updates** 1. I would like to provide real-time updates to people affected by disasters. 2. These updates will be based on the latest information about the disaster impact and will be provided during and after the disaster. 3. This will enable individuals to stay informed about the situation and take appropriate measures to protect themselves.	**Relaying real time information to the users to make informed decisions**

User	User story	Value
Disaster Response Team/NGOs/NPOs/ National Disaster Risk Reduction and Management Council	**US 3-1 Engaging disaster-affected individuals** 1. Via **conversations** with individuals affected by disasters,users can access their current situation by **receiving information** from them in various formats such as text, picture, and location. 2. This will enable users to **better understand** the type of issues the people are facing and **formulate a plan to deliver the solution** to resolve it.	**Understanding the needs of individuals affected by disasters**

Disaster Response Team/NGOs/NPOs/ National Disaster Risk Reduction and Management Council

Initiating conversation with users, and understand the ground condition

PIVE

Survey App/ Chatbots

(collected by PIVE operator)
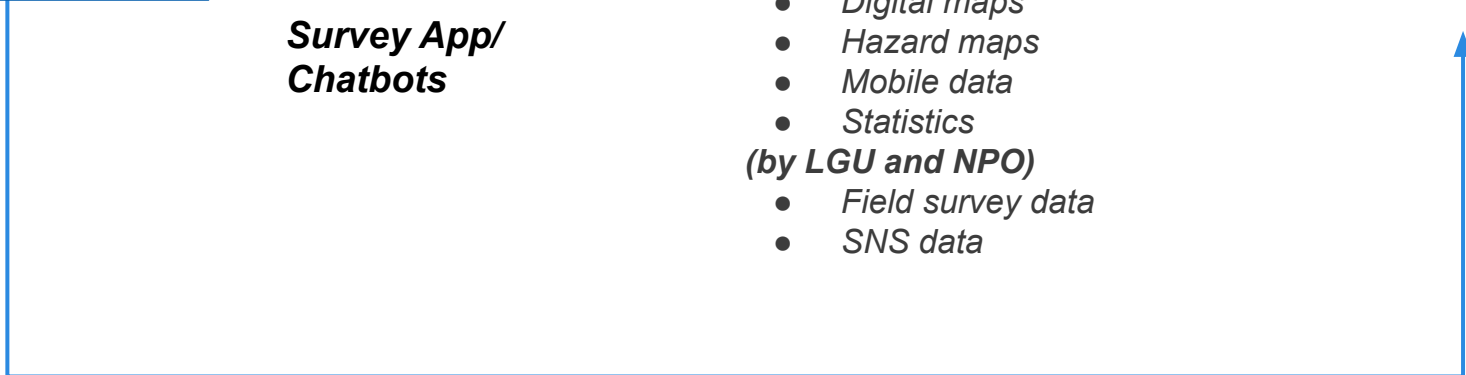- *Satellite images*
- *Digital maps*
- *Hazard maps*
- *Mobile data*
- *Statistics*

(by LGU and NPO)
- *Field survey data*
- *SNS data*

formulate a plan to deliver the solution

Sharing real time updates

SNS/Chatbot HP (US3-3)

User	User story	Value
Disaster Response Team/NGOs/NPOs/ National Disaster Risk Reduction and Management Council	**US 3-2 Gathering insights and delivering targeted information** 1. Users gather **information from users** to get a more comprehensive understanding of the **on-ground situation**. 2. By collecting information from multiple users, users **relay relevant information** to them based on their queries, such as moving to safe locations or accessing essential services. 3. This will ensure that the affected individuals receive accurate and timely information during a disaster.	**Better understanding of the on-ground situation during a disaster**

Disaster Response Team/NGOs/NPOs/ National Disaster Risk Reduction and Management Council

Understanding the situation on ground by collecting information from target users
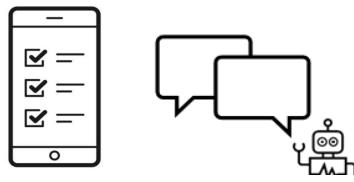
PIVE

Survey App/ Chatbots

(collected by PIVE operator)
- *Satellite images*
- *Digital maps*
- *Hazard maps*
- *Mobile data*
- *Statistics*

(by LGU and NPO)
- *Field survey data*
- *SNS data*

Relay information to users as per their requests such as information of nearest safe location

SNS/Chatbot HP (US3-3)

User	User story	Value
Disaster Response Team/NGOs/NPOs/ National Disaster Risk Reduction and Management Council	**US 3-3 Real time Disaster Updates** 1. Users would like to provide real-time updates to people affected by disasters. 2. These updates will be based on the latest information about the disaster impact and will be provided during and after the disaster. 3. This will enable individuals to stay informed about the situation and take appropriate measures to protect themselves.	**Relaying real time information to the users to make informed decisions**

Disaster Response Team/NGOs/NPOs/ National Disaster Risk Reduction and Management Council

From meteorological department gathering info about the disaster course, and how it may impact the users
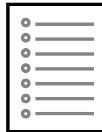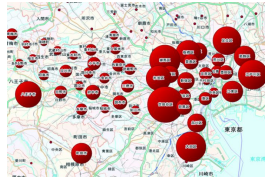
PIVE

(collected by PIVE operator)
- *Satellite images*
- *Digital maps*
- *Hazard maps*
- *Mobile data*
- *Statistics*

(by LGU and NPO)
- *Field survey data*
- *SNS data*
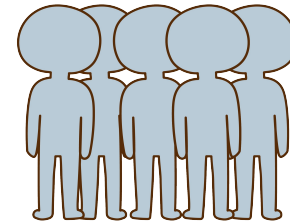
the population living in highly disaster-prone areas.

Relay information to users based on the disaster course and their ground situation

SNS/Chatbot HP

Use Case 4

Use Case 4: Transport infra and users' needs User Stories

User	User story	Value
Department of Transportation, University of Philippines and Transport companies	**US 4-1** **To timely collect information on transport mode usability and behavior in a region.**	To help to plan and implement transport policies and infrastructure that meets the needs of users.
Local Government Units (e.g. Quezon City)	**US 4-2** **To analyze transport accessibility and infrastructure in a region based on timely and appropriately collecting GPS data.**	To Evaluate accessibility on transport services based on evidence.
Local Government Units (e.g. Quezon City)	**US 4-3** **To understand the most probable origin and destination locations(high origin destination trips) based on demand estimates.** This will be achieved by analyzing data on user demand and usage patterns. By identifying these locations, we can revise transport policy and infrastructure plans in the region to better serve the needs of users and improve accessibility."	Better and more effective communication for enhancing disaster preparedness information dissemination
Local Government Units (e.g. Quezon City)	**US 4-4** **To identify challenges faced by users in accessing and using transport in the region.** This will be achieved by gathering user feedback and analyzing data on factors such as poor accessibility and infrequent services. By understanding these challenges, we can implement policies and infrastructure that better meet the needs of users and improve their experience using the transport system.	Real time and more frequent disaster updates and information sharing with citizens via SNS

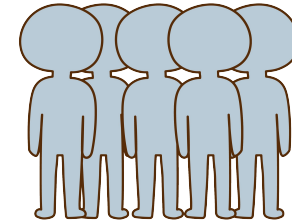# User Story 4-1: To timely collect information on transport mode usability and behavior in a region.

