



東京大学  
THE UNIVERSITY OF TOKYO

DMTC

# Disaster management process

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Associate Professor  
Dr. (Engineering)

**Muneyoshi NUMADA**





# Contents

1. Past experiences
2. Characteristics of emergency responses
3. BOSS
4. DMTC

# Research approach

## Research/ Project

- Total framework of DRR
- Engineering and Social science
- Domestic and International



JICA Myanmar @YTU



WB Sri Lanka @DMC

## Training by DMTC

- Comprehensive process
- Decision-making
- Government, Prefecture, Municipality, Business sector, Community



Practical leadership education



BOSS

Prefecture

Municipalities

@Kumamoto pref.

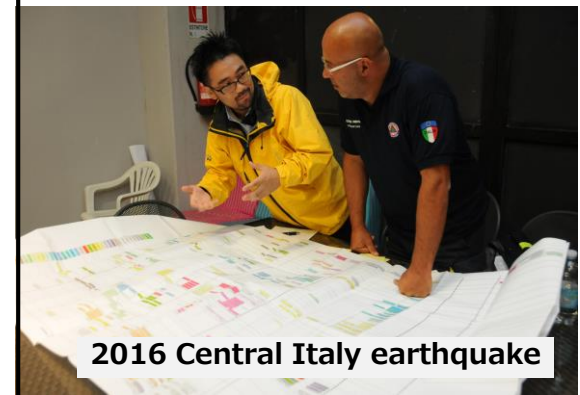
## Real disaster

- Technical support for EOC
- Process management
- Review



Mayor

Kurashiki town, Okayama pref. during 2018 Heavy rain



2016 Central Italy earthquake

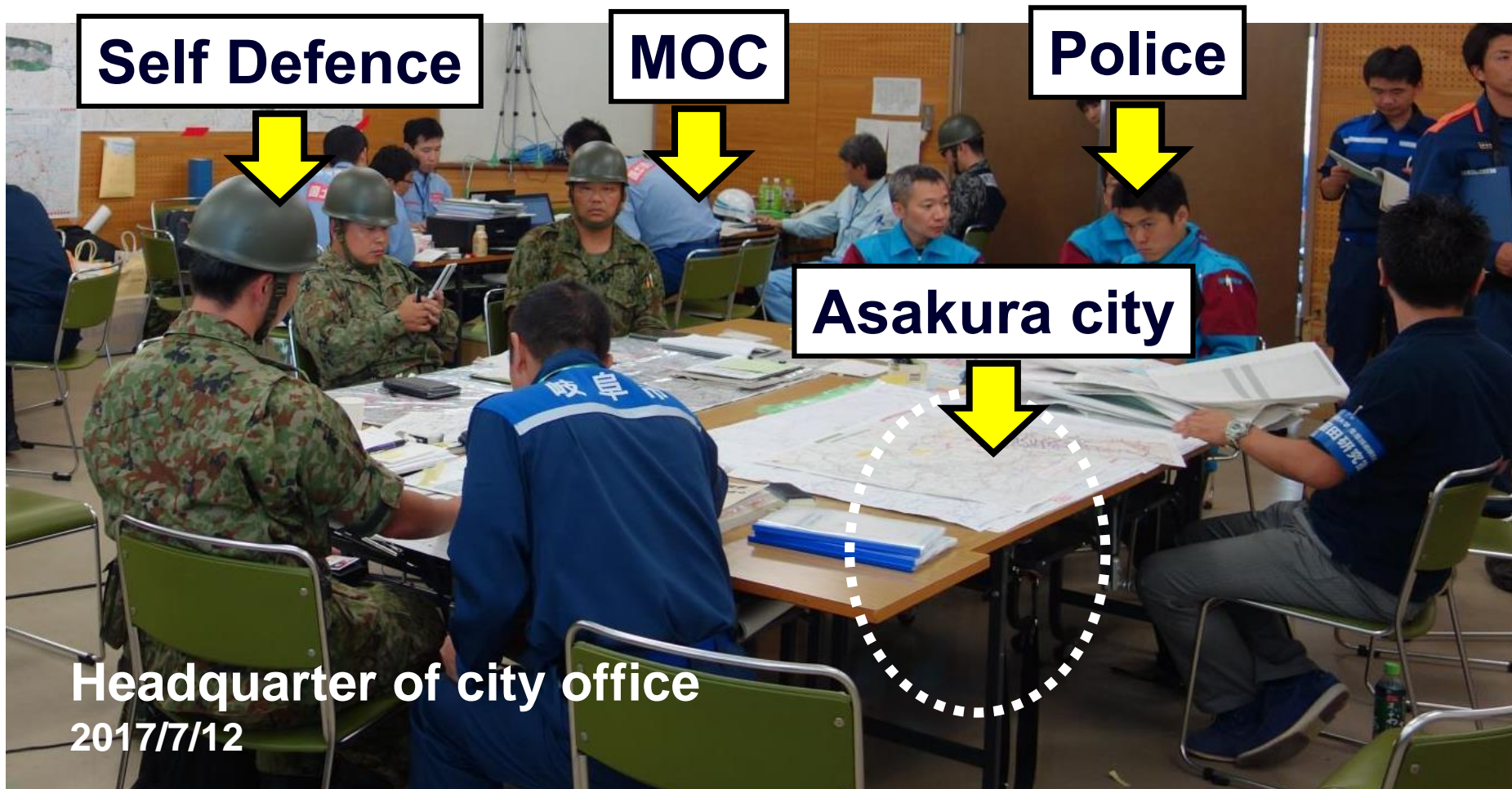
# Past experiences



# 2017 Heavy rain disasters

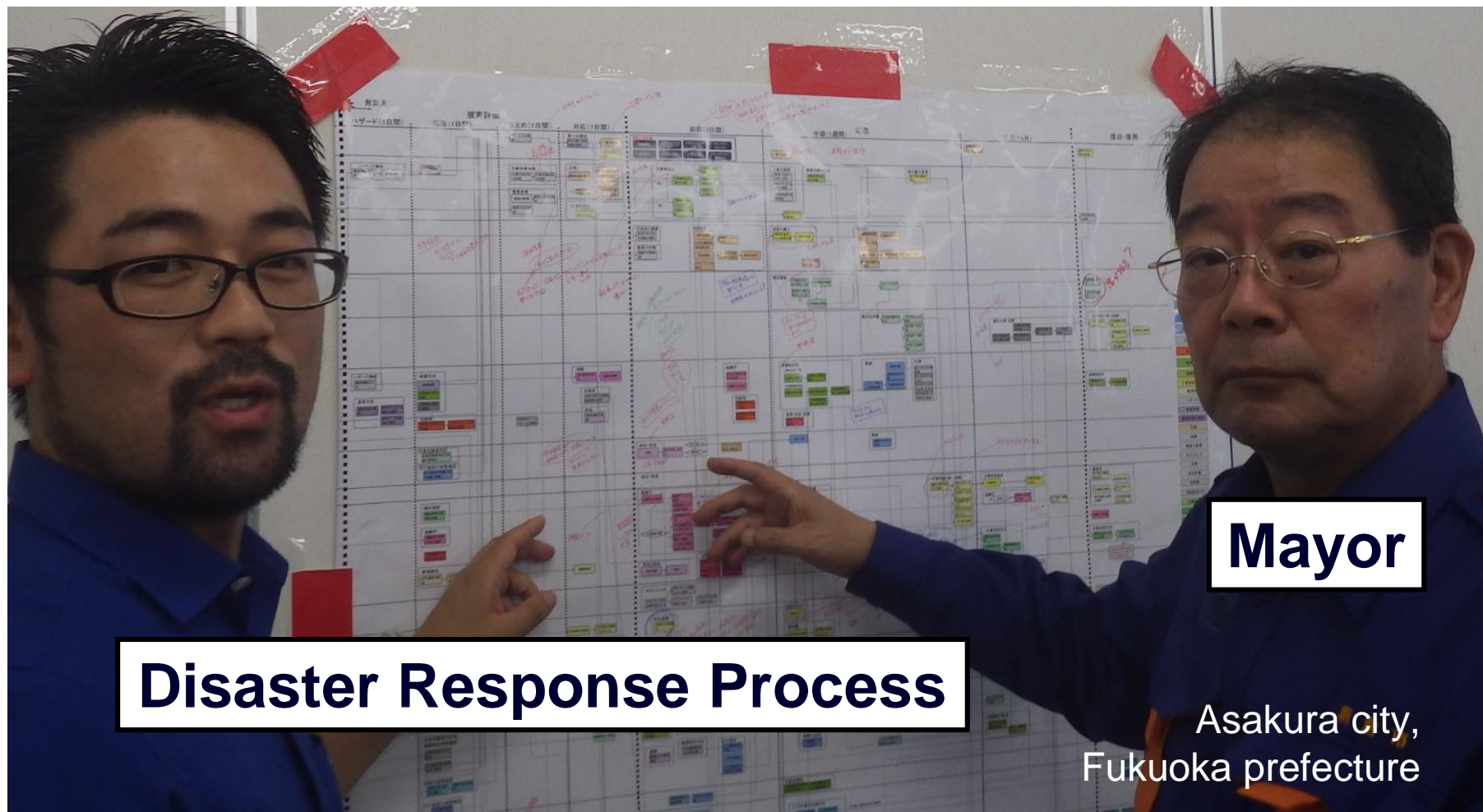


Nobody understand the roles of each stakeholder  
- No management -





# 2017/7/13(Thu) Understand the total disaster responses



**Disaster Response Process**

**Mayor**

Asakura city,  
Fukuoka prefecture

# How do you manage the information





# Importance of EOC



# Decision making at EOC





# Decision making on the building survey



# Do not mix strategic and operational decision making

**The true leader shows the direction of Strategic decision making.**

## Strategic decision making

**Correct disaster response and management policy**

- Long-term perspective
- Prepare for future uncertainty
- Have an overall view so as not to "look at the trees and not see the forest"
- Focus on the most important criteria and have the courage to take the plunge and throw away the details

## Operational decision making

**Correct on-site management**

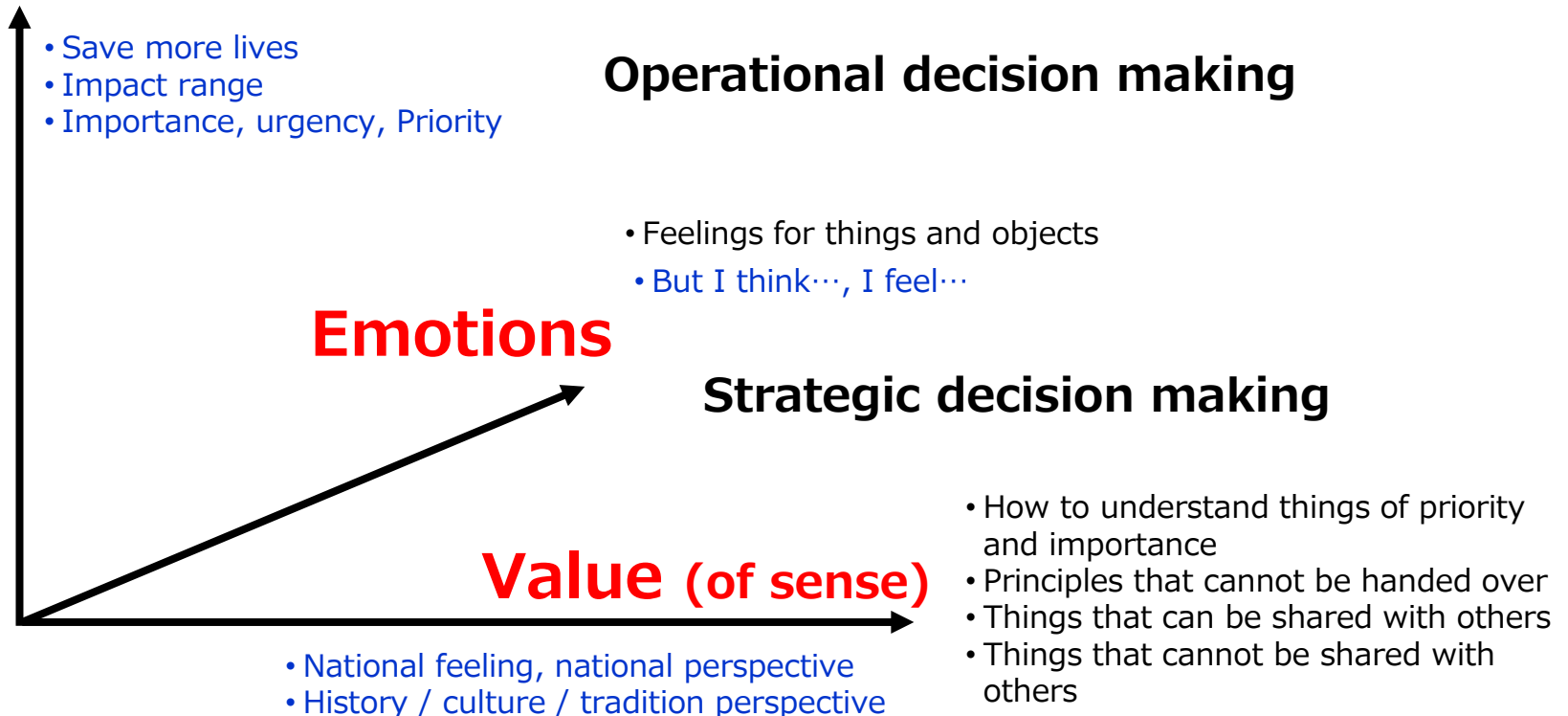
- Produce short-term results
- Little uncertainty and easier to collect necessary information
- Attention to detail
- Quantitative analysis and evaluation
- Make the best use of existing methods and resources



# What are the parameters of decision making

## Rationality

- It makes sense.
- Clarified reasons and rules that will lead to the same conclusion no matter who thinks.
- It is purposeful and profitable.



# 2016 central Italy earthquake








# What we can study from Italian system



# Systemize and optimize during normal days



- Needs lots of workload
- Location for stock
- No information management






- No needs lots of workload
- No need of location for stock
- Easy to manage the stock information



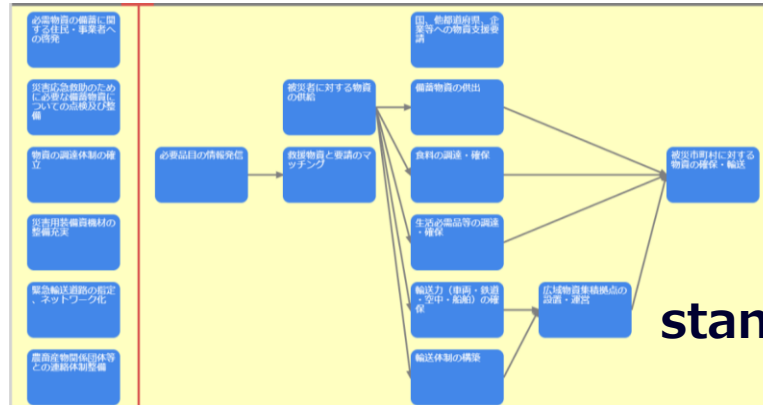
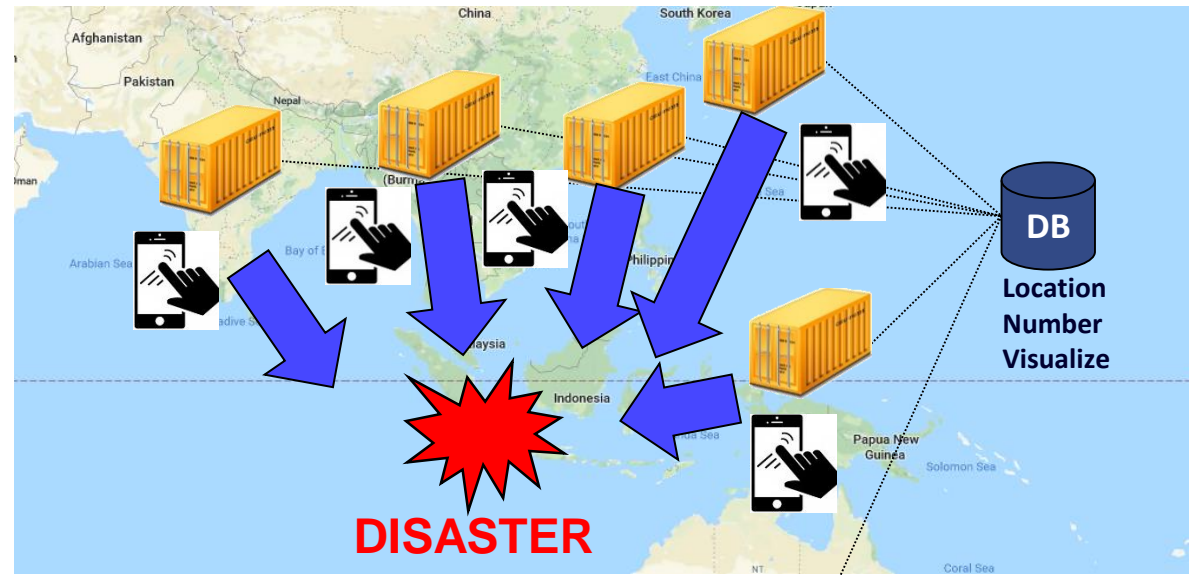
# International idea for One ASEAN One Response



