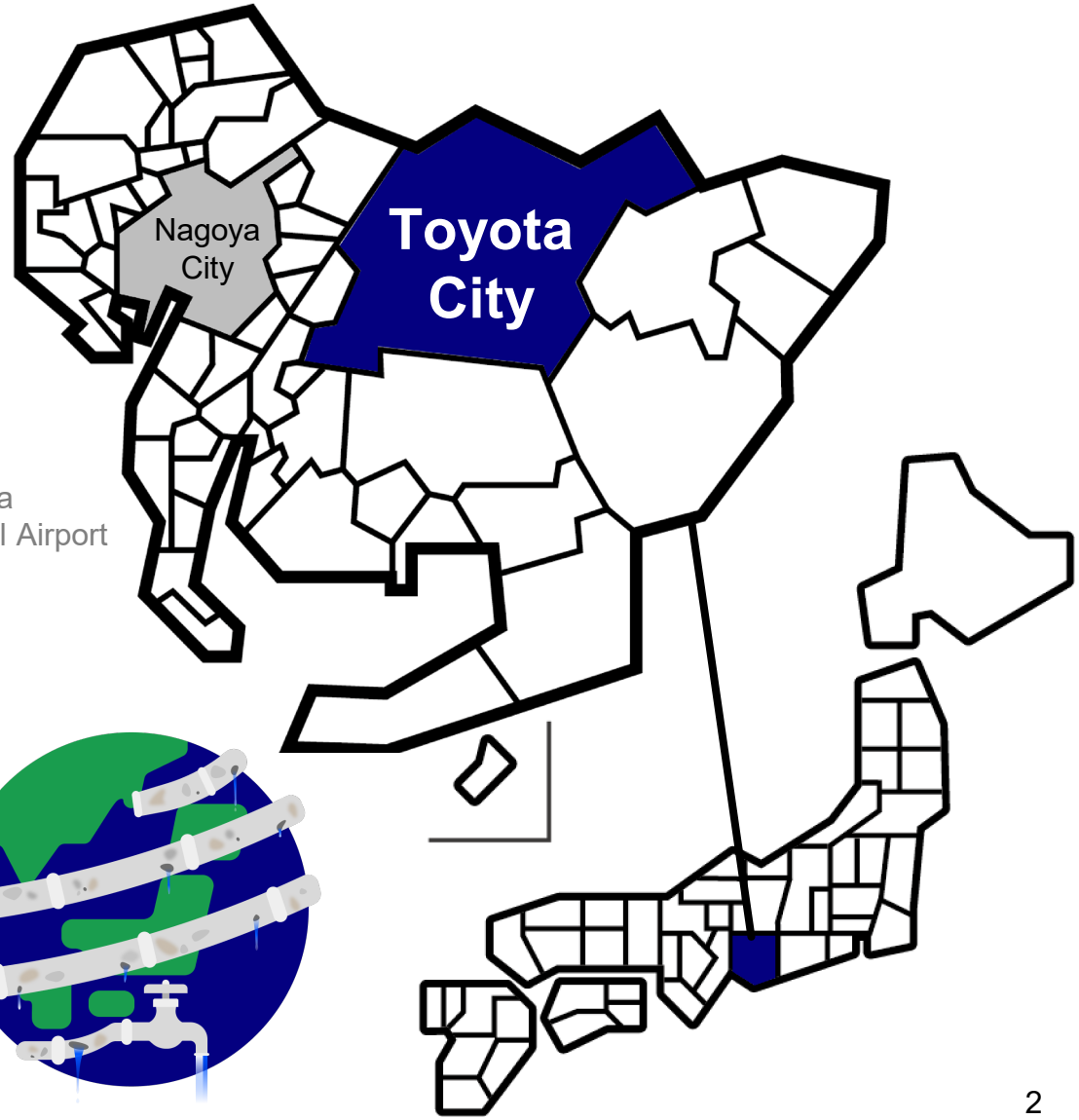
Water digital transformation

deterioration diagnosis of water pipes
utilizing AI and Artificial Satellite
by public-private partnerships in Toyota City

Location of Toyota City

Toyota City is home to Toyota Motor Corporation's headquarters and six plants.

