Japan Construction Information Center

CIM for sustainability appraisal of conceptual ILCM of the disaster restoration

April 2015

Japan Construction Information Center Foundation
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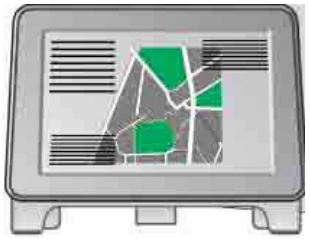
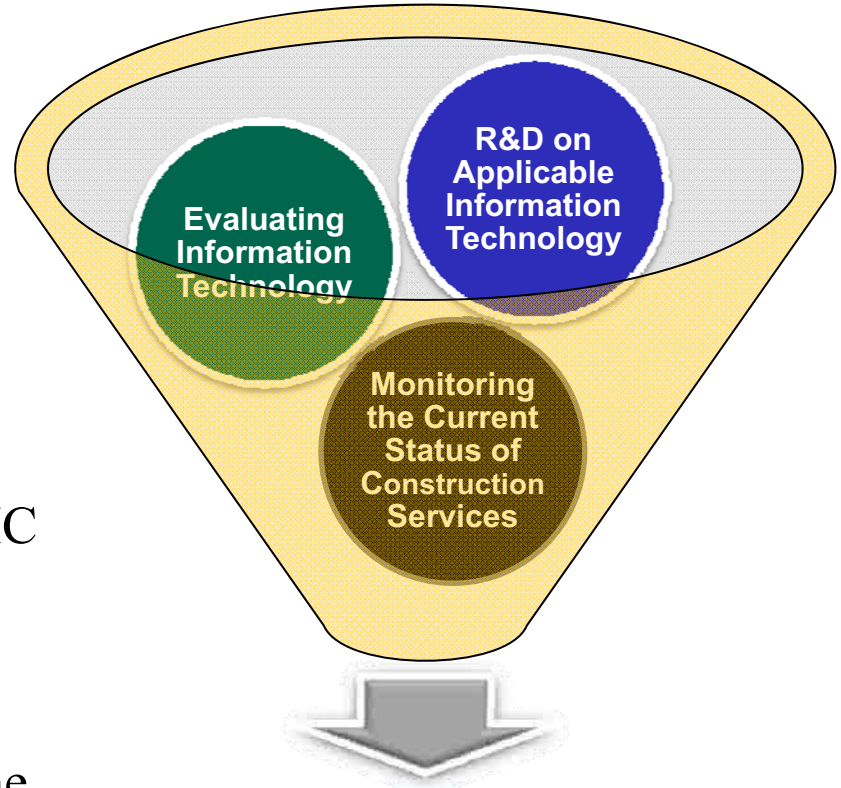


1. Introduction - JACIC is pronounced “jassik” -

JACIC is

- JACIC is developing construction-related information services through information technology and performing sustainable administration.
- Since its founding on Nov. 15, 1985, JACIC has been conducting a wide range of activities for digitization of construction sector information so that the construction industry as a whole can be responsive to the challenges of an intelligent society and the demands.

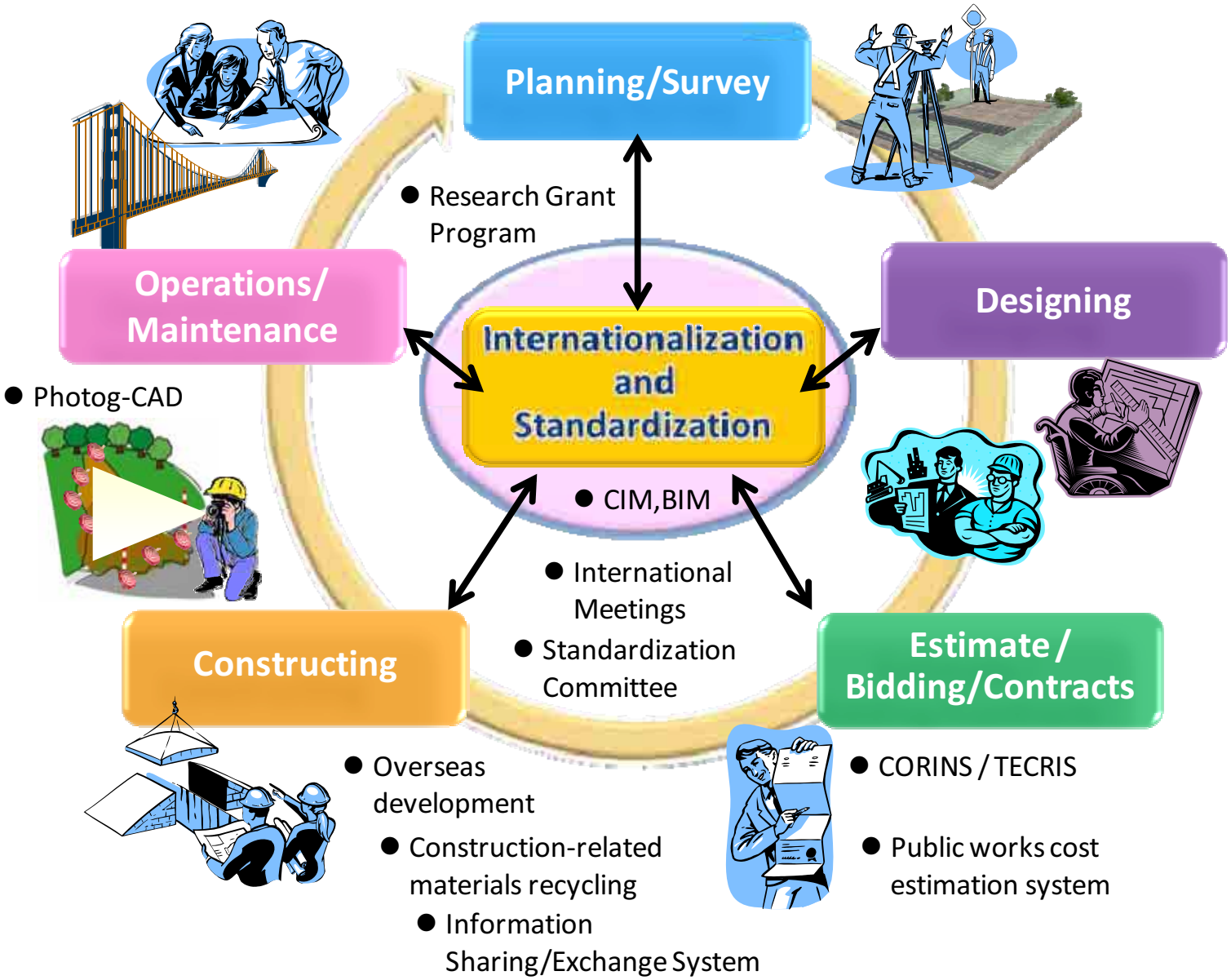


Promoting the Application of Information Technology

- Improving Construction Management
- Activities to promote the accumulation and dissemination of information.

JACIC

1. Introduction - JACIC



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2. Past Process and Background

We explain introduction process of CIM in Japan.

- CALS/EC has been promoted for 18 years since 1996 by MLIT and JACIC.
- Electronic delivery couldn't catch up with ICT and social environment.
- And systems were tied up in many strict standards.
- Finally each phase became independent, and Information sharing was not possible.
- CIM was aimed at IPD and IFC model of the thought of BIM as innovation of a new construction production system in 2011 by MLIT.
- Pilot implementation began as kickoff by JACIC seminar in 2012.
- MLIT had 11 trials of the design projects in 2012.
- In 2013,2014 many cases were tried as a construction project.

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Recommendation of CIM

For the innovation of the construction production system.

・November 11, 2011.

the Construction Management Committee of the Japan Society of Civil Engineers (JSCE) keynote speech

From BIM to CIM

Learn BIM!
Go ahead without thinking only a rule!

・April 13, 2012

JACIC seminar, keynote speech

Recommendation of CIM／ From CALS to CIM

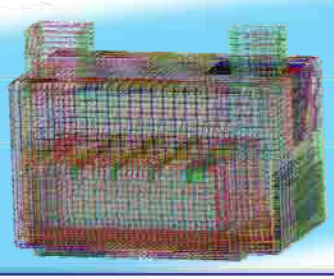
Vision

- we mobilize ICT such as 3D models and carry out model construction.
- we circulate by data for the idea from maintenance.
- Each engineer reforms consciousness and uses ICT forward.

Sato, Vice-Minister for Engineering Affairs, MLIT
(At the time of 2012)

・November 7, 2013

ICCBEI 2013, JACIC Session



Movement of CIM

Theme

"Movement of CIM in JAPAN & Development of product models through international collaboration"

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3. PURPOSE

- A concept called CIIM is recently proposed as a policy correction for the maintenance. CIIM is the concept that added civil infrastructure information management and National infrastructure management.
- As the first step to realization of CIM, we need to be able to easily use 3D model on survey site at maintenance phase.

- ◆We evaluate accuracy verification of the specifications and the software of terrain model to make a plan for the introducing CIM and CIIM into maintenance.
- ◆We verify the effectiveness if we can use photogrammetric survey data and point group data as ordering documents which are submitted to a receiver by a client with high quality.
- ◆We verify the effectiveness of construction information and CIM model using Collaborative Information Systems.

4. Methodology of Study

Method of Concurrently Shared Product Model (3D Annotated Model needs conditions and resource, environment.

1) Conditions
- Use case is clarified and to be the useful model.
- 3Dmodel to make in the long term is necessary.

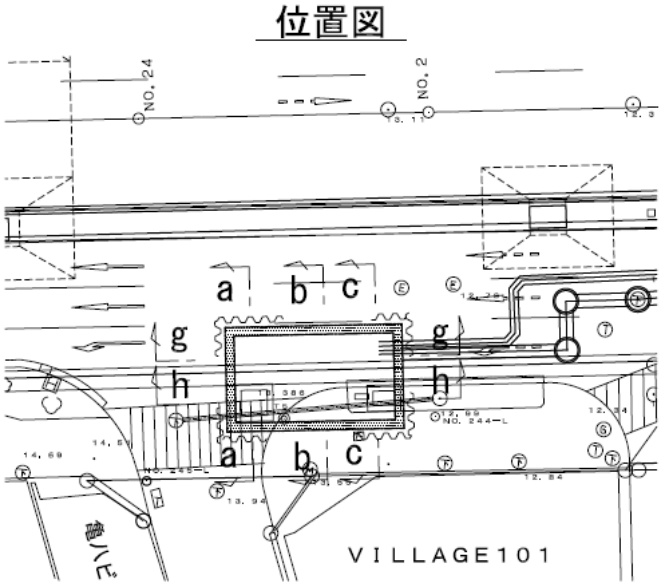
2) Viewpoint
- As well as making of 3Dmodel, it's important to provide a method and a management system for improving present construction production system using 3Dmodel.
- In consideration of project management elements that was derived from the production method of Toyota, we need to create sustainable BCP system which took in management elemental technology.
- According to IPD, we need the collaborative information systems by sharing knowledge, know-how by concerned to prevent rework.