Japan

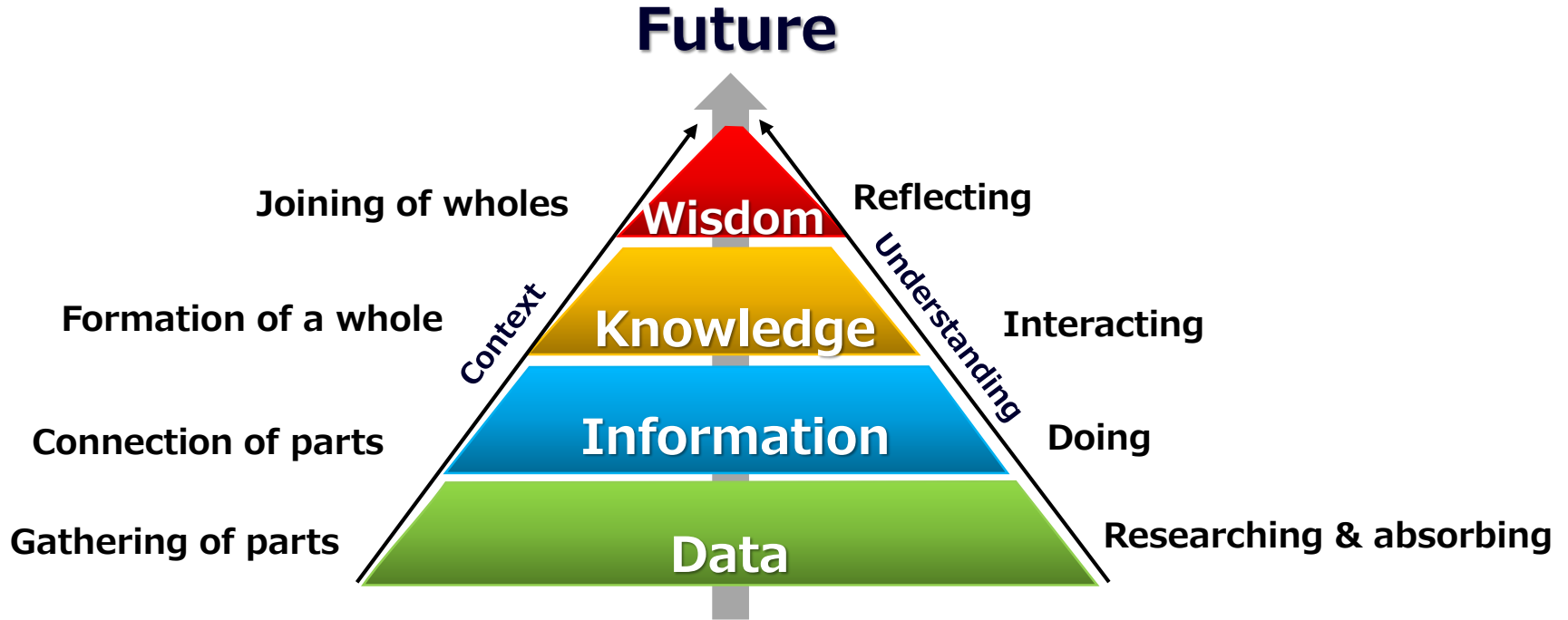


ASEAN Container



International standard procedure for logistics

# Past experiences can make our future



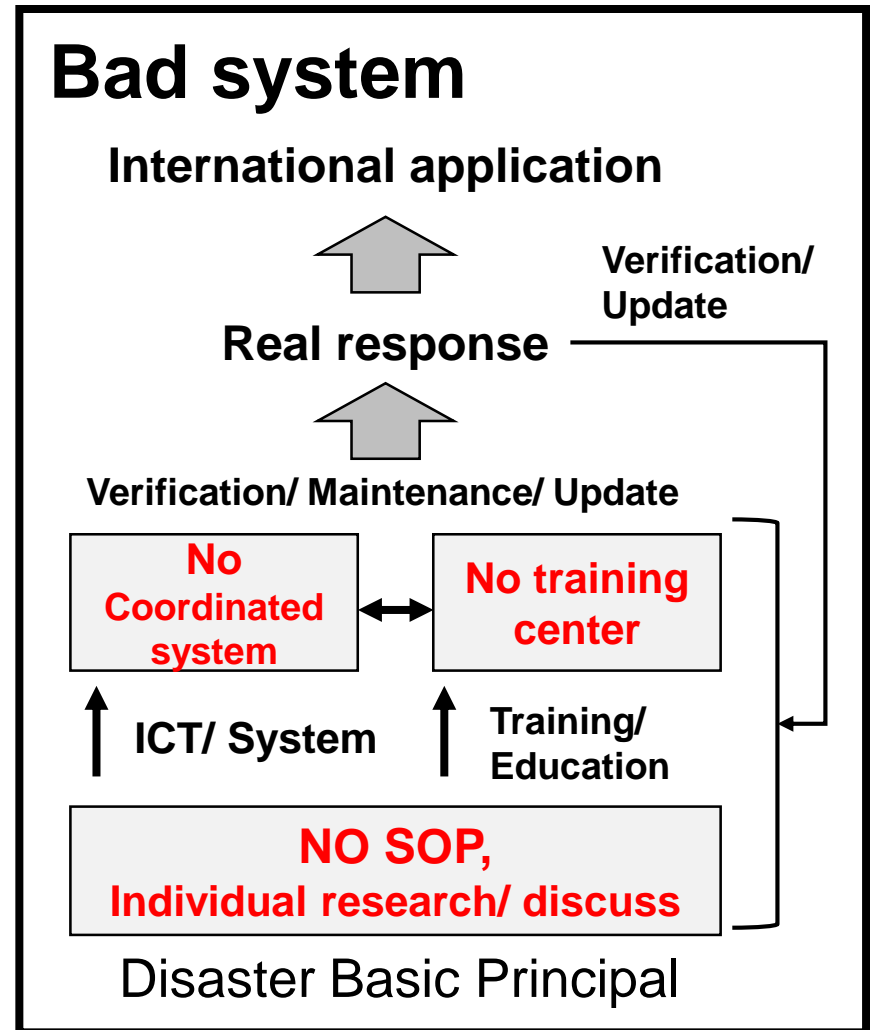
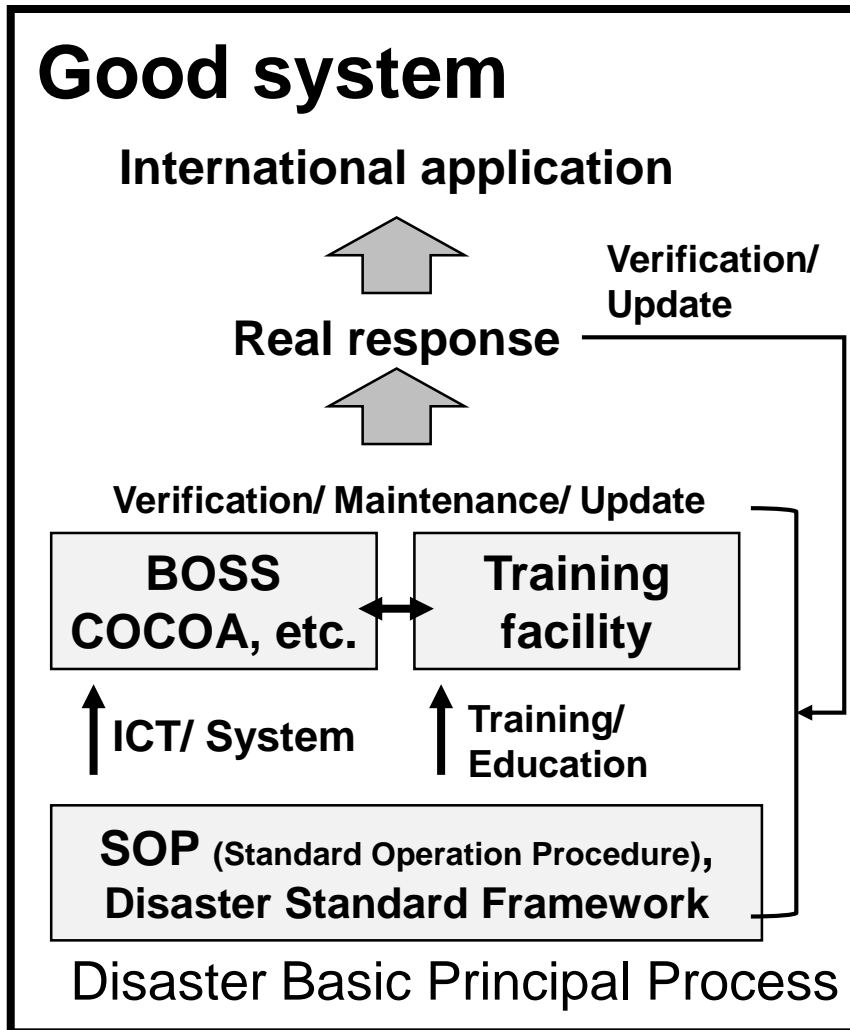
## Past experience

Sagaing faults induced earthquake disasters



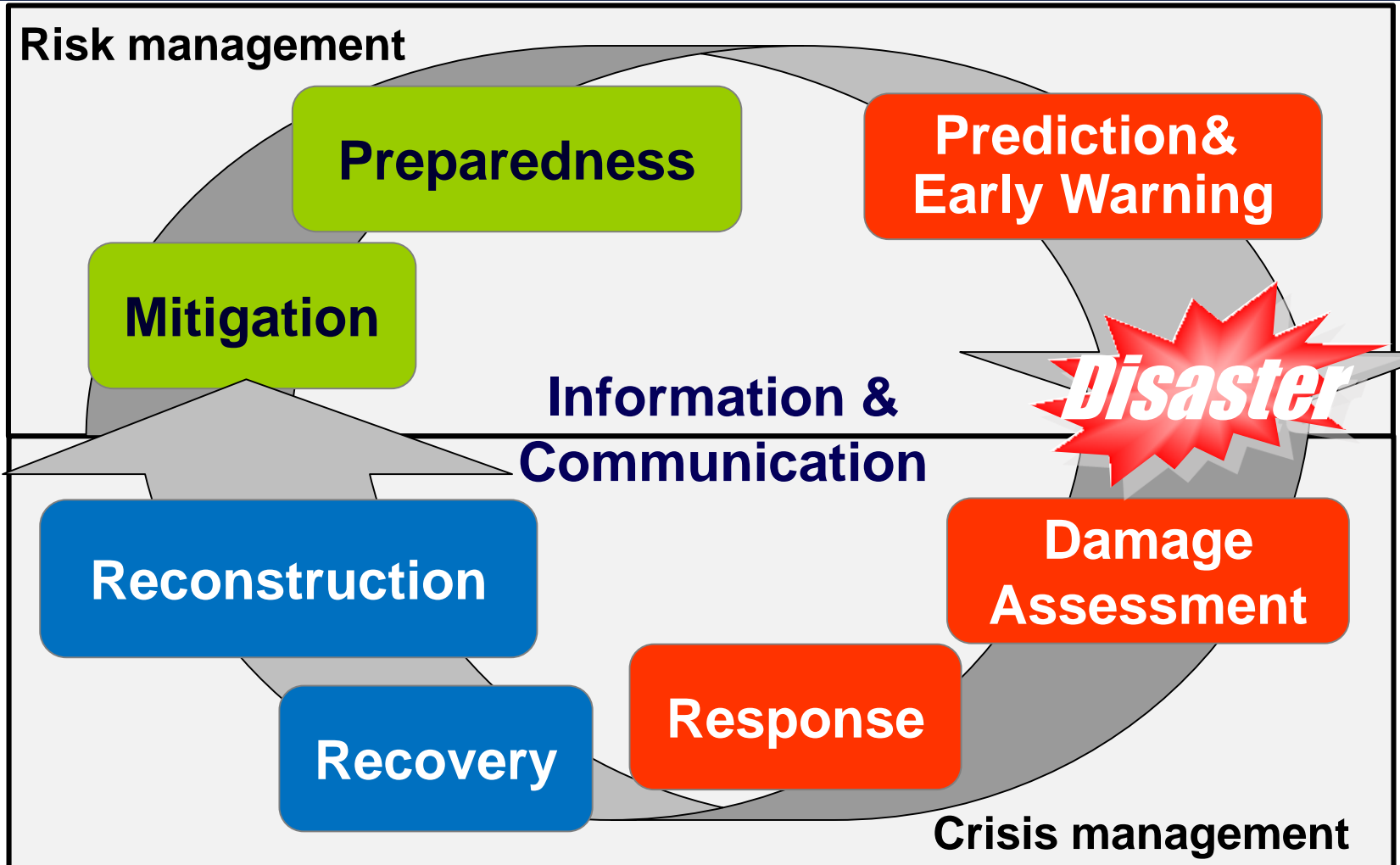


# Create good system on Disaster management



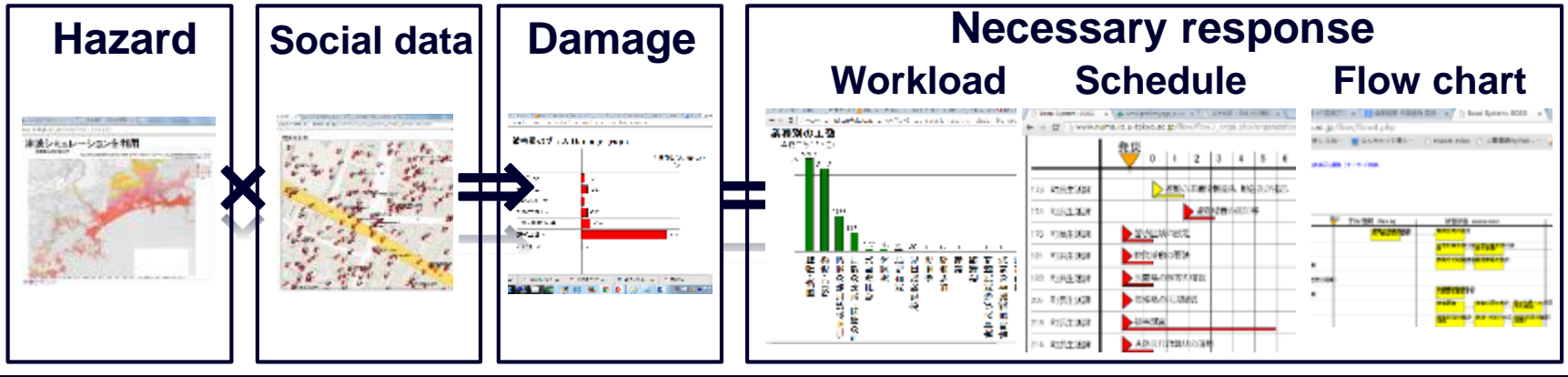
# Characteristics of emergency responses

# Total phase





# Impact analysis process



## Information management

- Kinds:**
- Hazard information
  - Damage information
  - Response information

**Description:** GIS, List, Route

**Dissemination:** Last mile

## Functional location

Evacuation	Shelter	Self-defense
Material logistics	Volunteer	Debris
Temporary house	Dead body	Public house

Integration analysis of route network

## Governance/ Team building

Effective allocation of resources

## What is the characteristics of emergency responses?

- 1. Forced to make decisions by unclear/ no information**
- 2. High workload compared to normal situation**
- 3. Various kinds of responses**
- 4. Quick response = No time to wait**
- 5. Severe evaluation by mass-media, SNS**
- 6. Responders under the danger situation**

# How can we manage shelters in the COVID-19 ?

## Problem for Typhoon and COVID-19

Real shelter in Shibecha town,  
Hokkaido



### 1. **Complicate responses** with COVID-19

Many different response progresses are needed to share with different stakeholders (NPO, NGO, municipalities).

### 2. **Information management**

Many shelters open to avoid the concentration in one place.

How can we collect and share the **information** about shelters with many shelters.

### 3. **Limited human resources** to manage shelters.

Many staff (local government staff, medical staff, NPO and etc.) need to be assigned based on the situation of shelters.

Optimize HR scheduling tool is important to reduce the inefficient assignment.

### 4. **Complication of material logistics**

Materials (medical equipment, hand sanitizer, cleaning tools...) need to be delivered to shelters

based on the stock to avoid the lack of materials.

### 5. **Difficult to follow the basic rule**

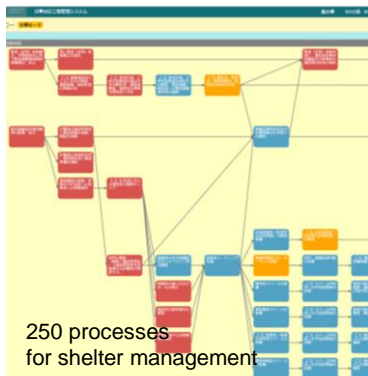
How can we keep to ask people to wash hands, wear a mask, keep distance.



