

# **Necessity of Dynamic Simulation for proactive disaster management by utilizing AI and DX**

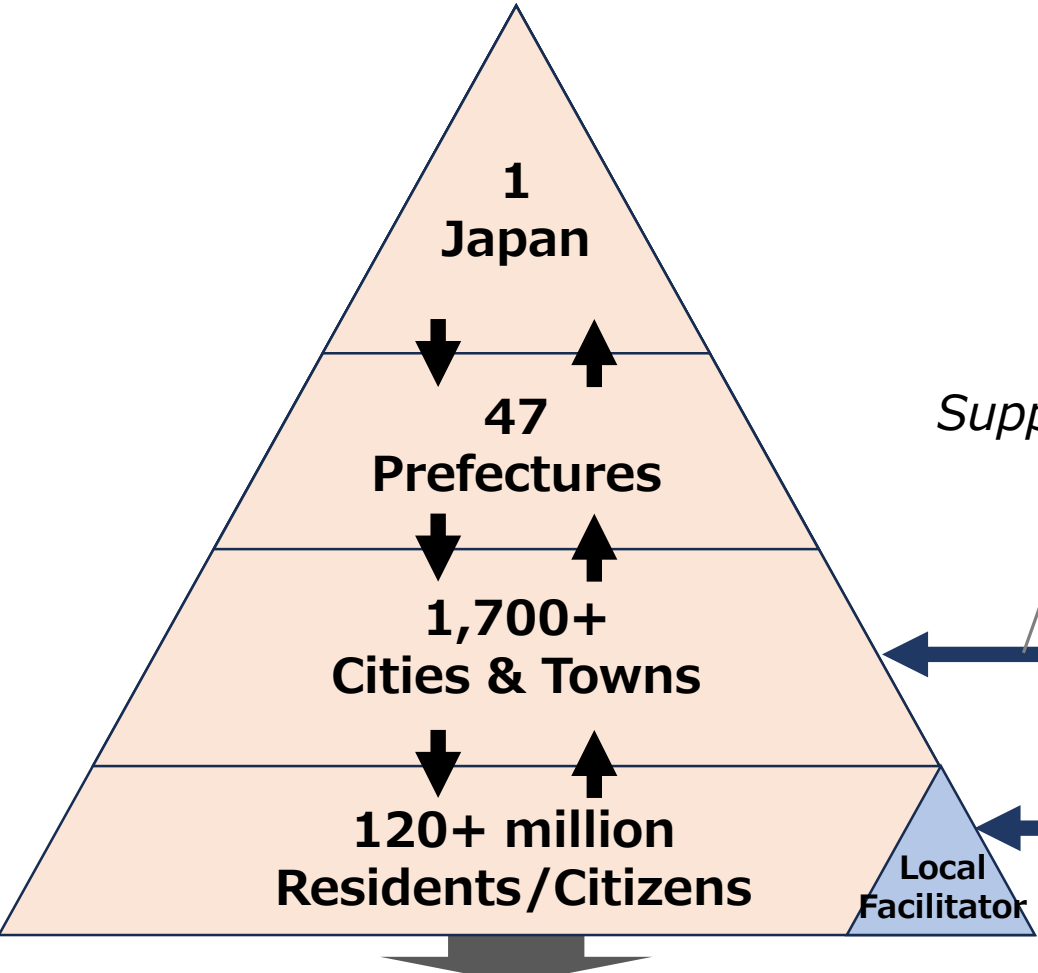
**Munenari Inoguchi (University of Toyama / NIED\*)**