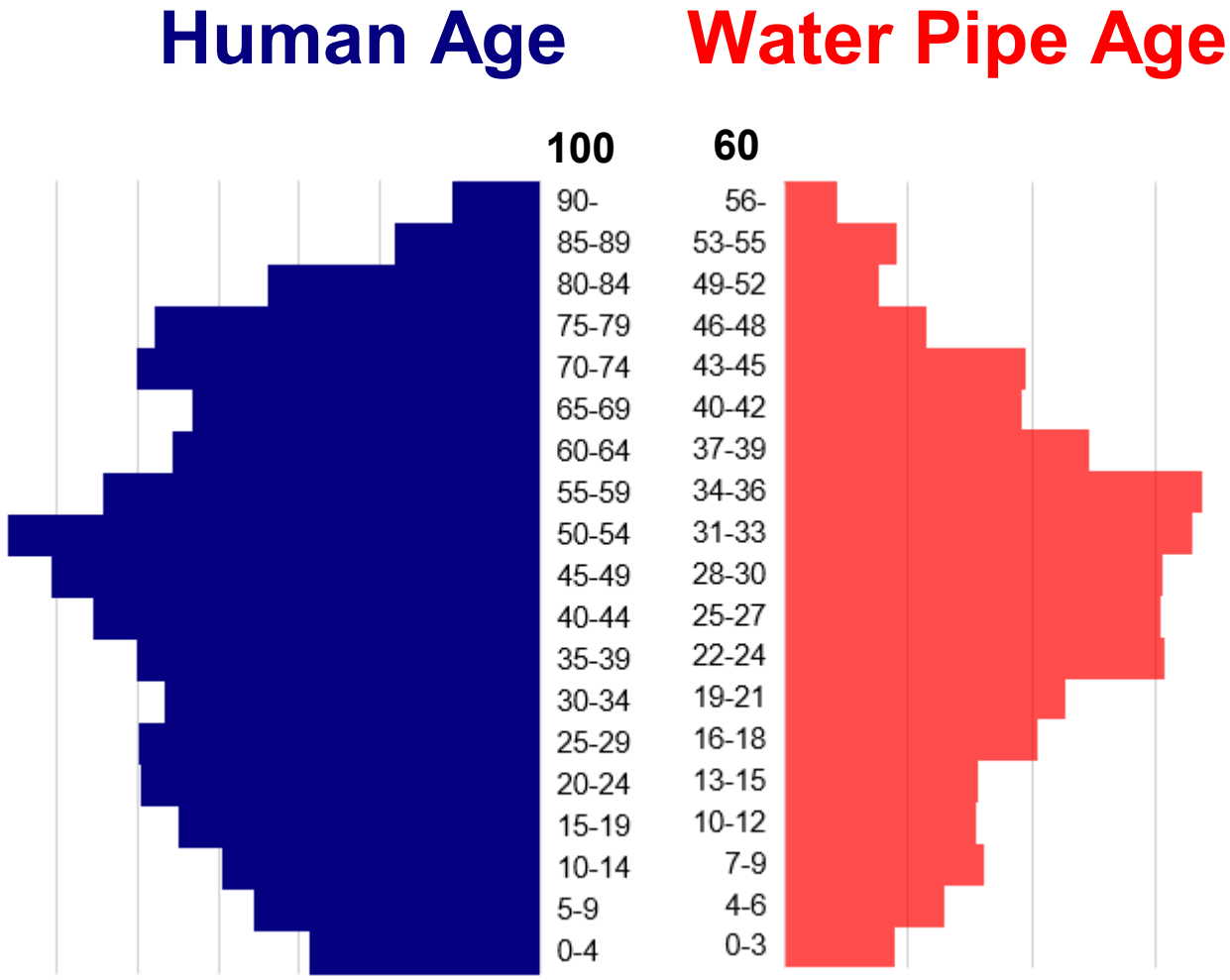
From the sky



The required time is about 1 hour from Chubu International Airport.

Background of Toyota City

Population	415,853
Started Supplying water	Jan.1956
Water Pipe Extension	3,685 km
Leakage	3,483,166 ㎥ (7%)



Issues on water supply maintenance

The condition of water pipes remains unknown until excavation is performed. How can we optimize maintenance costs for aging water pipes?

01 The current scope of leak detection is vast, leading to inefficient inspection activities

02 The need for tools that can analyse both urban and mountainous areas at once

The purpose of the project : To improve efficiency of water pipe inspection activities by setting high priority areas with smaller size in both urban and countryside.