# What is the emphasize preparedness for Typhoon and COVID-19

1. **SOP** (Standard Operation Procedure)
2. **Information management** about environment of shelters
3. **Optimize human resource allocation**
4. **Stock information and deliver system** for effective material logistics
5. Continue to follow a **basic policy**

1. SOP



2. Shelter opening



3. HR scheduling

避難所名	1	2	3 day	4
避難所1 Shelter 1	職員2 職員6 職員7	職員2 職員61 職員62	職員2 職員6 職員7	職員 職員 職員
避難所2 Shelter 2	職員1 職員8 職員9	職員1 職員64	職員1 職員8 職員9	職員 職員 職員
避難所3	職員3 職員10 職員11 職員12 職員13	職員3 職員65 職員66 職員67 職員68	職員3 職員8 職員10 職員11 職員12 職員13	職員 職員 職員 職員 職員
避難所4	職員4	職員4	職員4	職員

4. Stock information



5. Zoning

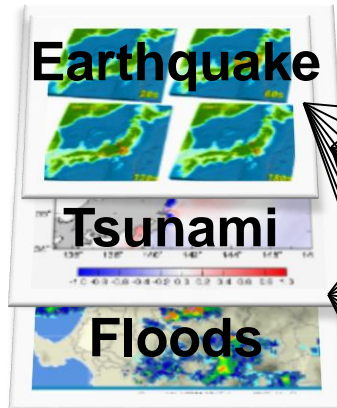


# Process based approach

# Simulation image

## Input:

$$\text{Hazard} = f(G)$$

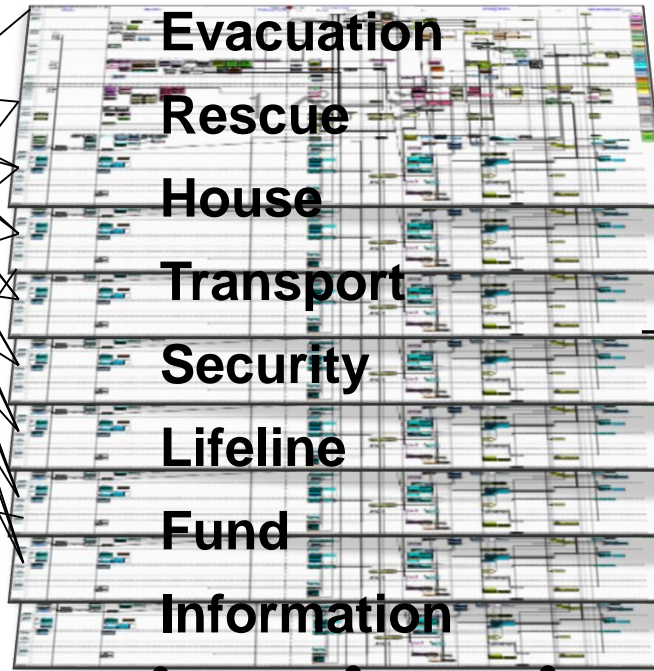


Accident  
Industrial accidents  
(Nuclear, Chemical Fire, ...)

Condition of  
weather, season

## System:

$$\text{Damage} = f(H)$$



Engineer

Society

Economic

## Output:

$$\text{Response} = f(D)$$

Government



Company

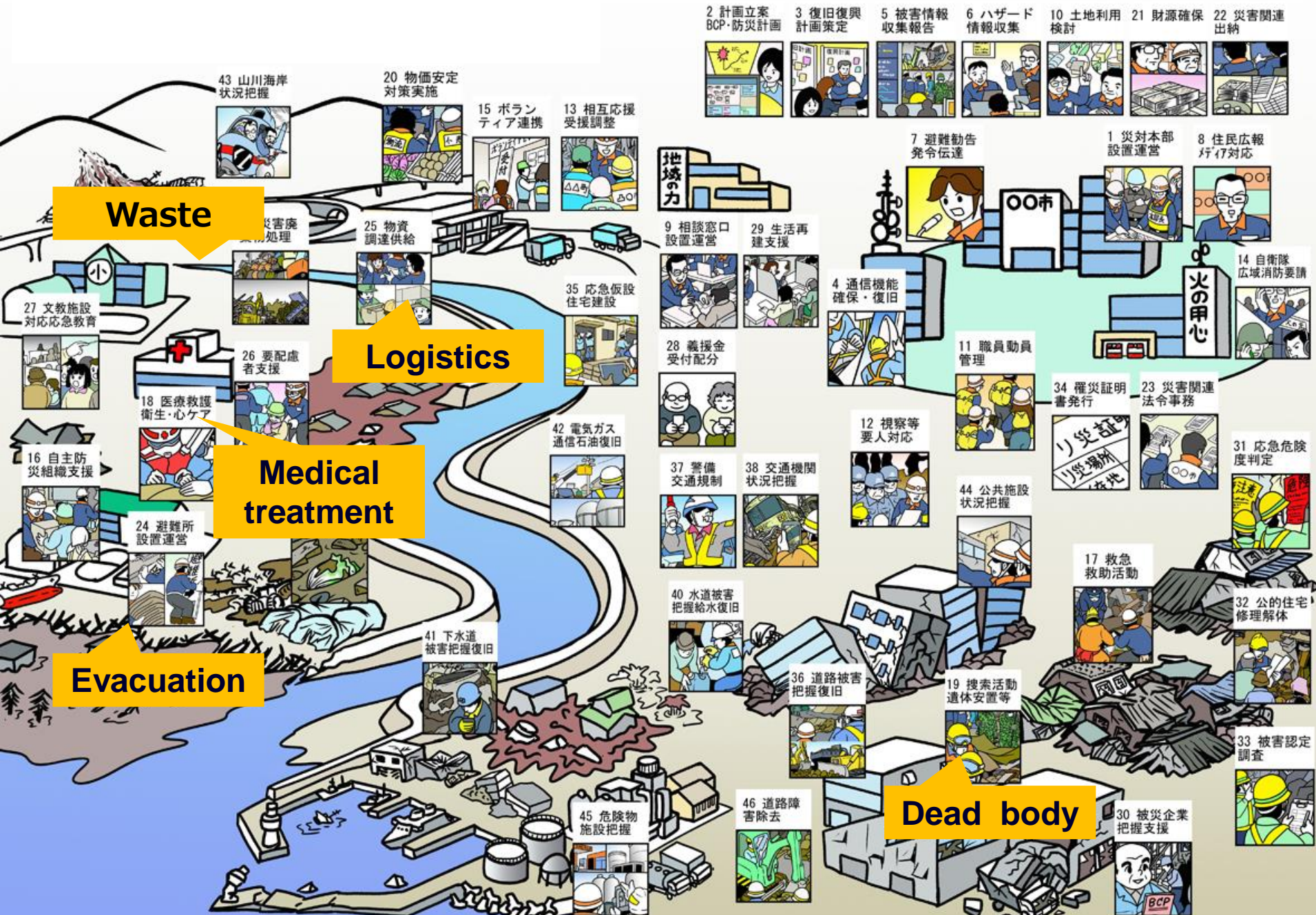


Residence



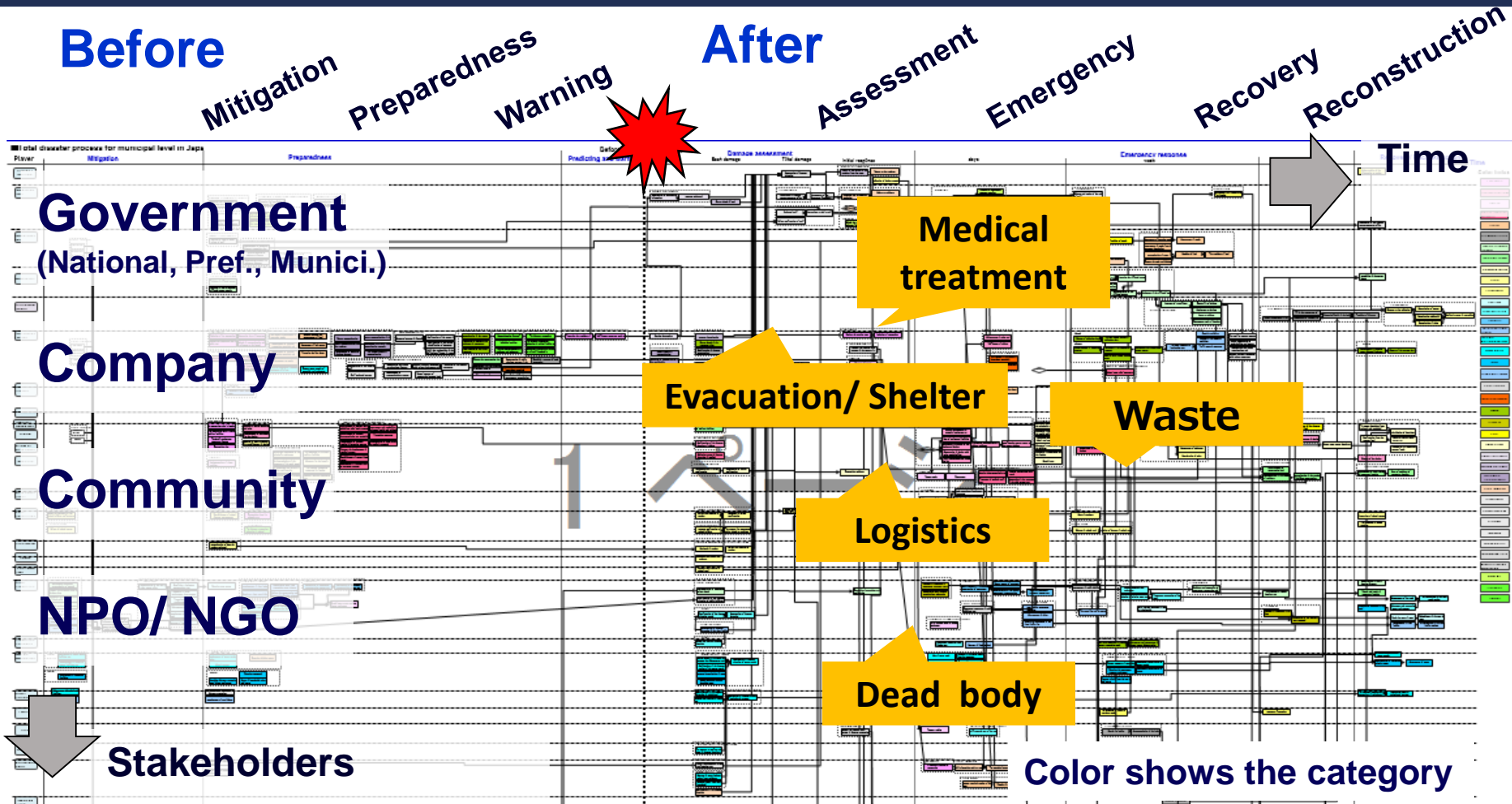


# DMTC 47 kinds response framework



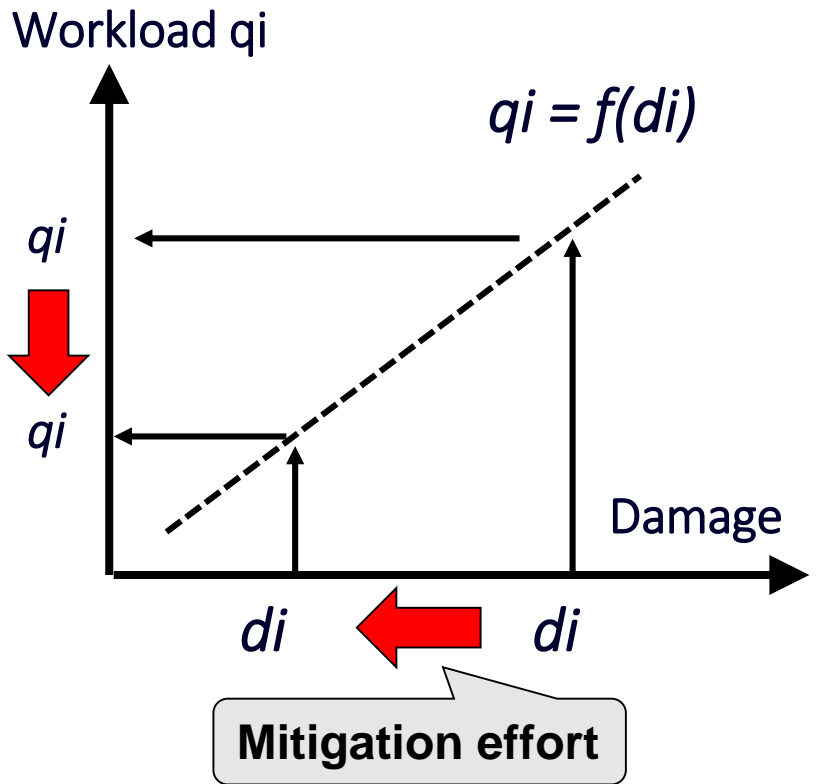


# Process based disaster management 500 processes are defined for 47 kinds categories



**Standard Operational Process should be developed in ASEAN**

# Equation of workload and damage



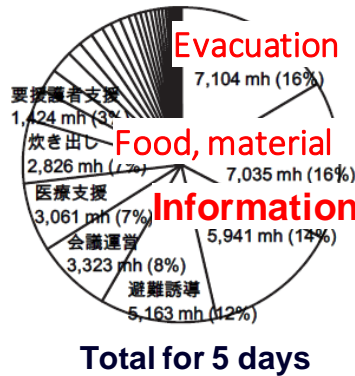
Parameter sheet

i	Workloads $q_i$	A mount of damages $d_i$	Sampl es	$A_i$	R
1	Shelter Management	Maximum evacuees	13	0.7739	0.9345
2	First-aid/Rescue Operation	fatalities	19	2.559	0.915
3	Medical/Relief activities	fatalities	17	2.403	0.5418
4	Food supply/security	Maximum evacuees	8	0.05178	0.9762
5	Searching missing person/Corpse treatment	Damaged buildings	8	1.165	0.727
6	Post earthquake quick inspection	Damaged of buildings	22	0.0403	0.9682



# Evacuation/ Shelter, Logistics, Information management...

(1) 700 officials from Ishinomaki city



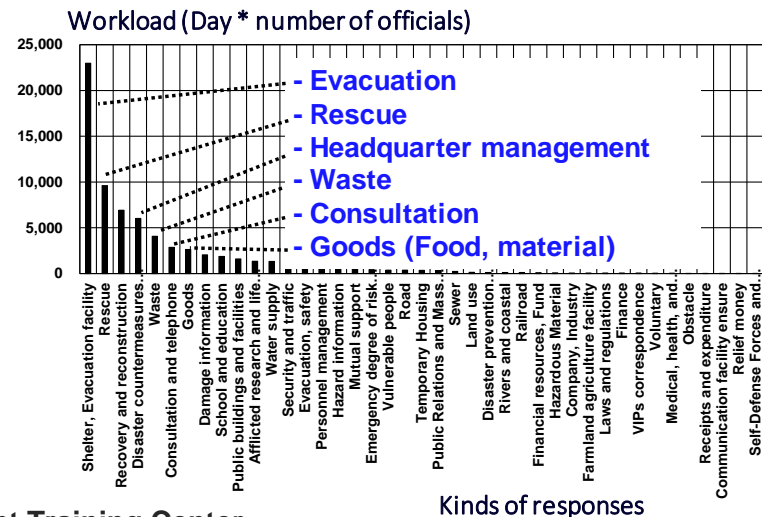
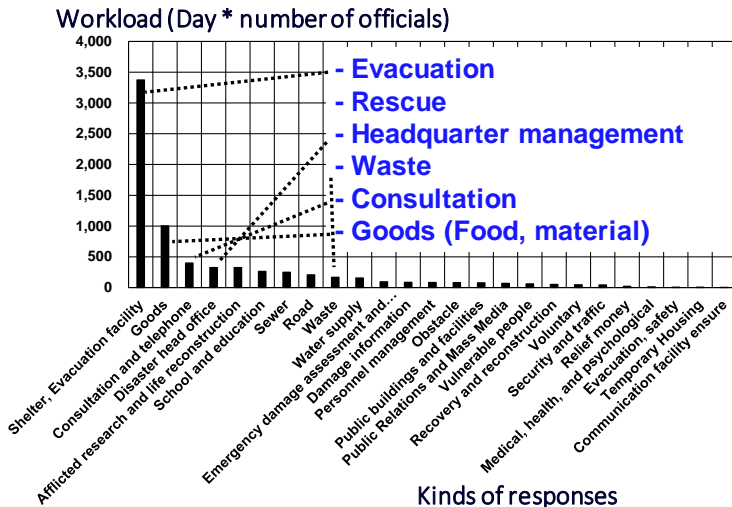
(2) 120 officials from Yabuki town