\* National Research Institute for Earth Science and Disaster Resilience

# Necessity of 2 info tech. in common platform

\* Online Synthesis System for Sustainability and Resilience

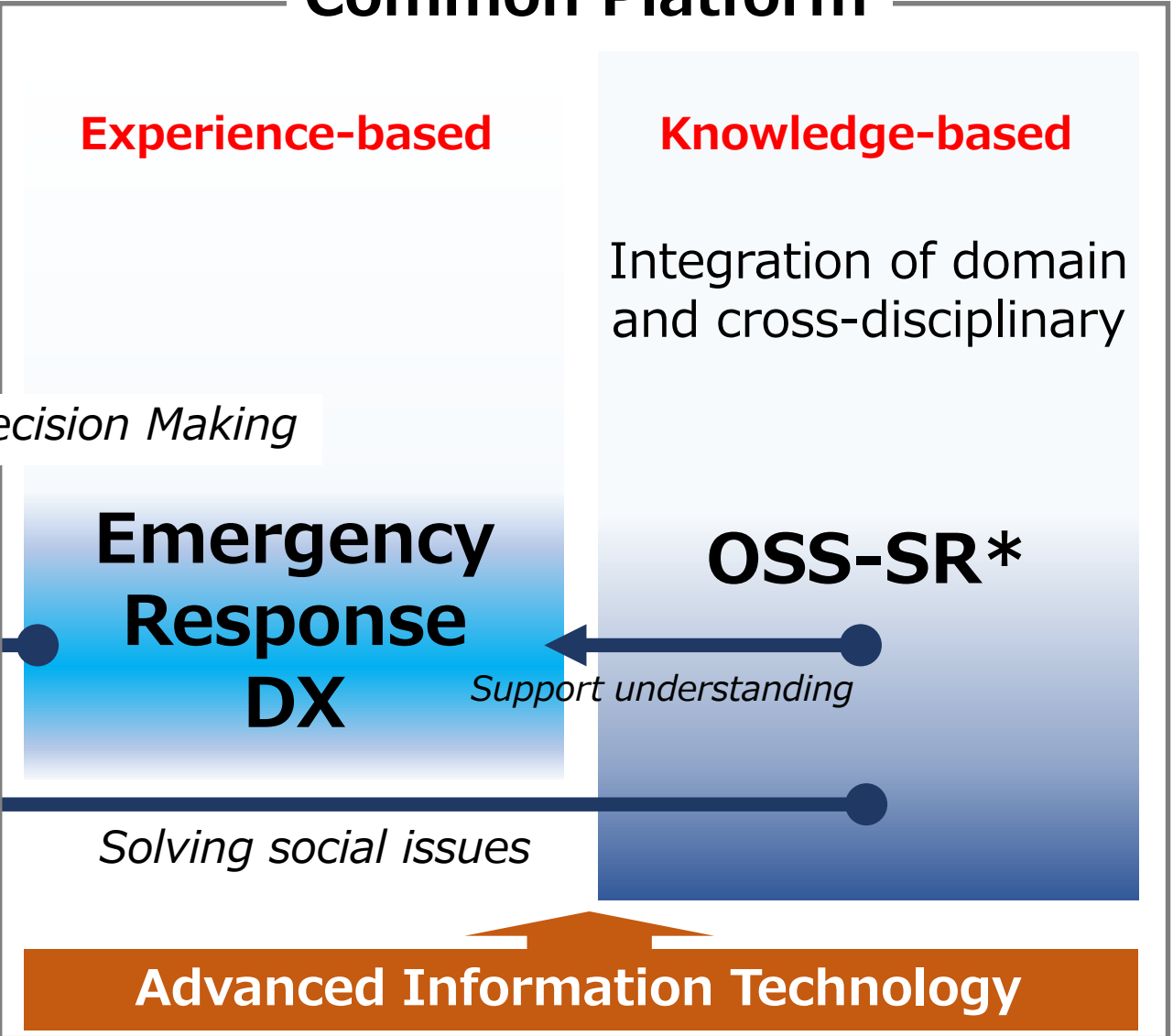
the structure of Japan society



Experience of Disaster Response



## Common Platform



Experience-based

Knowledge-based

Integration of domain and cross-disciplinary

*Support Decision Making*