Public-Private Partnership

Prime Minister's Award

Our initiative received Prime Minister's Award at "Digi-den Koshien 2023" Project

Prime Minister's Award at "Digi-den Koshien 2023" Project

The Japanese government has been pursuing the "**Vision** for **a Digital Garden City Nation**," which aims to utilize **digital technology** to **resolve social issues** and increase **attractiveness of regional areas** while **leveraging** their unique features and leading to the **promotion of local industries.**

In order to foster momentum for the realization of the Vision, the **Government** commends **initiatives** that use digital technology to solve regional issues and **enhance well-being of the people.**

At the **Digi-den Koshien Award** held in FY2023, our initiative won **first prize** and received the **Prime Minister's Award.**

Episode 1

May 2020 to Mar. 2021

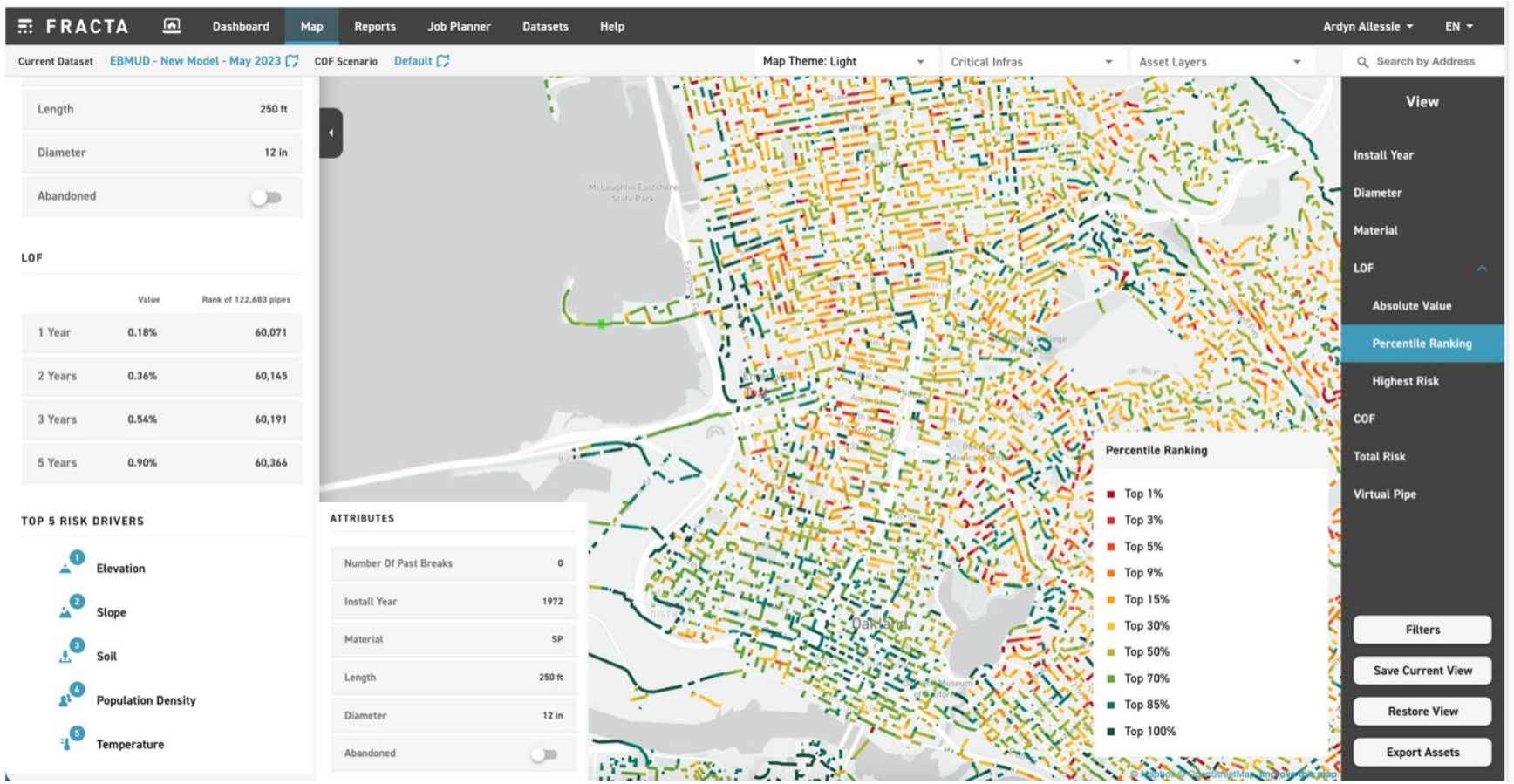

FRACTA
Ai
Achievements
in Toyota City
KURITA

About Fracta

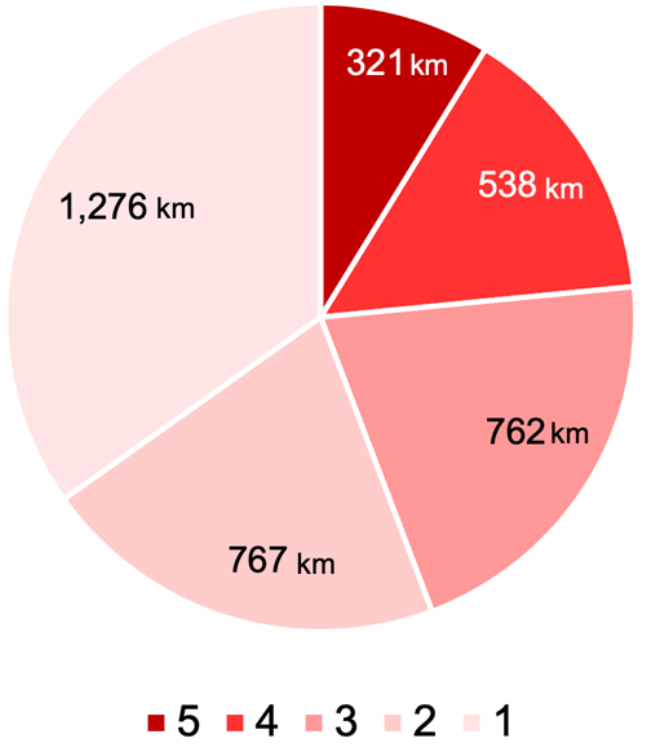
History	2015: Established U.S. headquarters (Silicon Valley, California) 2019: Established Japan subsidiary (Tokyo, Japan) 2023: Became a subsidiary by Kurita Water Industries (Japan)
Business	Infrastructure deterioration prediction and diagnosis service using machine learning algorithms
Achievement	Have over 140 cases, primarily in the U.S. and Japan, which have examined approximately 600,000 water break incidents and 310,000 km of of pipe infrastructure. Furthermore, diagnostic services for sewer and gas pipes are already underway.

Fracta's Results

Health checkup of water pipes using AI × big data

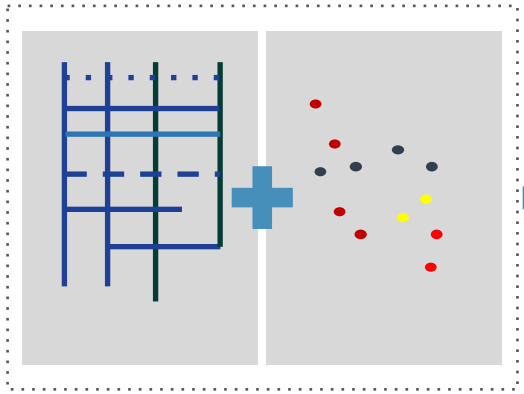
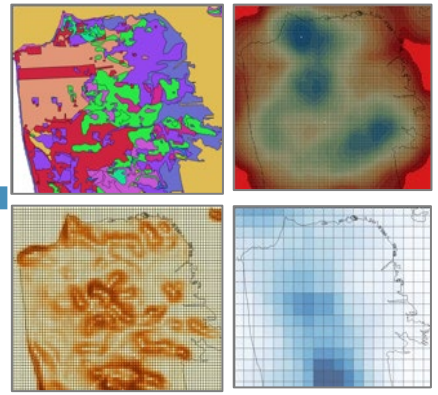
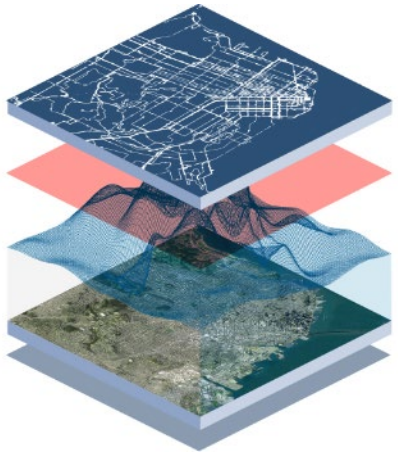
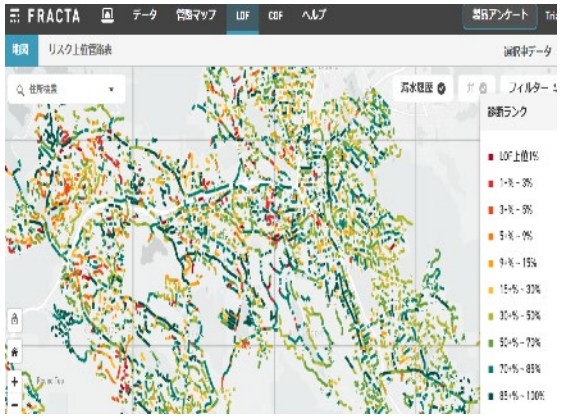