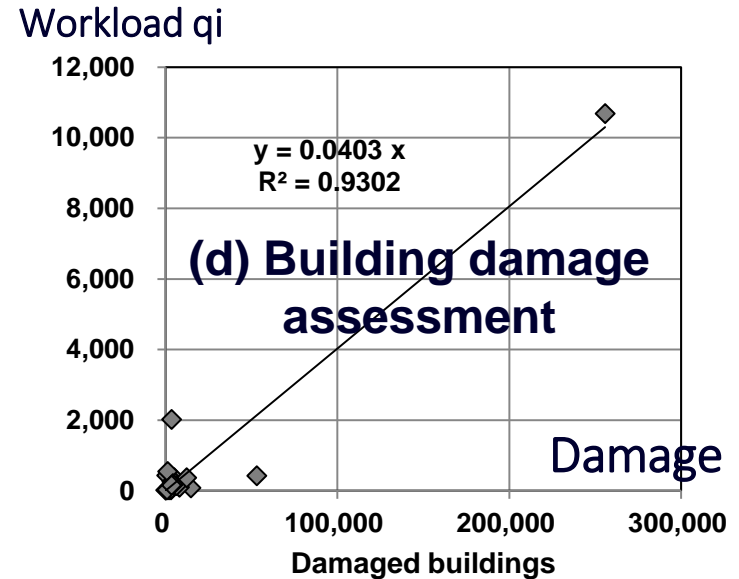
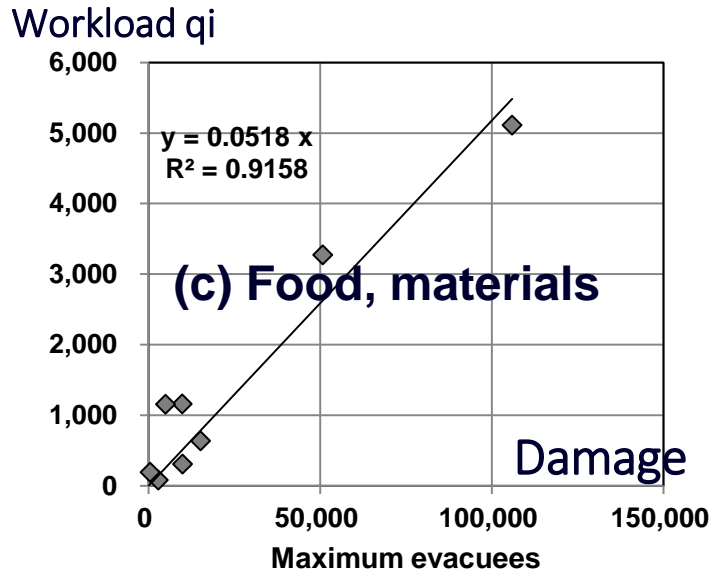
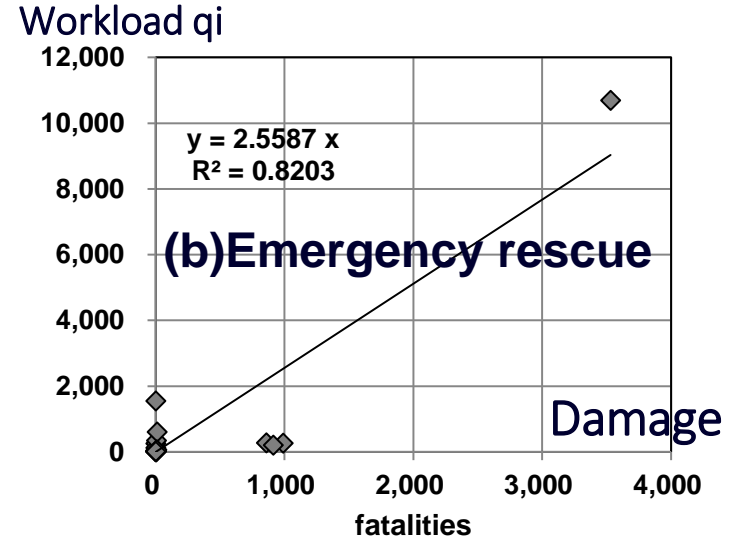
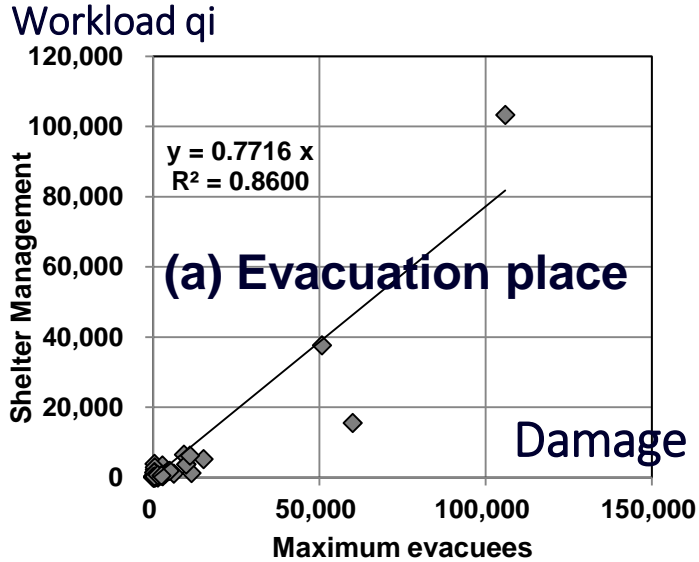
組織	Response contents															
	炊き出し	給水	被害調査	避難所	情報連絡	物資	応急危険度	会議	復旧	安全確認	窓口業務	交通整理	防災無き	子供の引き渡し	消防巡回	災害廃棄物
企画経営	138	90	45	27	9	15	0	33	0	0	0	0	0	0	0	0
庶務	3	96	30	42	6	90	0	0	93	0	0	6	0	0	0	0
総務	75	186	24	99	9	33	0	0	3	0	0	3	0	0	42	0
企画	81	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
庶務	39	45	3	1	1	1	1	1	1	1	1	1	1	1	1	1
総務	21	123	84	84	84	84	84	84	84	84	84	84	84	84	84	84
企画	0	0	183	183	183	183	183	183	183	183	183	183	183	183	183	183
庶務	99	36	222	222	222	222	222	222	222	222	222	222	222	222	222	222
総務	42	111	66	36	36	36	0	0	0	0	0	0	0	0	0	0
企画	234	75	9	36	84	39	0	9	3	114	3	0	0	33	0	0
庶務	0	15	0	0	0	0	0	6	30	0	0	0	0	0	0	0
出納室	120	0	0	0	0	0	0	0	0	0	24	0	0	0	0	0

Many staffs worked for Food supply, Water supply

(3) 6,000 officials from Kumamoto city

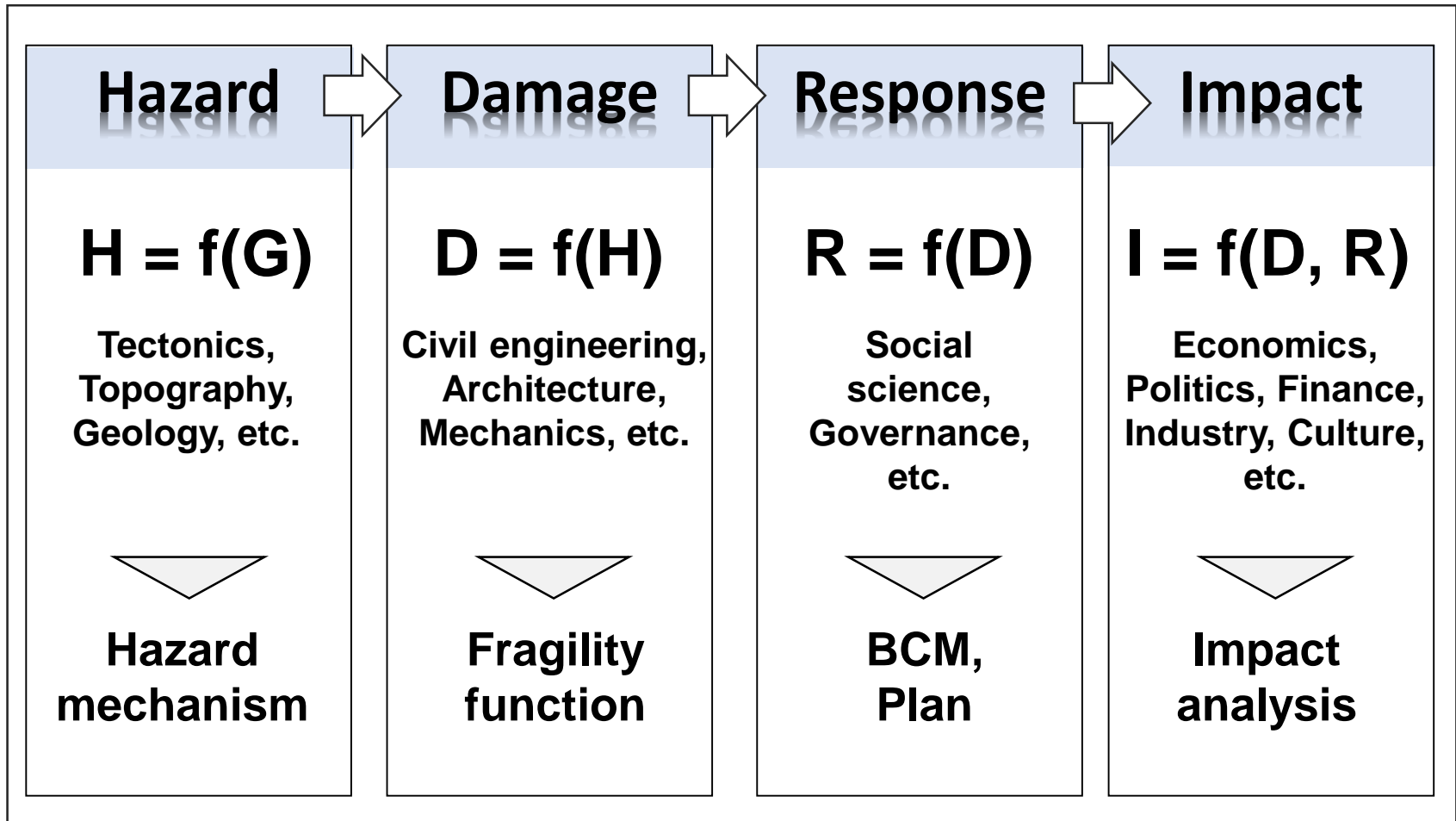
(4) 800 officials from Joso town





# Integrate the processes from hazard to impact

## Development of the system





Building Pattern

building pattern1

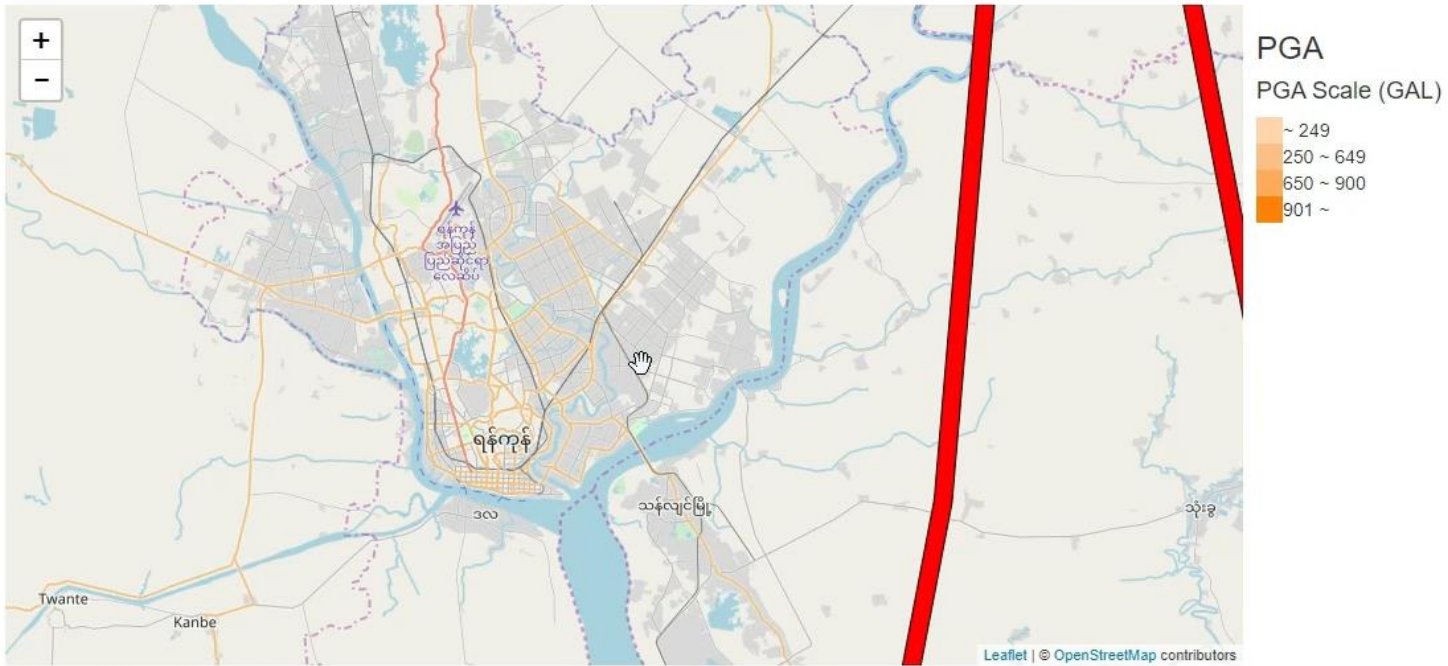
Fragility Pattern

fragility pattern1

## Earthquake Simulation

Moment magnitude (Mw)

Focal depth  [Km]



# Efficient human resource allocation

QCD	Overview
<b>Q</b> <b>quality</b>	(1) Prioritizing responses (2) Level of responses (required qualification and skill) (3) Special skills such as search and rescue (4) Psychological approach
<b>C</b> <b>Cost</b>	(1) Need lots of human resources (2) Volunteering human resources
<b>D</b> <b>duration</b>	(1) Duration of response (2) Waiting time between processes (3) Gap between supply and demand

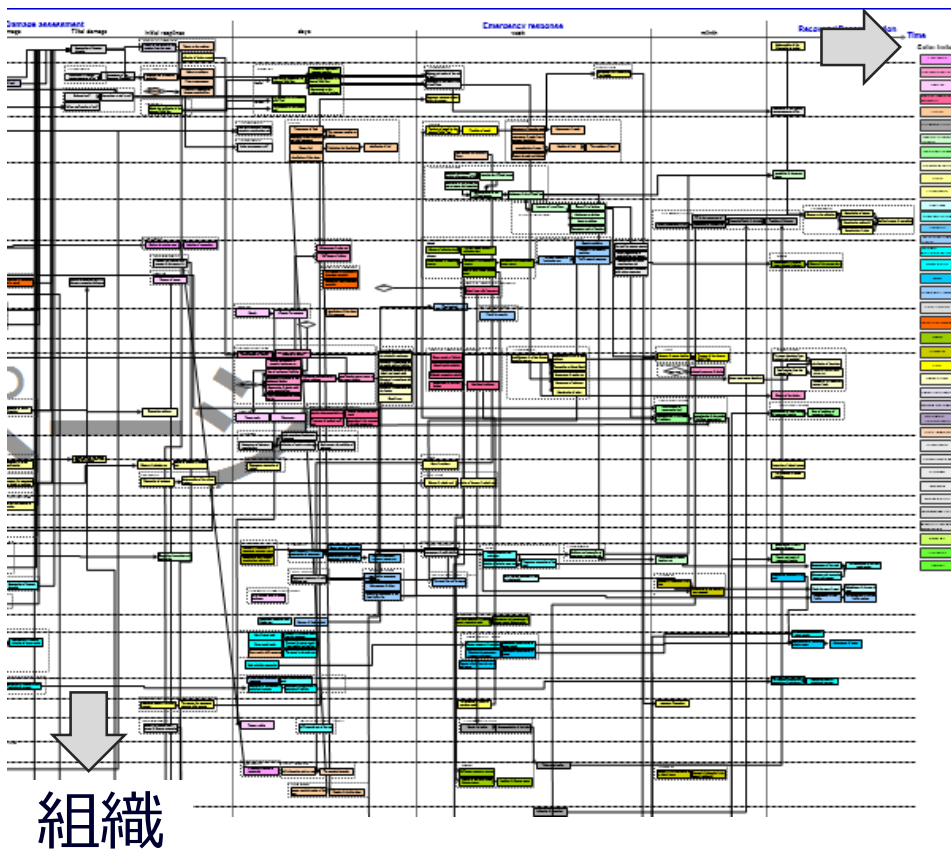
# BOSS

## Business Operation Support System

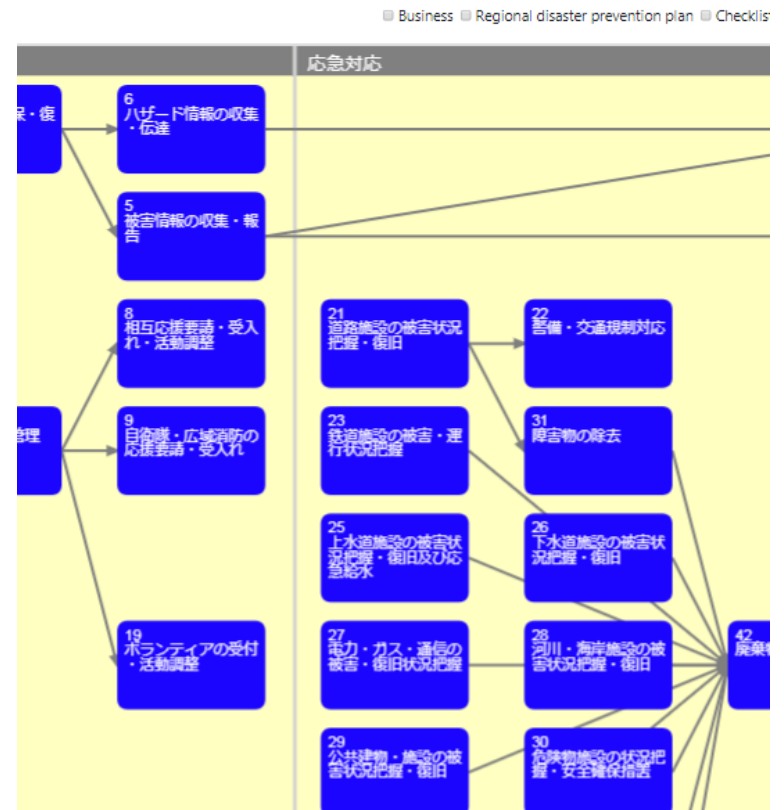


# SOP > Process > System

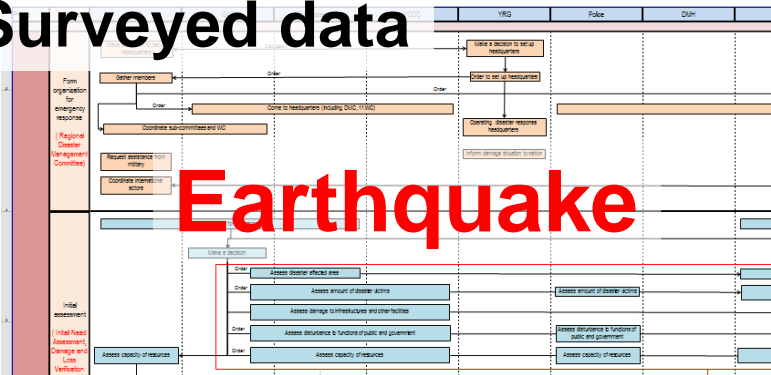
## DMM Process



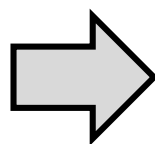
## System: BOSS



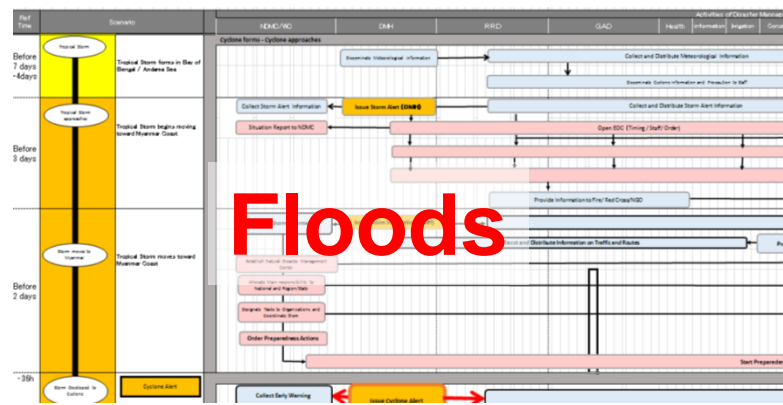
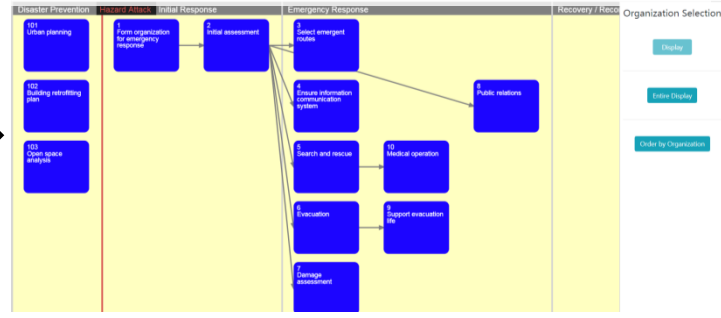
# Surveyed data