**Emergency Response DX**

**OSS-SR\***

*Support understanding*

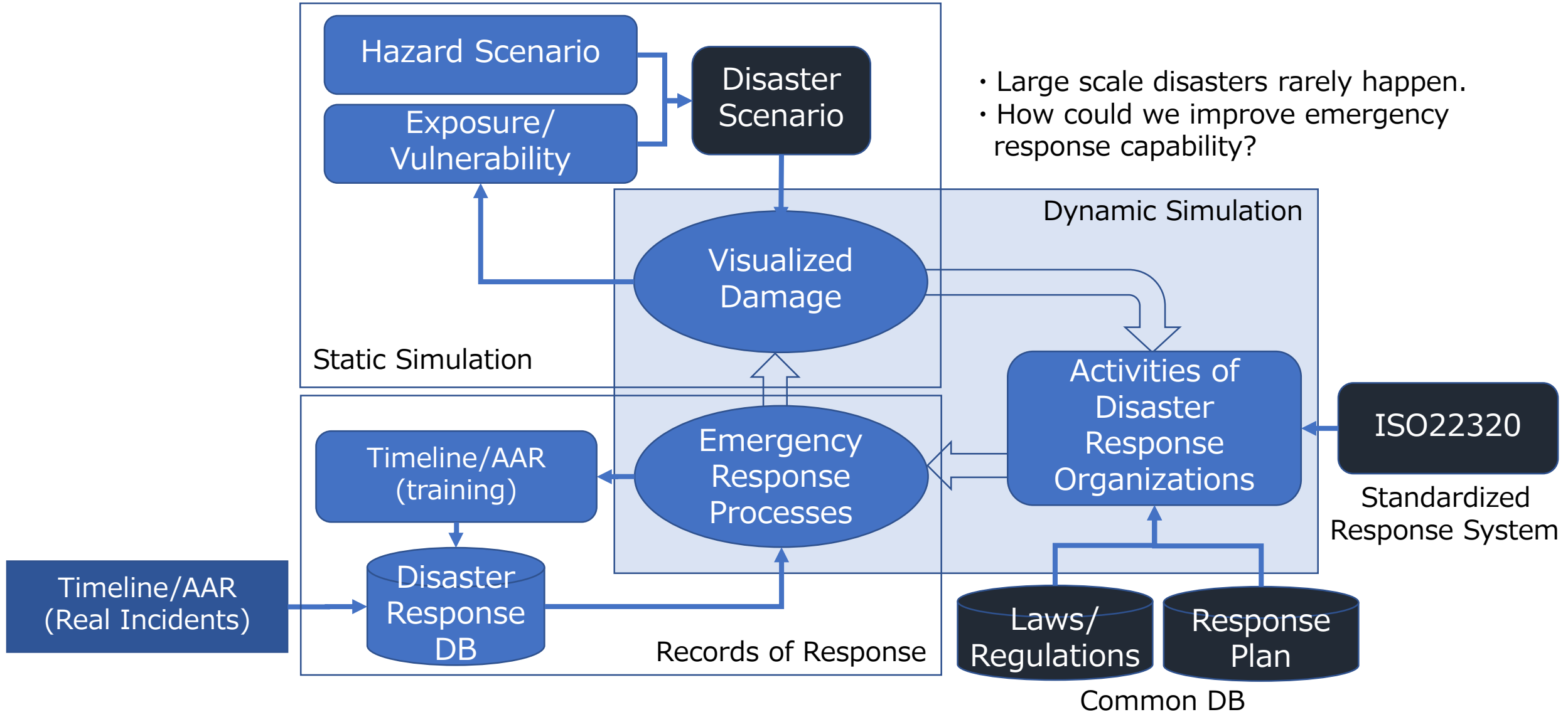
*Solving social issues*

**Advanced Information Technology**

# **Emergency Response DX (ER-DX)**

# Emergency Response DX (ER-DX)

## Standardization through Simulation for Disaster Responders



# Example of UI Design

The dashboard is titled "訓練" (Training) and includes a user profile for "避難部避難所 中村太郎" (Evacuation Dept. Evacuation Shelter Nakamura Taro).

