

Transformative Urban Mobility Initiative (TUMI) Lab **Flood-Proofing Urban Bus System in Ho Chi Minh City**

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Vietnamese-German University



Transformative Urban
Mobility Initiative



Deutsche Gesellschaft
für Internationale
Zusammenarbeit (GIZ) GmbH

The context – Urban Flooding Everywhere



Pic 1. Urban Flooding in Hanoi

(<https://vnexpress.net/giao-thong-ha-noi-roi-loan-do-mua-ngap-4498601.html>)



Pic 2. Urban flooding in Da Nang

(<https://zingnews.vn/giai-ma-tran-mua-ngap-lich-su-o-da-nang-post1365517.html>)



Pic 3. Urban flooding in Mekong Delta city

(https://congan.com.vn/doi-song/mien-tay-doi-mat-voi-dot-trieu-cuong-lich-su_138894.html)



Pic 4. Urban flooding in Ho Chi Minh City

(<https://zingnews.vn/sang-dau-tuan-sau-bao-so-9-sai-gon-ngap-nuoc-ket-xe-khaph-noi-post895234.html>)

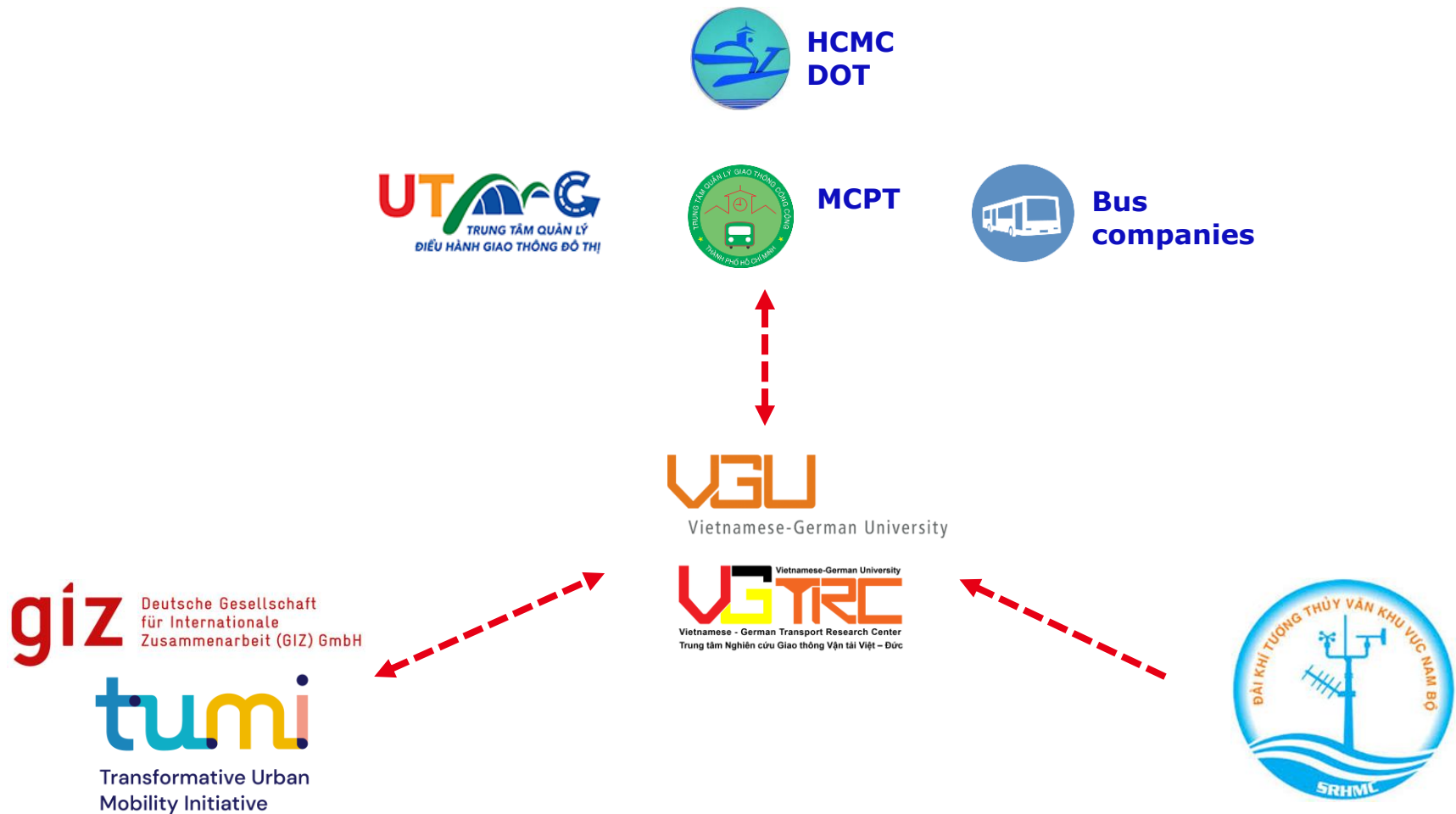
Goal & Objectives

To develop an innovative solution for HCMC authorities to coordinate, monitor and respond to the effects of extreme rainfalls and tidal rise that severely affect the operations of the bus system. Ensure the continued functioning of critical infrastructure during extreme climate events.

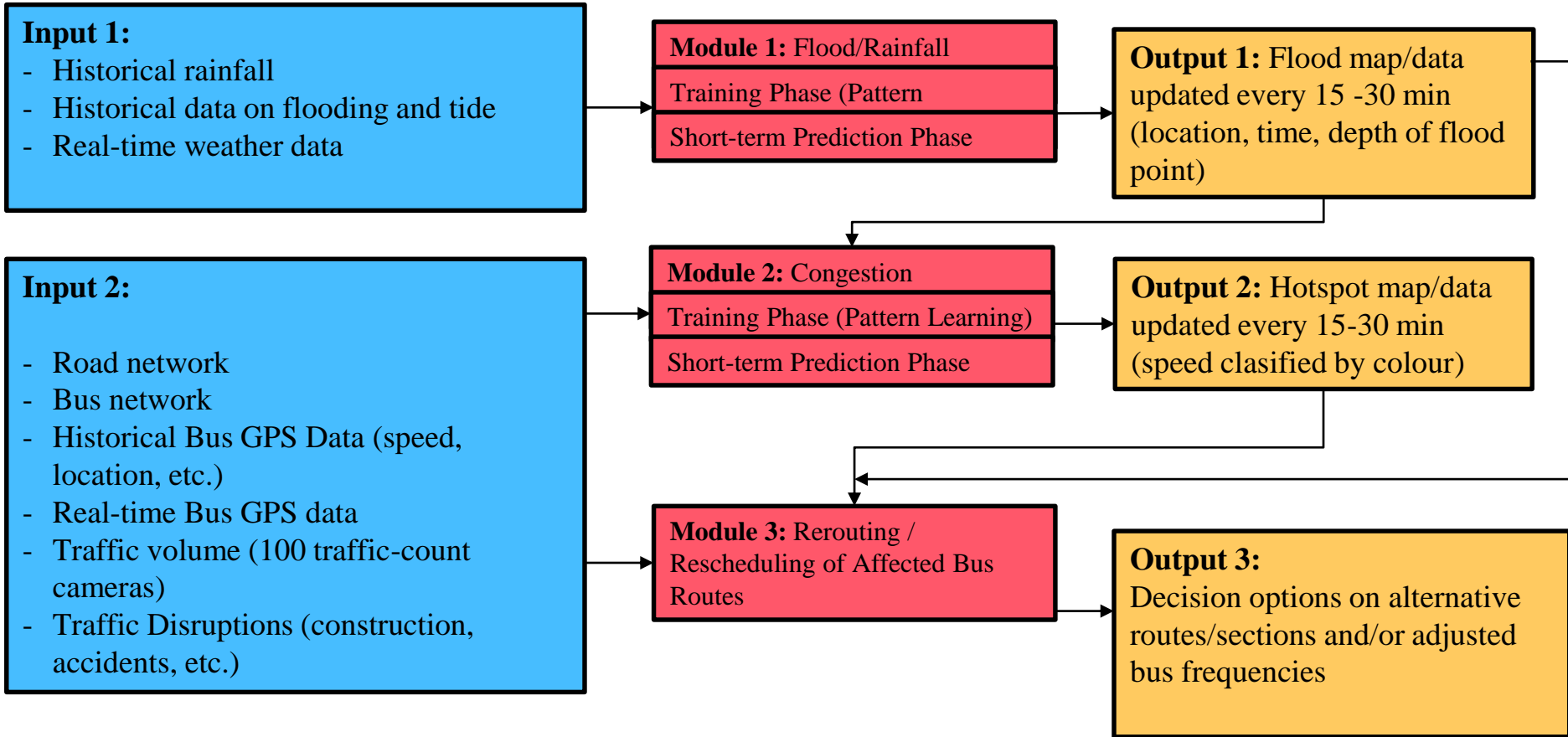
Objectives

- *Analyze weather data and historic extreme weather events.*
- *Develop big data approaches for analysis of road infrastructure vulnerability and road user behavior changes to identify bottlenecks and develop viable contingency plans for bus system.*
- *Design a comprehensive digital tool (1st prototype) to support city authorities in their planning processes during and after heavy rains.*