User	User story	Value
As a Department of Transportation, University of Philippines and Transport companies	**US 4-1** **To timely collect information on transport mode usability and behavior in a region.**	To help to plan and implement transport policies and infrastructure that meets the needs of users.

User Story 4-1: To timely collect information on transport mode usability and behavior in a region.

Department of Transportation, University of Philippines and Transport companies

Transport mode usability and behavior in a region

PIVE

the population in a target area

(collected by PIVE operator)
- *Digital maps*
- *Mobile data*
- *Statistics*

(by UP and NPO)
- *Field survey data*
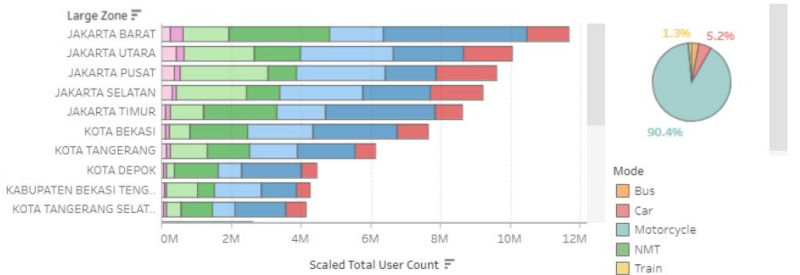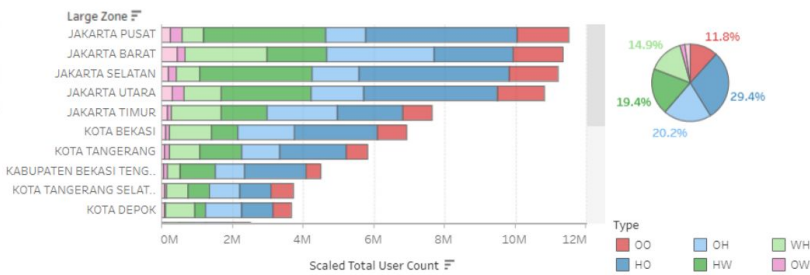
User Story 4-2: To analyze transport accessibility and infrastructure in a region based on timely and appropriately collecting GPS data.

User	User story	Value
Local Government Units (e.g. Quezon City)	**US 4-2** **To analyze transport accessibility and infrastructure in a region based on timely and appropriately collecting GPS data.**	To Evaluate accessibility on transport services based on evidence.

User Story 4-2: To analyze transport accessibility and infrastructure in a region based on timely and appropriately collecting GPS data.

Local Government Units (e.g. Quezon City)

transport accessibility and infrastructure in a region
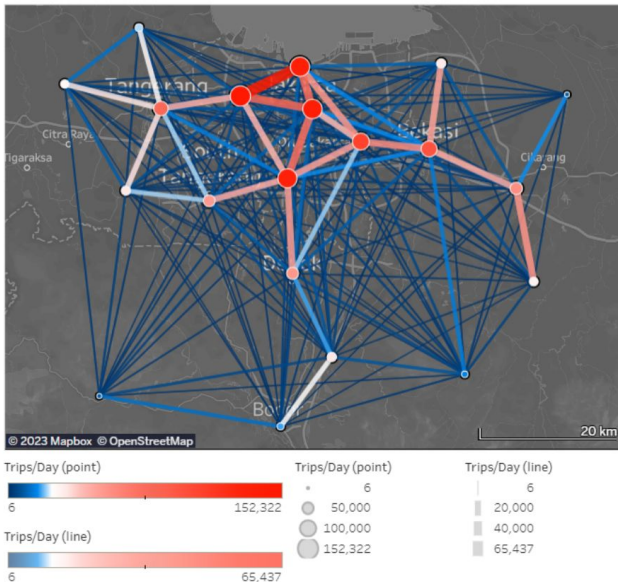
PIVE
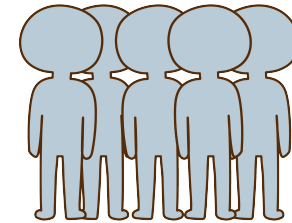
the population in a target area

(collected by PIVE operator)
- *Digital maps*
- *Mobile data*
- *Statistics*

(by UP and NPO)
- *Field survey data*

Flow Map

© 2023 Mapbox © OpenStreetMap   20 km

Trips/Day (point)		Trips/Day (point)	Trips/Day (line)
6	152,322	· 6	‖ 6
		○ 50,000	‖ 20,000
Trips/Day (line)		○ 100,000	‖ 40,000
6	65,437	◯ 152,322	‖ 65,437

User Story 4-3: To understand the most probable origin and destination locations(high origin destination trips) based on demand estimates.

User	User story	Value
Local Government Units (e.g. Quezon City)	**US 4-3** **To understand the most probable origin and destination locations(high origin destination trips) based on demand estimates.** This will be achieved by analyzing data on user demand and usage patterns. By identifying these locations, we can revise transport policy and infrastructure plans in the region to better serve the needs of users and improve accessibility."	Better and more effective communication for enhancing disaster preparedness information dissemination

User Story 4-3: To understand the most probable origin and destination locations(high origin destination trips) based on demand estimates.

Local Government Units (e.g. Quezon City)

origin and destination locations(high origin destination trips) based on demand estimates.
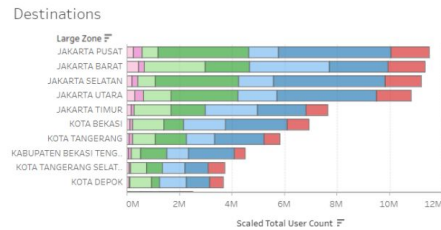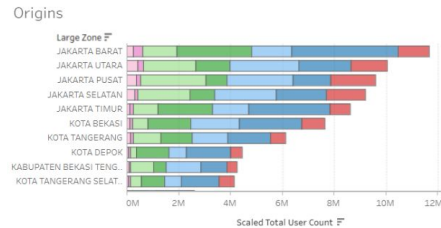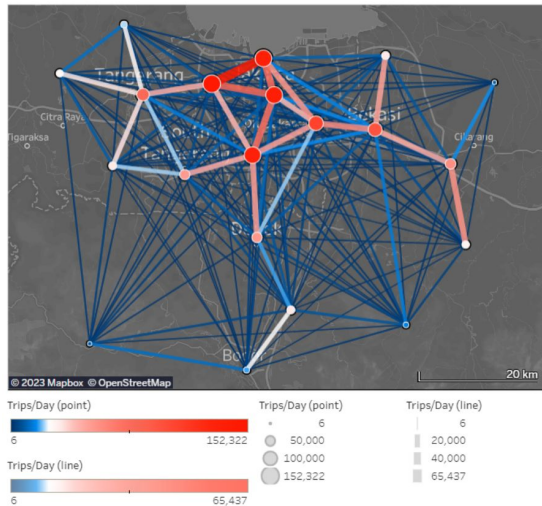
PIVE
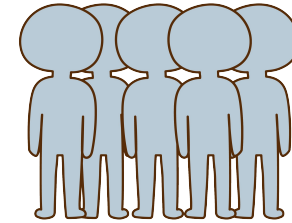
the population in a target area