**Annotations:**

- ① Clock: Shows the time 13:45:23 and time since disaster onset (32 minutes).
- ② Announcement: A message box with "アナウンス" (Announcement) and a "To: All" header.
- ③ Reminder: A "申し送り事項" (Handover items) section with EOC IDs and status confirmation requests.
- ④ Weather: A weather widget showing "天気" (Weather) and "雨量" (Rainfall).
- ⑤ Damage Sit.: A "被害状況" (Damage Status) map showing "人的" (Human) damage with counts like 169 and 203.
- ⑥ Resource Sit.: A "資源状況" (Resource Status) map showing "車両" (Vehicles) and "施設" (Facilities).
- ⑦ Action Logs: A table of communication logs.

**Table: 連絡処理表 (Communication Processing Table)**

レコード No.	ID	重要度	緊急度	対応状況	起票日時	送信元/送信者	送信先	件名	内容	回答
3992		重要	緊急	対応済	2016/10/11 16:04:55	本部統括班 本部統括班担当	全体共有	【周知】 【各部活動拠点】活動ログへの入力依頼	各部活動拠点は、以下の観点から活動ログへの入力をお願いします。 ・交代要員への引継ぎ事項 ・フワワー、ポイント《承認者:》	
3775	747	重要	緊急	未対応	2016/10/11 15:02:20	本部統括班 寺本 一樹	本部事務局情報班	【その他】 ライフラインの状況について	水道が使えない箇所として、白福南小学校・福北小学校・白福中学校・白福地区公民館・光福中学校・軟保東小学校 電気が使えない箇所として、軟保中学校です。《承認者:》	<ul style="list-style-type: none"> <li>10/11-15:03【本部情報班-川野 勝輝】 確認</li> <li>10/11-15:03【福祉救護防疫班-坂本 祥】 確認</li> <li>10/11-15:23【上下水道給水班-中村 拓哉】 水道が使えない理由は、停電 管破壊 断水のため 等理由はわかりますか。《承認者:》</li> </ul>
3613		重要	緊急	対応済	2016/10/11 14:28:28	本部統括班 立辻満浩	全体共有	【周知】 調整会議の開催	調整会議を15:30より開催します。各部はとりまの報の作成してください。《承認者:》	10/11-14:34【上下水道統括班-中村 大輔】 確認

**Bottom Dashboard Gadget-based Status Checks:**

- Weather: 晴れ 9°C (最高: 12°C 最低: 1°C)
- Damage Status: 死者: 330名, 重軽傷者: 1,000名
- Resource Status: 車両 残り 10台, 場所 残り 5箇所
- Communication Processing Table: 15:30から調整会議
- Response Plan: 人命を最優先 避難所の不足への対応
- Local Disaster Plan: 避難所の開設 避難所を開設する
- Legal Search: e-Gov検索
- Chat: チャット
- Contact: 連絡先

Gadget-based status checks

\* NIED is developing this system named "DxM4D" as a product of ER-DX

# Expected Impacts of ER-DX

## 1. Support decision-making in emergency response

Response plans that do not rely on people, but are improved through experience, complement the lack of experience in disaster management.

## 2. Improve mutual cooperation between municipalities.

It is fully equipped with a set of functions and operability that enable anyone to grasp the disaster situation, enabling mutual support of local authorities and public-private cooperation, and realizing faster and more advanced emergency response.

## 3. Enhance automated disaster response records

Automatically record all disaster responses so that the disaster response process can be reproduced and points for improvement can be identified through review.

## 4. Create capacity-building opportunities

The system operates simultaneously in peacetime, disaster and training modes, and the training mode simulates the experience within this system to identify problems in implementation, communication and to capture the key points of the operation.

