Group 4
A method of human resource development to effectively utilize the Integrated Expert System

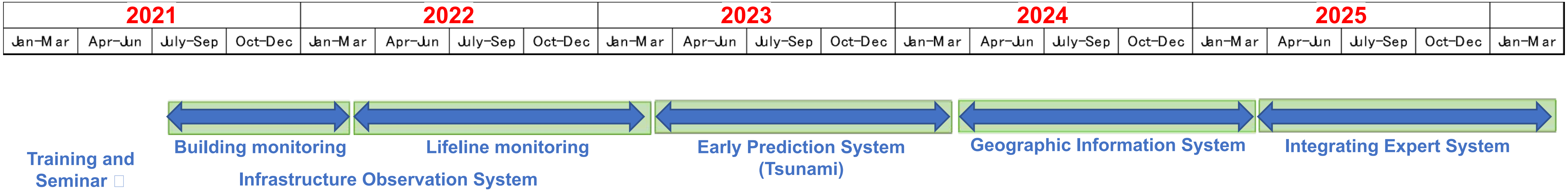
Francisco RIOS (CISMID, UNI)
Takuya NAGAE (Nagoya University)

OBJECTIVES

4-1 Enhance the capabilities of stakeholders and governmental officers to use the integrated expert system, under pre-disaster and post-disaster.

4-2 Awareness of the local government by promoting a sensibilization campaign in the most expected damaged sectors in the target area.

4-3 Awareness the community by the use of easy tools to alert at what level of risk they are exposed, if a big earthquake occurs.



2021				2022				2023				2024				2025				
Jan-Mar	Apr-Jun	July-Sep	Oct-Dec	Jan-Mar	Apr-Jun	July-Sep	Oct-Dec	Jan-Mar	Apr-Jun	July-Sep	Oct-Dec	Jan-Mar	Apr-Jun	July-Sep	Oct-Dec	Jan-Mar	Apr-Jun	July-Sep	Oct-Dec	Jan-Mar

Training and Seminar □

Building monitoring

Lifeline monitoring

Infrastructure Observation System

Early Prediction System (Tsunami)

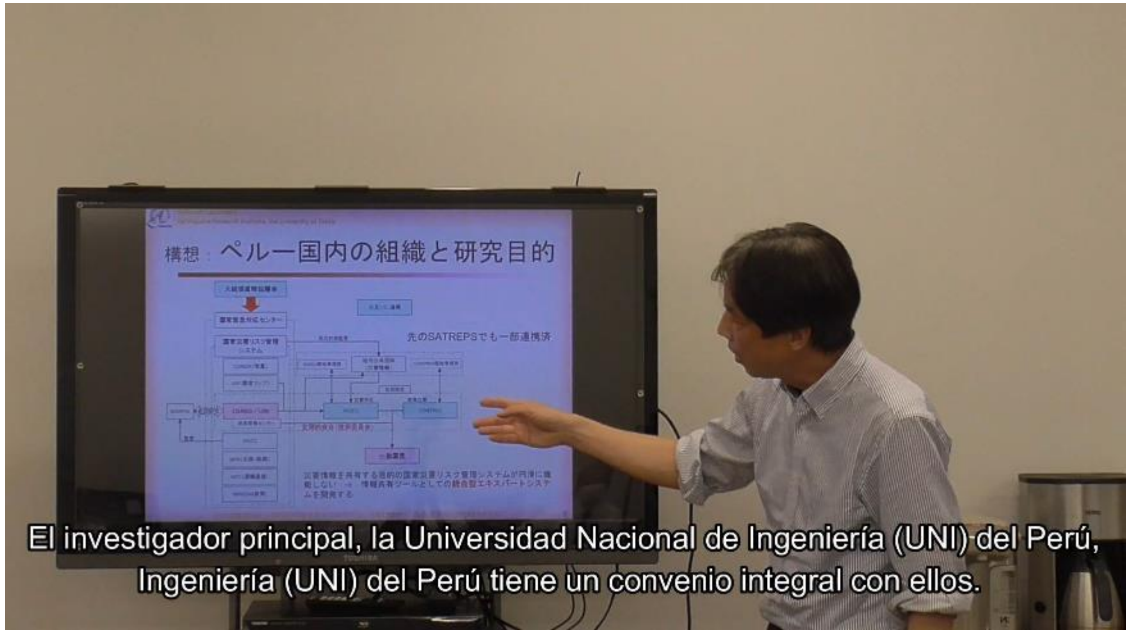
Geographic Information System

Integrating Expert System

*Functions consisting of Expert System will be demonstrated, given the representation of entire system design.
*Integrating Expert System will be used from 2025.

Prof. Kusunoki, ERI

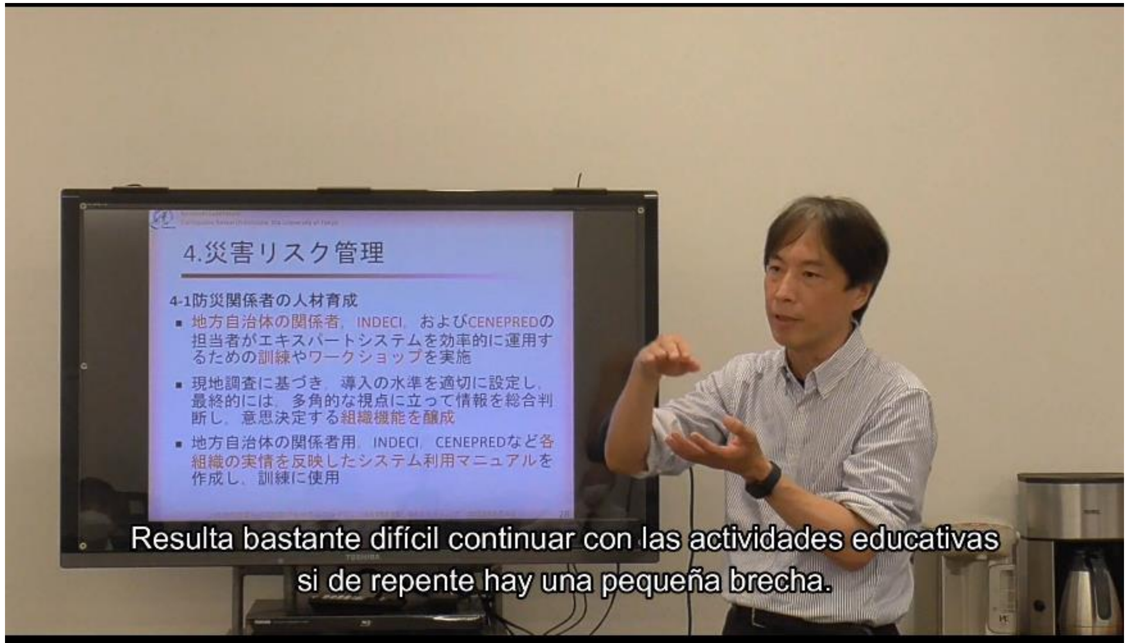
Face-to-face discussion event in Shizuoka, June 2022



構想：ペルー国内の組織と研究目的

先のSATREPSでも一部連携済

El investigador principal, la Universidad Nacional de Ingeniería (UNI) del Perú,
Ingeniería (UNI) del Perú tiene un convenio integral con ellos.