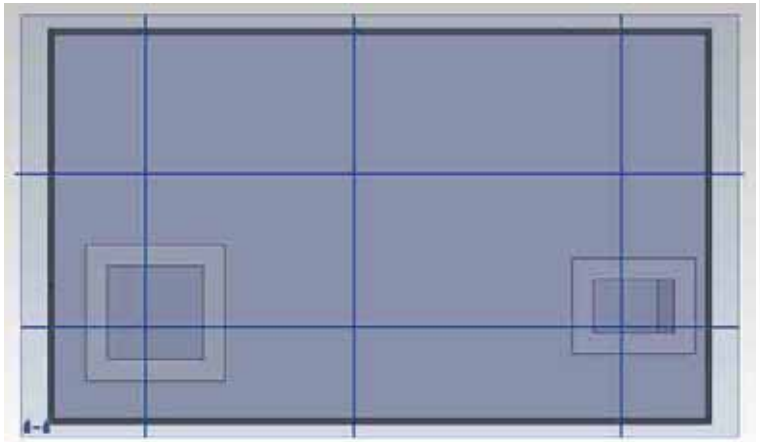
5. Analysis and effectiveness of utilization

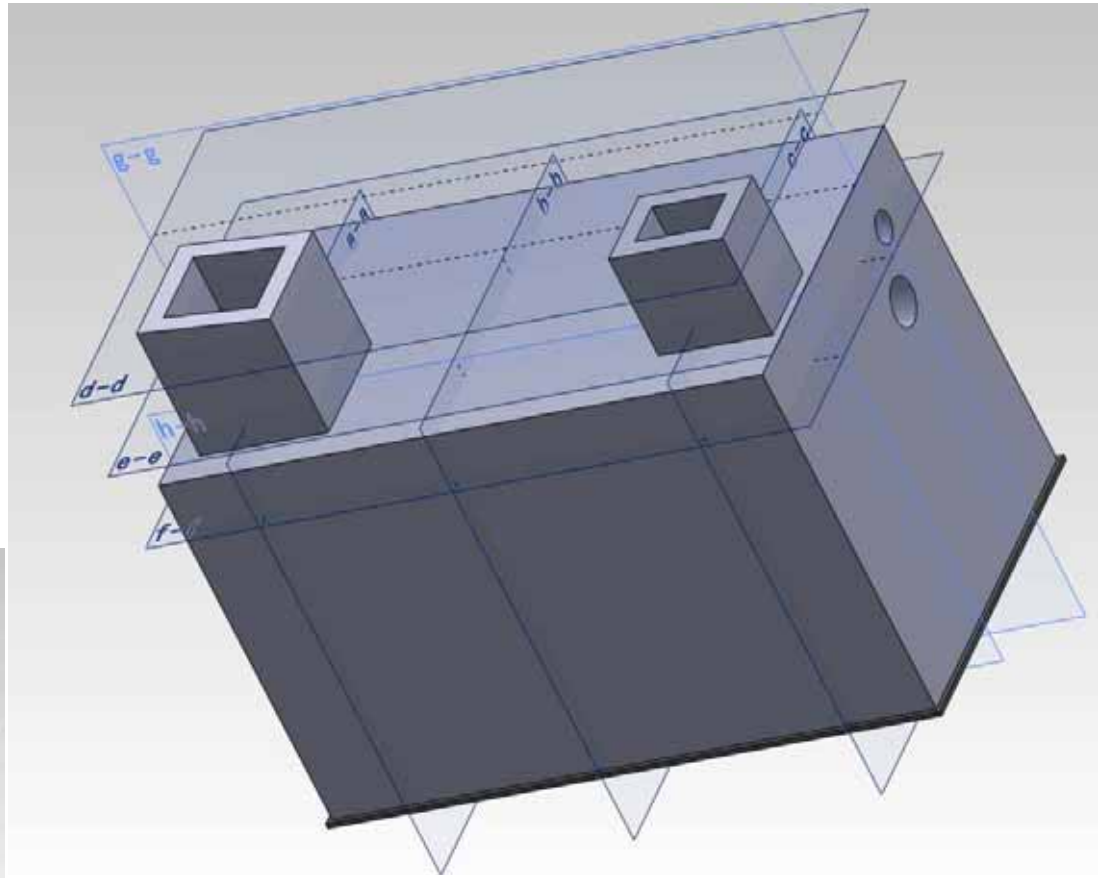
We investigated element data and attribute item on specification of 3D terrain model and its software to confirm accuracy verification of model. From these findings we found out that software with double precision of the input and output and calculation columns is enough.

Attribute item	Input value precision ※The number of the input figures		Output value precision ※The number of the output figures		Calculation precision ※The precision at the time of the calculation	
	Lower limit	Upper limit	Lower limit	Upper limit	Lower limit	Upper limit
Distance	3 columns	16 columns	3 columns	6 columns	4 columns	16 columns
Coordinate(x,y)						
Width						
Height						
Gradient	0.00001%, 1:0.00001		0.00001%, 1:0.00001		0.00001%, 1:0.00001	
Angle	0°0' 0"001		0°0' 0"001		0°0' 0"001	
Name	16 characters	127 characters	16 characters	127 characters	16 characters	127 characters
Terrain	5 columns		5 columns		10 columns	

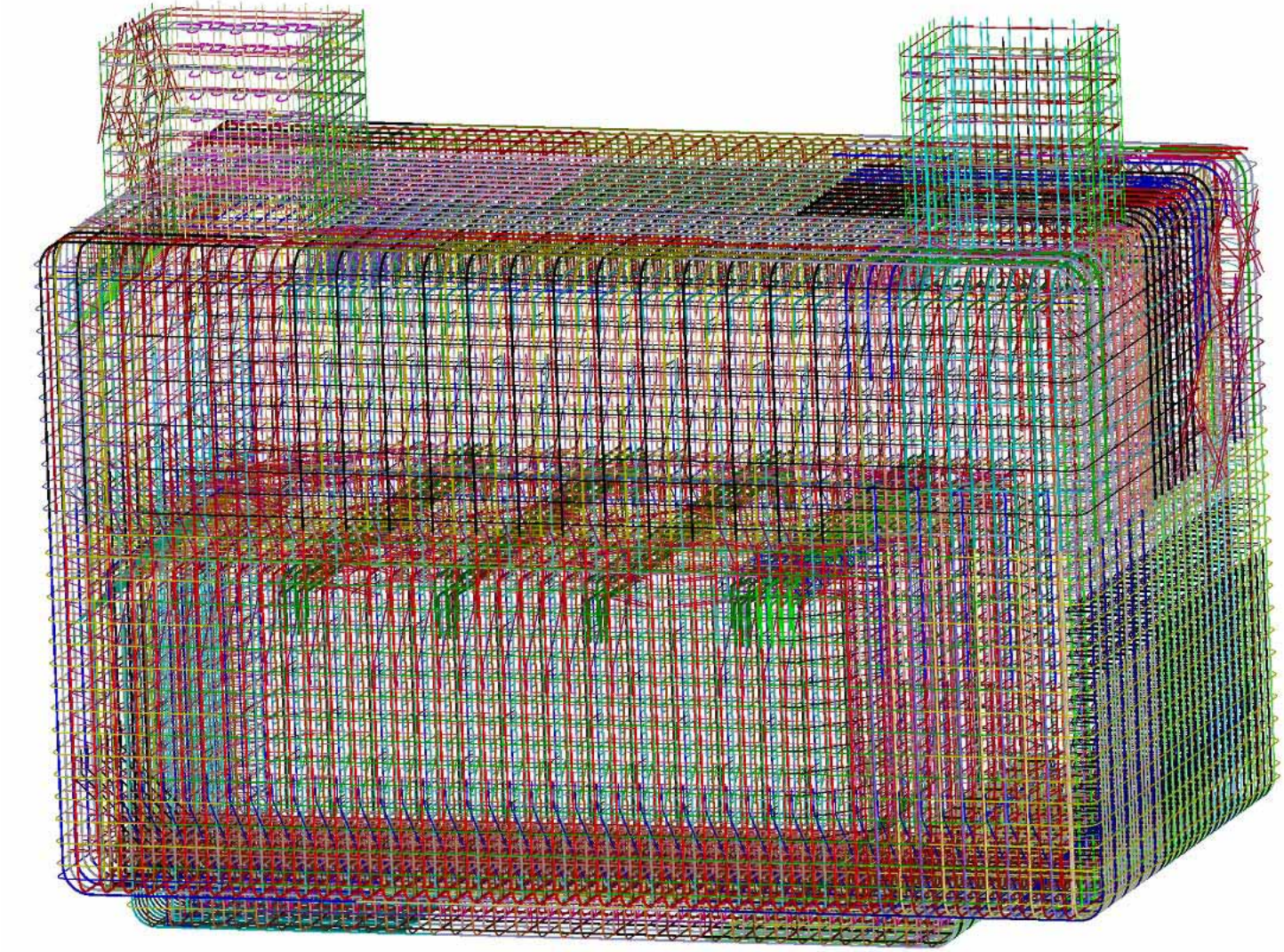
National Highway 246,
Shibuya basement pump well: Skeleton