Toyota City case



The process of diagnosis

Diagnose using piping information and environmental big data

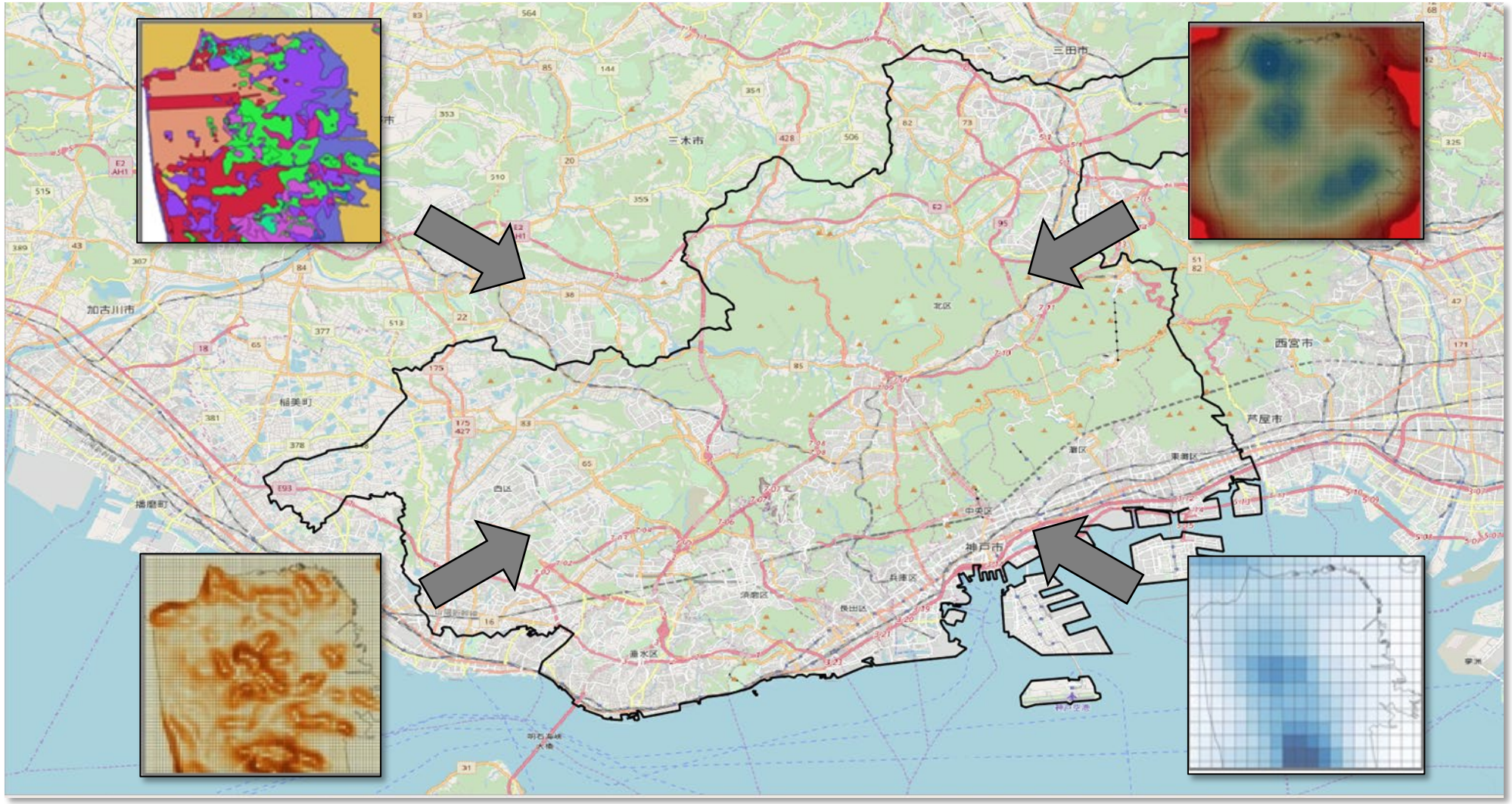
Pipe Asset and BreakData Acquisition / Organization	Integration of the Big Data of Environment	Calculation by AI/Machine Learning	Mapping & Visualization
			
• Acquisition of information on water pipes (diameter, year of construction, etc.) and break history. Digitization, correction, and completion of original data	• Uniquely constructed environmental data (Population, soil, rivers, transportation networks, earthquakes, etc.)	• Proprietary algorithms Calculate the probability of failure within 1~5 years	• Visualize the probability of water pipe failure on a map as a heat map Even if there is little break data, diagnosis is made using a model that has learned the break trends and patterns of other cities.

Water Utilities

FRACTA

3 months

Utilization of environmental big data



Population, soil, rivers, transportation networks, earthquakes, etc.