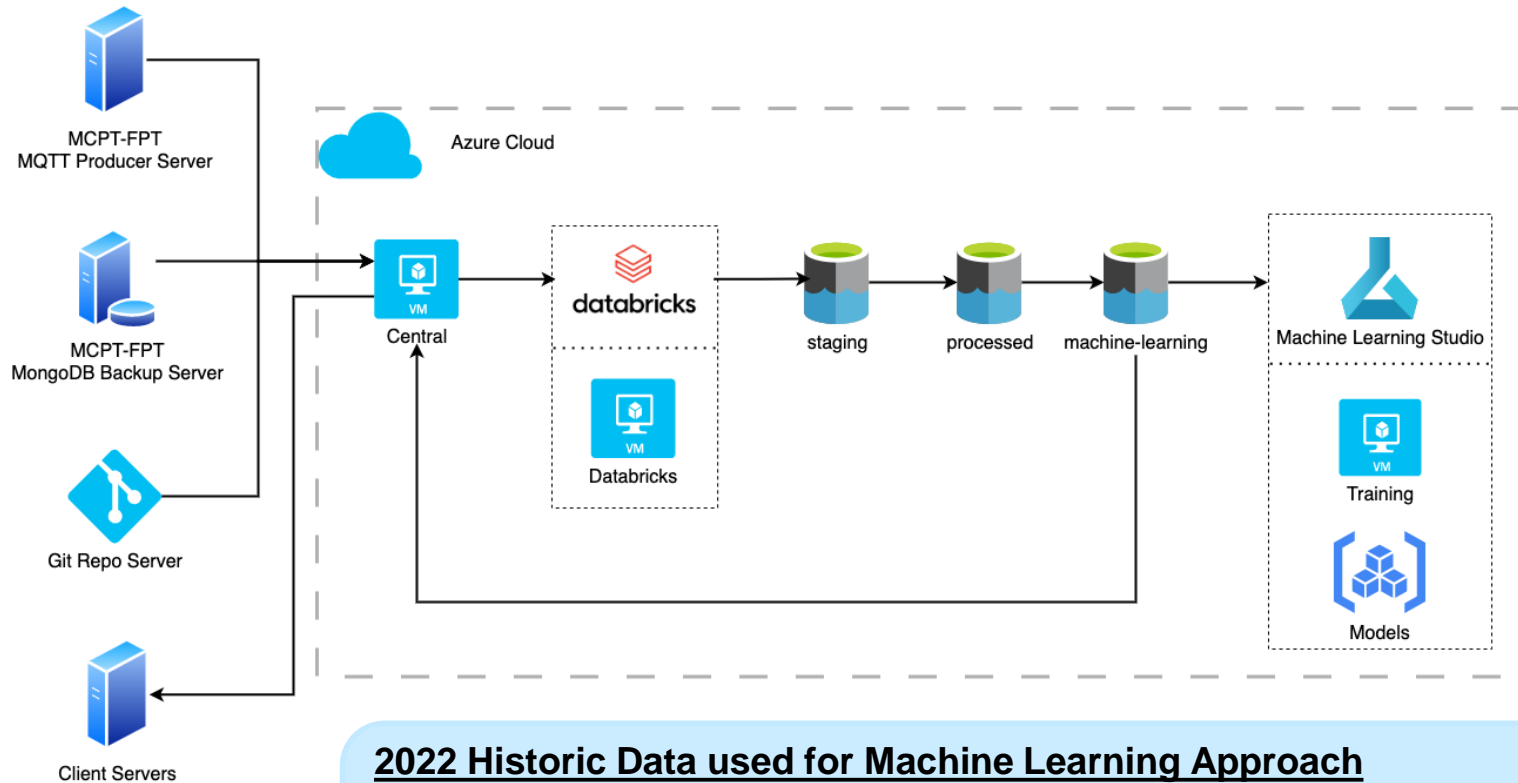
Approach – Stakeholder Constellation



Approach – Module Framework & Data Structure



Big Data Approach



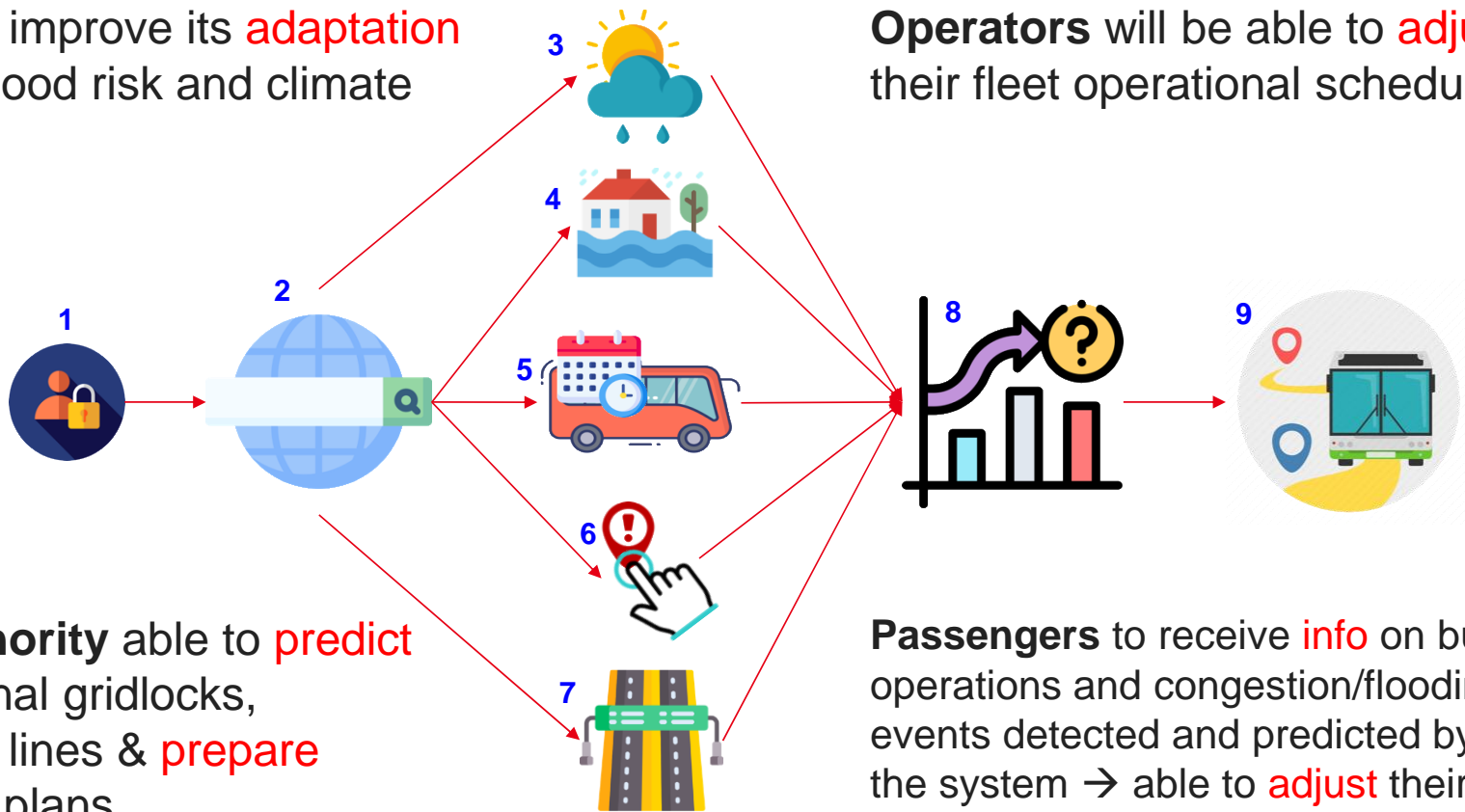
2022 Historic Data used for Machine Learning Approach

- | | |
|--|--|
| • Road Network: | 3 million road segments |
| • Bus GPS Data: | 3.6 billion points (10 Million/day) |
| • Hourly Traffic count of 100 cameras: | 875,000 data points |
| • Weather Data every 15 minutes: | 35,000 data points |

Outputs & benefits

The city will improve its **adaptation capacity** to flood risk and climate change risk.

Operators will be able to **adjust** their fleet operational schedules.



Transit authority able to **predict** the operational gridlocks, affected bus lines & **prepare** contingency plans.

Passengers to receive **info** on bus operations and congestion/flooding events detected and predicted by the system → able to **adjust** their travel plans accordingly.