4.災害リスク管理

4-1防災関係者の人材育成

- 地方自治体の関係者、INDECI、およびCENEPREDの担当者がエキスパートシステムを効率的に運用するための訓練やワークショップを実施
- 現地調査に基づき、導入の水準を適切に設定し、最終的には、多角的な視点に立って情報を総合判断し、意思決定する組織機能を醸成
- 地方自治体の関係者用、INDECI、CENEPREDなど各組織の実情を反映したシステム利用マニュアルを作成し、訓練に使用

Resulta bastante difícil continuar con las actividades educativas
si de repente hay una pequeña brecha.

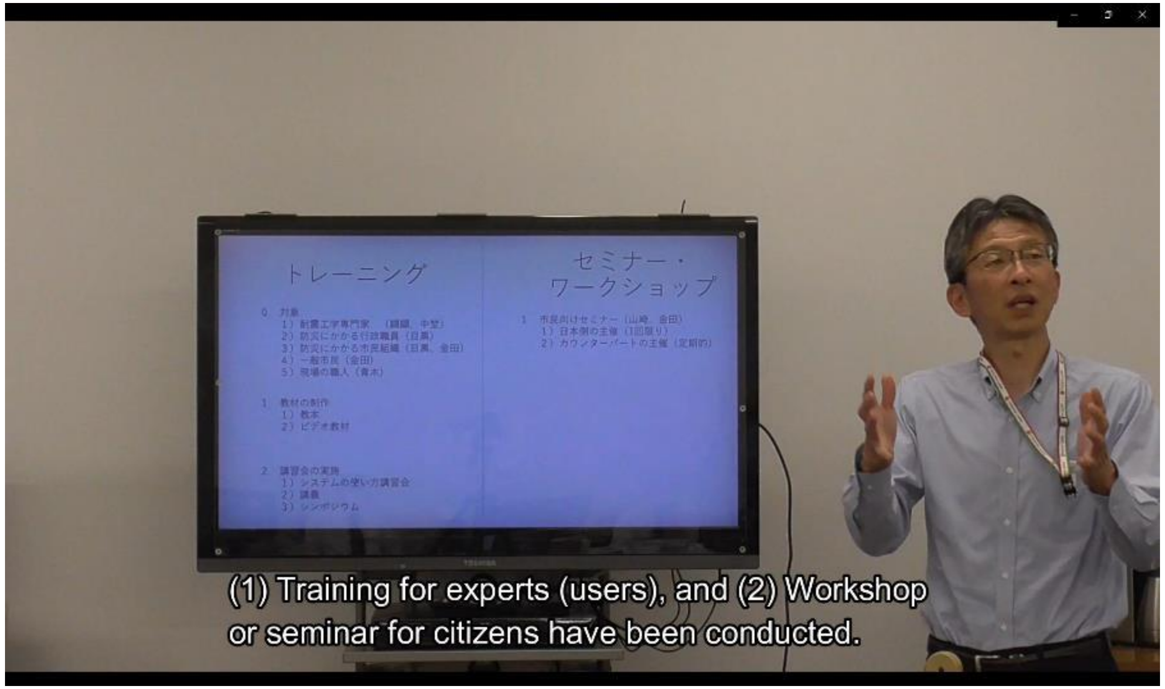
The purpose is disaster risk management. One of the major points is to develop human resources for disaster prevention personnel. It will be developed for those who mainly use the expert system, or for persons who need to make administrative decisions towards those who evacuate.

Regarding the expert system developed this time, such people will be trained to understand how to use it and what can be done with it.

There are INDECI and CENEPRED in Peruvian side. So, it's reasonable proceed with education activities together.

Raising the awareness of disaster prevention among the general public is targeted. For example, introductory videos and comprehensible texts will be produced.

G4 Prof. Tanaka, Tokoha University


トレーニング
セミナー・ワークショップ

(1) Training for experts (users), and (2) Workshop or seminar for citizens have been conducted.

Face-to-face discussion event in Shizuoka, June 2022

Reviewing the past SATREPS projects, the ideas were indicated regarding the earthquake disaster prevention for our Group 4.

First is a field survey that investigated the needs revealing what is necessary, or what is missing.

After developing a corresponding system for it, training will be performed on-site. Basically produced will be education materials and seminars and workshops may be held for the presentations on the results of training.

After that, such training systems will be taken over to the communities to use it continuously.

The first seminar can be held with Japanese tools, and after that, such mechanism will be taken over by the peruvian counterpart to continue.

Strategy using Science Literacy;

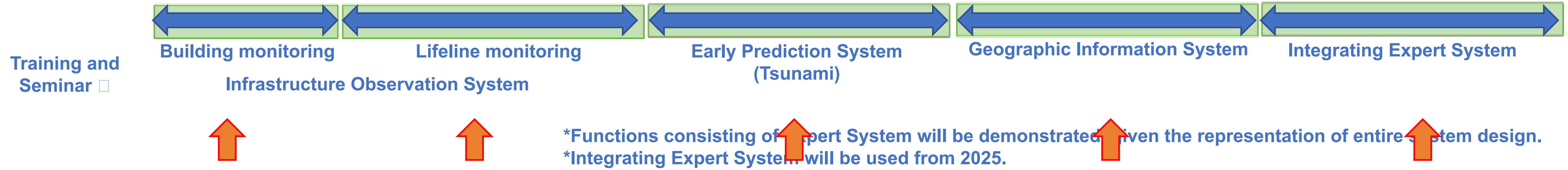
Education programs will be proposed with a series of the discipline explanation tools.

That is because education effects are well enhanced by the understanding process of the disciplines.

The disciplines are the outcomes from each group.

As the investigations of groups 1, 2 and 3 are developed, training activities will be developed through training and seminars for officials of the entities involved including officers from local Municipalities, so that they can learn the scientific basis of the project.