(collected by PIVE operator)
- *Digital maps*
- *Mobile data*
- *Statistics*

(by UP and NPO)
- *Field survey data*

Flow Map

Origins

Destinations

User Story 4-4: To identify challenges faced by users in accessing and using transport in the region.

| User	User story	Value
Local Government Units (e.g. Quezon City)	**US 4-4** **To identify challenges faced by users in accessing and using transport in the region.** This will be achieved by gathering user feedback and analyzing data on factors such as poor accessibility and infrequent services. By understanding these challenges, we can implement policies and infrastructure that better meet the needs of users and improve their experience using the transport system.	Real time and more frequent disaster updates and information sharing with citizens via SNS

User Story 4-4: To identify challenges faced by users in accessing and using transport in the region.

Local Government Units (e.g. Quezon City)

challenges faced by users in accessing and using transport in the region
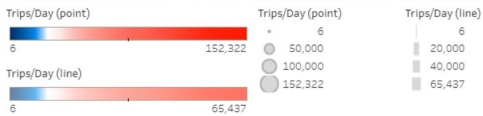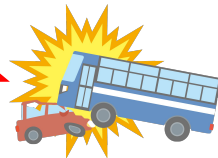
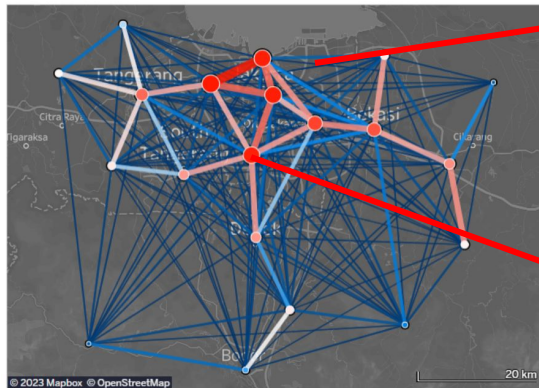**PIVE**
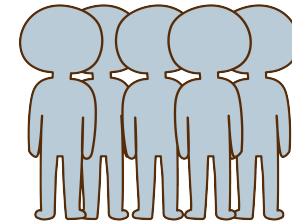
the population in a target area

(collected by PIVE operator)
- *Digital maps*
- *Mobile data*
- *Statistics*

(by UP and NPO)
- *Field survey data*

Flow Map

© 2023 Mapbox © OpenStreetMap

20 km

Trips/Day (point)
6   152,322

Trips/Day (line)
6   65,437

Trips/Day (point)
.   6
○   50,000
○ 100,000
○ 152,322

Trips/Day (line)
▮ 6
▮ 20,000
▮ 40,000
▮ 65,437

Key Message, Collaboration points, and Inputs:

Key Message:

- The Poverty Information Visualization and Evaluation (PIVE) is an integrated and multiscale **tool for data-driven decision-making**. With its user-friendly visual interface, PIVE helps understand better complex and fine-granularity information collected from **satellite images, mobile data, field data, SNS data, and GIS-based statistics data**.

- With its user-friendly visual interface, PIVE facilitates effective **communication and collaboration among stakeholders** like National governmental institutions, LGU, NPOs, and local people in responding to social issues such as disaster response and damage recovery.

- PIVE can be **easily scaled up to DMC** (Developing Member Countries) because it's based on data available for any country and region, like satellite images, mobile data, open GIS data (Open Street Map), and field survey apps supported by SNS/Chatbot.
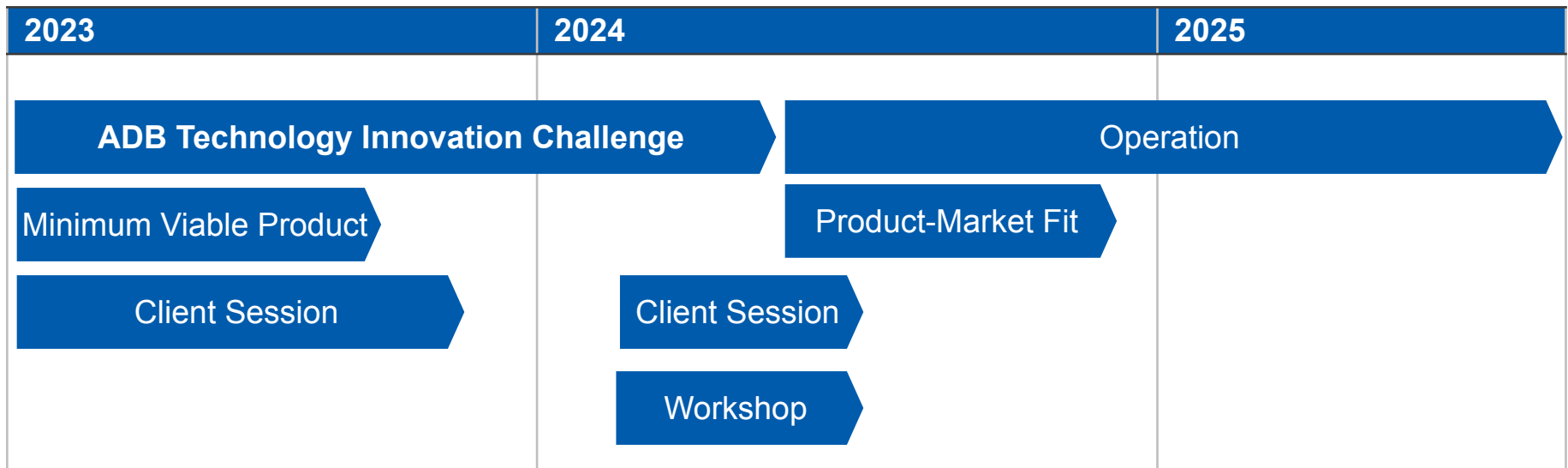
Collaboration Points and Inputs:

