



GIS Mapping for Water Supply Infrastructure in Japan

*JWRC Study Group for International
Comparison of Water Supply Services*

August 2018

What is GIS Mapping?

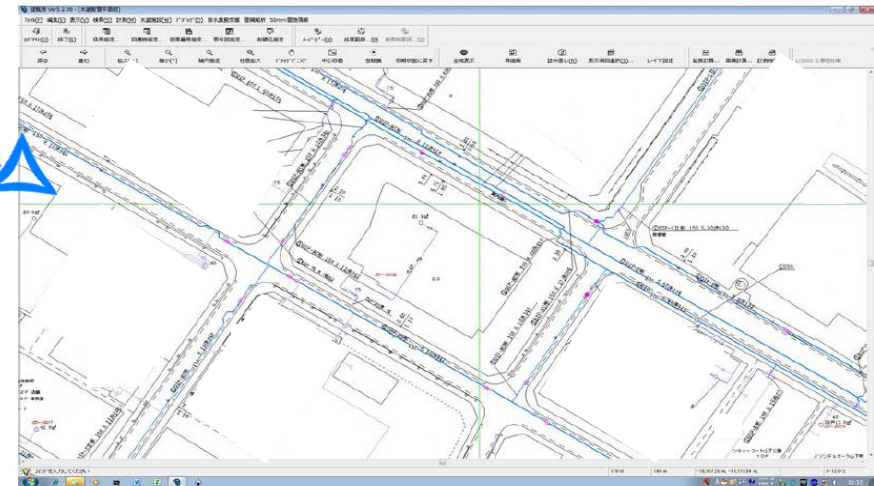
- The GIS mapping enables water utilities to project positions of water mains onto a computerized map surface, along with relevant data such as pipe material, diameter, installation year, ground conditions.

Computerized 1/500 paper plane drawing



1. to manage and register drawings
2. to search data

Building up by “GIS” technology



Special system focused on Water Works Facility
This Mapping system has all data of water facilities & pipelines on topography(road , house ,etc.)

Characteristics of GIS Mapping

- Useful at various stages of service delivery from addressing service disruption, to mains network analysis and renewal planning, to checking various data and records of facilities, and more.
- The web-based system is easy to use and can be adopted regardless of the size of utility
- The data security function can restrict the use of, and access to the system by the user ID, password, types of data requested, data encryption, historical access record, and others.
- Highly adaptable to future system upgrades for potential service expansion and modification, including for coordination with the rates management system
- Accumulated data is easy to transfer within the utility.