2021				2022				2023				2024				2025				
Jan-Mar	Apr-Jun	July-Sep	Oct-Dec	Jan-Mar	Apr-Jun	July-Sep	Oct-Dec	Jan-Mar	Apr-Jun	July-Sep	Oct-Dec	Jan-Mar	Apr-Jun	July-Sep	Oct-Dec	Jan-Mar	Apr-Jun	July-Sep	Oct-Dec	Jan-Mar



Training and Seminar

Building monitoring

Lifeline monitoring

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Integrating Expert System

*Functions consisting of Expert System will be demonstrated given the representation of entire system design.
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A famous training evaluation methods

Kirkpatrick's four-point evaluation is commonly used as a conventional training evaluation method. Developed in 1959, it has been widely used in Japan and overseas.

- Level 1 measures satisfaction immediately after training. Evaluated subjectively by participants.
- Level 2 allows objective evaluation by a third party, such as judging the degree of learning achievement based on reports and tests immediately after training.
- Level 3 verifies whether behavioral changes have occurred in daily work due to the effects of the training after completing the training. Evaluation will be conducted through interviews with trainees and interviews with superiors.
- Level 4 examines how the training impacted performance. Evaluate whether the training has created value for the organization as a whole, for example, increased productivity/increased sales.

Not just training but interactions are important!

National Institute of Civil Defense (INDECI)

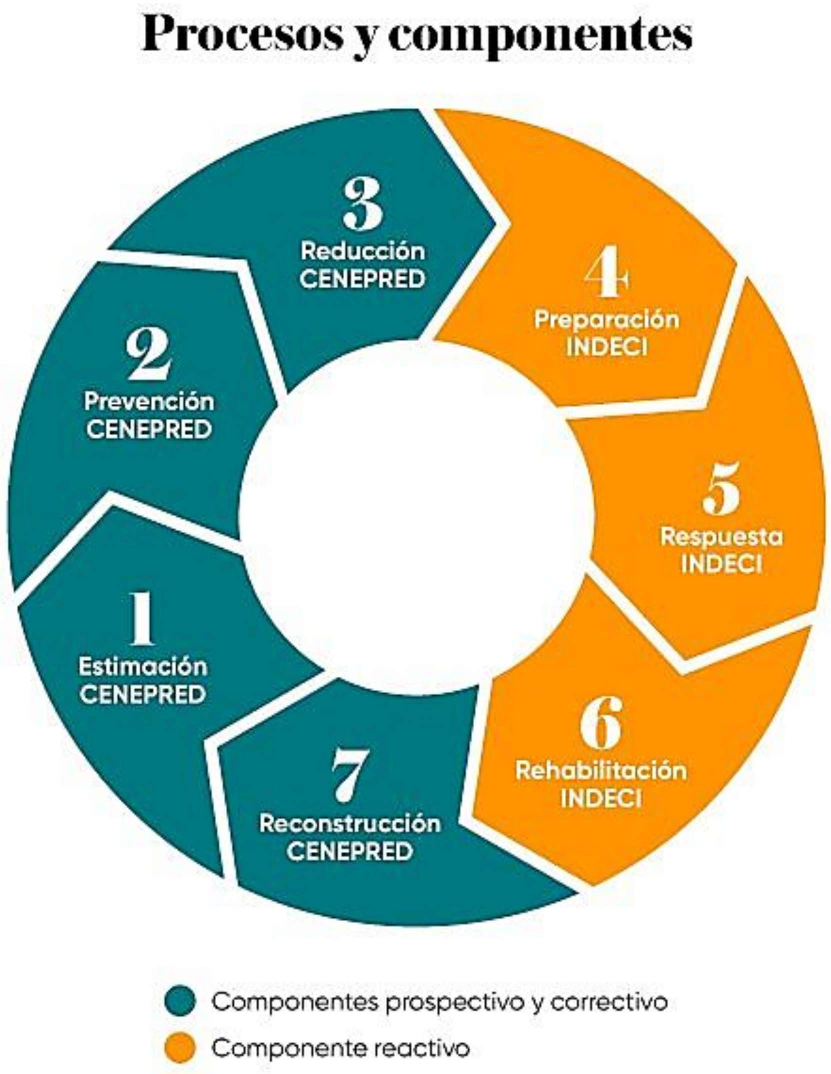
- Conducts reactive management processes within the framework of the National Disaster Risk Management System (SINAGERD) for the benefit of the population in general, their livelihoods and the State's assets in an immediate, permanent and efficient manner.

INDECI
INSTITUTO NACIONAL DE DEFENSA CIVIL

National Center for Disaster Risk Estimation, Prevention and Reduction (CENEPRED)

- Proposes regulations, develop capacities, provide technical assistance and information on prospective and corrective disaster risk management to the members that make up the SINAGERD, in a timely and reliable manner, to reduce the vulnerability of the population and their livelihoods to the risk of disasters.

CENEPRED
Centro Nacional de Estimación, Prevención y Reducción del Riesgo de Desastres

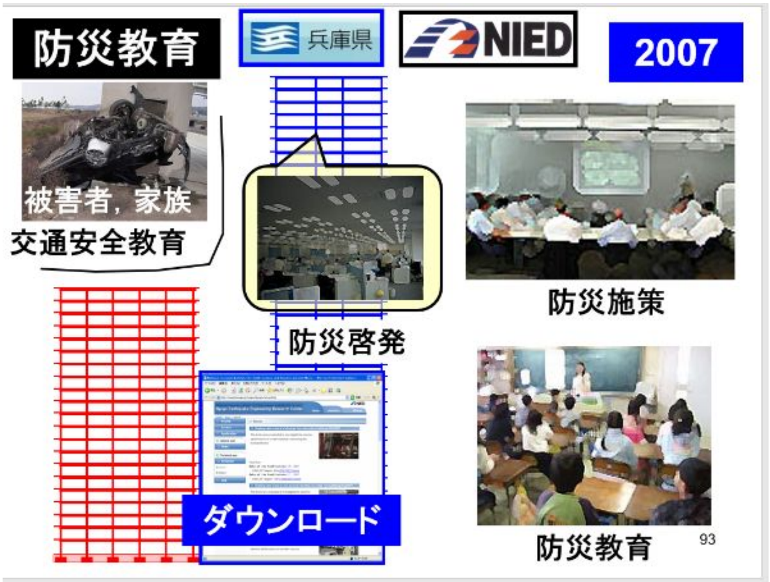

Procesos y componentes
3
Reducción
CENEPRED
4
Preparación
INDECI
2
Prevención
CENEPRED
5
Respuesta
INDECI
1
Estimación
CENEPRED
6
Rehabilitación
INDECI
7
Reconstrucción
CENEPRED
● Componentes prospectivo y correctivo
● Componente reactivo

Processes and components in disaster risk management in Peru:

1. Estimation
2. Prevention
3. Reduction
4. Preparation
5. Response
6. Rehabilitation
7. Reconstruction

Past Activities Disseminating “The Building Damage and The Countermeasure”