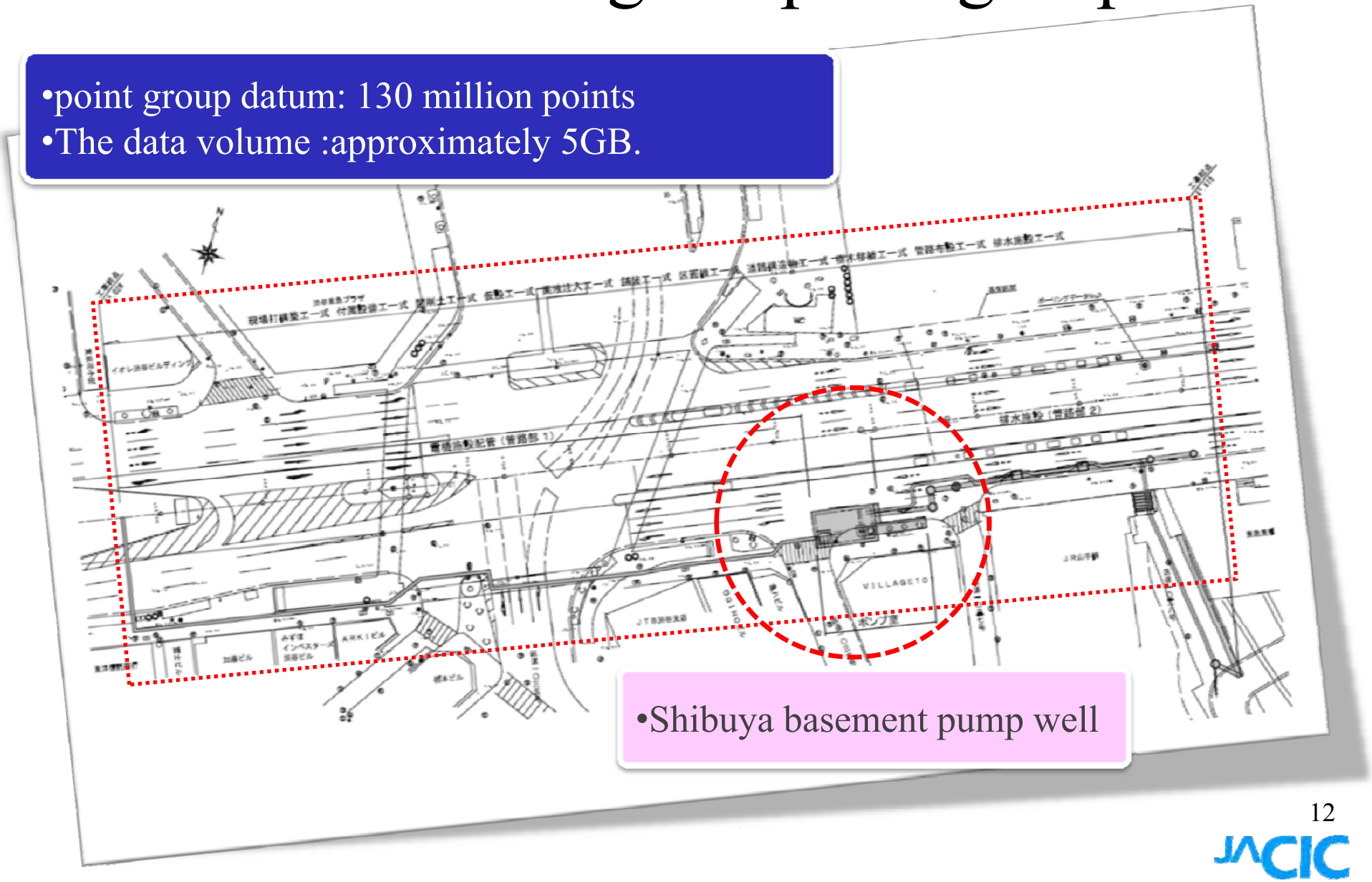


Reinforcing bar model, Shibuya basement pump well: Skeleton



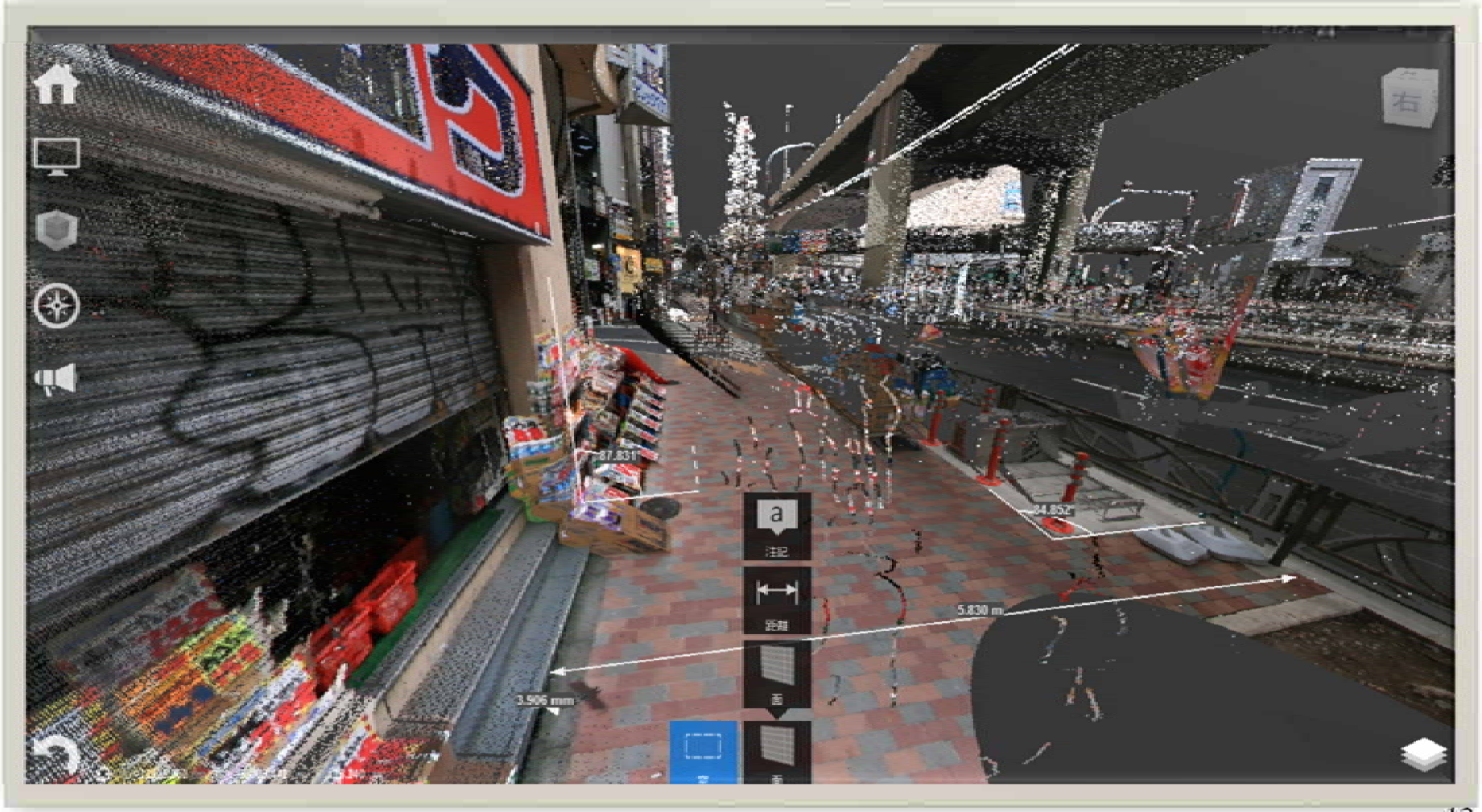
Measurement range of point group data

- point group datum: 130 million points
- The data volume :approximately 5GB.