Basic Function 1 : Simulation of Service Disruption and Turbidity Increase

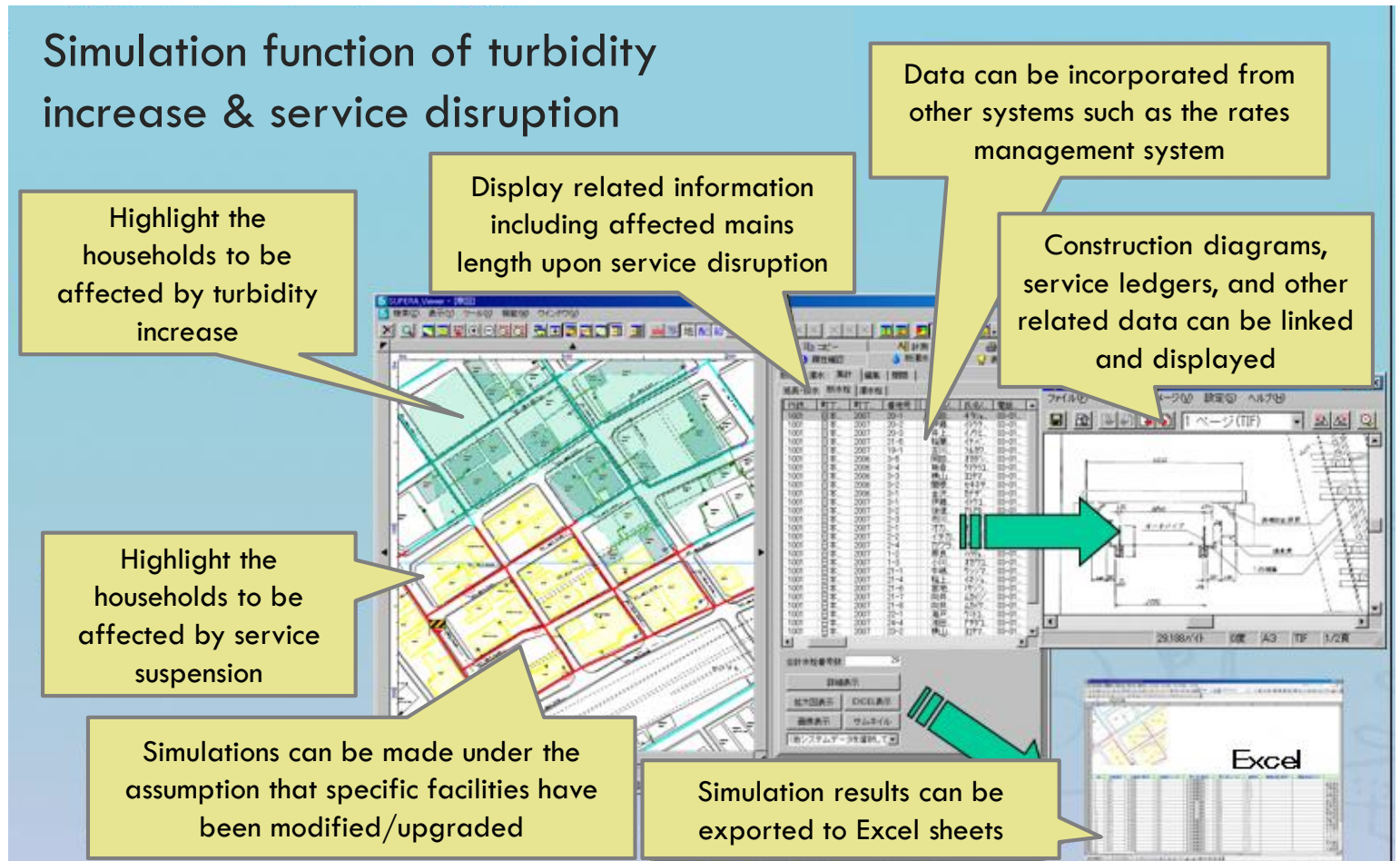
- Simulate an impact of service disruption due to scheduled construction work

Supporting Function for Water Stoppage

If you plan water stoppage point on the mapping system pipeline



- (1) You can count number of water stoppage houses
- (2) You can specify water stopping area