School educations



防災教育

兵庫県

NIED

2007

被害者，家族

交通安全教育

防災施策

防災啓発

ダウンロード

防災教育

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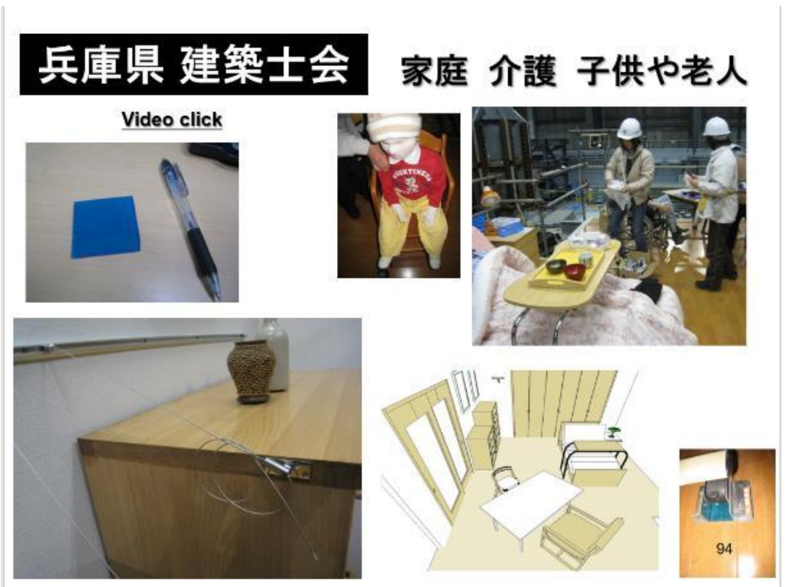
Experts of buildings



兵庫県 建築士会

家庭 介護 子供や老人

Video click

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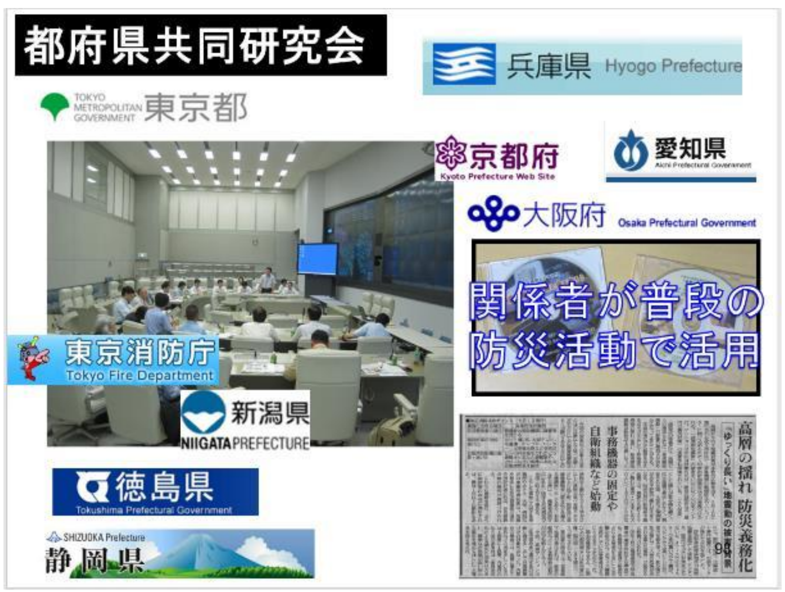
Municipalities



都府県共同研究会

兵庫県 Hyogo Prefecture

TOKYO METROPOLITAN GOVERNMENT 東京都

京都府 Kyoto Prefecture Web Site

愛知県 Aichi Prefectural Government

大阪府 Osaka Prefectural Government

関係者が普段の防災活動で活用

東京消防庁 Tokyo Fire Department

新潟県 NIIGATA PREFECTURE

徳島県 Tokushima Prefectural Government

SHIZUOKA Prefecture 静岡県

高層の揺れ 防災義務化

事務機器の固定や自衛組織など始動

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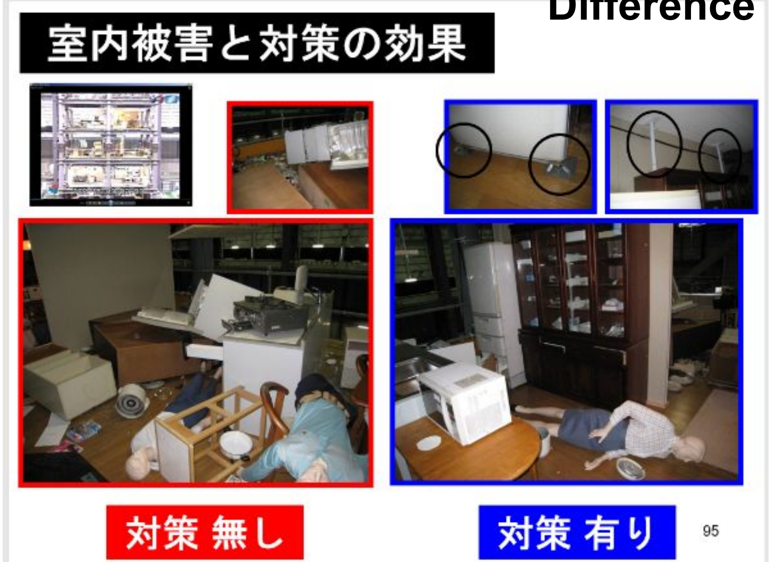
Difference