Alignment of objectives: ADB's guidance in accessing relevant data and information to align the PIVE Team's objectives with ADB's 'Making Cities More Livable' initiative.
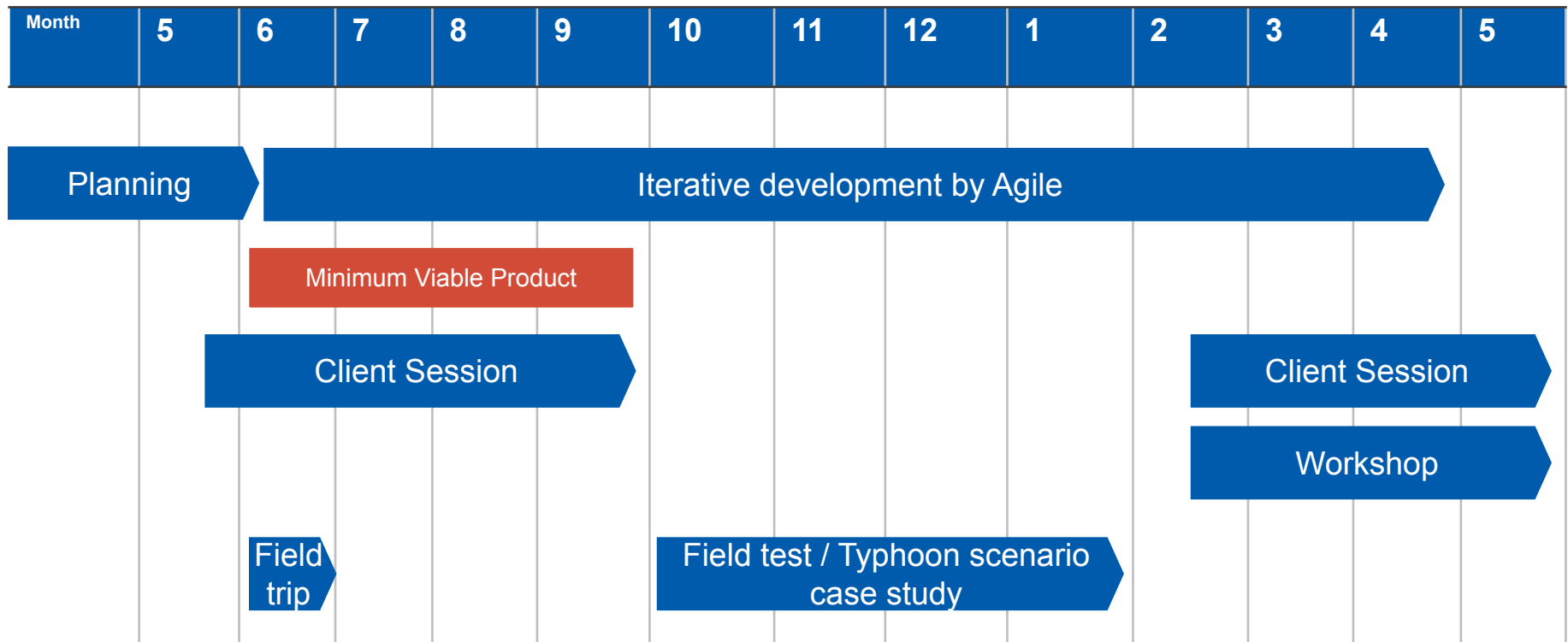
Outreach: Participation of ADB and DMC members in capacity building and training activities, support for project outreach and communication with high-level senior government officials in relevant organisations.

Scale-up: Suggesting organisations in DMC for future utilization of the PIVE tool, beyond the TIC timeline of the project.
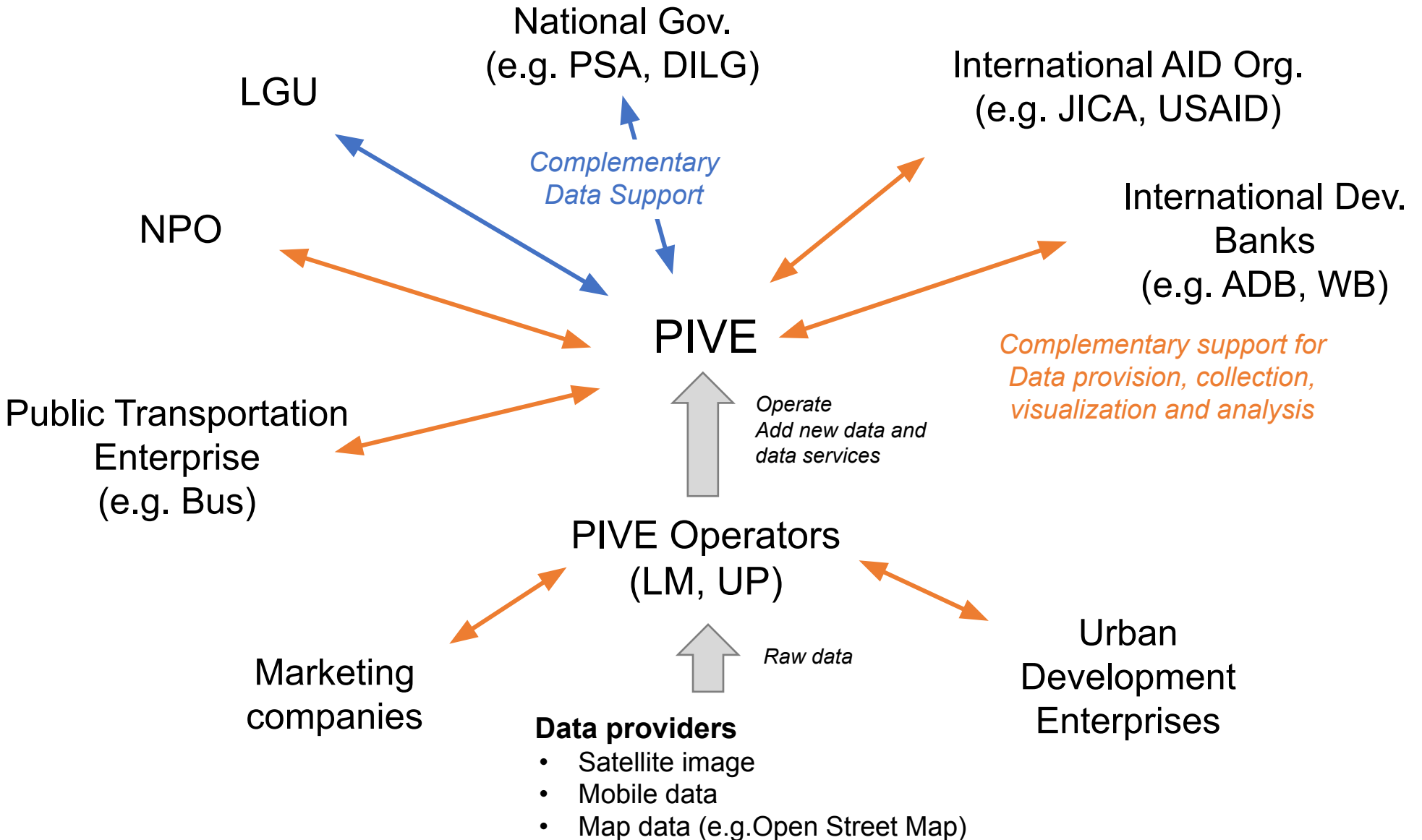
Timeline and outlook