- Shibuya basement pump well

Representaion and Measurement of point group data



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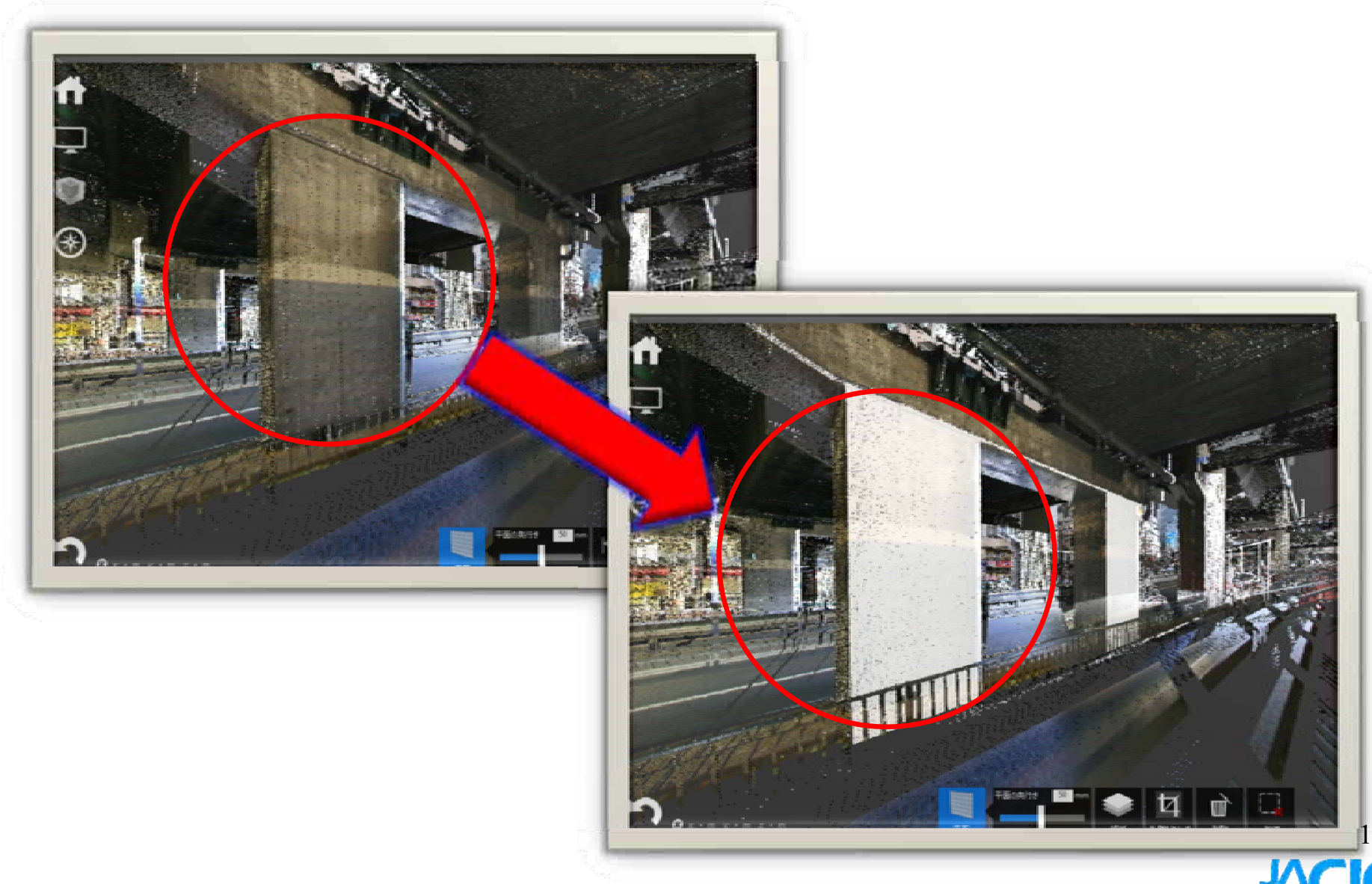
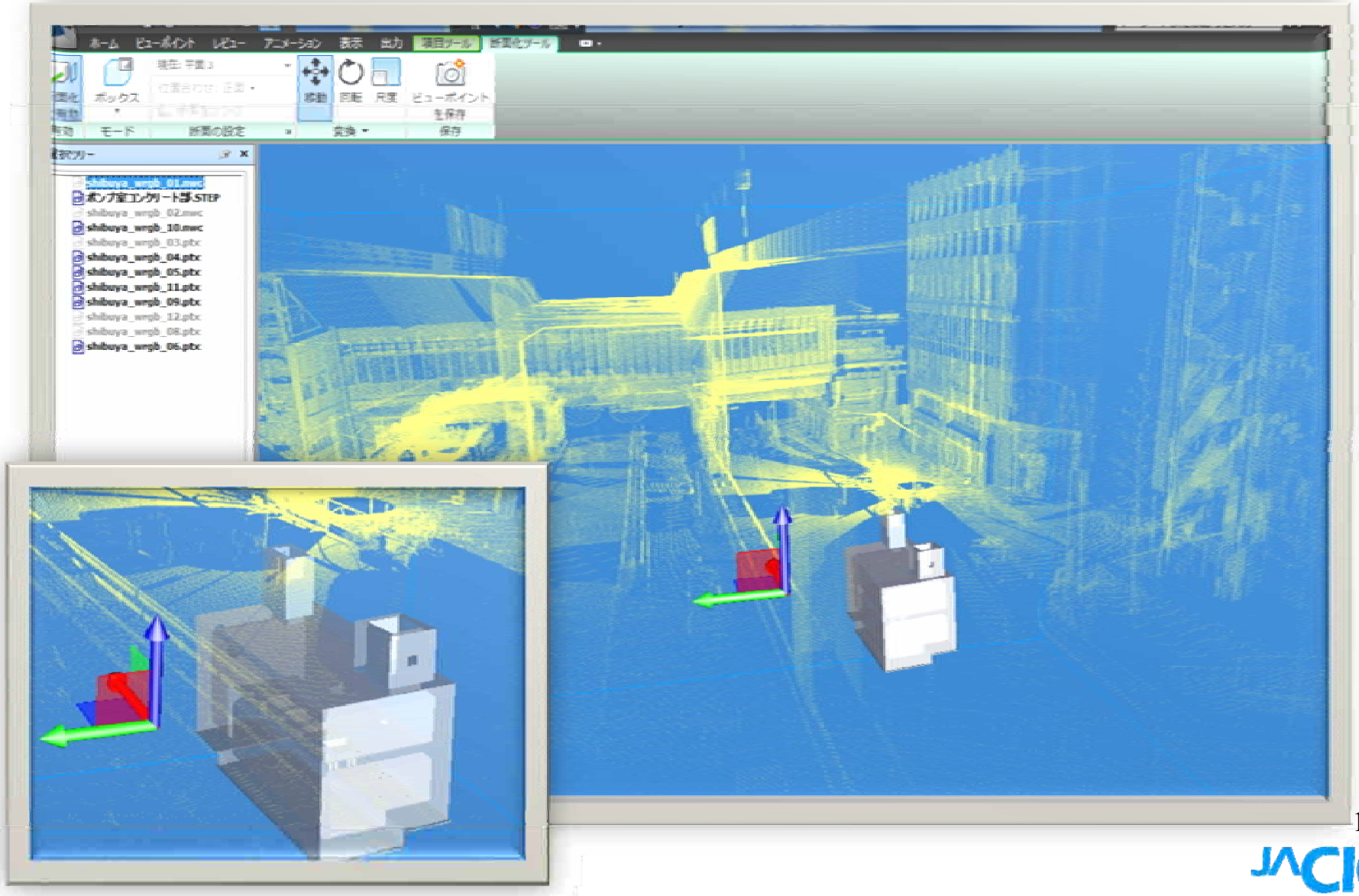
High indication of point group data