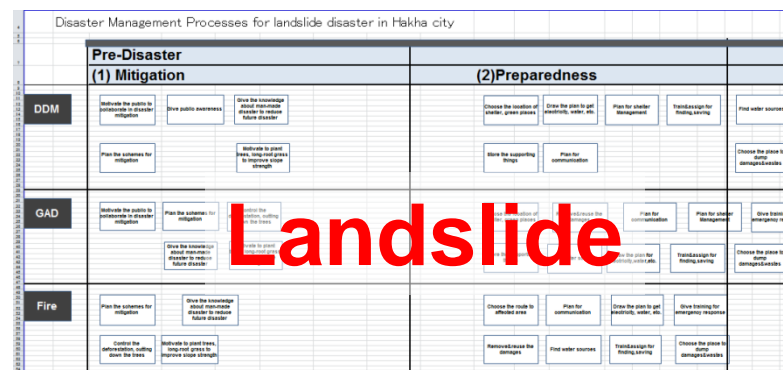
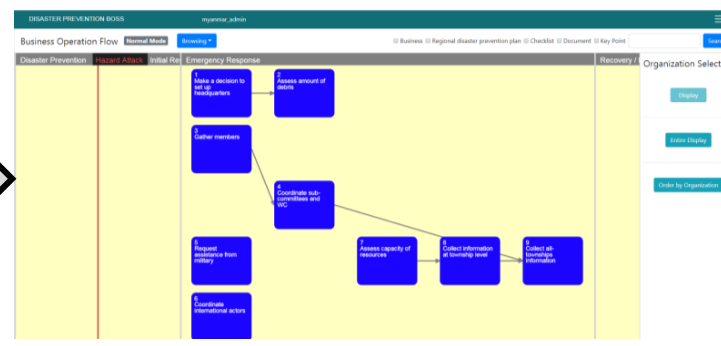
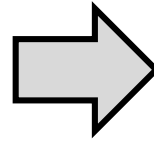
**Earthquake**



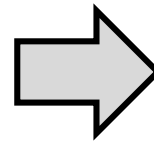
# Imported to the system



**Floods**



**Landslide**



# Development of system for managing the process "BOSS"



<http://150.249.208.3/boss2/process-flowchart/pm/187>

Business Operation Flowchart

Organization Selection

- 知事公室
- 総務部
- 企画振興部
- 健康福祉部
- 環境生活部
- 商工観光労働部
- 農林水産部
- 土木部
- 出納局
- 企業局
- 議会事務局
- 教育庁
- 警察本部

Display

Entire Display

Order by Organization

Big process

Detail process

Detail explanation



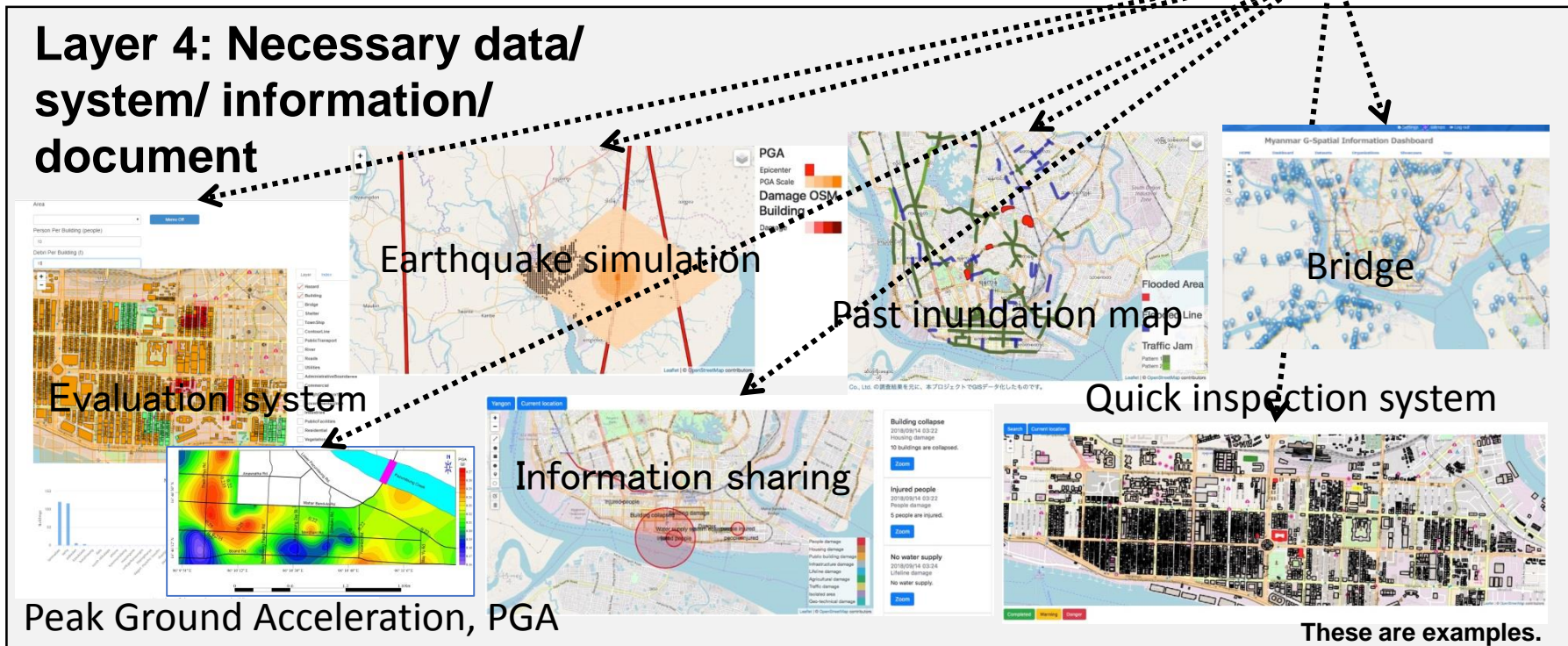
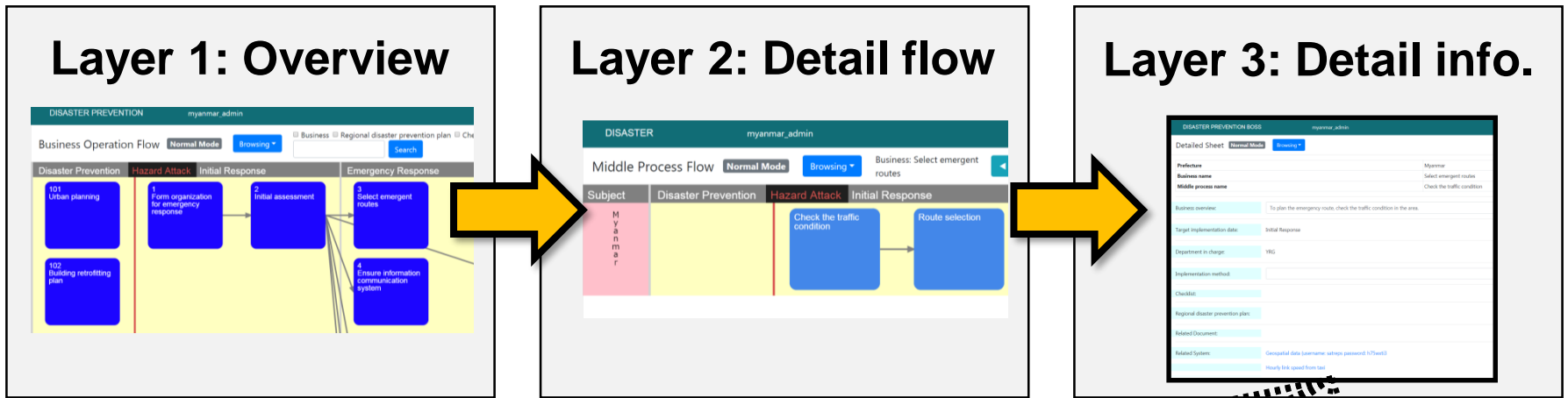
<https://www.youtube.com/watch?v=5PBBuZtdYjo>



Disaster Management Training Center

# Plan, Manual, Law, Form





# Basics of the BOSS

skd.iis-boos.com/work-flowchart

災害対応工程管理システム 地震 minamiizucho\_admin

業務フロー 通常モード

災害予防 発災 初動対応 応急対応 復旧・復興

```

    graph LR
      subgraph Disaster_Prevention [災害予防]
        1[1 災害対策本部の設置・運営]
      end
      subgraph Initial_Response [初動対応]
        2[2 職員の動員・管理]
        4[4 通信機能の確保・復旧]
        5[5 被害情報の収集・報告]
        8[8 相互応援要請・受入れ・活動調整]
        9[9 自衛隊・広域消防の応援要請・受入れ]
        19[19 ボランティアの受付・活動調整]
      end
      subgraph Emergency_Response [応急対応]
        6[6 ハザード情報の収集・伝達]
        21[21 道路施設の被害状況把握・復旧]
        23[23 鉄道施設の被害・運行状況把握]
        25[25 上水道施設の被害状況把握・復旧及び応急給水]
        27[27 電力・ガス・通信の被害・復旧状況把握]
        29[29 公共建物・施設の被害状況把握・復旧]
        24[24 農地・農業施設の被害状況把握・復旧]
        22[22 警備・交通規制対応]
        31[31 障害物の除去]
        26[26 下水道施設の被害状況把握・復旧]
        28[28 河川・海岸施設の被害状況把握・復旧]
        30[30 危険物施設の状況把握・安全確保措置]
        17[17 文教施設の対応、応急教育]
      end
      subgraph Restoration_Recovery [復旧・復興]
        10[10 住民への全庁的広報・マスメディア対応]
        47[47 災害救助法等災害関連法令の事務]
        43[43 財政・金融関連の措置]
        45[45 財源の確保・基金の活用]
        46[46 災害関連の出納]
      end
      1 --> 2
      1 --> 4
      2 --> 5
      2 --> 8
      2 --> 9
      2 --> 19
      4 --> 6
      5 --> 6
      5 --> 21
      5 --> 23
      5 --> 25
      5 --> 27
      5 --> 29
      5 --> 24
      6 --> 10
      6 --> 47
      21 --> 22
      23 --> 31
      25 --> 26
      27 --> 28
      29 --> 30
      24 --> 17
      10 --> 43
      10 --> 45
      10 --> 46
      47 --> 43
      47 --> 45
      47 --> 46
  
```

組織選択

- 総務課総務係
- 総務課財政係
- 総務課防災係
- 議会事務局
- 企画課企画係
- 企画課情報政策係
- 地方創生審地方創生係
- 商工観光課観光推進係
- 商工観光課商工振興係
- 地域整備課公共管理係
- 地域整備課建設設備係
- 地域整備課農林水産振興係
- 生活環境課水道係
- 生活環境課下水道係
- 生活環境課生活環境係
- 健康増進課健康増進係
- 健康増進課国民健康保険係
- 福祉介護課介護保険係
- 福祉介護課福祉係
- 福祉介護課子育て支援係
- 会計室会計係
- 町民課総務係
- 町民課納税係
- 町民課住民年金係
- 教育委員会学校教育係
- 教育委員会社会教育係

表示 全体表示 組織順

2月20日(木)\_村...doc DM policy english.pdf DM Act English.pdf BOSS活用訓練開...doc FR JP ABSTRACT 2...pdf

ここに入力して検索 14:53 2019/12/26

# Myanmar project supported by JICA

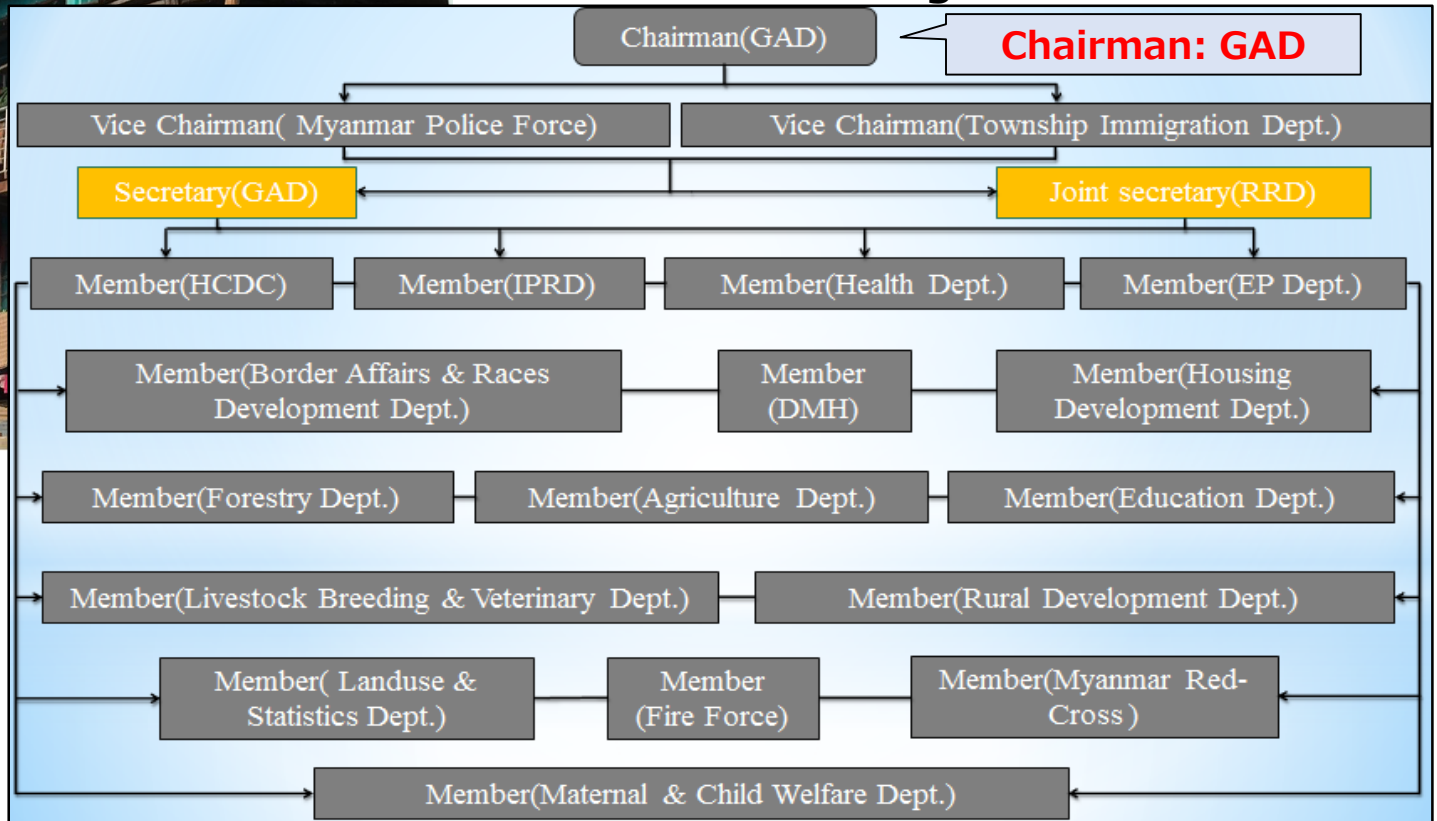
Disaster Management Support System

[Our activity](#) [Training materials](#) [Our system](#) [Our team](#) [Informations](#) [Contact](#) [Only member](#)



<http://www.disasterinfo.jp/bs/mmr/>

## Township Natural Disaster Management Working Committie





The screenshot shows the SATREPS website interface. At the top, there is a navigation bar with the SATREPS logo and the text "地球のために、未来のために". To the right, there are links for "よくあるご質問", "お問い合わせ・ご意見", "関連リンク", and "ENGLISH", along with a search box labeled "Googleサイト内検索" and a "検索" button. Below the navigation bar, there are tabs for "SATREPSについて", "活動事例", "研究課題一覧", "研究課題と事業の評価", "研究機関の皆さま", and "広報関連". The main content area features a banner with a globe and a headline in Japanese: "『ミャンマーの災害対応力強化システムと産学官連携プラットフォームの構築』 災害リスクの評価と万全な備えて、安全な都市を形成せよ!". Below the banner, there are two profile cards for research representatives: 目黒 公郎 (Japan) and キンタンユー (Myanmar). The bottom section lists domestic and international research institutions.