室内被害と対策の効果

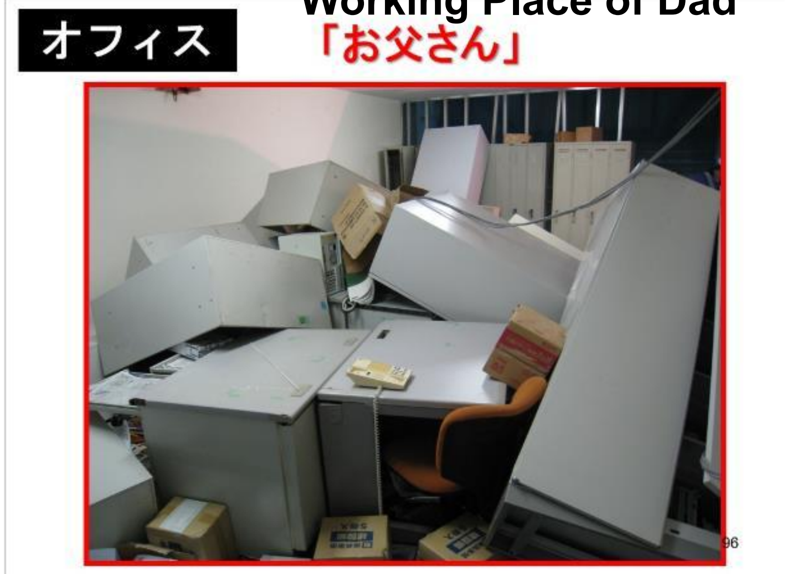
対策 無し

対策 有り

95

Not Prepared **Prepared**

Working Place of Dad



オフィス

「お父さん」

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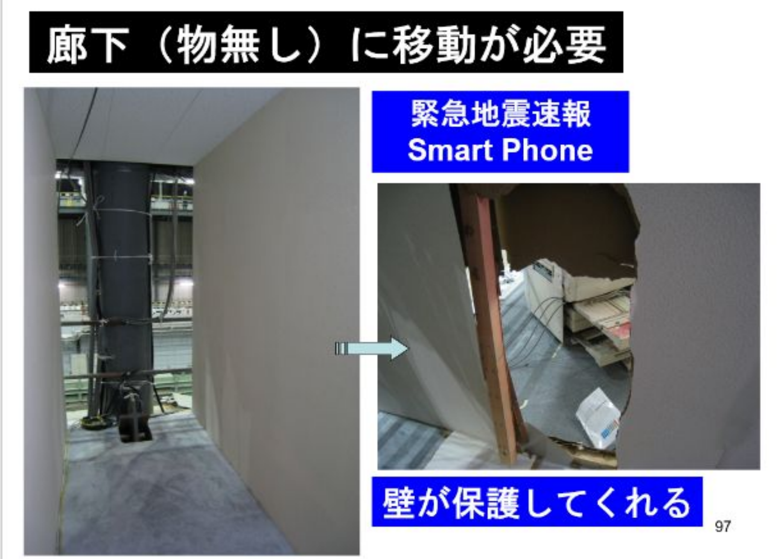
Best Reaction Scenario