Surface acquisition from point group data

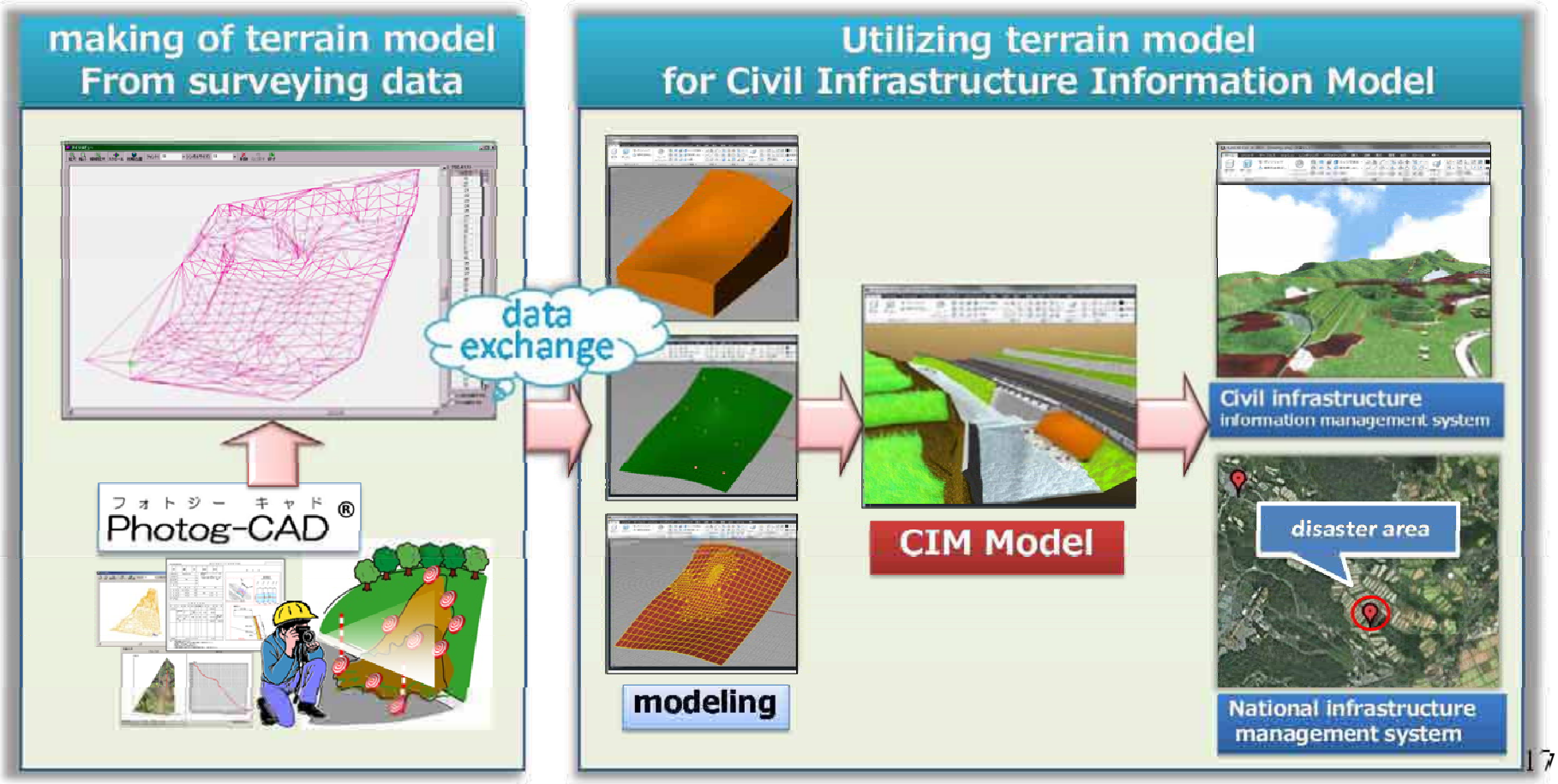


Point group data + skeleton model



5. Analysis and effectiveness of utilization

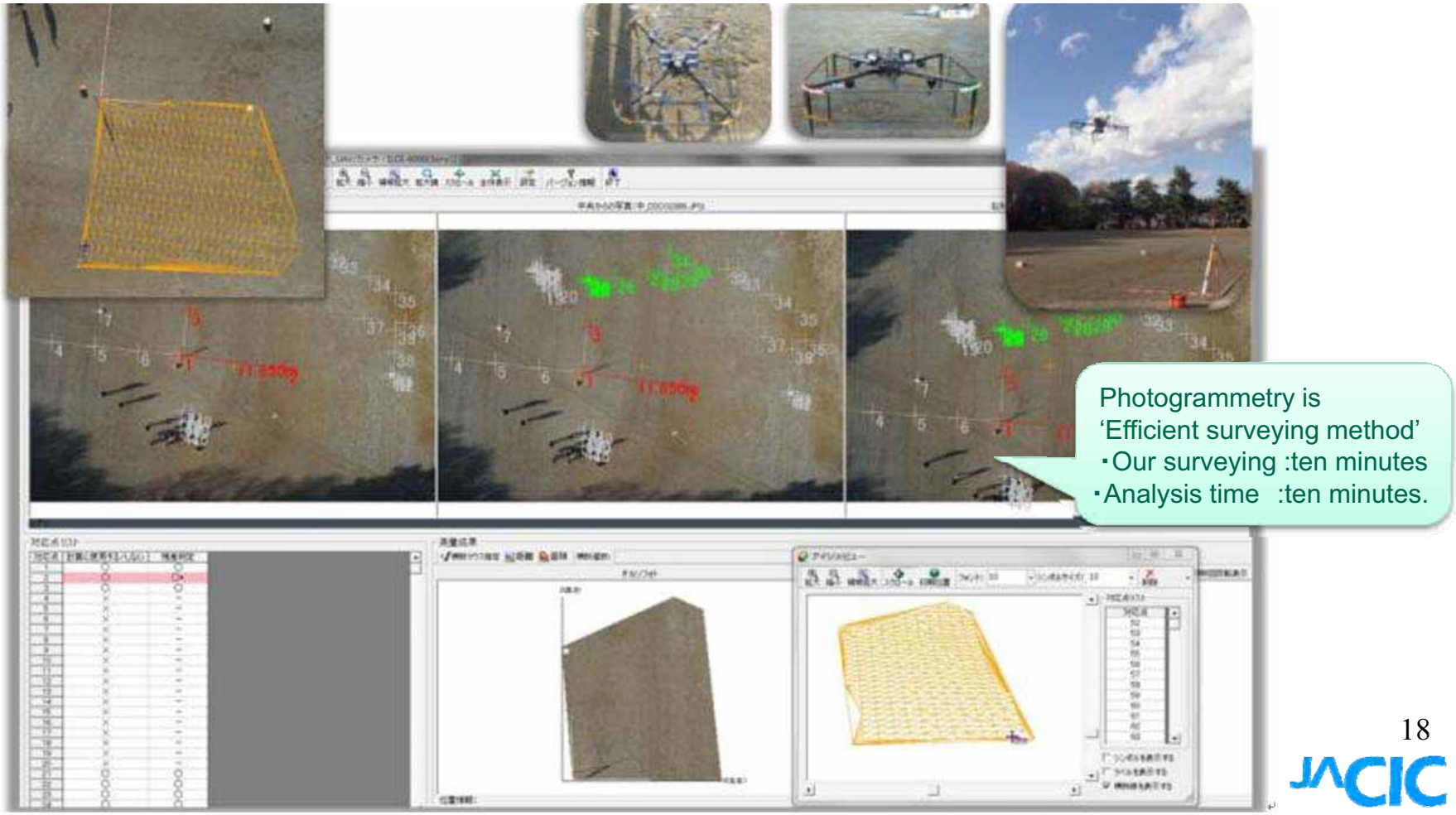
Anyone can make 3D terrain model from photogrammetric data easily by Photog-CAD developed. Accordingly, CIM and CIIM DB would be built by the file export and accumulation of terrain model.



JACIC

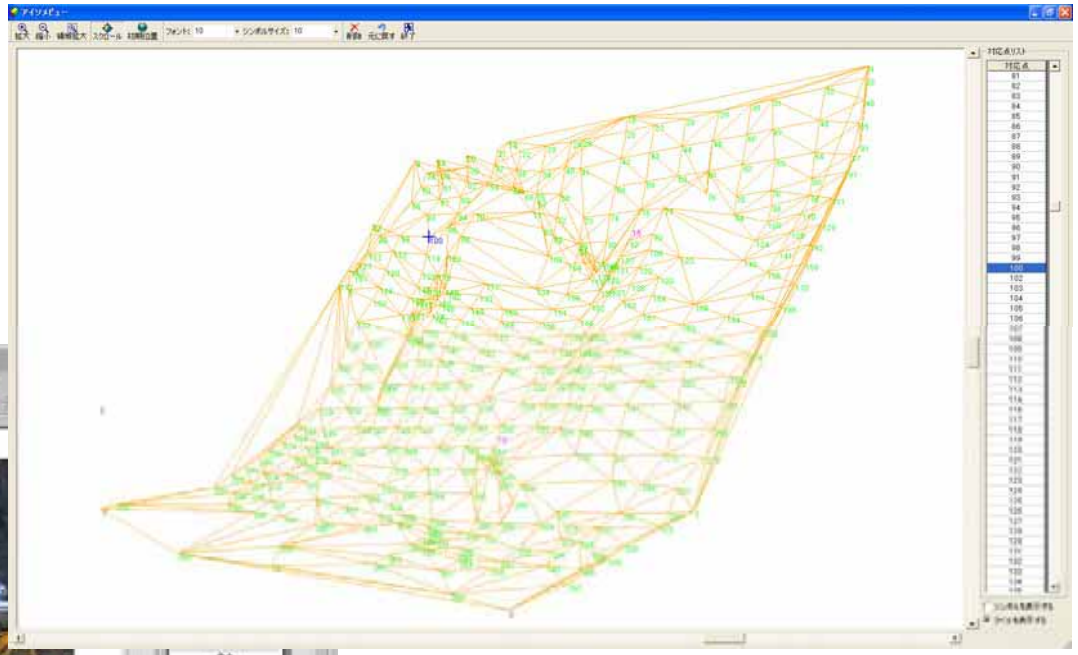
5. Analysis and effectiveness of utilization

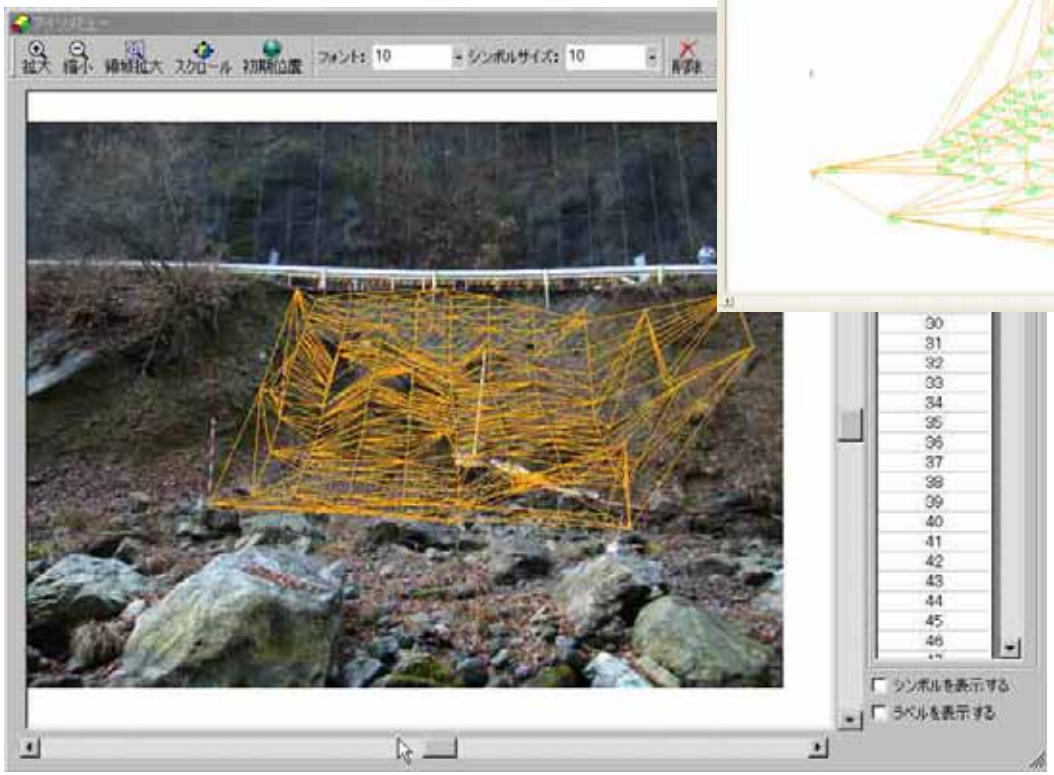
We acquired 3D terrain model data from 3 pieces of photographs from 3 directions effectively by the terrain data of the wide area by UAV and Photog-CAD. We could confirm precision of several centimeters.

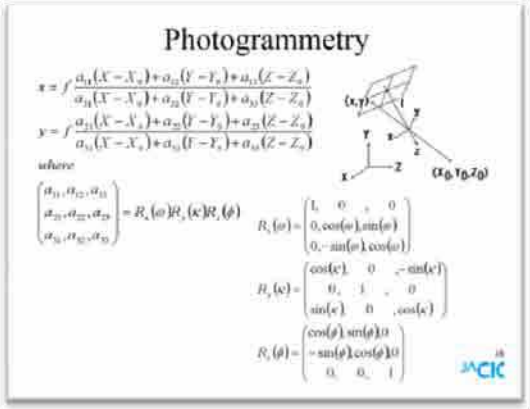


TIN model of damaged site

By designating the structure edge directly as a feature point by the mouse using Photog-CAD, so it is easy to make a structure model of the river levee