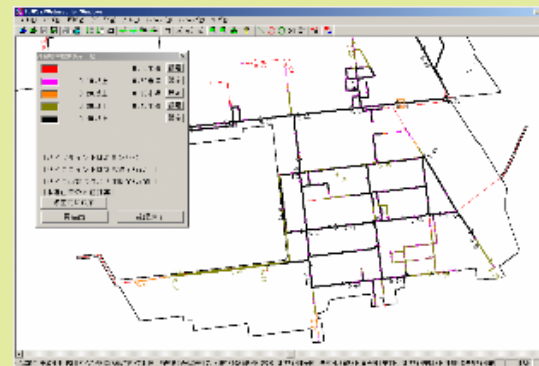
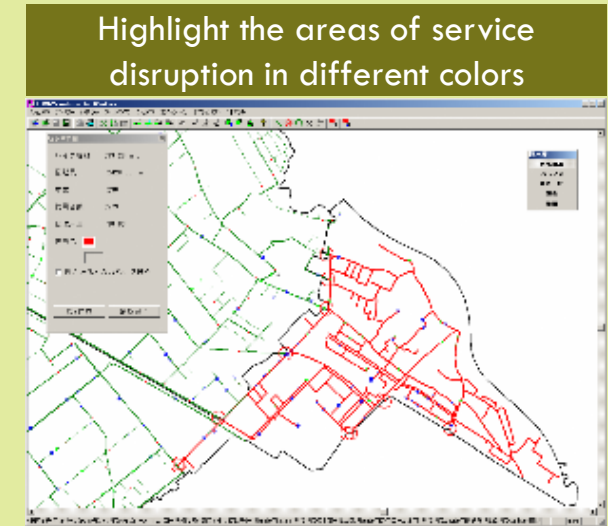
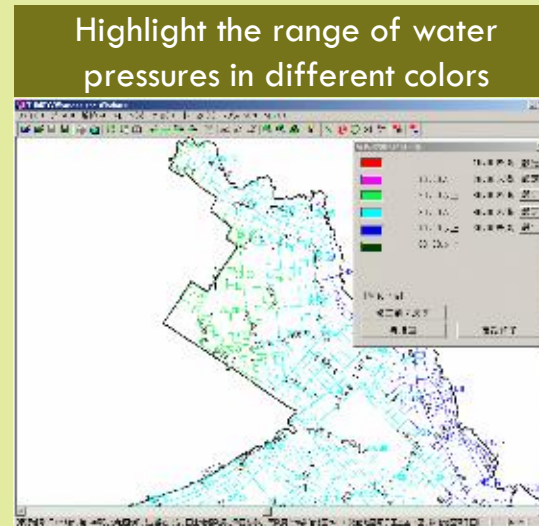
Basic Function 2 : Network Analysis

- Review the composition of mains network

Hydraulic Calculation (Pipe Network Analysis)

You can calculate

- (1) Water pressure
- (2) Velocity
- (3) Volume
- (4) Arrival Time
- (5) Flow Direction
- (6) Residual Chlorine



Option 1 : Mobile Device to Check Mapping Data

- Operable even when the server is down.
- Portability in the field can facilitate emergency response
- Work like a tablet computer with a rotatable, touch screen