- During ADB's Technology Innovation Challenge (TIC) project, we aim to establish a Minimum Viable Product (MVP) to offer concrete values to users.
- We hold client sessions to understand users' needs and finalize the requirements/specifications of the application.
- We hold workshops to introduce PIVE to a broader audience and review users' values.
- After TIC, we seek Product-Market Fit and start operating the working system.

2023	2024	2025
ADB Technology Innovation Challenge	Operation	
Minimum Viable Product	Product-Market Fit	
Client Session	Client Session	
	Workshop	

- During ADB's Technology Innovation Challenge (TIC) project, we aim to establish a Minimum Viable Product (MVP) to offer concrete values to users.
- We hold client sessions to understand users' needs and finalize the requirements/specifications of the application.
- We hold workshops to introduce PIVE to a broader audience and review users' values.
- After TIC, we seek Product-Market Fit and start operating the working system.

Month	5	6	7	8	9	10	11	12	1	2	3	4	5

Planning

Iterative development by Agile

Minimum Viable Product

Client Session

Client Session

Workshop

Field trip

Field test / Typhoon scenario case study

- We would like to receive feedback on our ideas and product images.

- We would also appreciate suggestions about your requirements and priorities.

- We would also appreciate your participation in evaluation tests. In principle, tests will be conducted at the end of each sprint (once every two weeks), but we will discuss the frequency and method of participation separately.

- Workshops will be held to develop test scenarios. We hope that you will participate in the workshops for a realistic set of tests and to provide us with your valuable suggestions and feedback.

National Gov.
(e.g. PSA, DILG)

LGU

International AID Org.
(e.g. JICA, USAID)

Complementary Data Support

NPO

International Dev.
Banks
(e.g. ADB, WB)

PIVE

Complementary support for Data provision, collection, visualization and analysis

Public Transportation
Enterprise
(e.g. Bus)

Operate
Add new data and
data services

PIVE Operators
(LM, UP)

Marketing
companies

Raw data

Urban
Development
Enterprises

Data providers
- Satellite image
- Mobile data
- Map data (e.g.Open Street Map)

Appendix

User Story 1-1:

Informal settlement residents face heightened concerns regarding the impact of disasters due to limited access to information and relief support.

An image depicting typhoon approaching and people are panicking

Non-government organizations and disaster preparedness teams utilize the PIVE tool's outputs to effectively communicate disaster planning to vulnerable populations.

NGO/ Disaster Response Team/ Government Organisation

PIVE
via Chatbots and Survey App

Provide aids and logistics and real time updates about the disaster
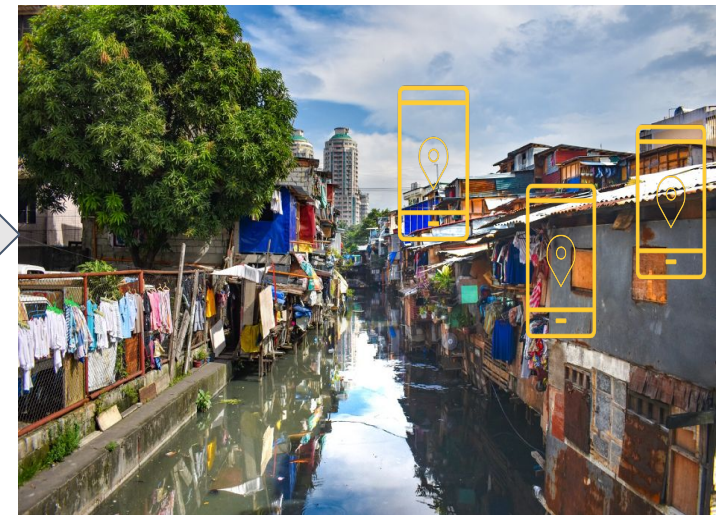
Informal Settlements

The PIVE tool combines diverse datasets to identify areas with higher susceptibility to disasters
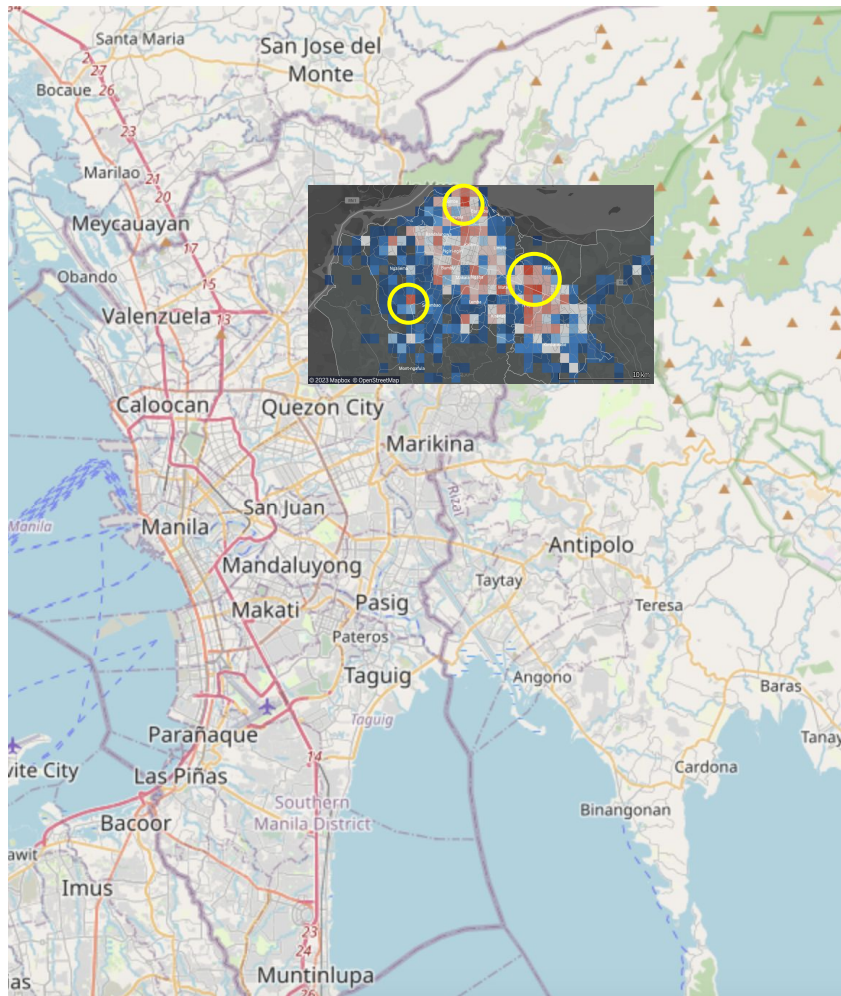
Outputs from the Dashboard, identifying vulnerable hotspots

The PIVE dashboard provides government agencies and institutions with data-informed tools to proactively prepare for disasters and support vulnerable populations.