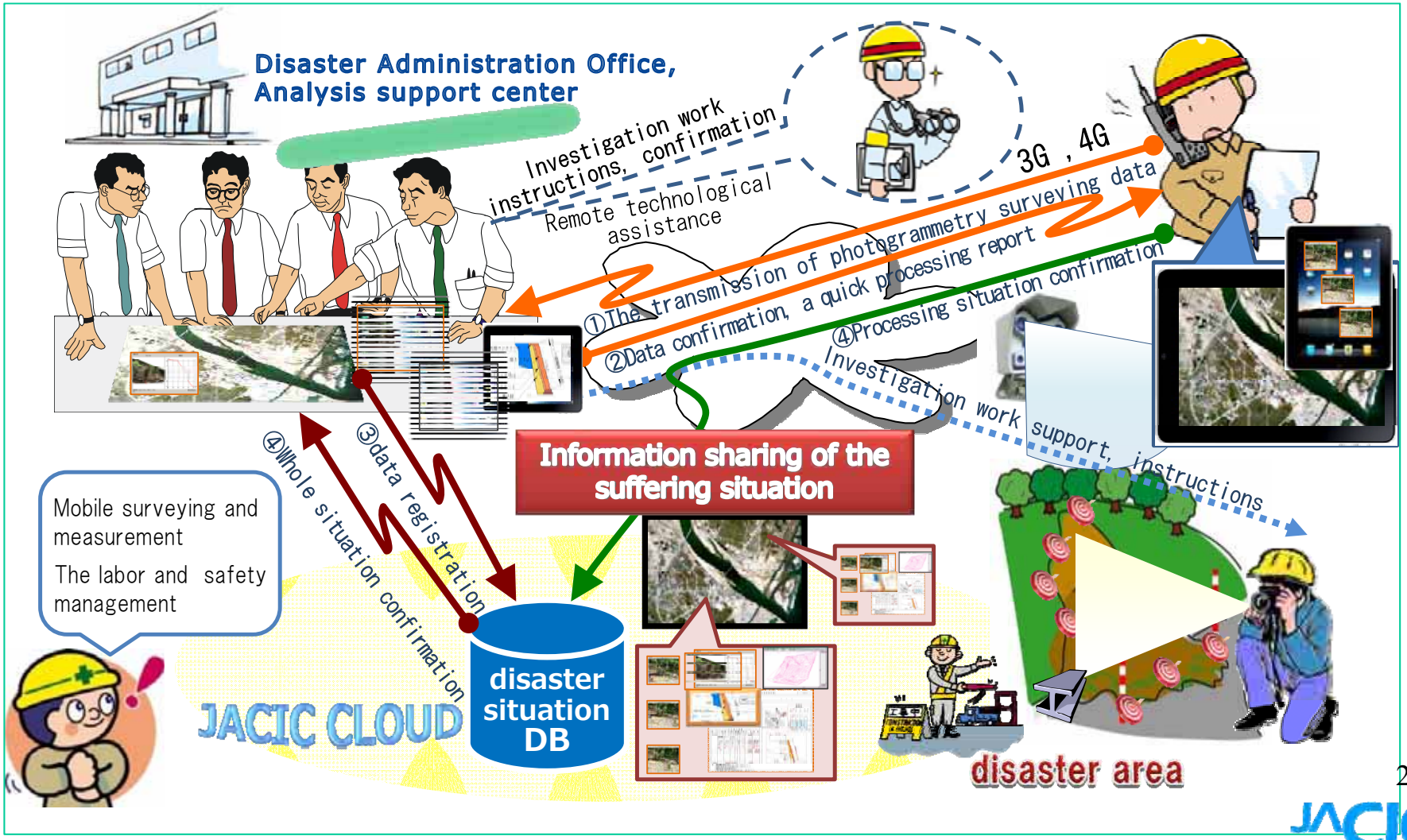




Rotatable with slider

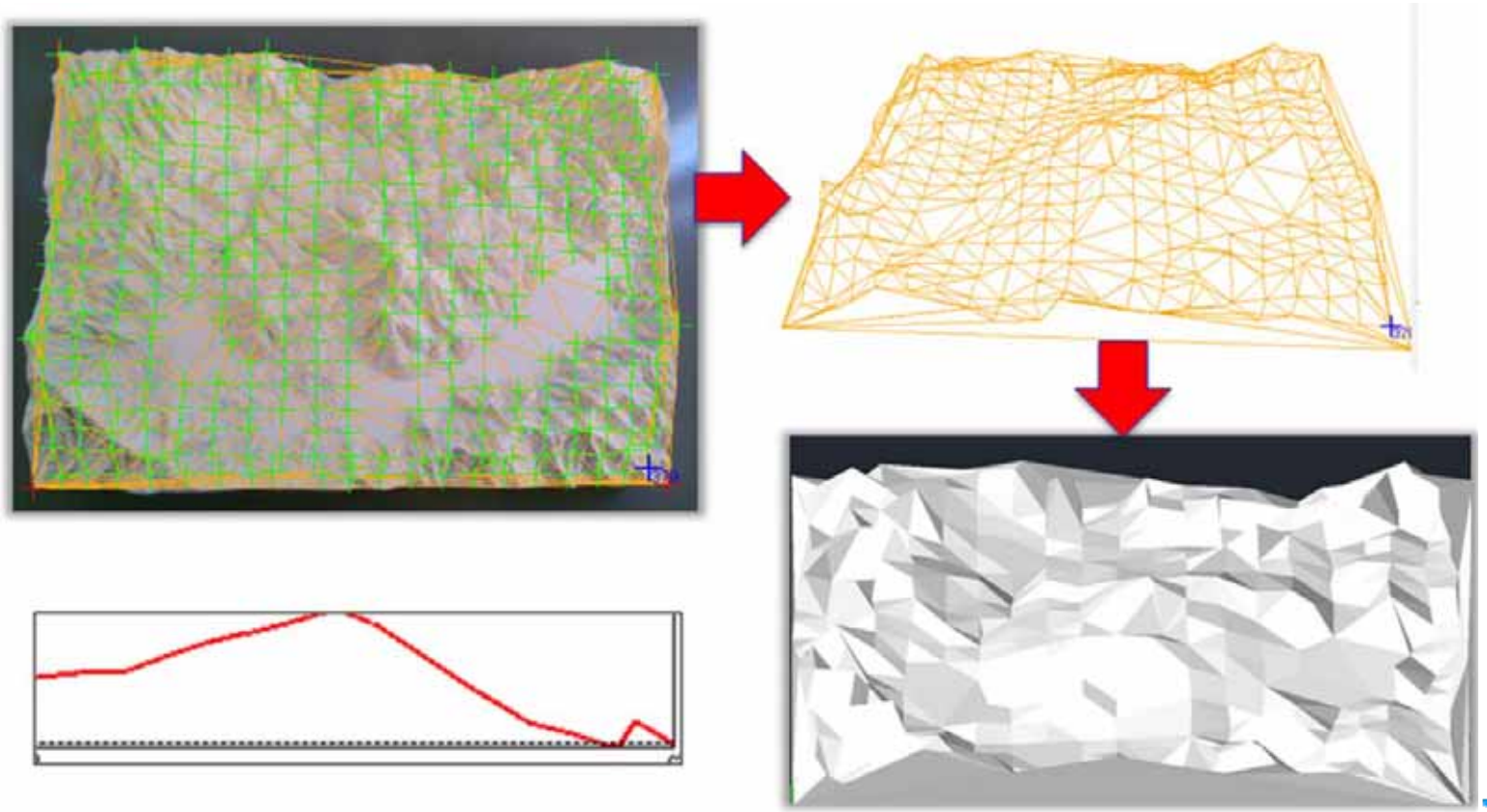
5. Analysis and effectiveness of utilization

In disaster restoration at the maintenance stage, we explored structure of VE using infrastructure model of CIM and CIIM.



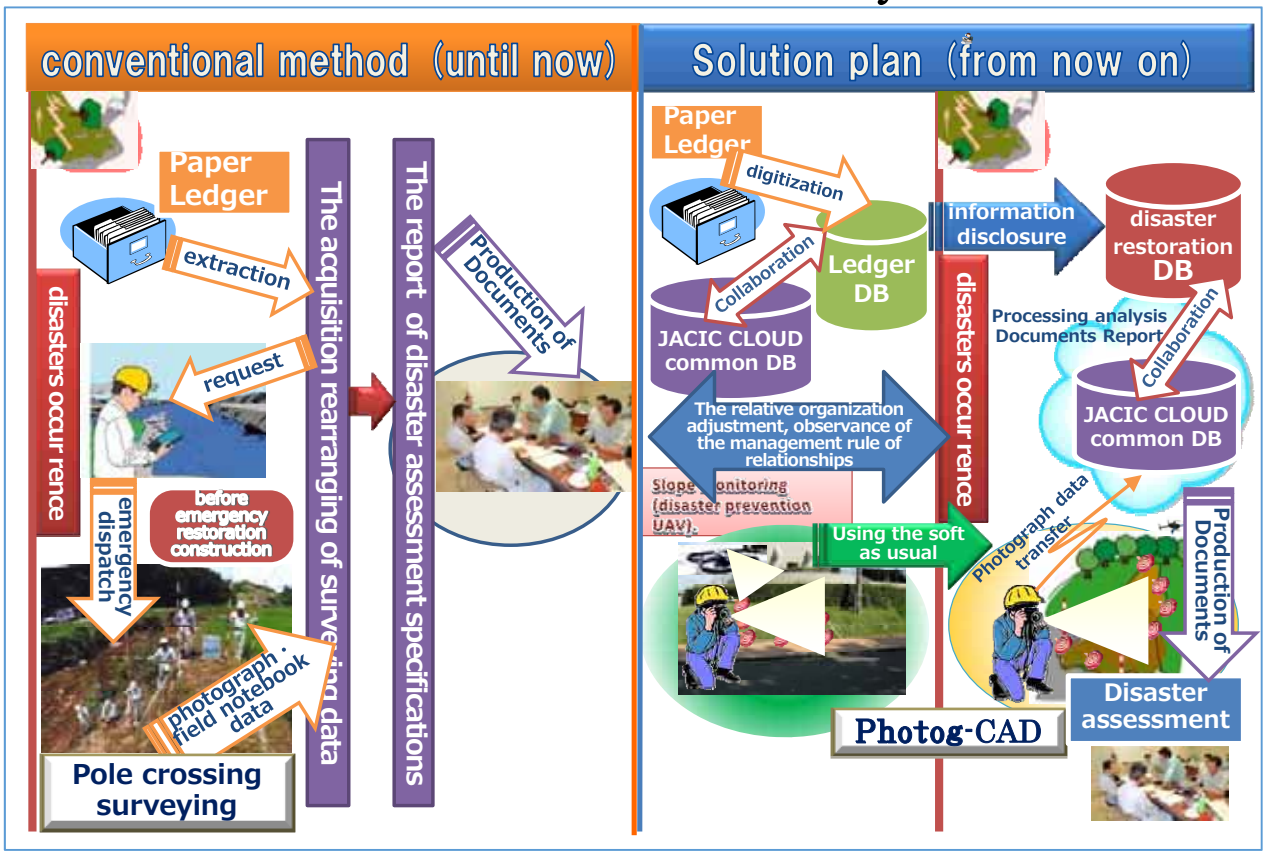
5. Analysis and effectiveness of utilization

We acquire 3D terrain model from Photogrammetry data quickly by cooperating with the disaster spot in our office. Therefore we arrange a use model with a series of processes until the collection of data, accumulation before disaster outbreak, and it is important to cooperate at the time of disaster outbreak smoothly.