Achievements in Toyota City

- Visualization of leakage risk by diagnosing all area
- Optimize piping renewal plans across the city
- Passing on tacit knowledge of veteran staff

We’re taking on challenges worldwide!

- Fracta already has achievements outside of the United States and Japan.
- Infrastructure will continue to deteriorate.
- Our mission is to tackle the challenges of social infrastructure globally.

I‘d love to hear from you!

Episode 2

Feb. 2022 to Mar. 2023

Tenchijin COMPASS

KnoWaterleak

Enhancing water pipe inspection efficiency and leakage detection using data fusion and AI

Tenchijin at a Glance

Tenchijin

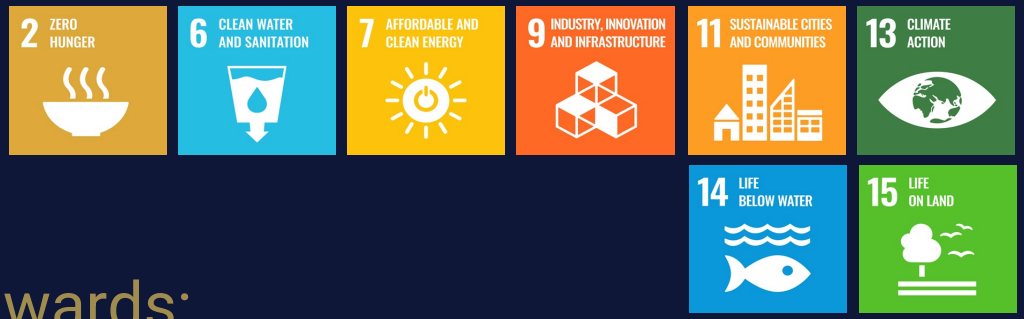
Founded in 2019
30 FTE

JAXA STARTUP

*Japan Aerospace Exploration Agency

Solutions in:

- Infrastructure
- Agriculture
- Renewable energies



Awards:

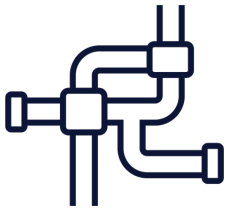
How it works

Tenchijin

Input data
Pipe and Environment

AI/ML algorithm analyzes condition of leakage

The water leak risk map by 100m x 100m

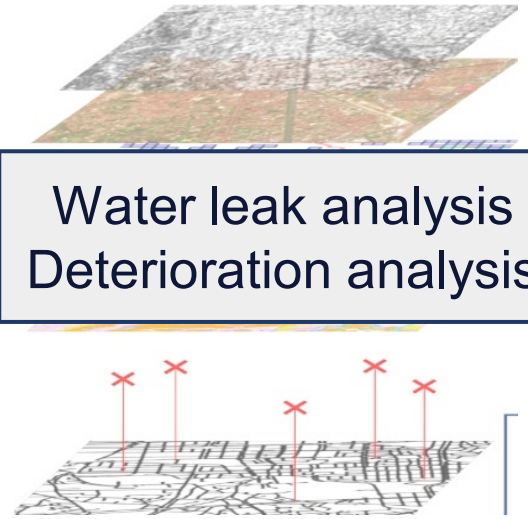


Water pipe network data

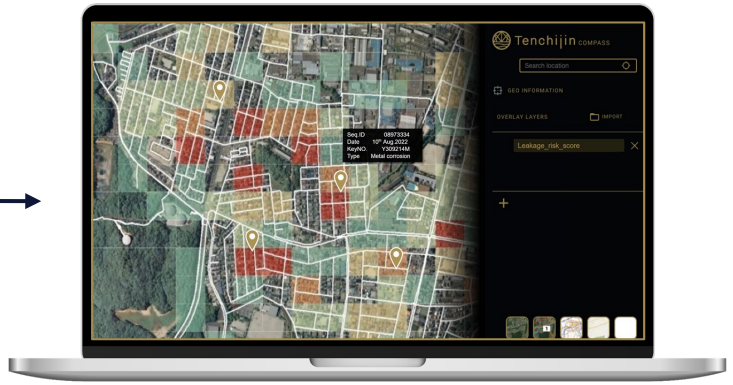
(place, repair history, etc.)

Environment info from satellite

(temperature, rain, landslide, etc.)