PIVE Dashboard helps in identifying disaster vulnerable areas

Relevant agencies getting outputs from PIVE dashboard

PIVE empowers government agencies to make data-informed decisions and take effective action.

PIVE keeps end users informed about the current situation and communicates their needs to disaster preparedness teams.

PIVE serves as a bridge between users and the government, ensuring optimal resource allocation to areas where they are most needed.

PIVE facilitates prompt access to essential resources and information for end users, enhancing their knowledge and awareness of real-time updates.
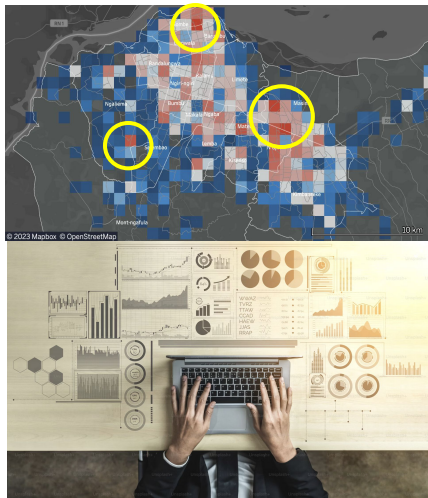
PIVE solution

Vulnerable hotspot location

Access to essential services

User Story 1-1:

PIVE plays a vital role in raising disaster preparedness awareness among residents in vulnerable locations while providing valuable insights to relevant organizations. This fosters a more resilient society, reducing vulnerability to the impact of disasters.

Concerned citizens

PIVE Dashboard

PIVE insights about accessing essential services

Satisfied citizen with better informed information
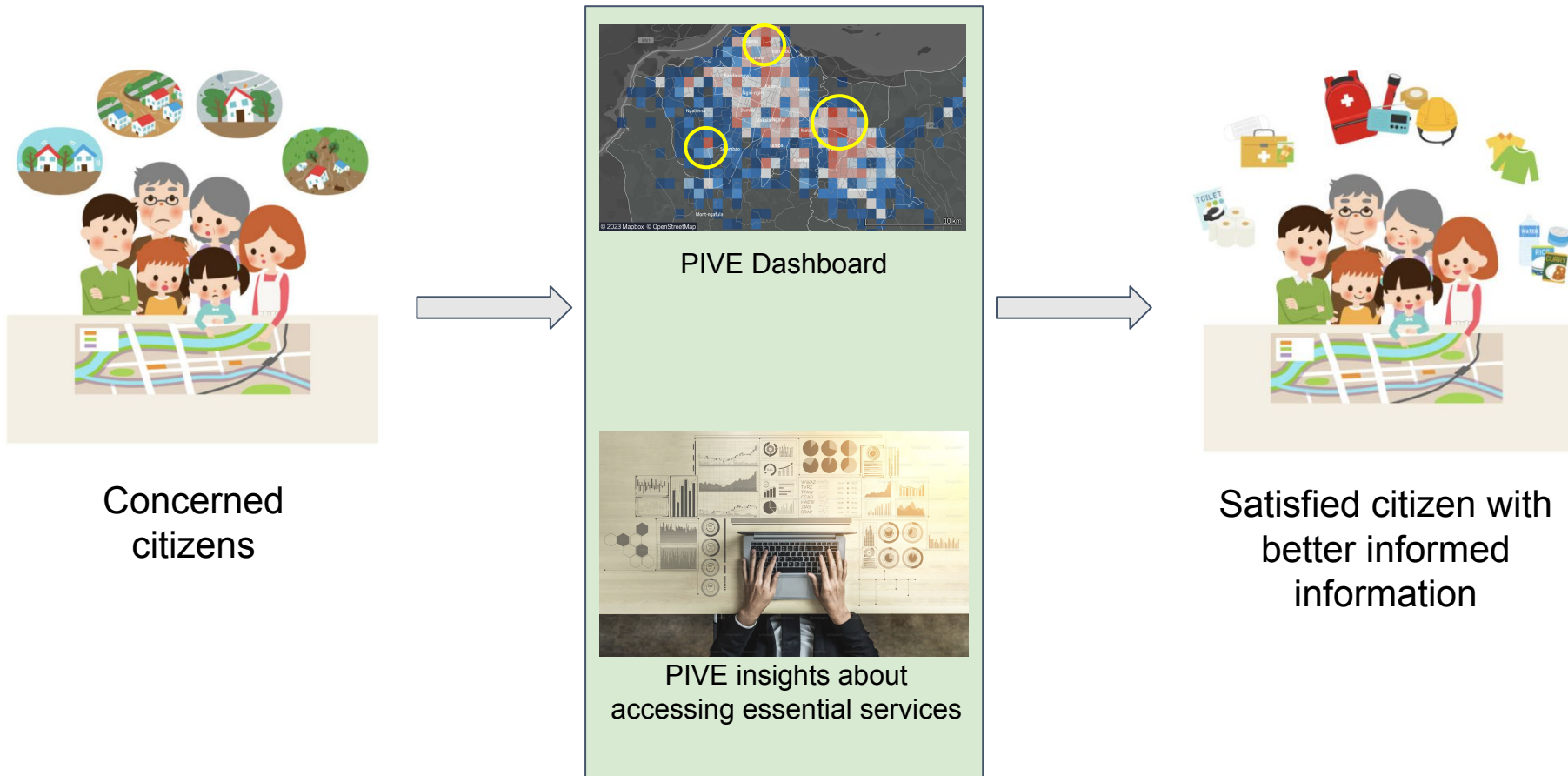
Through surveys, questionnaires, satellite data, and hazard maps, we gain insights into the availability and accessibility of critical services such as safe houses, medical aid, emergency food, and evacuation transportation. This helps to strategically plan and implement tailored disaster preparedness measures that cater to the specific needs of these communities, fostering resilience and safeguarding their well-being during times of crisis.