5. Analysis and effectiveness of utilization

In Japan, recently disasters by a typhoon and the torrential rain occur frequently. Therefore, safe and effective disaster restoration measures are hurried. We acquire 3D terrain models from photogrammetry data quickly by cooperating with the disaster spot in an office. Therefore we arrange a use model with a series of processes until the collection of data, accumulation before disaster outbreak, and it is important to cooperate at the time of disaster outbreak smoothly.

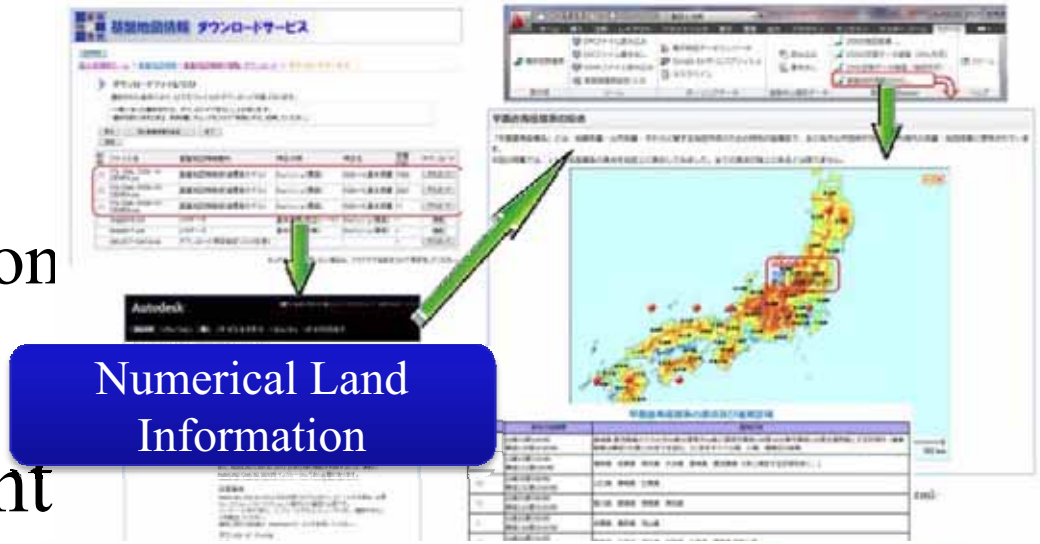


5. Analysis and effectiveness of utilization

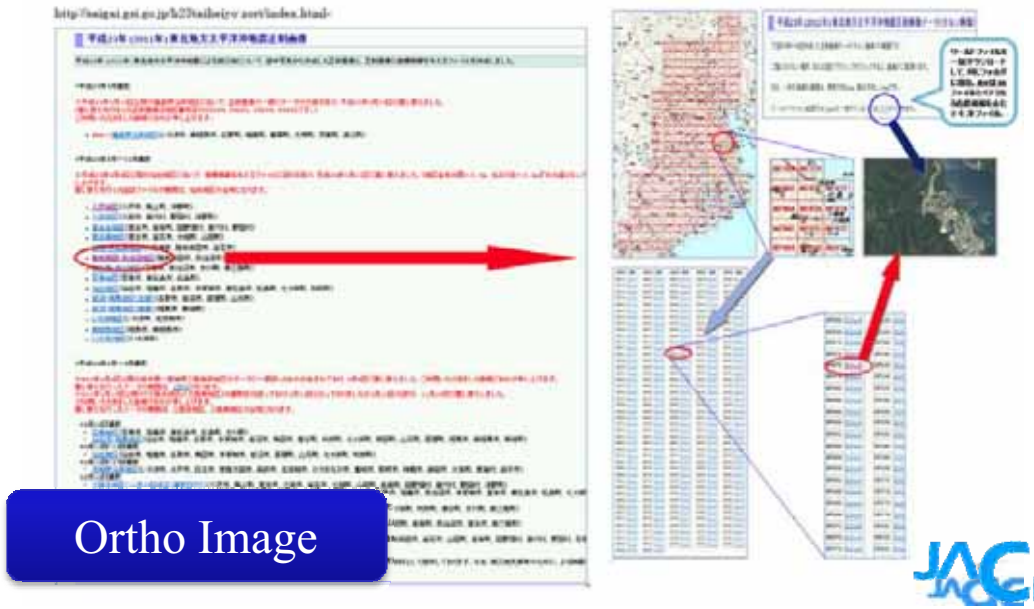
- We used collaborative information systems as the tool for Collaborative Design which could handle CIM data based on Knowledge Management.
- "Information sharing/exchange system" is considered as a tool resolving the whole problem about the construction sector.
- With the agreement formation between stakeholders in future, we could create the environment that knowledge that is sophisticated by compiling the infrastructure lifecycle information using CIM model specifications on collaborative information systems.

Flow to handle 3D Terrain Model

- Resources
  - Base map information
  - Ortho Image
- 3DCAD environment



Numerical Land Information

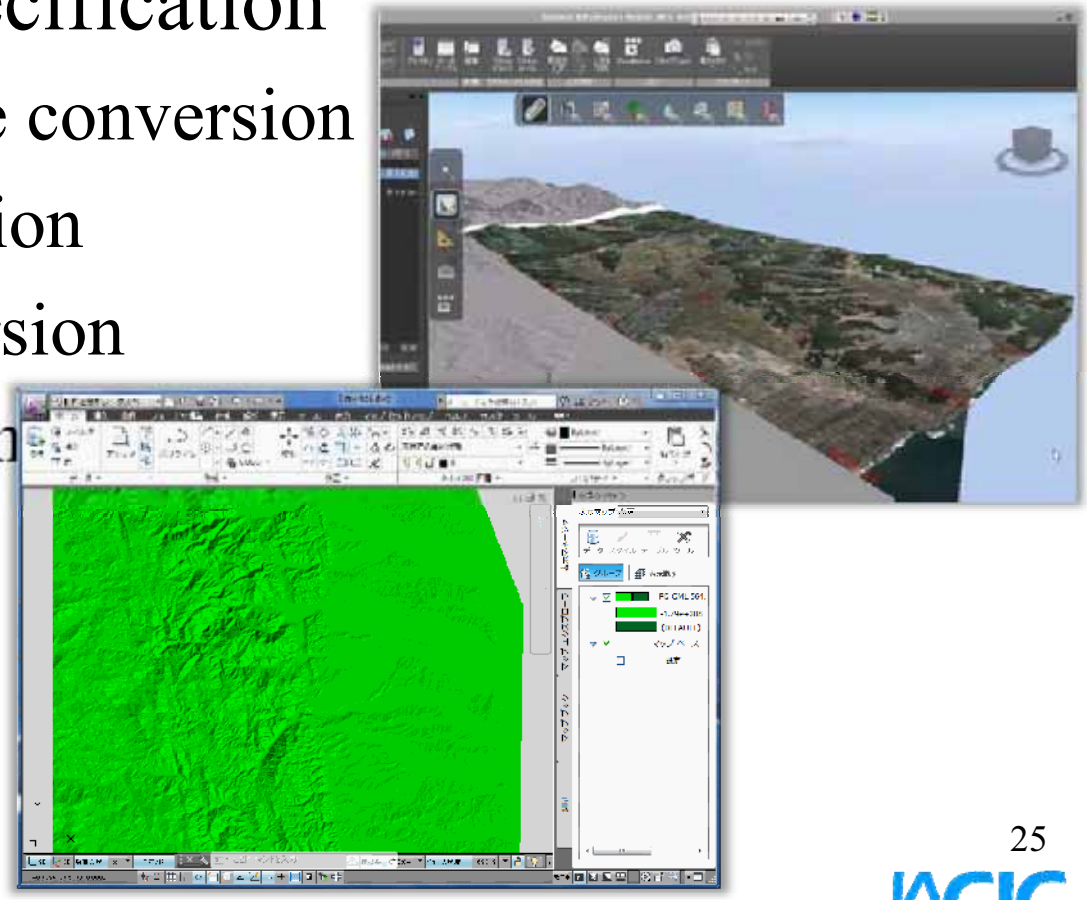


Ortho Image

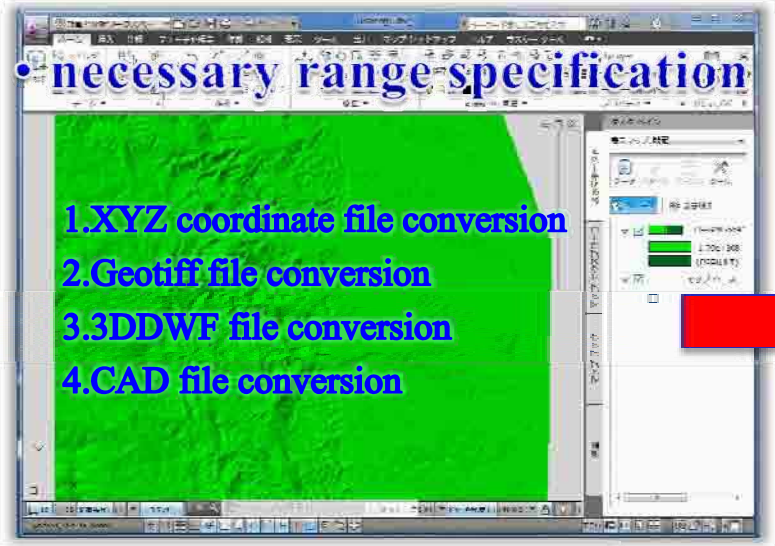
Handling of 3D Terrain Model flow

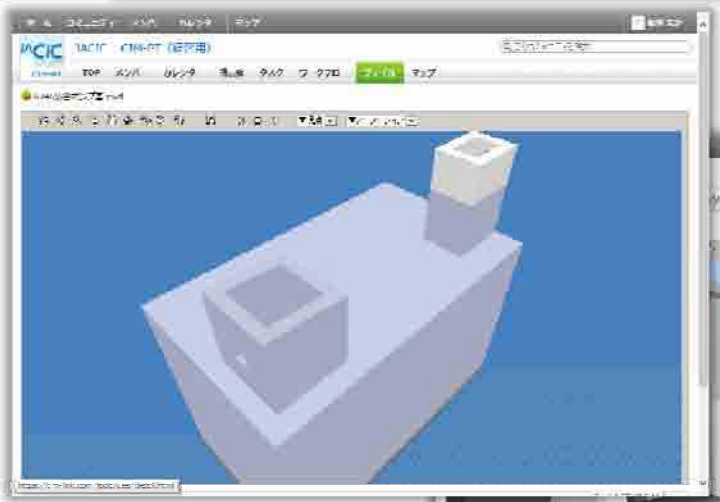
- Numerical Land Information
- necessary range specification
  1. XYZ coordinate file conversion
  2. Geotiff file conversion
  3. 3DDWF file conversion
  4. CAD file conversion