# **OSS-SR**

**Online Synthesis System for  
Sustainability and Resilience**

# Science Council of Japan emphasized the importance of “Consilience” and “Synthesis” in 2020

1. “**Consilience**” in DRR and Environment/ Development should be conducted in a comprehensive manner at the “on-site” where various issues arise.
2. It is necessary to create “**consilience knowledge base**” and cultivate and increase human resources who will undertake development and management of the knowledge base. For “Consilience”, it is recommended to develop “**Online Synthesis System (OSS)** for the Promotion of DRR and Sustainable Development”

## RECOMMENDATION

Building a sustainable global society by strengthening disaster resilience:

- Developing an "Online Synthesis System (OSS)"
- and fostering "Facilitators" to realize consilience -



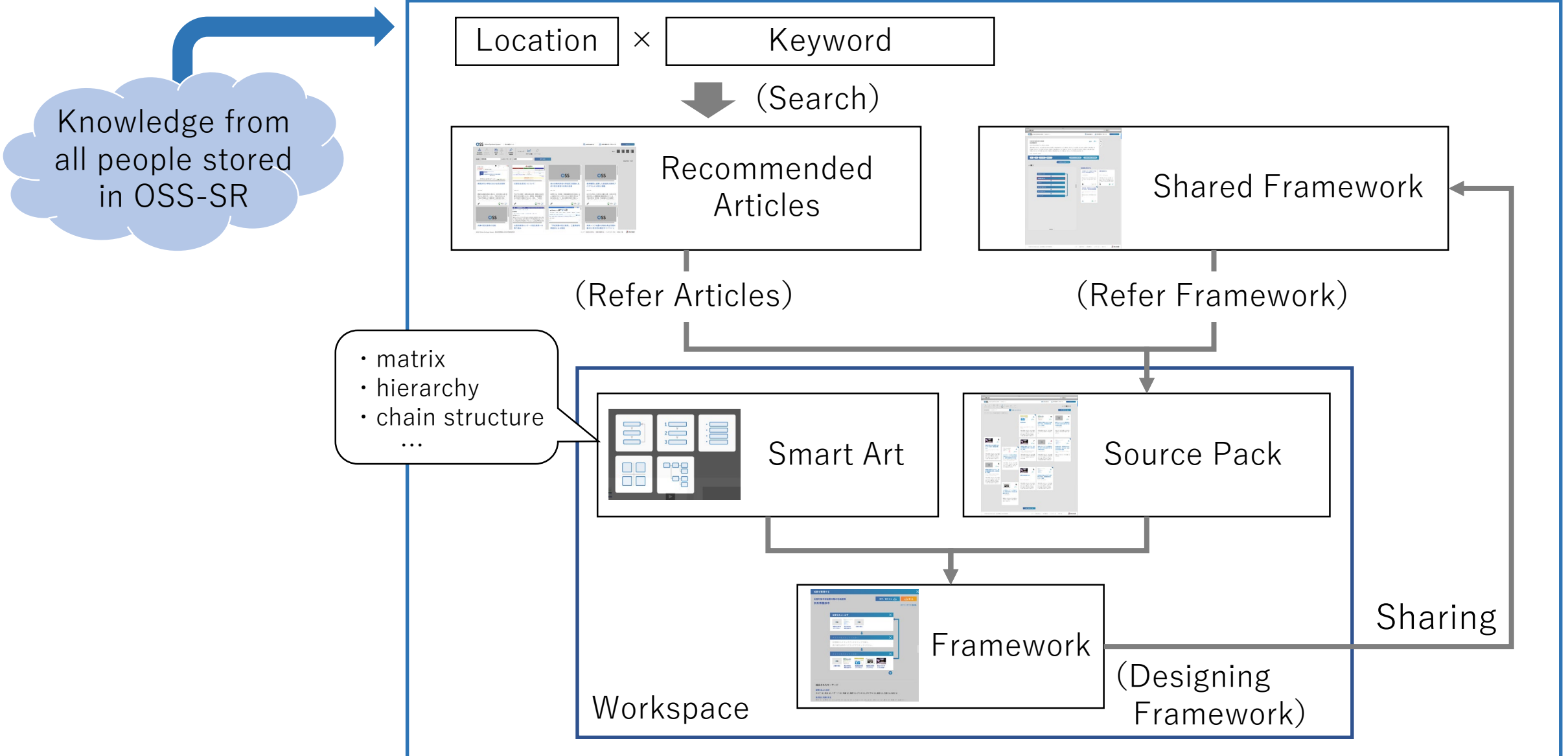
September 18, 2020

Science Council of Japan  
Committee on International Cooperation  
for Promoting Science-Based Disaster Risk Reduction