Water leak analysis
Deterioration analysis



Show risk level by colors for each 100m area

Use in the planning phase

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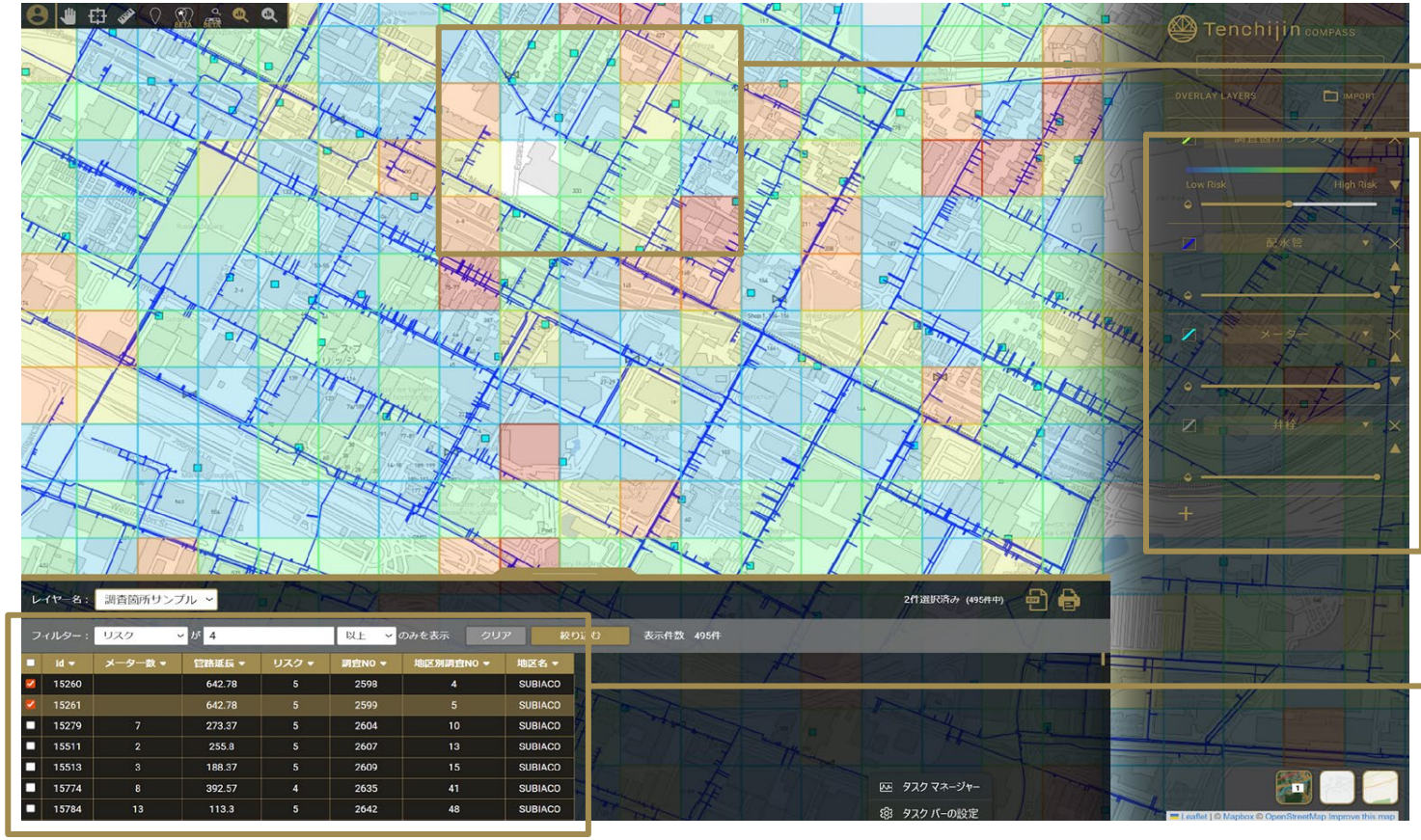
Municipalities can manage all data in digital and share it with different division.



Id	メーター数	管路延長	リスク	調査NO	地区別調査NO	地区名
15260		642.78	5	2598	4	SUBIACO
15261		642.78	5	2599	5	SUBIACO
15279	7	273.37	5	2604	10	SUBIACO
15511	2	255.8	5	2607	13	SUBIACO
15513	3	188.37	5	2609	15	SUBIACO
15774	8	392.57	4	2635	41	SUBIACO
15784	13	113.3	5	2642	48	SUBIACO

Color-map to show risk level

Aggregate in one place all information.

Record and share all inspection data.