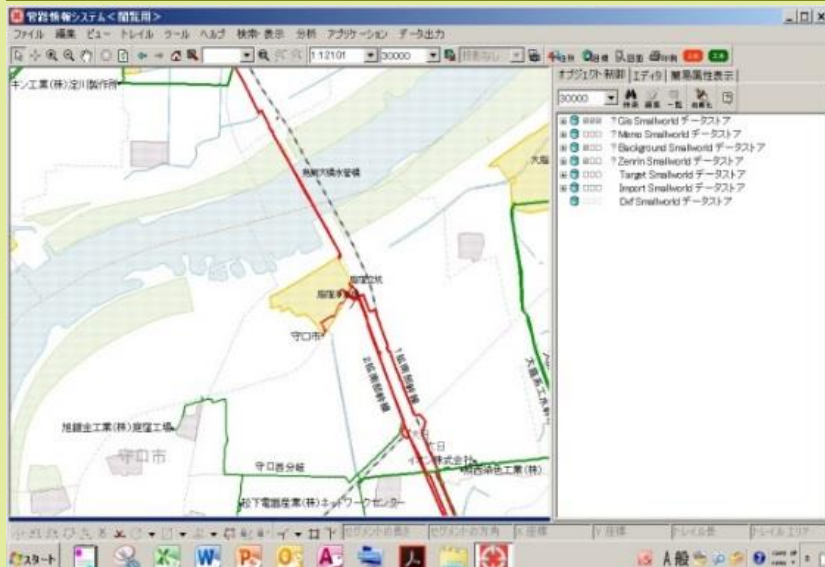


Source: Saitama City Waterworks Bureau

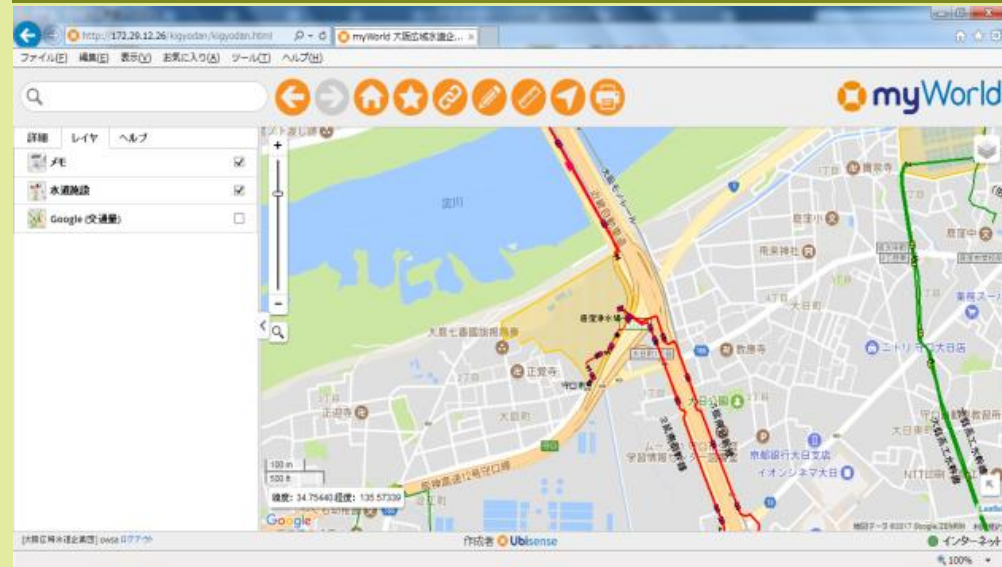
Option 2 : Two Types of Interfaces

- Two types of interfaces are available according to the needs of the utility