<https://www.youtube.com/watch?v=hI4qNPTQUWM&feature=youtu.be>



# Disaster Management Process based training



GAD training for directors  
6 February 2019.



Total about 350  
GAD staffs are  
trained.



## Chart of the Sendai Framework for Disaster Risk Reduction 2015-2030

[www.preventionweb.net/go/sfdr](http://www.preventionweb.net/go/sfdr)  
[www.unisdr.org](http://www.unisdr.org)  
[isdr@un.org](mailto:isdr@un.org)

### Scope and purpose

### Scope and purpose

The present framework will apply to the risk of small-scale and large-scale, frequent and infrequent, sudden and slow-onset disasters, caused by natural or manmade hazards as well as related environmental, technological and biological hazards and risks. It aims to guide the multi-hazard management of disaster risk in development at all levels as well as within and across all sectors.

### Target:

Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to people by 2030

### Targets

Substantially reduce global disaster mortality by 2030, aiming to lower average per 100,000

Substantially reduce the number of affected people globally by 2030, aiming to lower the average

Reduce direct disaster economic loss in relation to global gross domestic product

Substantially reduce disaster damage to critical infrastructure and disruption of basic services, among

Substantially increase the number of countries with national and local disaster risk reduction strategies

Substantially enhance international cooperation to developing countries through adequate and

Substantially increase the availability of and access to multi-hazard early warning systems and

## Priorities for Action

**Priority 1:** Understanding disaster risk.

**Priority 2:** Strengthening disaster risk governance to manage disaster risk.

**Priority 3:** Investing in disaster risk reduction for resilience.

**Priority 4: Enhancing disaster preparedness for effective response**  
and to “Build Back Better” in recovery, rehabilitation and reconstruction.

# Sri Lanka Since 18th December 2019



7,025 people (2,062 families) are reported to have been affected, in ten (12) Districts during the since 18th December 2019.

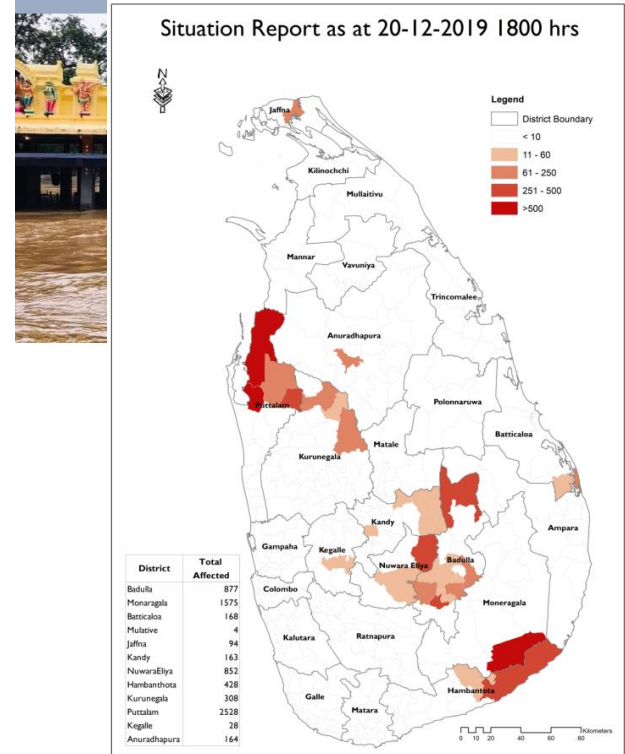
Further, 2 persons are reported to be dead due to floods and cutting failure.

### Situation Report Summary

Heavy rains, flooding, landslides

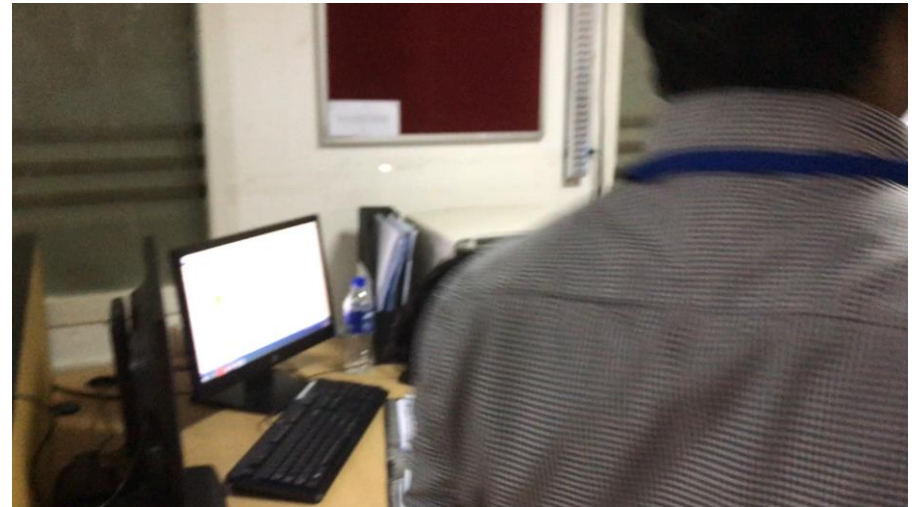
## Sri Lanka

1800 hours 20-12-2019





# Heavy rain disaster response at EOC of DMC



EOC room



SOP



# Disaster Management Center in Sri Lanka

**Before**

**After**

Mitigation

Preparedness

Warning

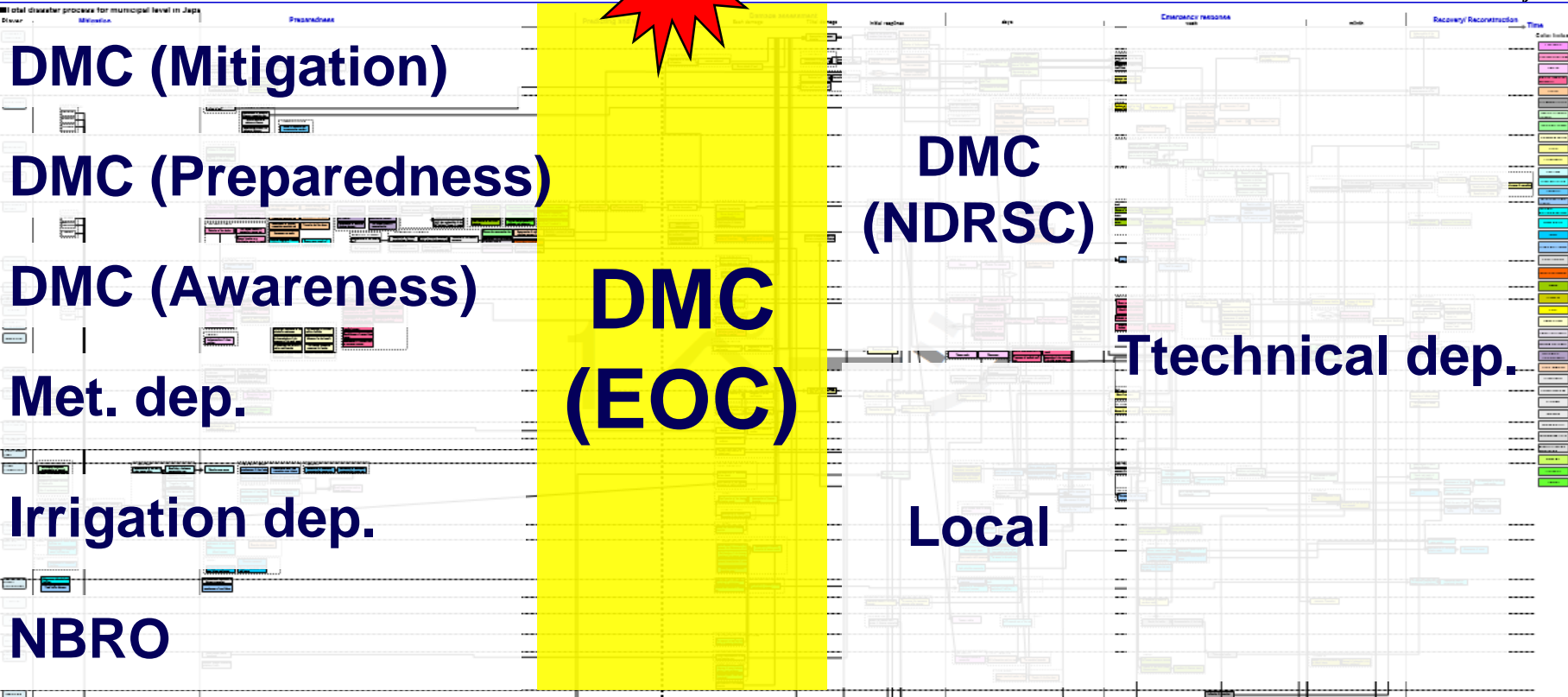
Assessment

Emergency

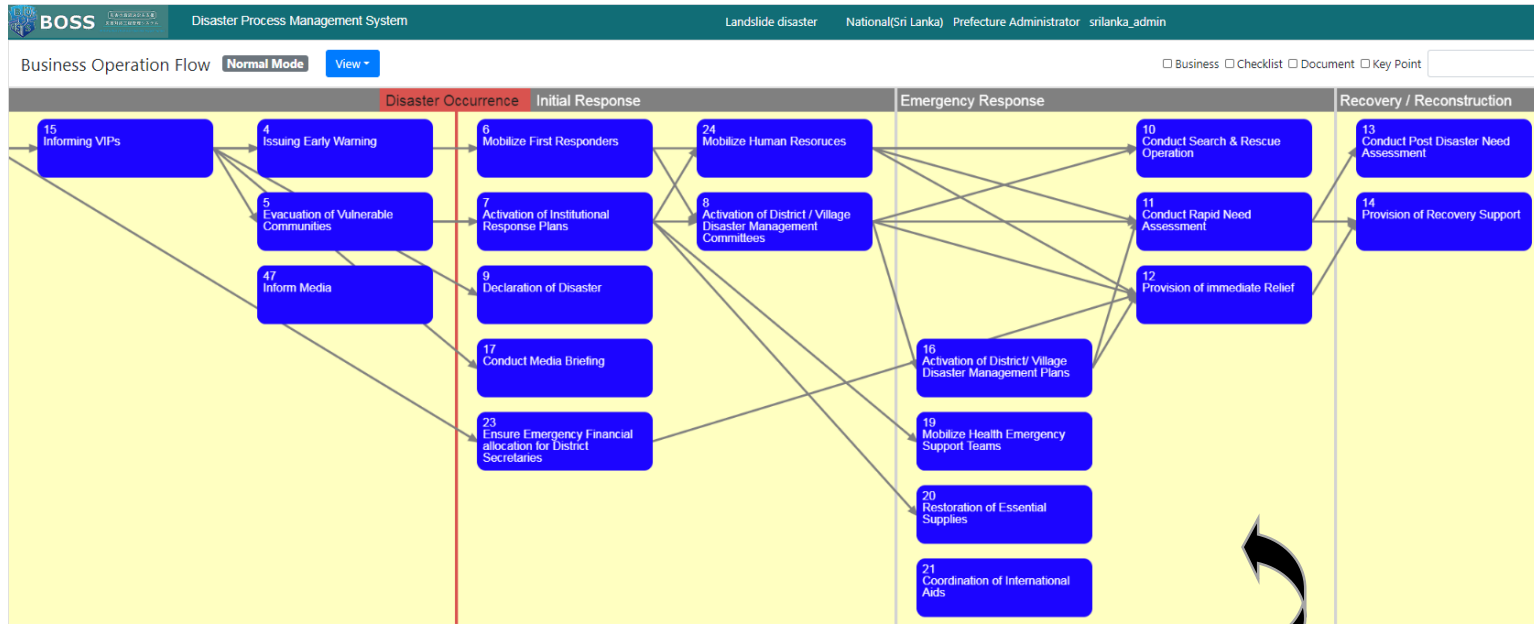
Recovery

Reconstruction

Time

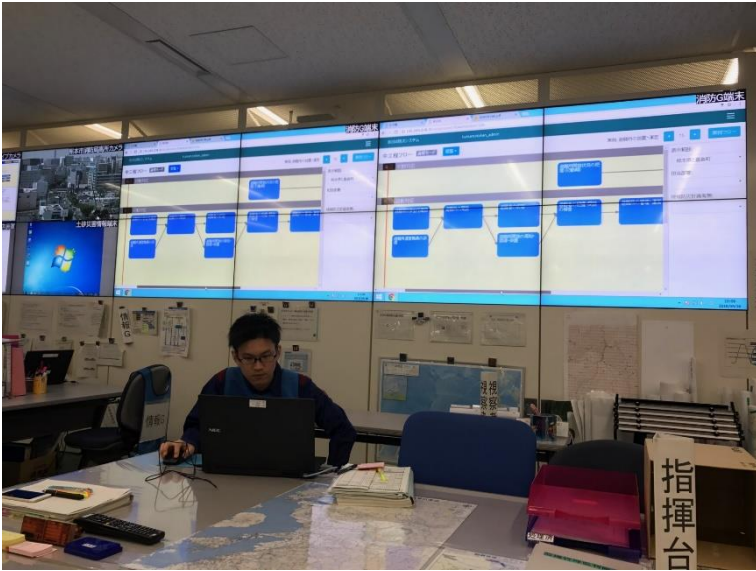


# Data Archive of documents for knowledge sharing



**Data Archive/  
Data base**

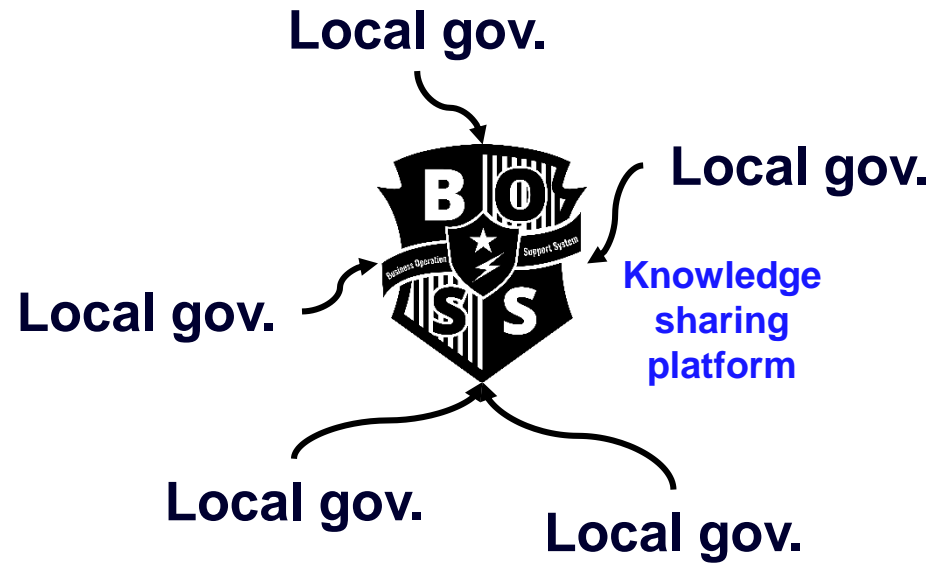
Disaster Management Training Center



Local gov



Local gov.

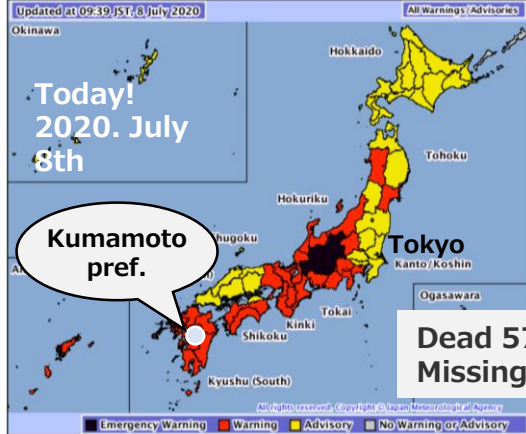


# BOSS at EOC

## 2020 July Heavy rain disaster

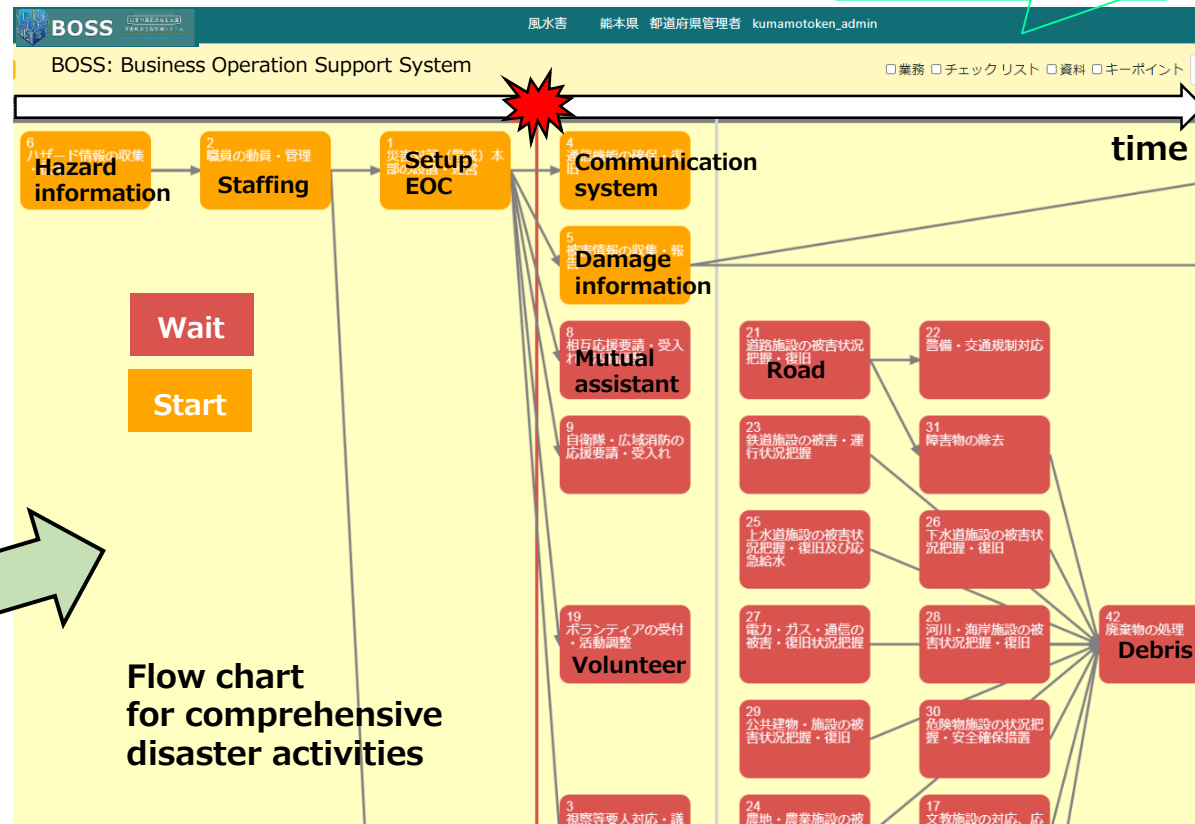
Emergency Weather Warnings

Currently valid Warnings/Advisories



EOC manages the response process by **BOSS**

SOP management system.  
47 categories and  
500 process are defined.