Data Collection

PIVE solutions

User Story 1-3 and 1-4:

Chatbots enable effective communication with individuals, providing up-to-date information on the disaster's impact and helping them understand the importance of preparedness for their safety.
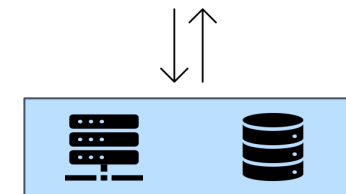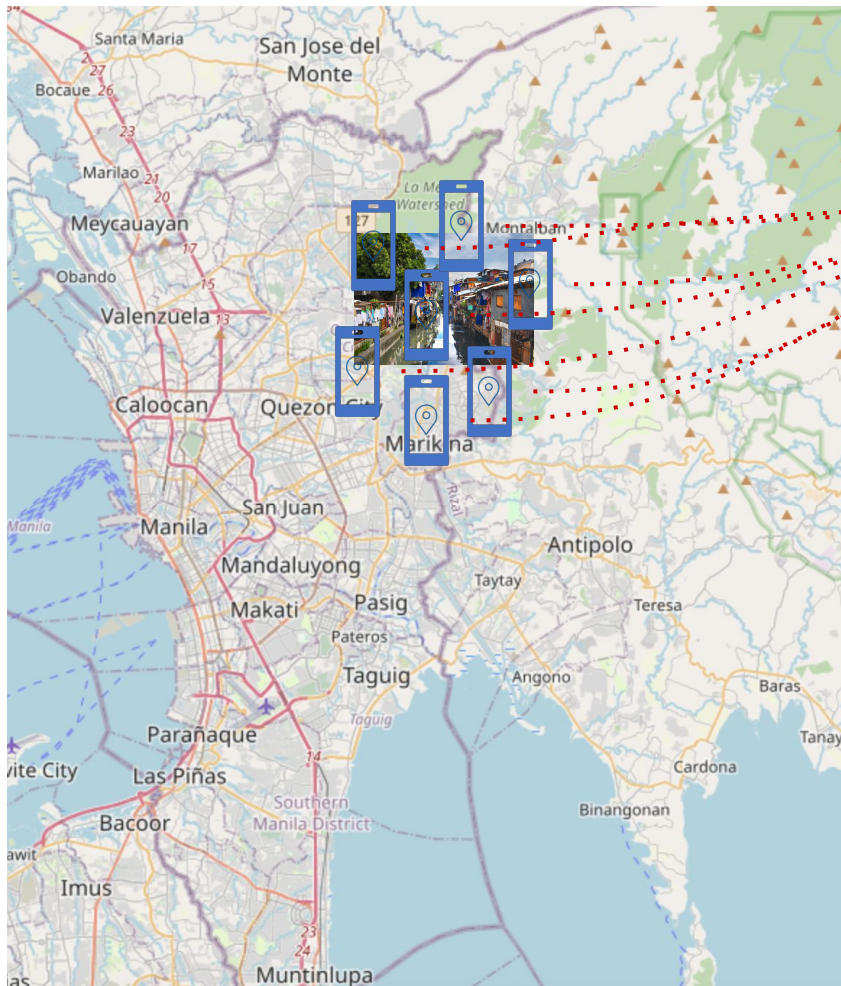
NGO/ Disaster Response Team

User Story 2-1: To complement Socio-economic Indicator in more specified social strata or on smaller area with more frequency
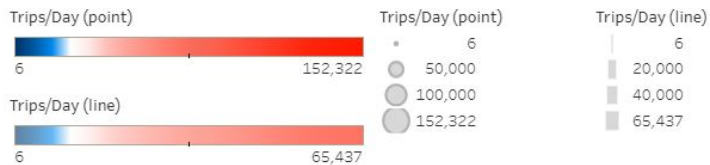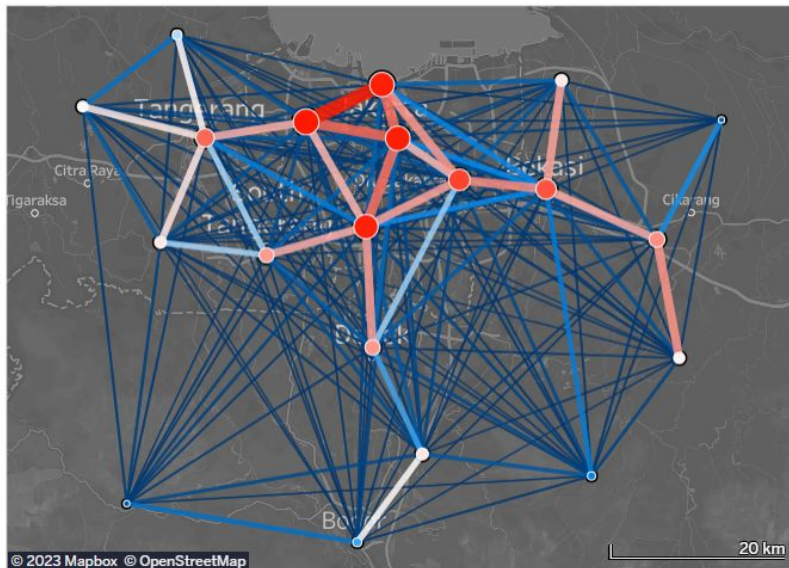
69