廊下（物無し）に移動が必要

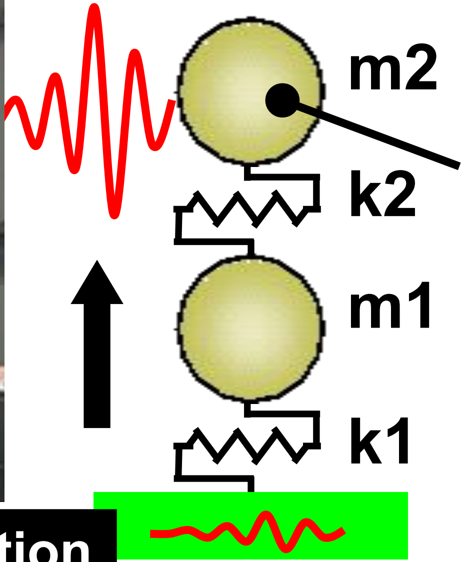
緊急地震速報
Smart Phone

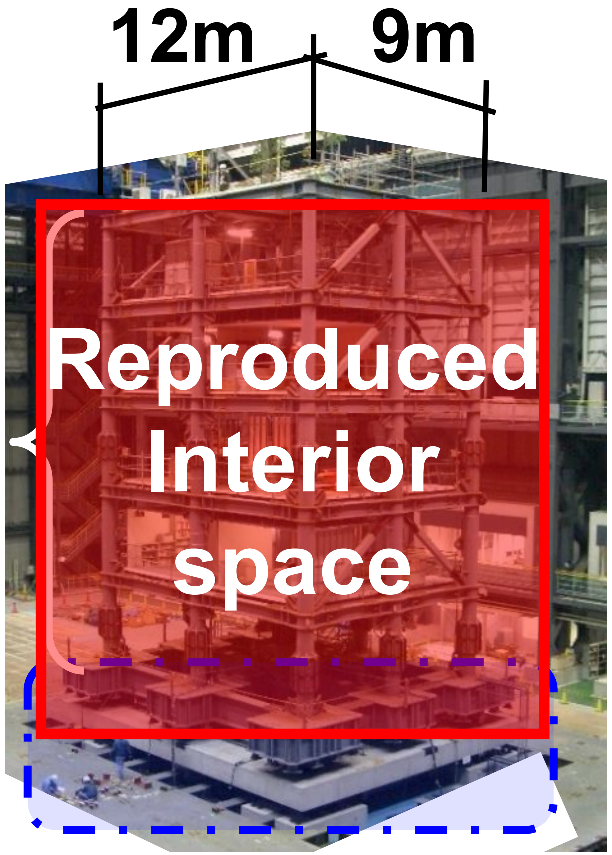
壁が保護してくれる

97

A Past Large Scale Test
Planned for Promotion Videos

TCR 15:06.48.09

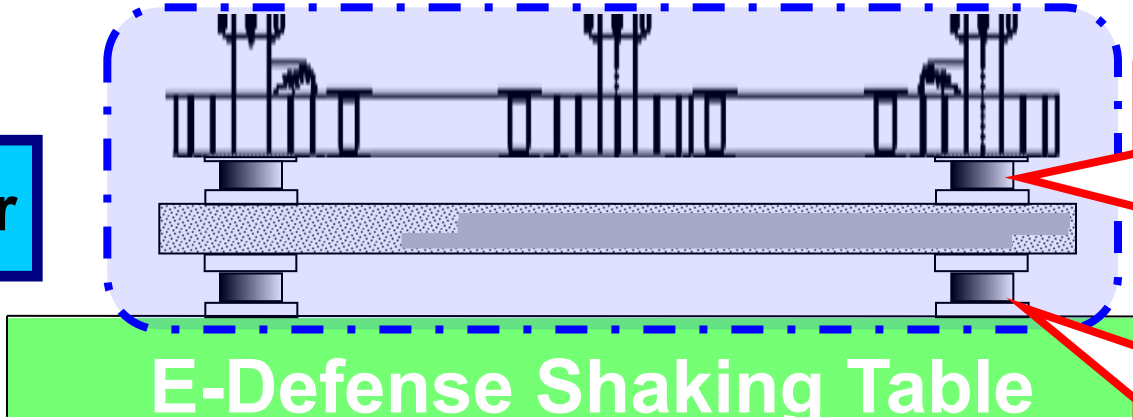




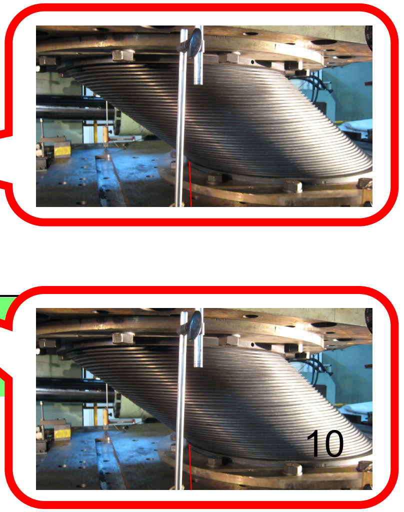
Reproduced Interior space

Testing Technology for Education

Amplifier



E-Defense Shaking Table



Rubber Bearing D=1.0 m

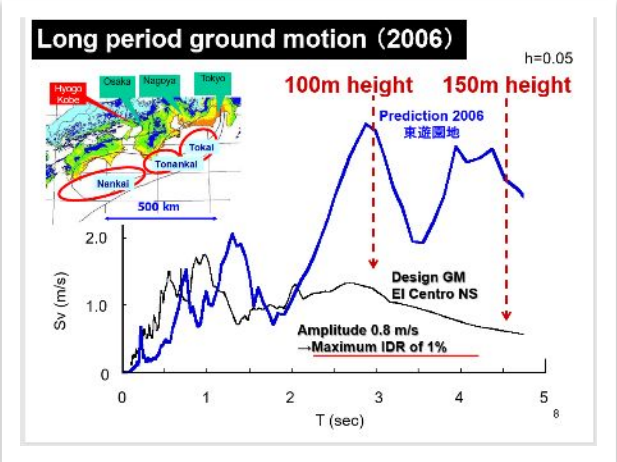
Japan High-Rise History

1961年　建築基準法が改正（特定街区制度）
　　　　絶対高さ規制廃止（1970年全面導入）
1964年　TOKOYO Olympic
1964年　ホテルニューオータニ（地上17階, 73m）
1968年　霞が関ビルディング Kasumigaseki Building by KAJIMA（地上36階, 156m）
1978年　サンシャイン60（地上60階, 240m）, 1991年 東京都庁第一本庁舎（243m）
1993年　横浜ランドマークタワー（296m）, 2014年 あべのハルカス（300m）

現在（東京）

現在（大阪）

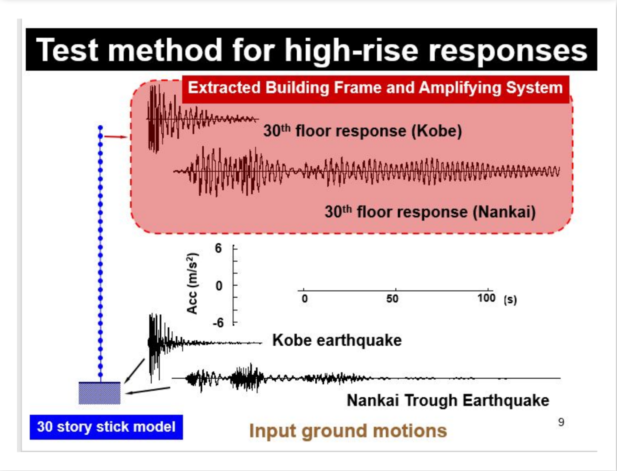
5



Long period ground motion（2006）

h=0.05
Hyogo Kobe
Osaka
Nagoya
Tokyo
Tokai
Tonankai
Nankai
500 km
100m height
150m height
Prediction 2006
東遊園地
Design GM
El Centro NS
Amplitude 0.8 m/s
→Maximum IDR of 1%
Sv (m/s)
2.0
1.0
0
0
1
2
3
4
5
T (sec)

8



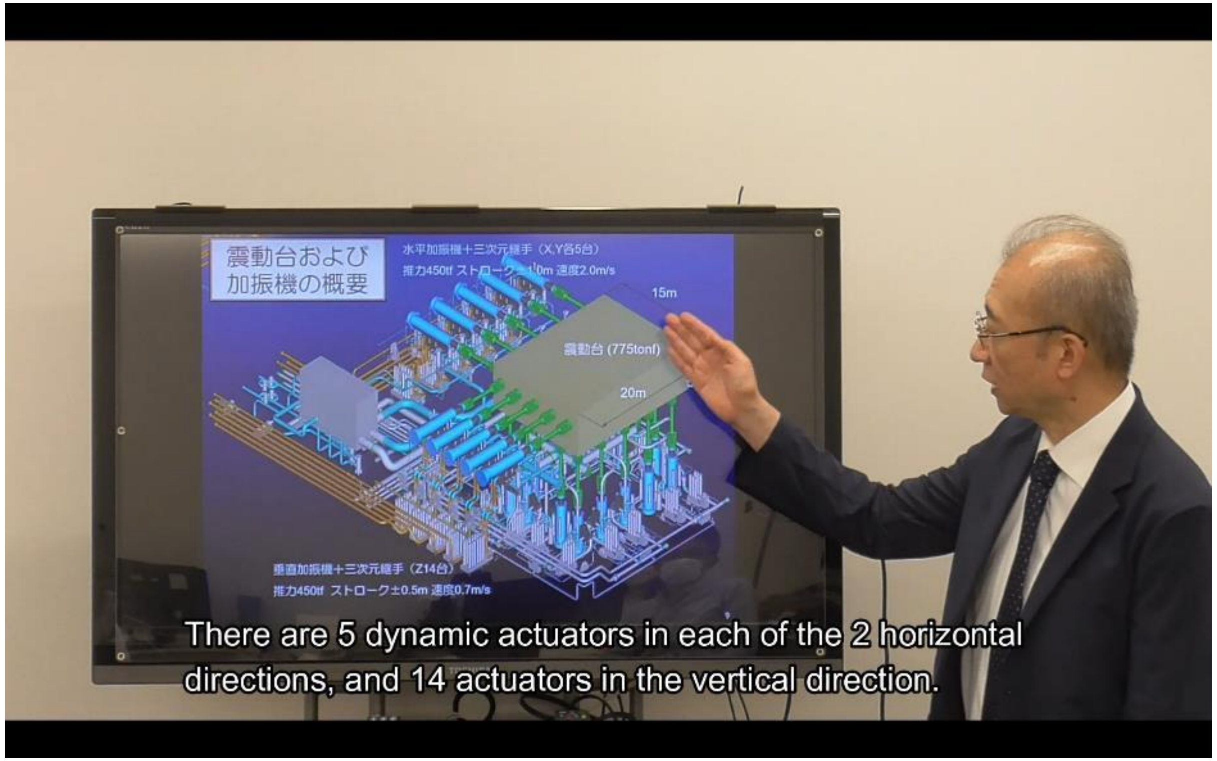
Test method for high-rise responses

Extracted Building Frame and Amplifying System
30th floor response (Kobe)
30th floor response (Nankai)
Acc (m/s2)
6
0
-6
0
50
100
(s)
Kobe earthquake
Nankai Trough Earthquake
30 story stick model
Input ground motions

9

G4 Dr. Kajiwara, NIED

Face-to-face discussion event in Shizuoka, June 2022


震動台および
加振機の概要
水平加振機+三次元継手（X,Y各5台）
推力450tf ストローク±1.0m 速度2.0m/s
15m
震動台 (775tonf)
20m
垂直加振機+三次元継手（Z14台）
推力450tf ストローク±0.5m 速度0.7m/s

There are 5 dynamic actuators in each of the 2 horizontal directions, and 14 actuators in the vertical direction.