1. Interface with detailed information and more advanced functions

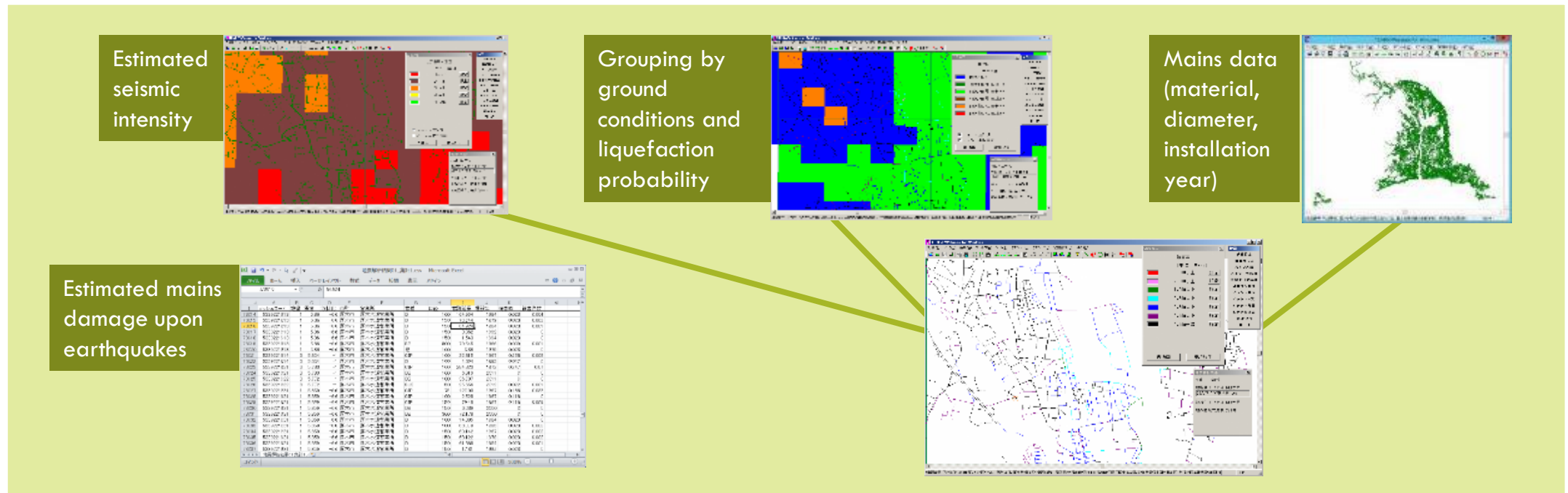


2. Interface with simplified information and functions to maximize day to day operation



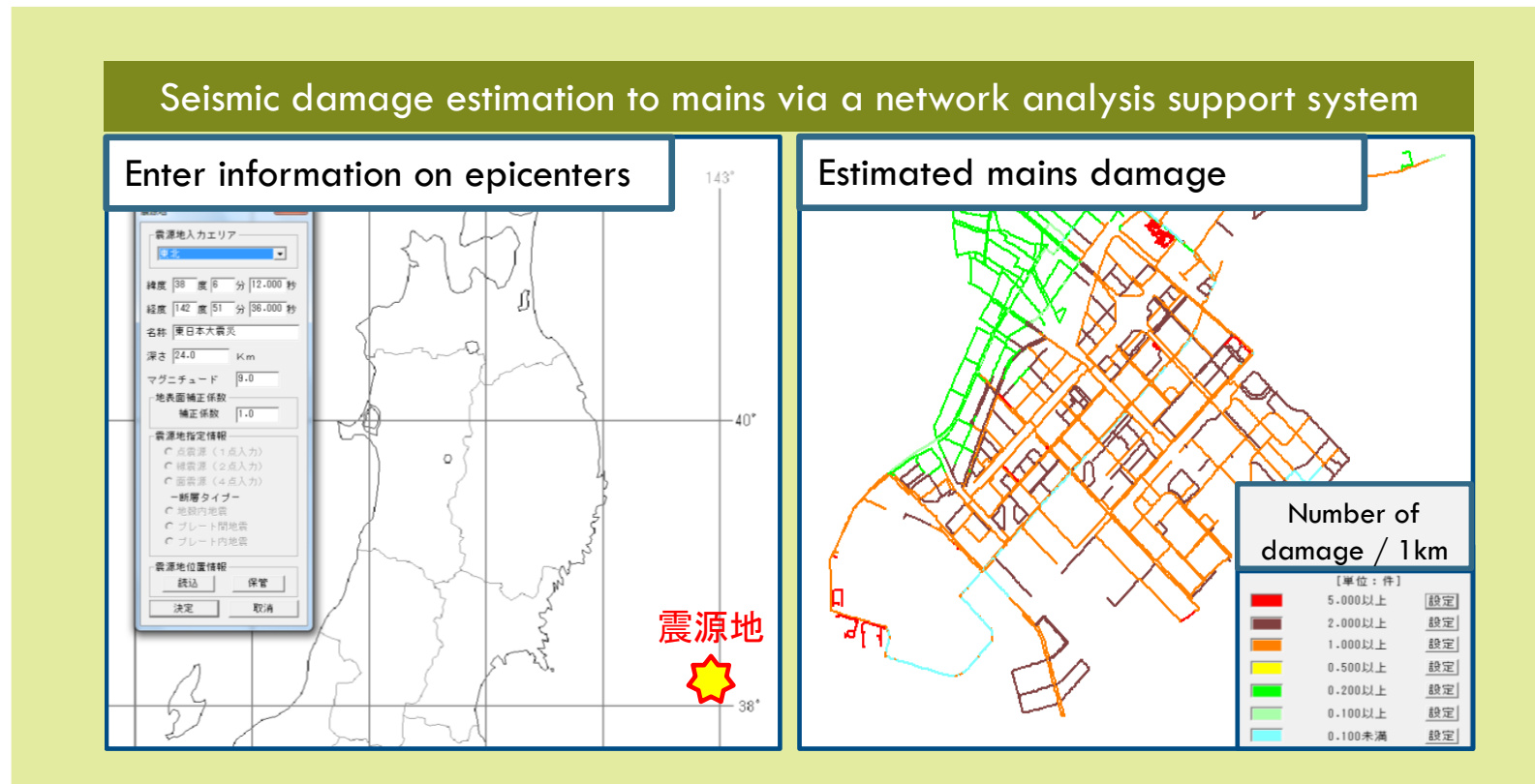
Option 3-1 : Seismic Damage Estimation to Water Mains