Value Added Using Satellite Data

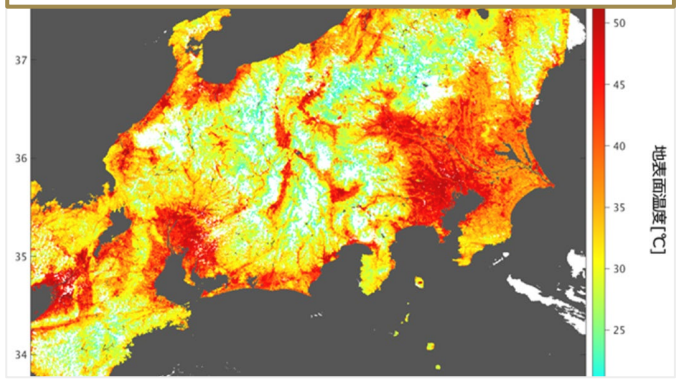
Tenchijin

Advantages

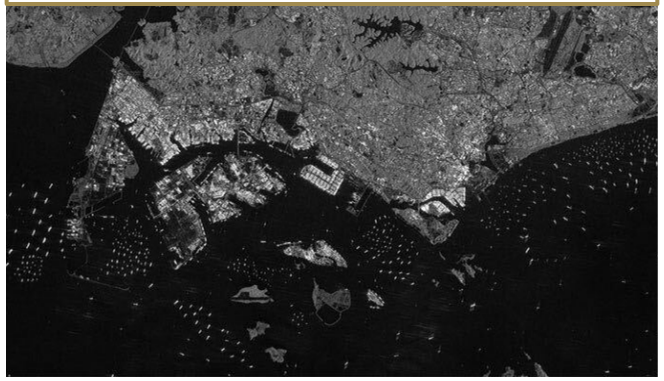
Continuity	Scalability
Perennity	Simultaneity
Depth	Transnationality

Relevant applications

Temperature imagery



SAR imagery



Land surface temperature

Land displacement

Severe temperature impact on leakage

Effect of land motion on pipe leakage occurrence

Demonstration Project Results

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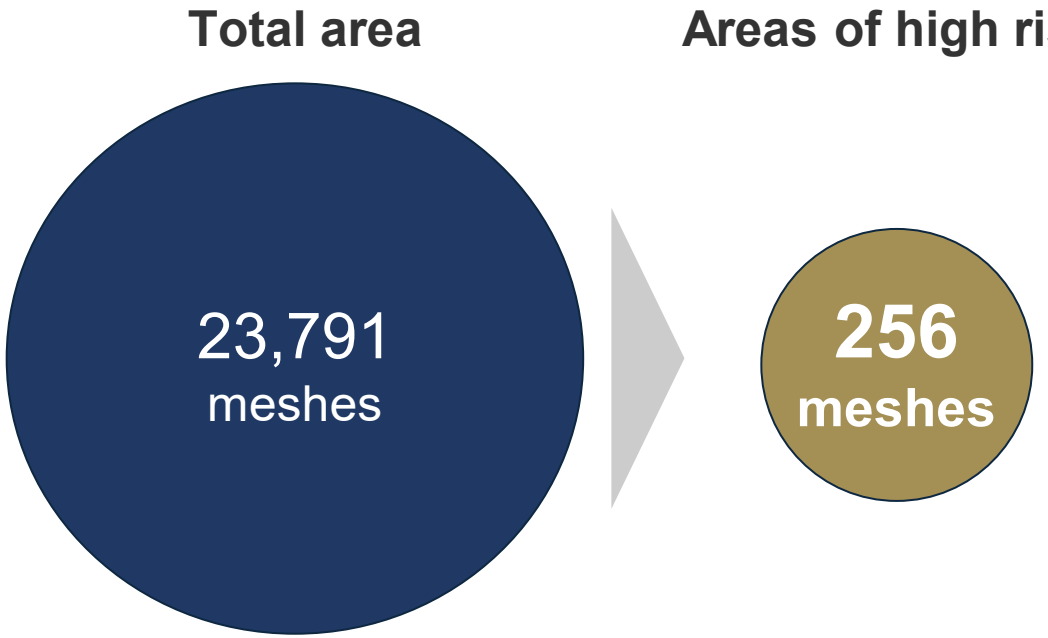
01 Narrow down



3,600 km | 5 years

113 km| 2 months

02 Number of water leaks

Value Added for Users

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The expected benefits of this solution include up to **65% reduction** in inspection costs and up to **85% reduction** in investigation time.

65% reduction

Inspection Cost

85% reduction

Survey Duration

*Data from Toyota City case

Traction: 8 Customers

Tenchijin

10 municipalities use our solution as of April 2024

*Some city names cannot be publicized

- Fukushima City
- Seto City
- Aomori City
- Maebashi City
- Sapporo City
- Hirosaki City

More are coming:

Tenchijin

Let's work together

for a sustainable and eco-friendly water infrastructure.

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