The nickname of the 3-D Full-Scale Earthquake Testing Facility is E-Defense. The location is Miki City of Hyogo Prefecture. It's located in the Miki Disaster Management Park. The cost to make this was 45 billion yen (350million USD).

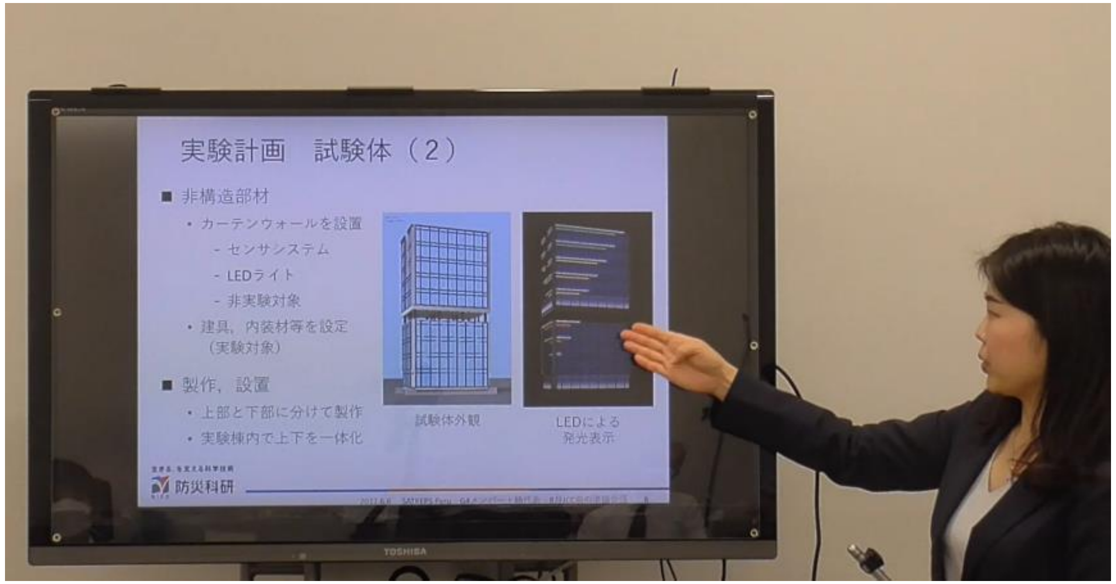
This international facility is the biggest shaking table with the highest performance. And also this shaking table facility can reproduce long-period, long-duration earthquakes that caused damage in the Great East Japan Earthquake.

This is the basic specification of the E-Defense facility. With the maximum accommodating weight of 1200 tons, a 6-story reinforced concrete building in Japan, or a slightly slimmer 10-story reinforced concrete building can be tested.

We look forward to working with you in this SATREPS project.

G4 Dr. Kishida, NIED

Face-to-face discussion event in Shizuoka, June 2022



実験計画　試験体（２）

- 非構造部材
  - カーテンウォールを設置
    - センサシステム
    - LEDライト
    - 非実験対象
  - 建具，内装材等を設定（実験対象）
- 製作，設置
  - 上部と下部に分けて製作
  - 実験棟内で上下を一体化

試験体外観

LEDによる発光表示

防災科研

The large-scale test specimen adopted 10-story steel frame structure with an aluminum curtain wall installed. The plane is 12m x 8m. It's 27m in height. The total weight of the test specimen is 550 tons.

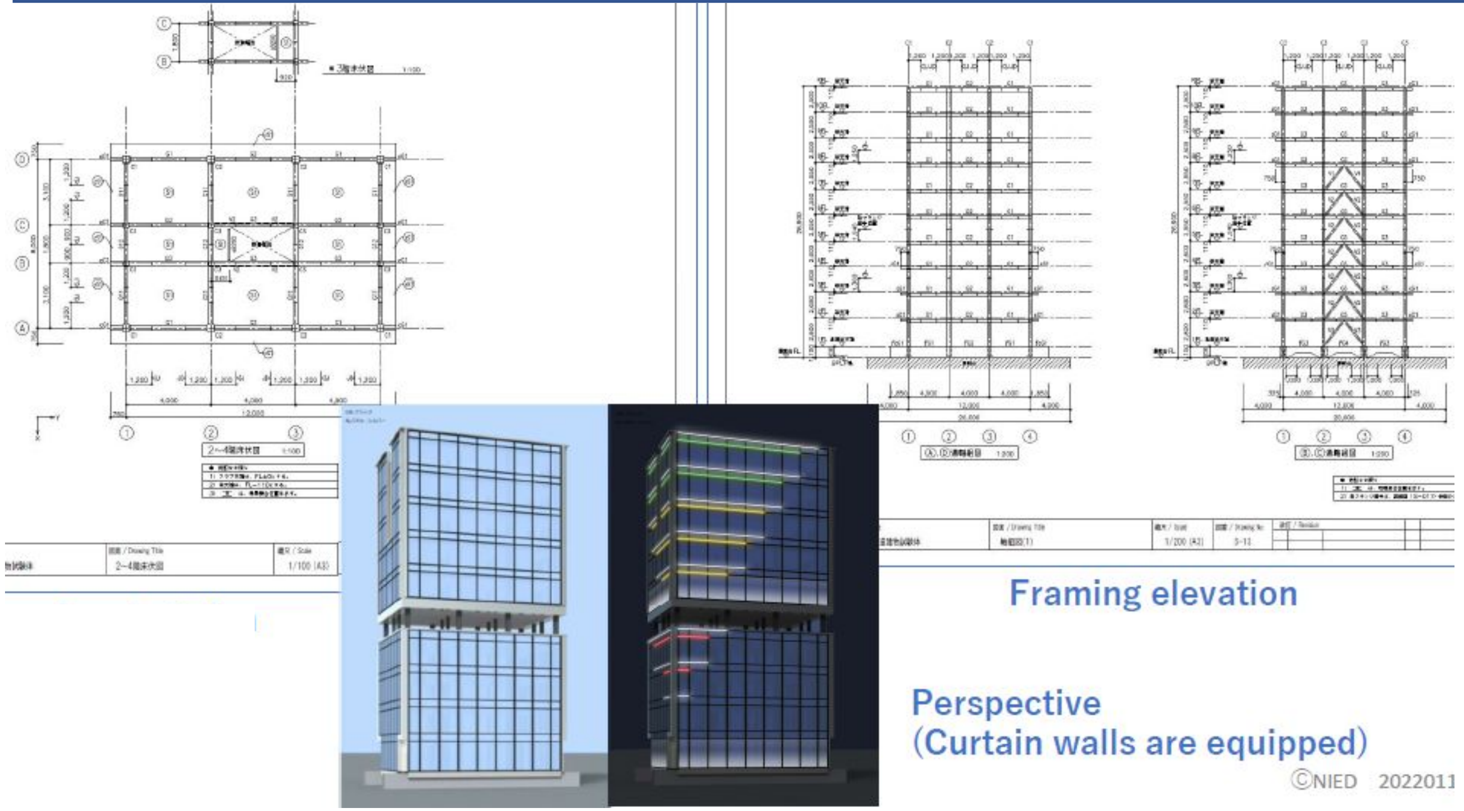
In preparation for future earthquakes, it is essential to promote measures to maintain the function of building structures and to continue the public daily life and the nation economic activities.