- Serve the development of mains renewal plans for enhanced seismic resistance
- Estimate seismic damage to mains using the pipe material and diameter data as GIS parameters and the data of estimated seismic intensity, ground conditions, and liquefaction probability as mapping data



Option 3-2 : Seismic Damage Estimation to Water Mains

- Estimate seismic damage to mains by feeding the information on the epicenters of potential earthquakes



Source: Chiba Prefectural Waterworks Bureau

Option 4 : Mains Renewal Decision Support System

- The utility can select mains with a high renewal priority from the information such as the mains corrosion level and estimated areas to be affected by discolored tap water. This would support the utility's decision making in terms of mains renewal planning.

The system allows the selection and display of the mains that fit specific conditions

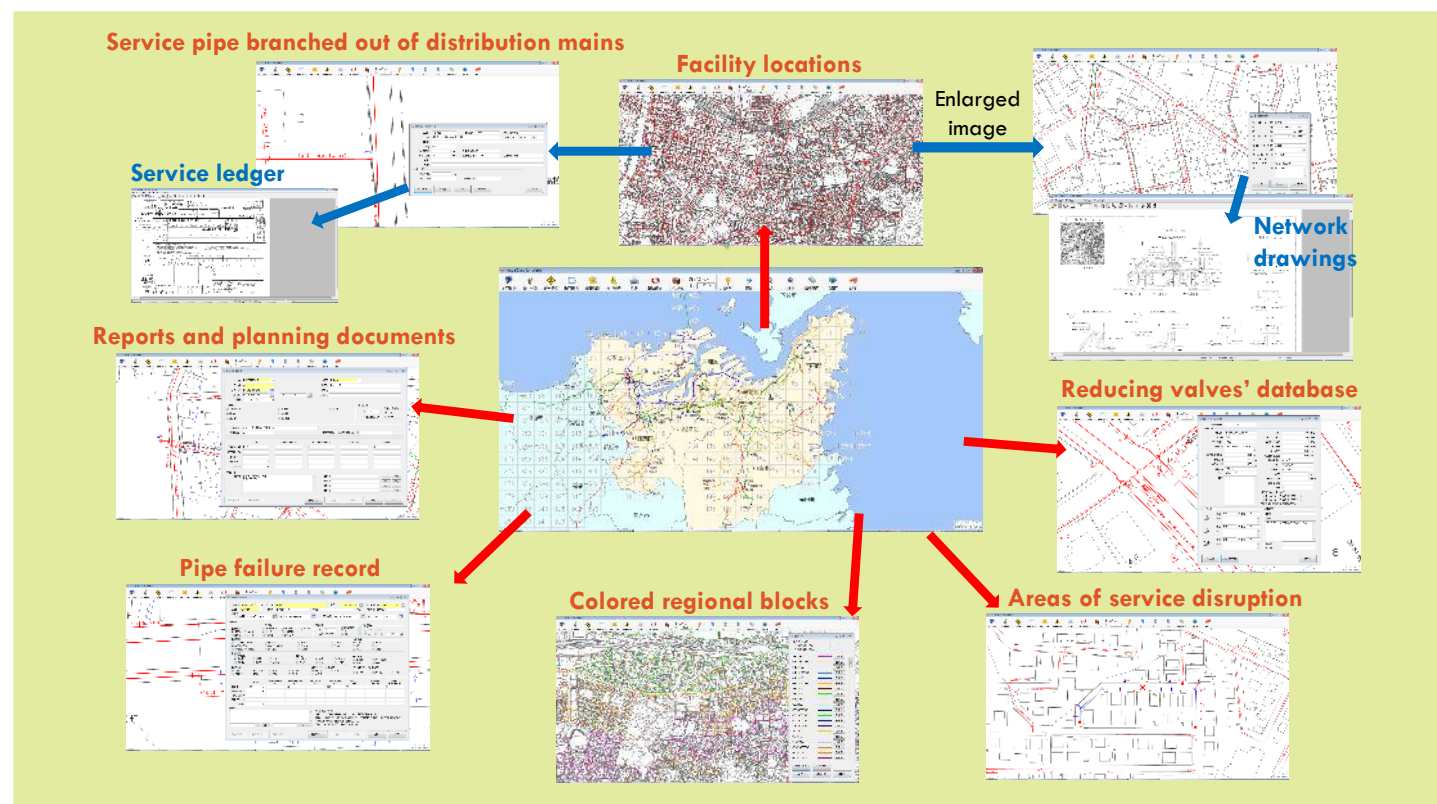
Target mains

Conditions that can be specified

Usage	Administrative area
Material	Liquefaction
Diameter	Ground condition
Year of installation	Road for emergency transportation
Degradation level	Historic leakage
Renewal priority	Corrosion level
Yes/No of polyethylene sleeves	Frequency of discolored water

Option 5 : Emergency Response Support

- Upon a major pipe failure, relevant departments feed the mapping system related information such as the incident's location and causes, the main's current condition, number of affected households, and the progress of restoration efforts and emergency water supply. This way, relevant utility personnel can check the necessary information in real-time.



Option 6 : Identification of Properties of Other Entities

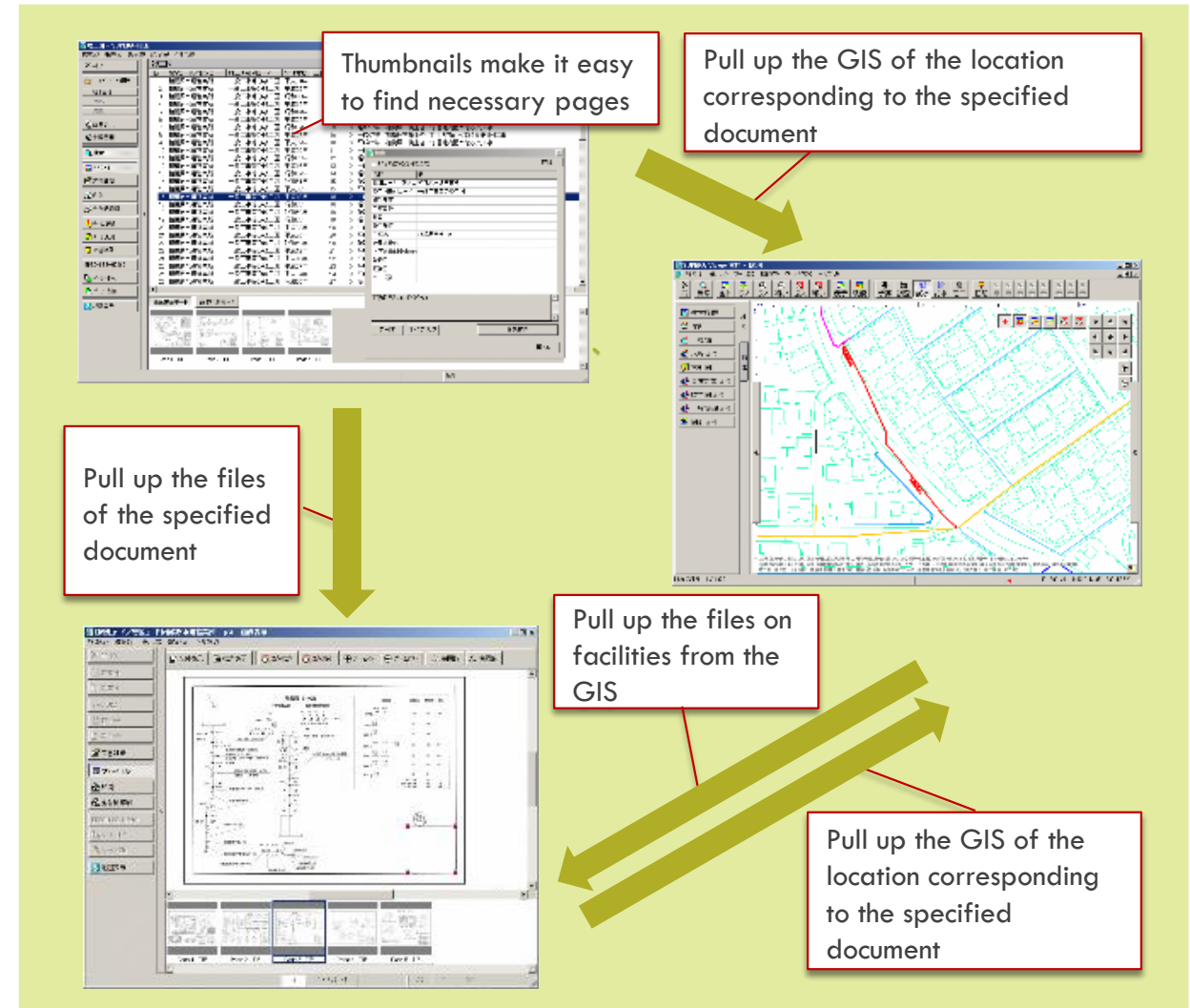
- Function to identify and project on the map the buried properties of other entities