# The flow of utilizing OSS-SR

## A tool of OSS-SR utilization



# Prototype System of OSS-SR for managing contents that users have

The screenshot shows the OSS-SR search interface. At the top, there are navigation links for 'Online Synthesis System' and '知の統合サイト'. The search bar contains '地域: 東南海' and 'キーワード: 地震'. A blue callout 'Geo-Location' points to the location field, 'Keyword' points to the keyword field, and 'Do Search' points to the search button. The search results are displayed in a grid, with a green callout 'Result' pointing to the first result card. The first result card is titled '新居浜市小学校における防災教育' and includes a thumbnail, title, author '馬野 吉博', and a brief description. Other visible results include '災害安全(防災) について', '海水浴場利用者の津波防災意識に及ぼす防災教育や対策の効果', '教育機関と連携した鉄道防災教育プログラムの成果と課題', '兵庫の防災教育の充実', '大阪府教育センターの防災教育への取り組み', and '南海トラフ地震の多様な発生形態に備えた防災対応検討ガイドライン'. The interface also shows a '絞り込み' (Filter) button and a '表示' (Display) menu.

# Introduce Framework & Knowledge to local facilitators as catalysts (Educate local facilitators appropriately)

**1** 地域の避難計画を策定する

**2** 地域の脆弱性を知る

**3** 避難計画を策定する

**4** 感染症に留意する

**5** 訓練を検討する

Editing title of framework

Editing title of each component of framework

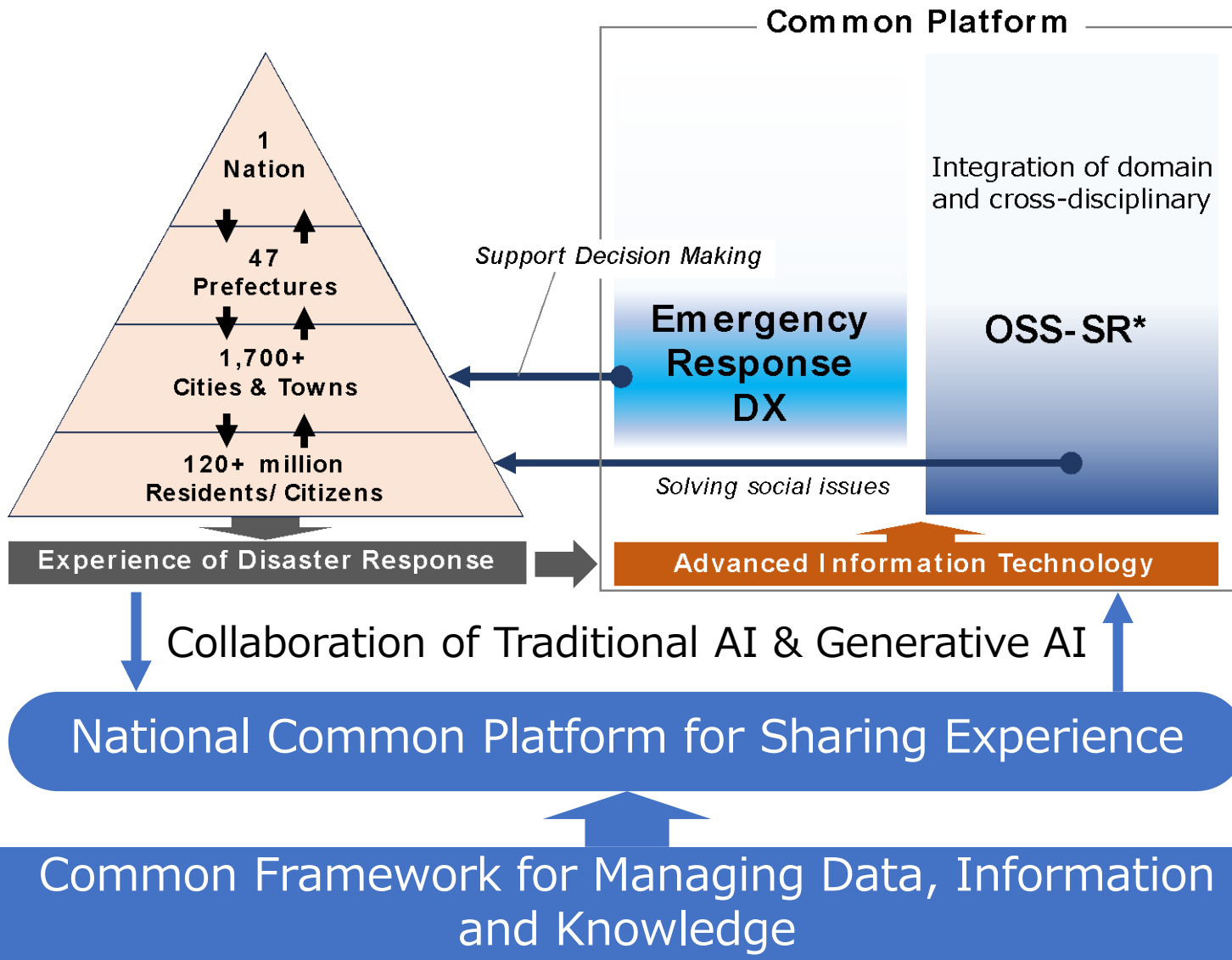
Accumulate articles (knowledge) in framework by drag & drop