The dynamic characteristics of the structure, such as the natural period and the damping ratio, are very important for the countermeasure planning, but the method for obtaining them accurately has not yet been established.

The purpose of this research is to develop and demonstrate the technologies to evaluate the dynamic characteristics of the structures and utilize them for the various earthquake countermeasures.

The 2023 Ten-story Test Event Promoting Expert System (Regarding Building Sensing)

Not just a demonstration of building sensing
but also various promoting & training videos
fitting the target audience (officer, expert, citizen, etc.)

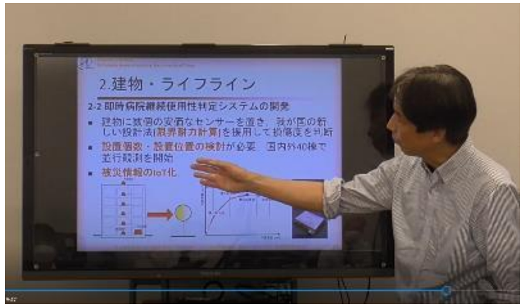


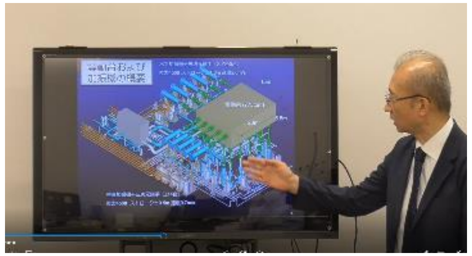
Framing elevation

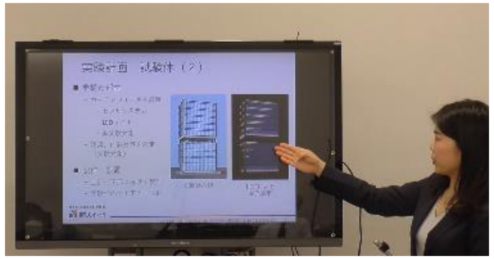
Perspective
(Curtain walls are equipped)

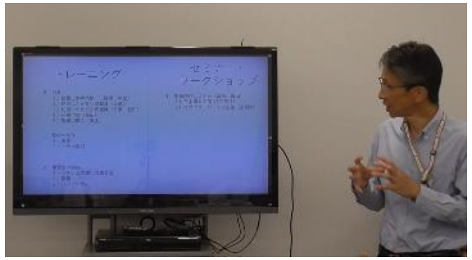
©NIED 2022011

The expert system principle will be incorporated in
the comprehensive testing protocols


2.建物・ライフライン
2-2 即時病院継続使用性判定システムの開発
建物に数個の安価なセンサーを置き、我が国の新しい設計法[限界耐力計算]を採用して損傷度を判断
設置個数・設置位置の検討が必要 国内外40棟で並行観測を開始
被災情報のIoT化

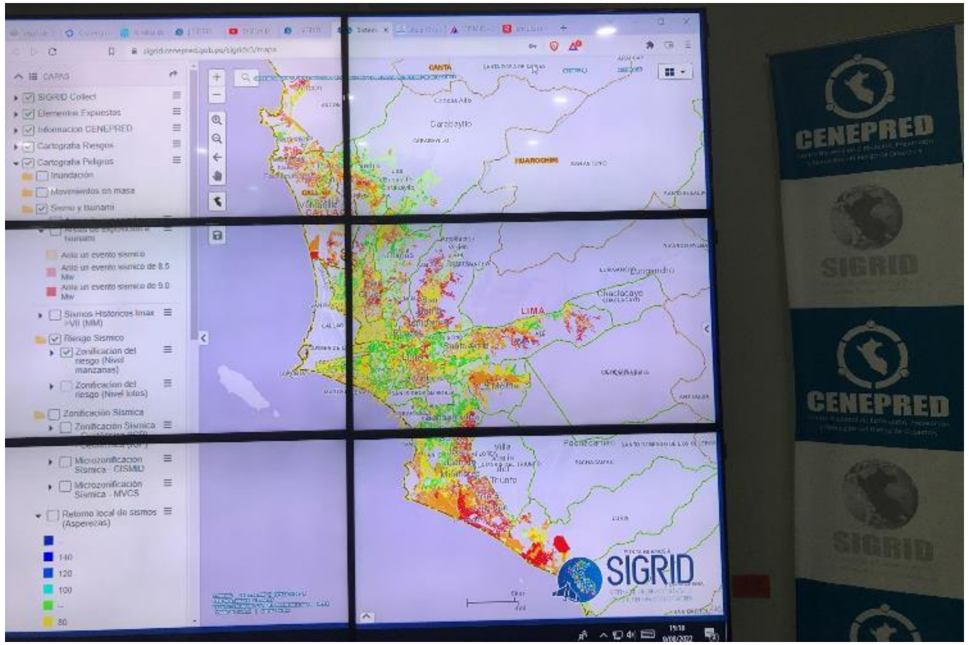






Collaborating with

Advertising agency


SIGRID
LIMA
CENEPRED
SIGRID

CENEPRED
Centro Nacional de Estimación, Prevención y Reducción del Riesgo de Desastres
"Promoviendo Cultura de Prevención"

CENEPRED
SIGRID

Members of G4:

- -Takuya NAGAE, Nagoya University
- -Akiko KISHIDA, NIED
- -Koichi KAJIWARA, NIED
- -Miguel YAMASAKI, INDECI
- -Christian CHOQUE, INDECI
- -Eduardo PORTUGUEZ, CENEPRED
- -Claudia HONMA, CISMID-FIC-UNI
- -Francisco RIOS, CISMID-FIC-UNI

Thank you