For Better Data Management 1 : Saving Changes

- Register facility modification record
 - Saving changes on facility upgrades/renewal enables reference to the historic modification record.
- Save the entire registry upon each update
 - Saving the entire registry upon every update enables reference to the whole pipeline condition at certain points in the past.

For Better Data Management 2 : Easy Access to Linked Files

- Features
- 1. Finding related documents becomes easy by putting together various diagrams and linking them to the GIS mapping.
- 2. Many kinds of diagrams data can be filed efficiently.
- 3. Confidential information can be safely stored via data masking and access restrictions.



Source: Public Enterprises Agency, Kanagawa Prefectural Government

For Better Data Management 3 : Online Access to Mains Network Diagram

- Function to enable online access to the information on distribution mains, service pipe, water meters and other equipment
 - * Access is limited to specific contractors and developers with the ID and password.
 - * Information on the customers and primary facilities cannot be viewed.

For Better Data Management 4 : Online Access to Construction Schedules

- Publish on the website of the utility the information on the construction date, location, name of the work, responsible department, and the contractor.

Entering construction information

Publish online information on service disruption, reduced supply or an increase in turbidity

くらしと水道

23区個別断水・濁水情報

23区個別断水・濁水情報(新宿区)

- 工事は、施工状況・気象条件等により、中止や延期になる場合があります。
- 突発的な事故による緊急工事などのため、掲載している工事以外に実施している工事もあります。
- 工事にあたって断水や濁水の影響がある場合は、影響のある全戸に工事前にお知らせ文書を配布します。工事の詳細な内容はお知らせ文書でご確認ください。
- お問い合わせは [水道局ホームページ](http://www.tokyo-met.go.jp/water) (03-5326-1101)までご連絡ください。
- 掲載内容は平日に1回更新しています。そのため、緊急の事情などによる直近の変更等は反映されていない場合があります。

《水道局を装った訪問販売などにご注意ください!!》

水道局や工事業者が、掲載の工事に伴い、浄水器等の販売や工事代金の請求を行うことはありません。

不審な訪問があった場合は、支払や契約の前に、まず [水道局ホームページ](http://www.tokyo-met.go.jp/water) にお問い合わせください。

実施日	実施時間	区分	影響区域	工事又は作業場所	理由	工事件名	工事担当部署
	10:00~11:00						配水小課

Effects of Introducing GIS Mapping System

- All the related diagrams and drawings can be viewed now in electronic format regardless of which department you are in, while in the past only the department-specific material could be viewed in paper format.
- Mains network modeling and analysis have become much easier as there is no need now to make the models manually. More detailed network analysis has also become possible.
- Related work efficiency has improved.
- Faster response has become possible upon emergency.
- Calculating the ratio of seismic damage to mains has become possible, which used to be difficult to do in the past.



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