## EOC @Kumamoto prefecture



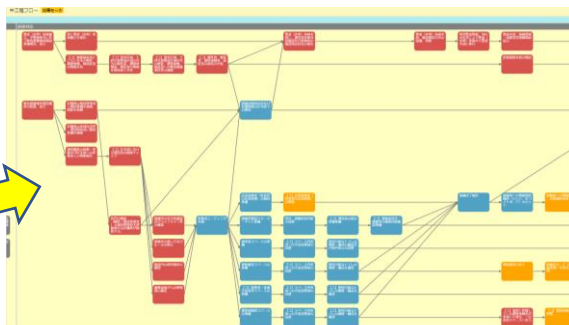


# Compare BOSS and Paper Manual (Only conventional paper)

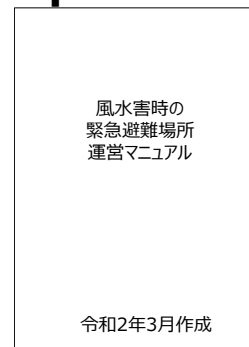
## BOSS team



Shelter management: about 300 kinds response work-flows



## Paper Manual team



- ① Mission① キャリーカートの持ち出し
- ② Mission② 避難所案内幕の設置
- ③ Mission③ 受付道具の準備
- ④ Mission④ ペットの受入場所の設置
- ⑤ Mission⑤ 受付開始
- ⑥ Mission⑥ 閉鎖時の対応

No	Team	Leader	Members	Prepare
No.1	Manual	Young staff without experiences	Young staffs without experiences	No
	BOSS	Young staff <b>with</b> experiences	Young staffs without experiences	No
No.2	Manual	Middle age staff <b>with</b> experiences	Middle age staffs <b>with</b> experiences	<b>Pre-training</b>
	BOSS	Young staff without experiences	Middle age staffs without experiences	No

**BOSS team**

Leader: Experience  
Member: No experience



**Manual team**

Leader: No experience  
Member: No experience



**EOC**

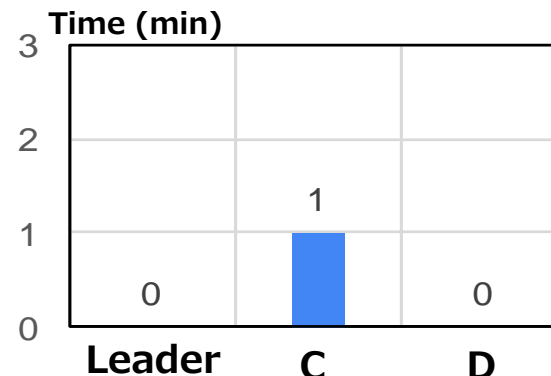
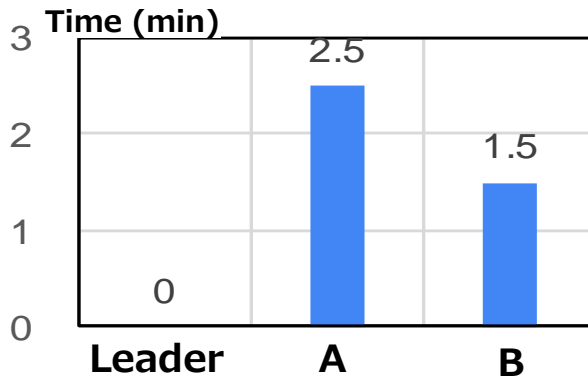




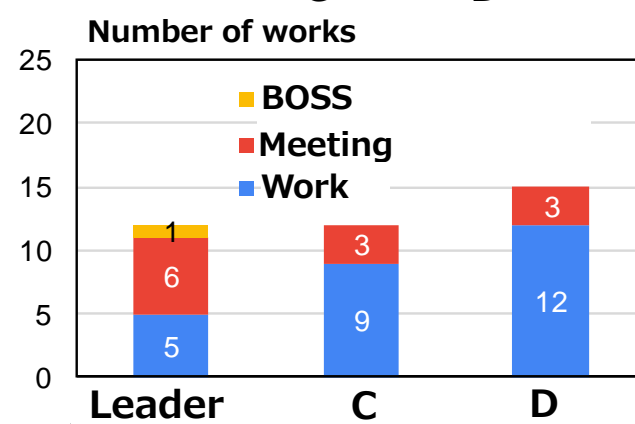
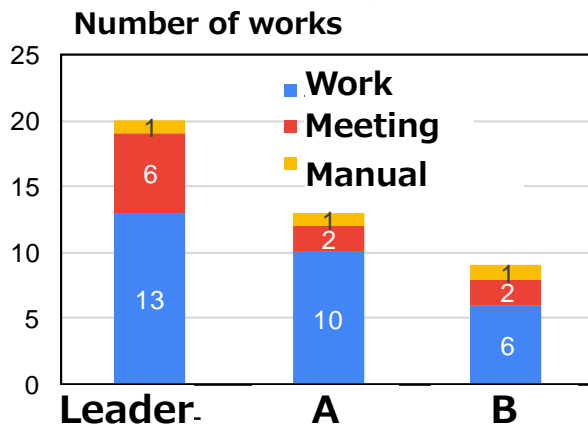
### Manual team

### BOSS team

Waiting time

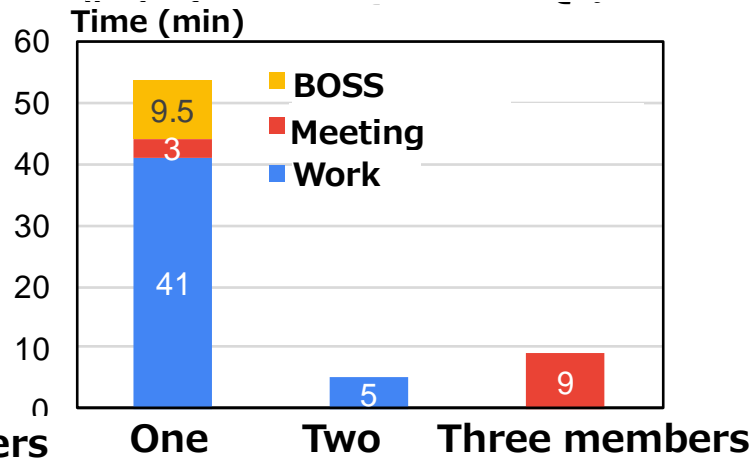
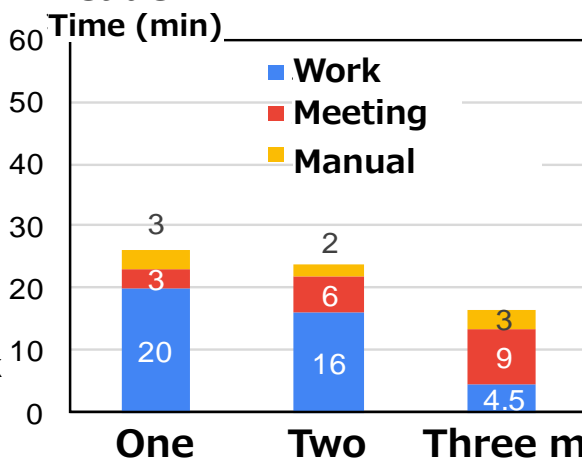


Number of works



Time of different number of staffs

How many staffs work for same job together



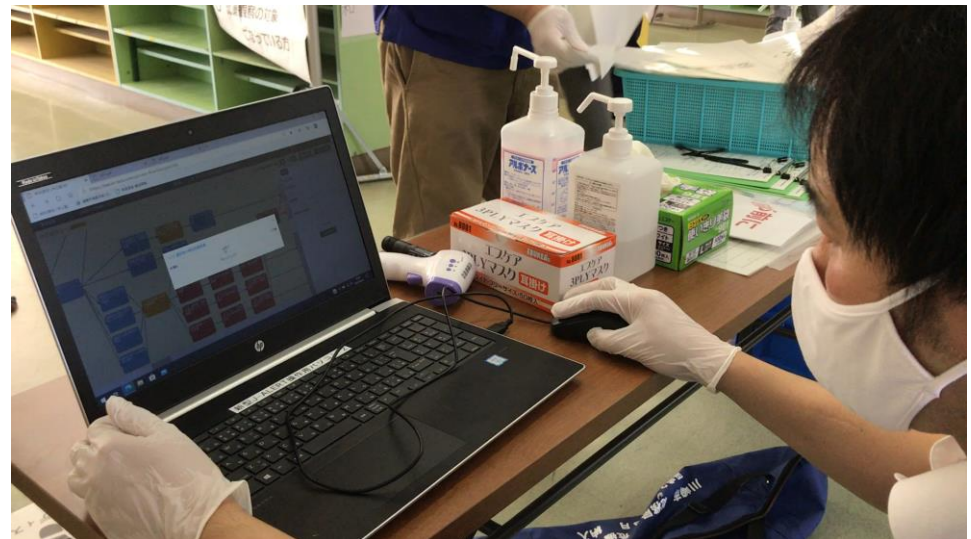


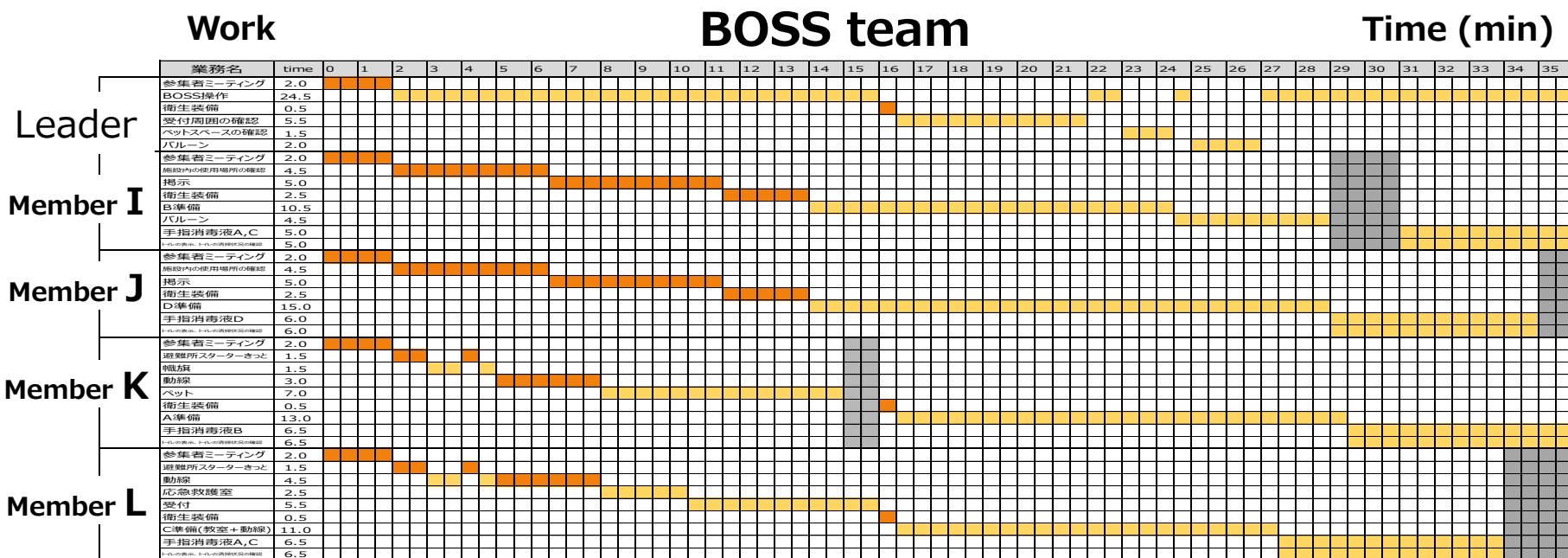
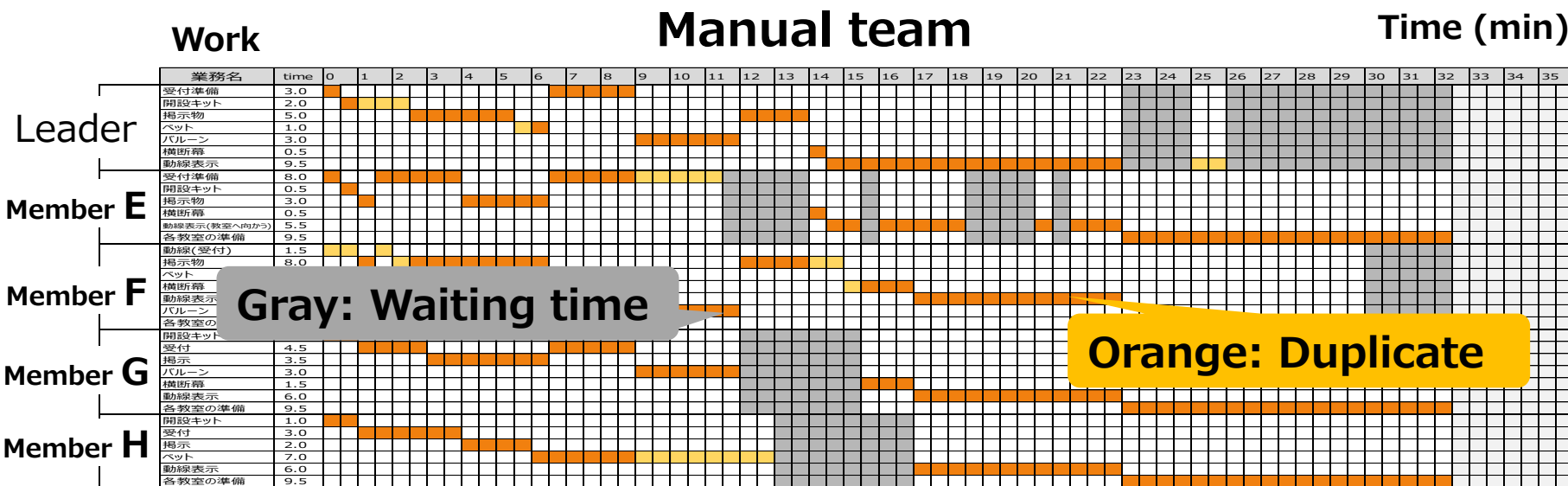


**Manual team  
(Experienced)**



**BOSS team  
(No Experienced)**

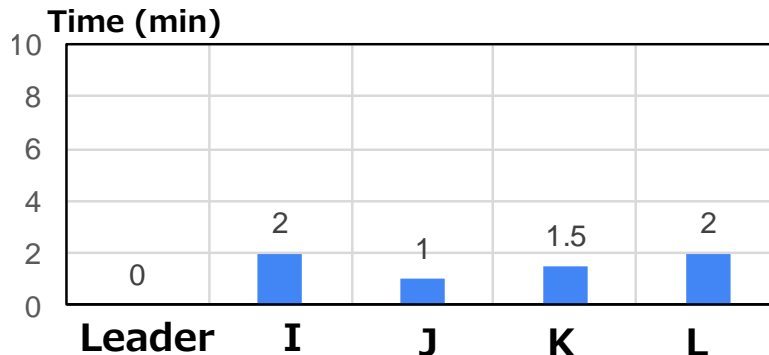
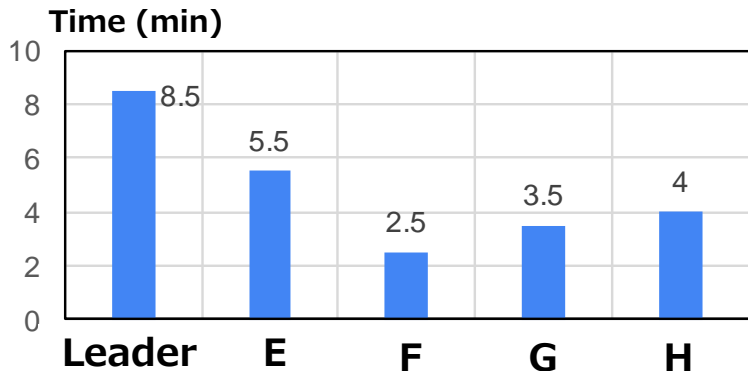