Save and share framework & knowledge with others

All keywords from accumulated articles were put in each component

Natural Language Processing

# Conclusion: Suggestions on what to do



## We should research & develop

- Common Framework for managing Data, Information and Knowledge
- Utilize traditional & generative AI actively
- Develop a national common platform for managing and sharing experience in past disaster
- Promote capacity building of local governments and citizens by Emergency Response DX and OSS-SR

International  
Collaboration



# 2 types of AI

	<b>Traditional AI</b>	<b>Generative AI</b>
<b>Learning Perspectives</b>	Organize, Categorize, and Search for Information	Learning Patterns and Relationships
<b>Purpose of Output</b>	Identification and Prediction	Creation
<b>Business Impact</b>	Automation of Predetermined Actions	Generate New Content
<b>Training Data</b>	Specific Data Sets	Unstructured Data Set


# Semantic Image Segmentation

- When users uploaded (or shared) images, AI can recommend the keywords relating to those images using the advanced technology of semantic image segmentation.




# Examples of the use of OFA (image captioning)




The roof of this house is badly damaged.  
(Probs: 0.361) 




View of the damaged road.  
(Probs: 0.380) 




The roof of the temple has collapsed.  
(Probs: 0.406) 




Cracks in the road  
(Probs: 0.398) 




Roads are badly damaged.  
(Probs: 0.314) 



There are blue recycling bins by the roadside.  
(Probs: 0.473) 

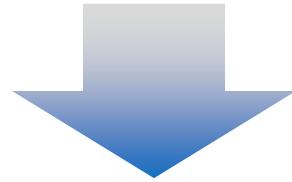


Water gushing from holes in the ground.  
(Probs: 0.406) 

These are the result of analysis by traditional AI, however it could be useful for categorizing images, and we can grab the whole picture of disaster damage situation.



Generative AI is still imperfect at reproducing or predicting human behavior and decision making in disaster events...



**Harmonious Collaboration of Traditional AI and  
Generative AI could be realized  
by mediating Human support**

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## 2. Improve mutual cooperation between municipalities.

It is fully equipped with a set of functions and operability that enable anyone to grasp

However...

In Japan, local governments have equipped disaster information system individually. So, the actual logs, knowledge and experience in disaster response were scattered.

Against this issue, we have to :

- 1) Develop a common platform for storing those logs, knowledge and experience comprehensively.
- 2) Utilize AIs (traditional and generative AI) actively for managing those data to create response flow model.

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