Use Case 3:
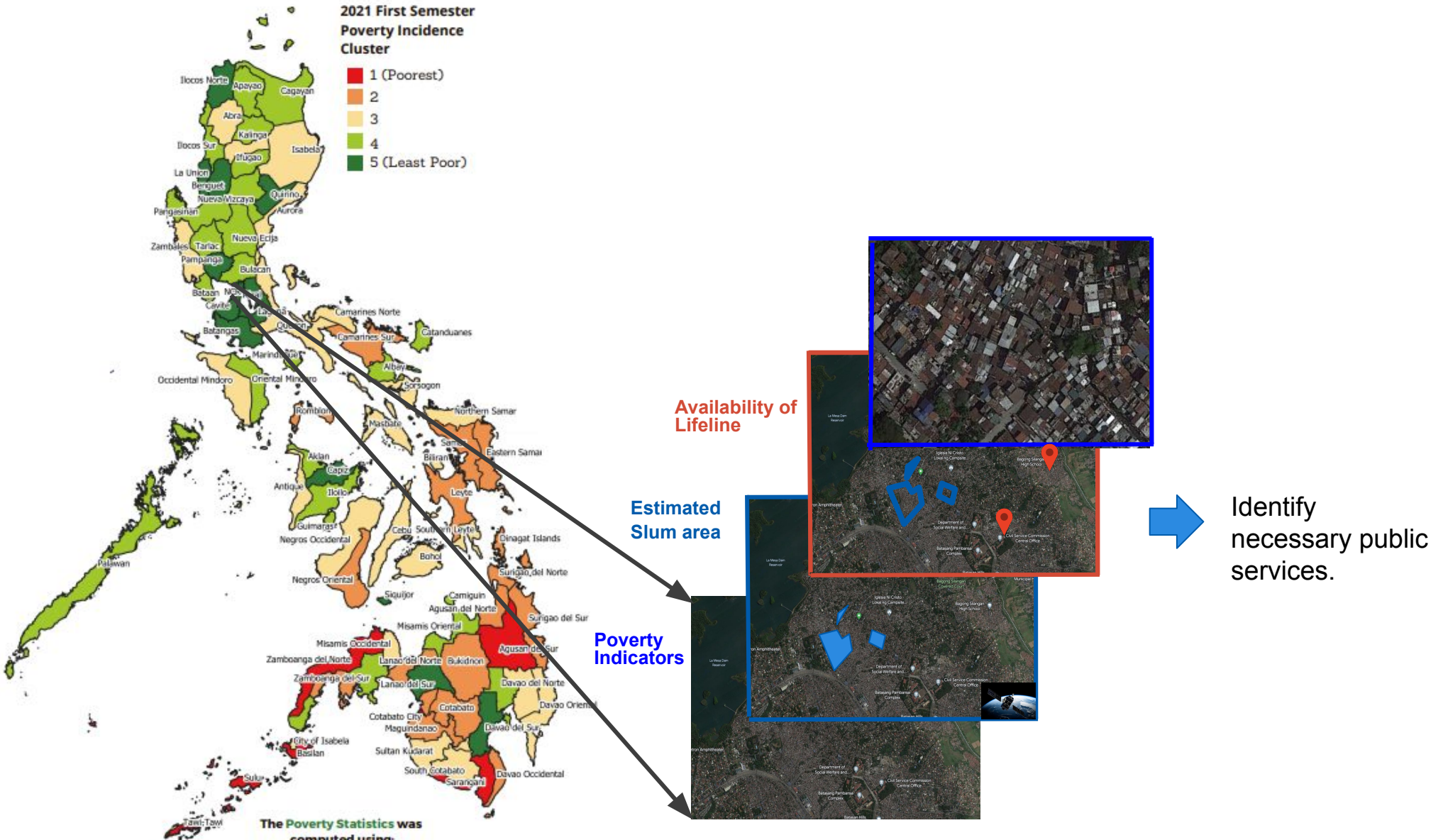
The PIVE Chatbot serves as a reliable and interactive platform that communicates updated information to users while providing valuable insights from the disaster response teams.
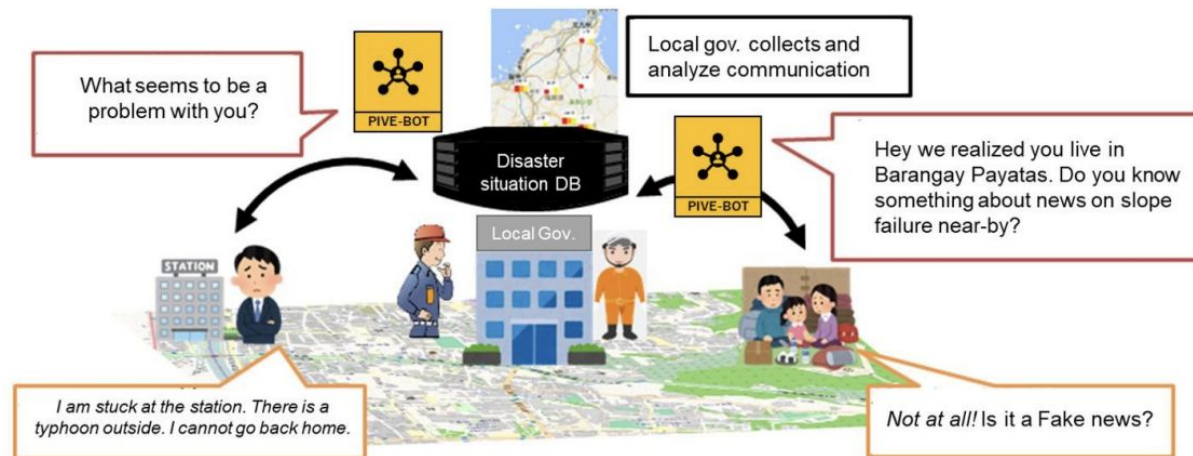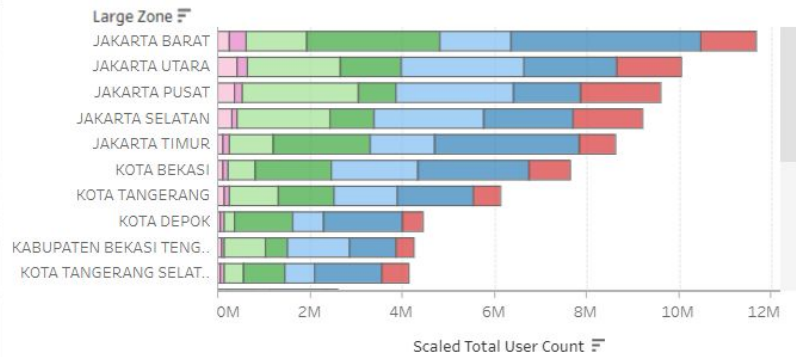

Chatbot communication with users

Use Case 4:

PIVE identifies which transportation means are used by the settlement residents, where they commute to for work or school and quantitatively monitors traffic issues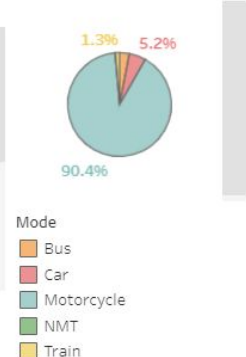 or traffic usage of 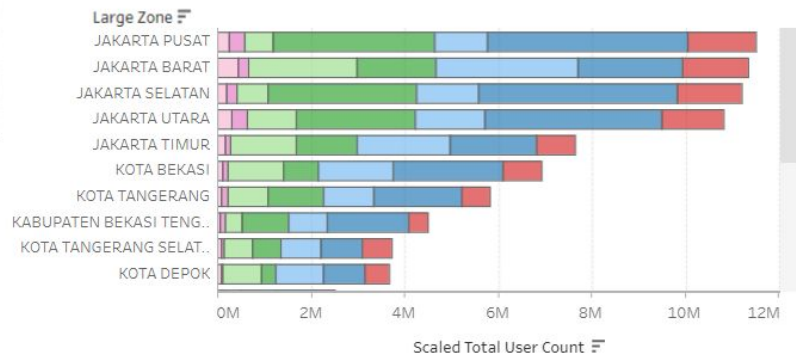the socially vulnerable people.