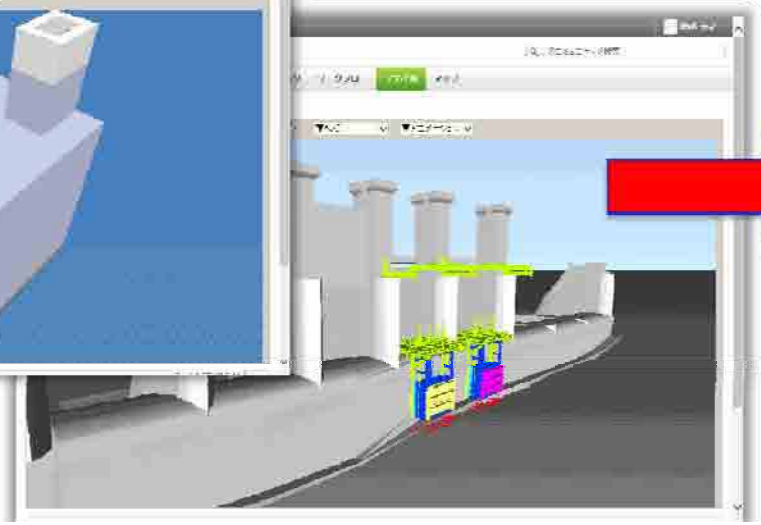
- Ortho Image



Composition of 3D Terrain Model and engineering works model

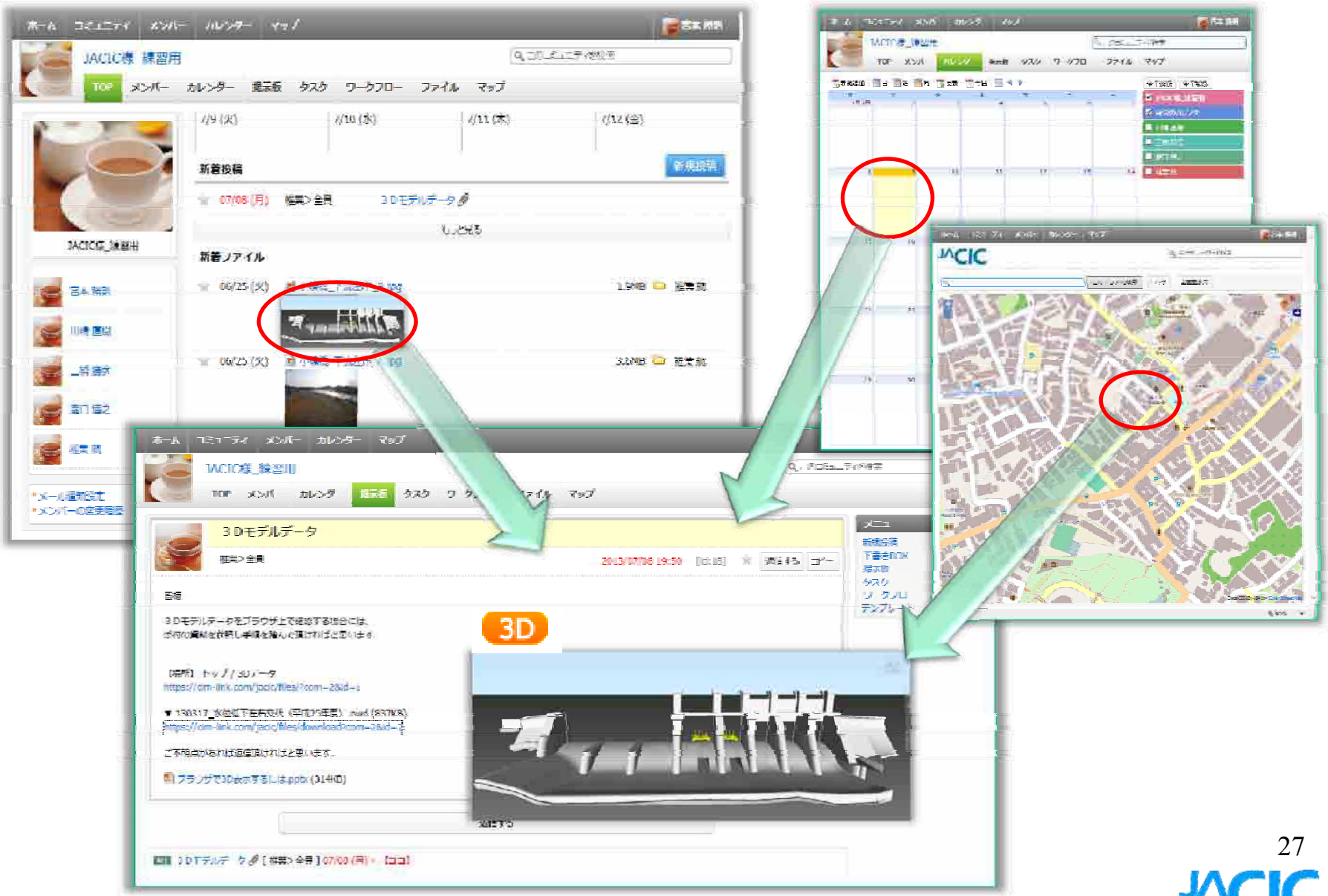






working on model composition

Colaboration on 3D Complex model

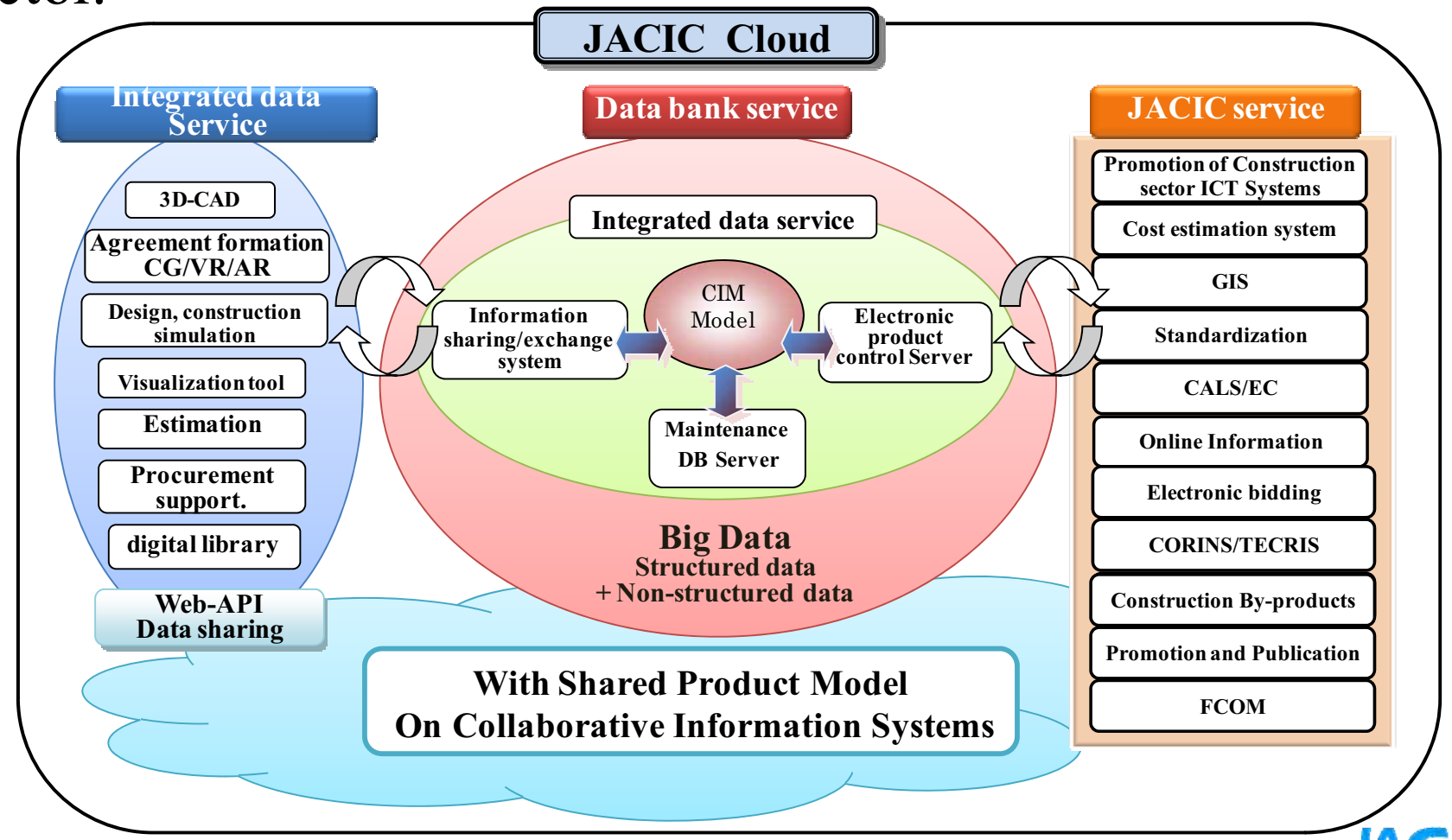


6. CONCLUSION

- We found out that this study could be applicable to Infrastructure Lifecycle Management based on Big Data by CIM database.
- As a problem left unfinished in this study, we could not make Big Data model on Infrastructure Lifecycle information model about both common resource and domain such as terrain model like Land XML.
- We want to perform the suggestion of neutral fair "JACIC Cloud" which we made use of JACIC strength in based on this service model idea through this study.

7. FUTURE STUDY THEME

The next is the imaged plan of the JACIC managed Cloud Service Model included various services on the construction sector.



7. FUTURE STUDY THEME

As experiment environment, we established virtualized evaluation place. Surveying and monitoring of investigation on lifecycle infrastructure management is important to survey for the collection of Big Data.
We would create accumulation of best practices and know-how to deliver to the world, to promote innovation in virtual enterprise environments on lifecycle infrastructure management.