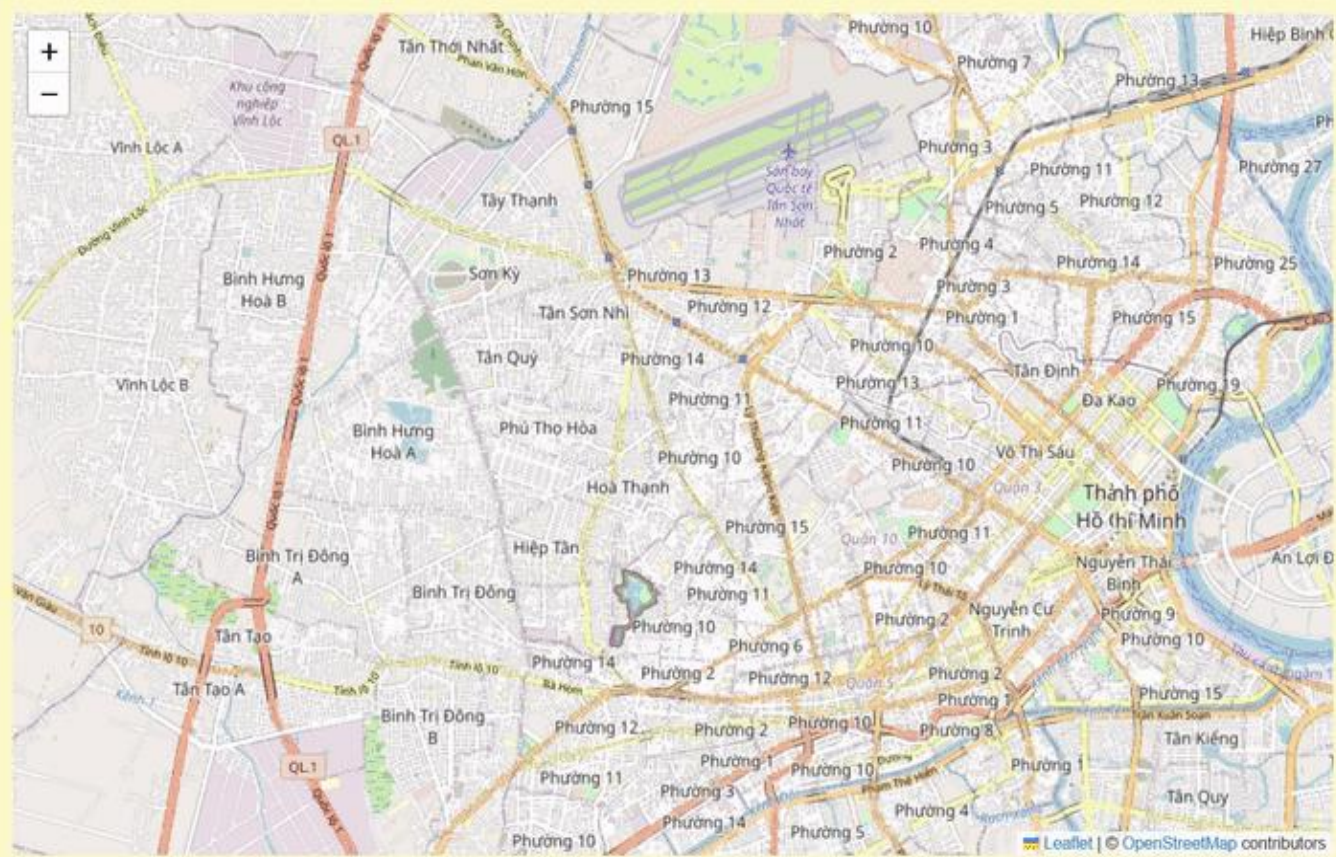
End users – Transit Authority [predicting & planning]

TUMILAB-HCM

www.BANDICAM.com

Data selection

Select...



The map displays the city of Ho Chi Minh City with various districts and bus routes. The routes are color-coded to represent different levels of congestion. The map includes labels for districts such as Tân Thời Nhất, Tây Thanh, Tân Sơn Nhì, Tân Quý, Phú Thọ Hòa, Hoà Thành, Hiệp Tân, Tân Tạo, Binh Tri Đông, Binh Tri Đông A, Binh Tri Đông B, Binh Hưng Hoà A, Binh Hưng Hoà B, Vinh Lộc A, Vinh Lộc B, and Tân Tạo A. The map also shows major roads like QL1 and QL5. The map is sourced from Leaflet and OpenStreetMap contributors.

User can select the bus route and see the level of congestion on the route.

Transferability

- The concept, implementation processes, and first prototype digital solutions of TUMI Lab are **highly replicable** in the other cities.
- GIZ and VGU will **continue to improve** the tools and **transfer** the idea and product knowledge to the other cities in Vietnam and around the world.
- **Collaboration** from other organizations and individuals is warmly welcomed.



THANK YOU FOR YOUR ATTENTION



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