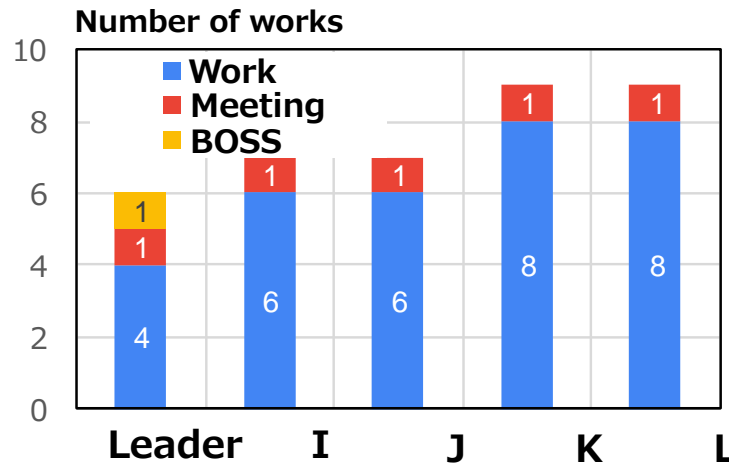
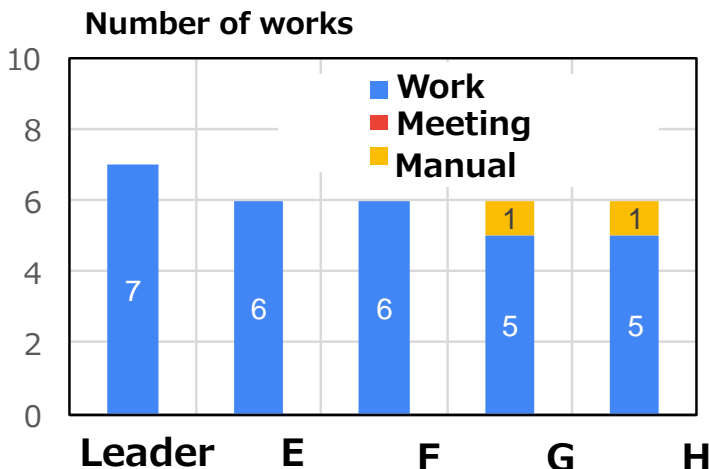
### Manual team

### BOSS team

Waiting time

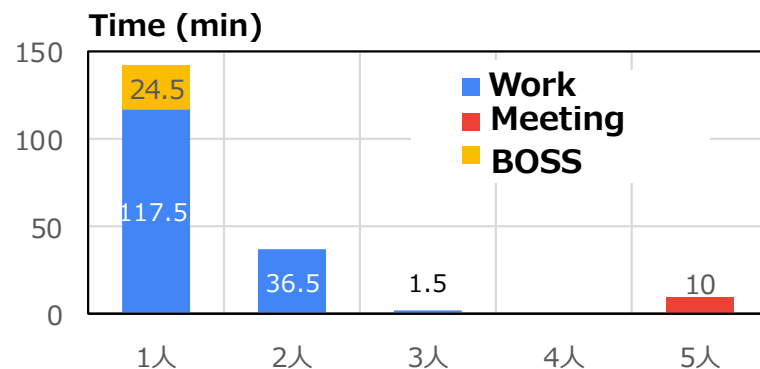
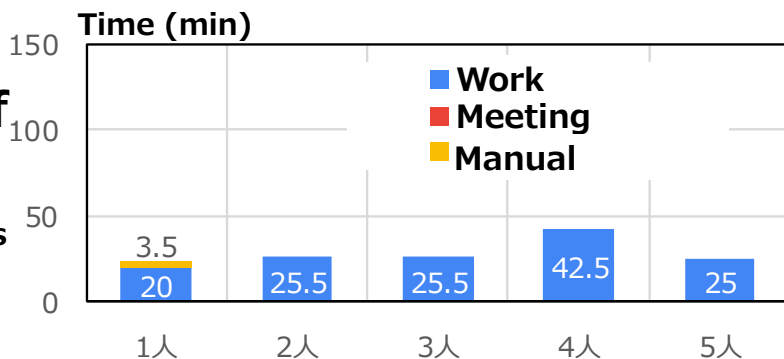


Number of works



Time of different number of staffs

How many staffs work for same job together



# BOSS needs good contents from manual

As a result, by utilizing the BOSS, the leader gave the members instructions to clarify their roles. The members shared the work efficiently without duplication, waiting for instructions, and what to do next.

But...

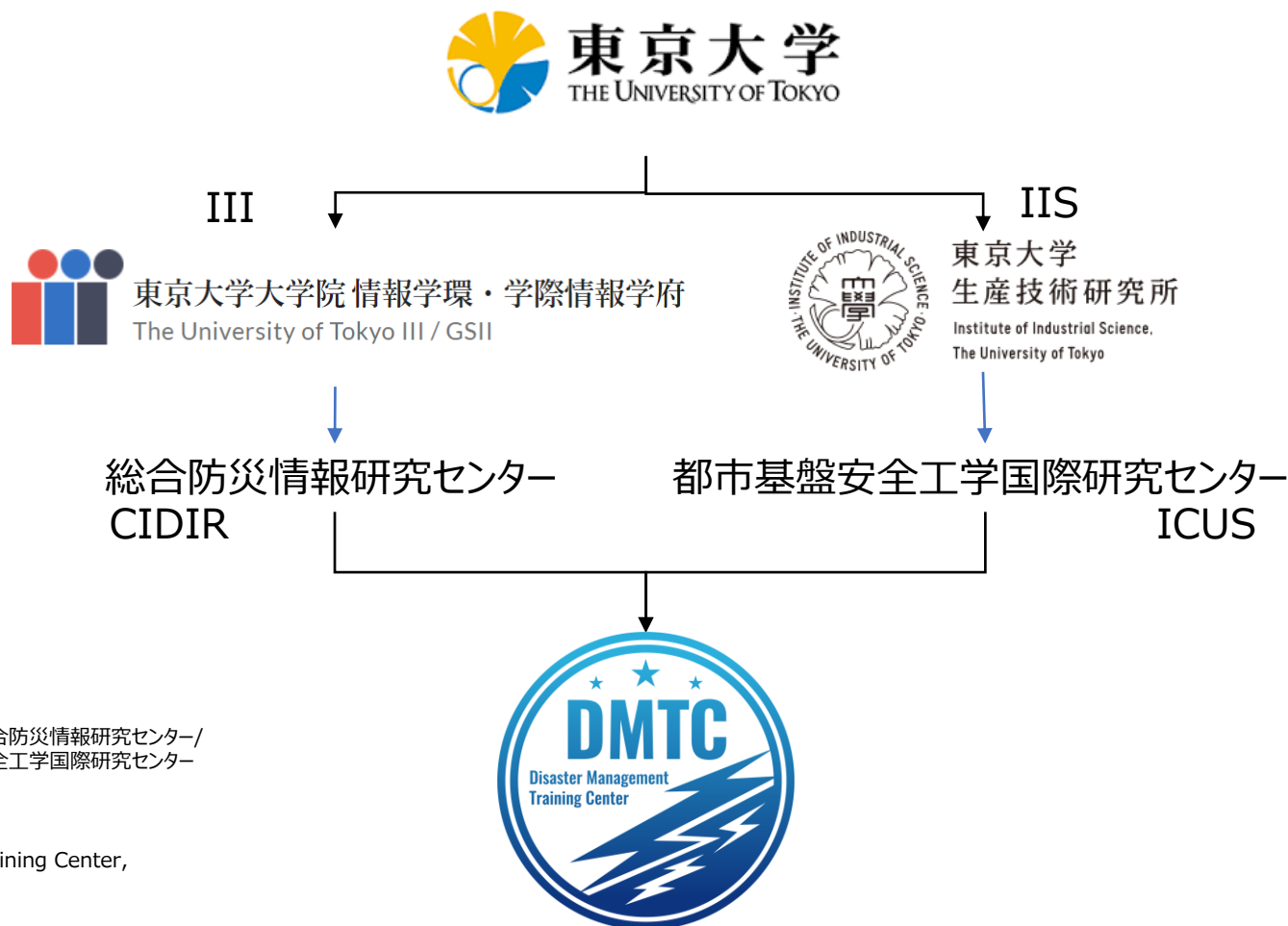
If BOSS don't show the necessary workflow, the members cannot response based on the flow.

Therefore, BOSS needs good manuals  
and/ good manual need the BOSS to create the contents.



# DMTC

# Organization



(和文名称)

東京大学大学院情報学環総合防災情報研究センター/  
生産技術研究所都市基盤安全工学国際研究センター  
災害対策トレーニングセンター

(英文名称)

Disaster Management Training Center,  
CIDIR, III/ ICUS, IIS,  
The University of Tokyo.

# No Process, No System, No practical Training

## Performance

Good performance need "awareness"



## Training course

Executive course

Advanced course

Standard course

## Training tools

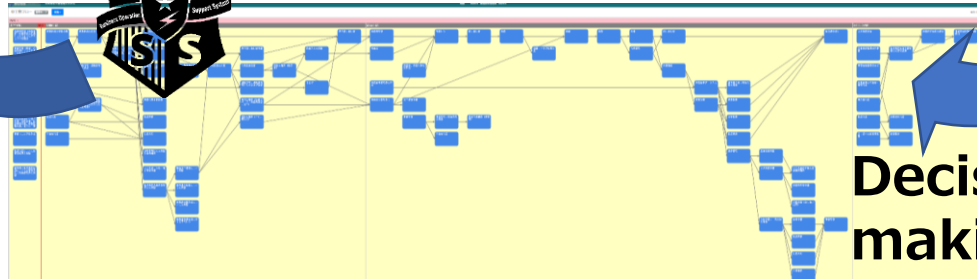
VR



## Online campus



## Awareness



Process based basic understandings

Decision-making/  
Planning

# Basic knowledge and practical training

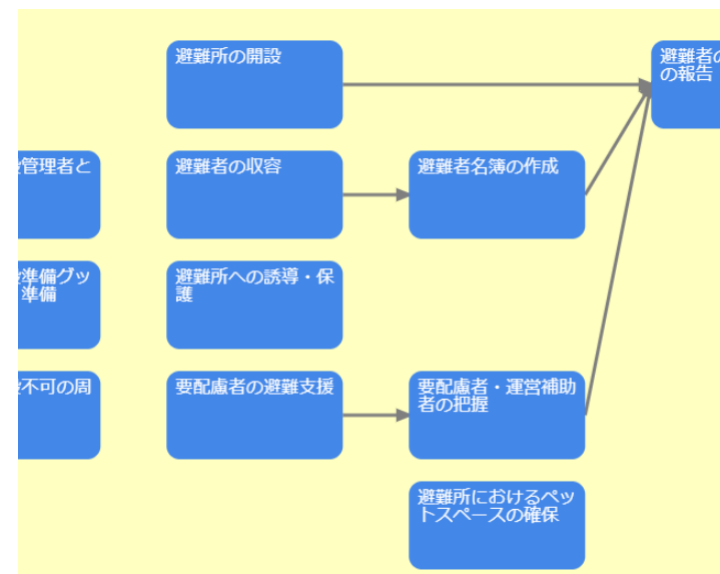
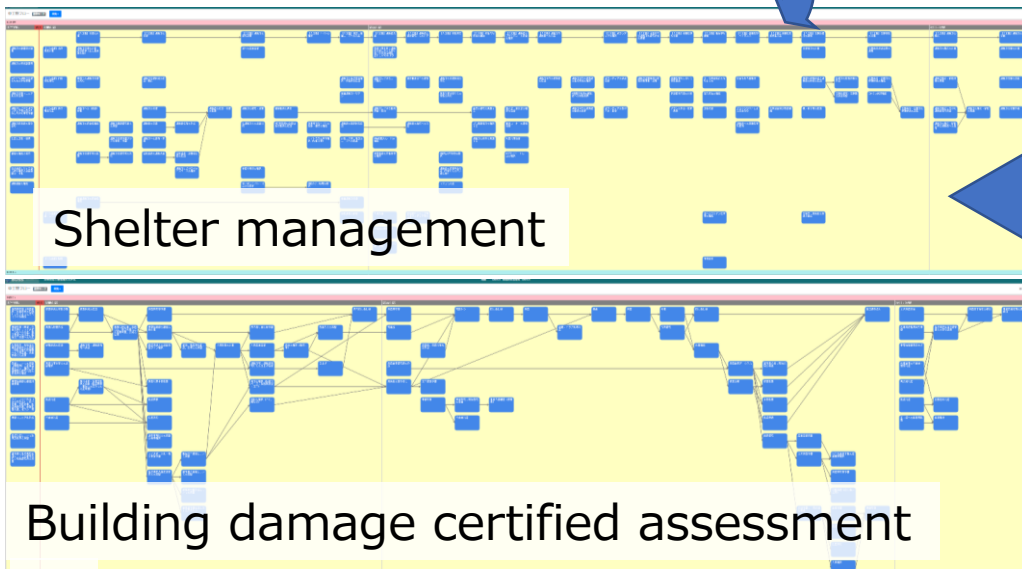




# Advantage of Online platform



Discussion and Share the past experiences from Hokkaido to Kagoshima pref.  
**Create ideal process.**



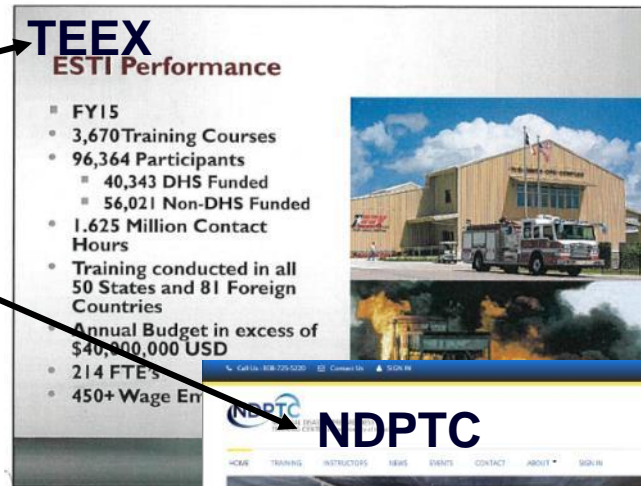
...

# Consortium can manage all training contents

## Member

1. TEEX
2. NDPTC
3. CDP
4. LSU-NCBRT
5. NNSA-CTOS
6. NMT-EMRTC
7. TTCI-SERTC

} Visited



**TEEX**  
ESTI Performance

- FY15
- 3,670 Training Courses
- 96,364 Participants
  - 40,343 DHS Funded
  - 56,021 Non-DHS Funded
- 1.625 Million Contact Hours
- Training conducted in all 50 States and 81 Foreign Countries
- Annual Budget in excess of \$40,000,000 USD
- 214 FTE's
- 450+ Wage Emp



**NDPTC**

Home TRAINING INSTRUCTORS NEWS EVENTS CONTACT ABOUT SIGN IN

The University of Hawaii's NDPTC (National Disaster Preparedness Training Center) hosted the National Domestic Preparedness Consortium in Honolulu.

// Mailing List  
Sign Up Today!

Enter your email address to receive NDPTC newsletters, updates and information.

Your Email:

Submit

## Committee

1. Curriculum Course development
2. Operation
3. Information

# BNPB



Deputy director







# ROAD MAP INA DRTG (2014-2024)

## INA DRTG Strategic Management Mileston

1. **Building Strategic Planning**
2. Integrated mngt System
3. Human Resouces development
4. **Infarstructure**
5. **Training Curriculum**
6. **Training attendance from indonesia**
7. **Cooperation with ASEAN**

## Internatónal Standard: ASEAN's

1. Buiding réputation in ASEAN
2. **Training attendance from Indonesia & ASEAN**
3. **Training program**
4. Cooperation with Asia Countries

## International Standard: ASIAN's

1. Buiding reputation in ASIA
2. **Training attendance from Asia**
3. Have 1.0 int'l training program

## International Standard: World

1. **Buiding reputation in The World**
2. Training attendance all over the world
3. Have 15 int'l training program
4. Cooperation with all countries

**INA-DRTG :  
World  
Leader**

2 Years

4 Years

6 Years

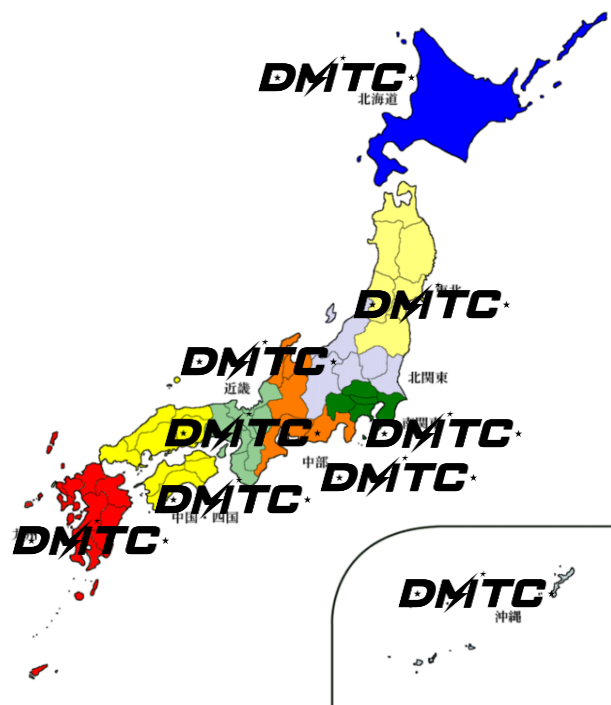
8 Years

10 Years



# All Japan and international platform for future DRR

## All Japan platform



## How can we make an international platform



## Disaster training program network

**Muneyoshi Numada**  
numa@iis.u-tokyo.ac.jp

<http://tdmtc.tokyo/>

**Thank you**

The 2011 Tohoku disaster: taken 26<sup>th</sup> March 2011 by Numada