Disaster prevention

2018.12.13





Shaping a New Journey

KANSAI AIRPORTS

Disaster Response TF Basic Policy

Consider the following three points in terms of both materials and operations

Prevention | **Resist & emergency response** | **Speedy restart**

[Seawall TF] (Prevention)
Survey and analyze how seawall damage led to flooding, and reflect findings in future actions.
(Establish “Committee for Assessing Wave Overtopping Caused by Typhoon Jebi”)

[Underground Facilities TF] (Resist, speedy restart)
Examine damage to equipment such as control panels and drainage pump systems, and reflect findings in future actions.

[Crisis Management TF] (Prevention, Resist & emergency response, speedy restart)
Review internal disaster response actions to re-establish crisis management system including integrated and speedy decision-making during resist, emergency response and early restart phases.

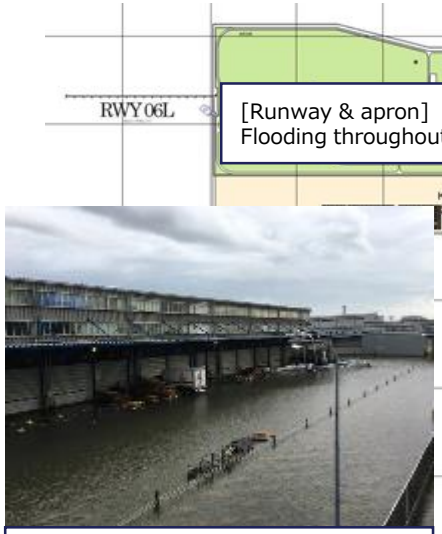
New BCP

Seawall TF

Underground Facilities TF

As measures against flooding in KIX, gather the considerations of Seawall TF (Prevention) and Underground Facilities TF (Resist, speedy restart)

Damage from Typhoon Jebi



[Cargo warehouse]
- Roofs blown off, shutters damaged
- Utilities (power, AC) partially or totally offline in nearly all buildings due to flooding
- Damage to some goods in warehouse

[Ground handling]
Flooding submerged 90% of 600 vehicles (i.e. towing cars) and 2,200 pieces of equipment *Source: Two airlines

【Sea wall】
・Partial damage

[T1]
- Flooding of electrical equipment, AC, pax/cargo handling facilities and disaster prevention facilities
- Power offline in north and central areas of main terminal building

【Railway excavated part 】
・Flooded

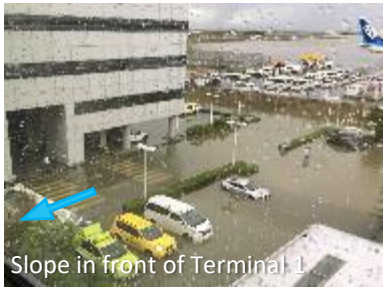
[Access bridge]
- Heavy damage from tanker collision
- Gas leaks from damaged areas
- Roads blocked
- Rail service halted

Jebi's damage - terminal, cargo and fuel areas -

Terminal building
Along a passage running from north to south in the basement of Terminal 1, there are electric rooms, a disaster prevention center, a central monitoring room, a telecommunication equipment room, and machine rooms. While power supply to the island still continued, seawater flowed down a slope into these basement facilities, causing a large-scale blackout.

Cargo area
Cargo operators' warehouses and inflight meal facilities along with warehouses managed by KAP are located in Int'l Cargo Area in the south of Phase I Island. Damage to this area includes ripped off roofs and damaged shutters due to strong wind as well as water damage to cargos, and vehicles and equipment (e.g. forklifts) for cargo operations. Power facilities in the basement and on the 1st floor of cargo warehouses were also flooded, and some warehouses were without electricity.

Fueling area
KIX is running operations under a hydrant system: fuel transported by oil tankers is delivered at the berth in KIX, and then stored in tanks in the fueling area before being sent to each stand on the apron through the buried pipeline. Major damage to this area includes rusty bottom plates of tanks due to floods, an overturned emergency stop equipment, and flooded hydrant pits for the fuel access opening. In the typhoon, pipes for fuel as well as the building with electric rooms for the fuel area were flooded, yet didn't sustain damage from the flooding.


Slope in front of Terminal 1


Flooded basement electric room in T1


Ripped-off roof of cargo warehouse


Flooded Cargo Area


Flooded Fueling Area


Overturned emergency stop equipment

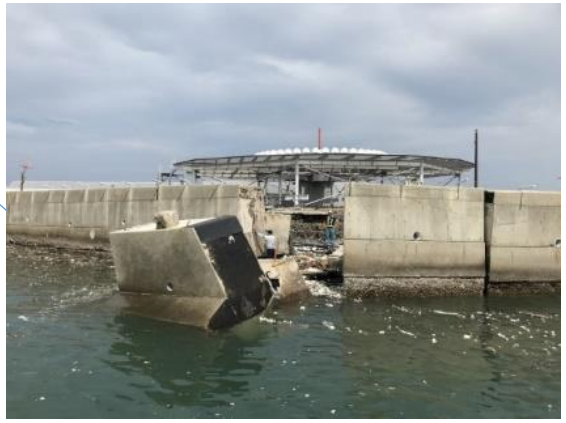
Jebi's damage - infrastructure

Displaced armour stone

Pump power supply cubicle flooded

Broken seawall

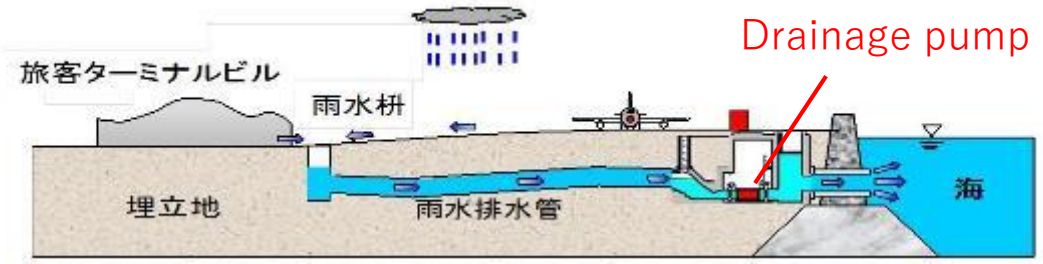
Perimeter road ripped off



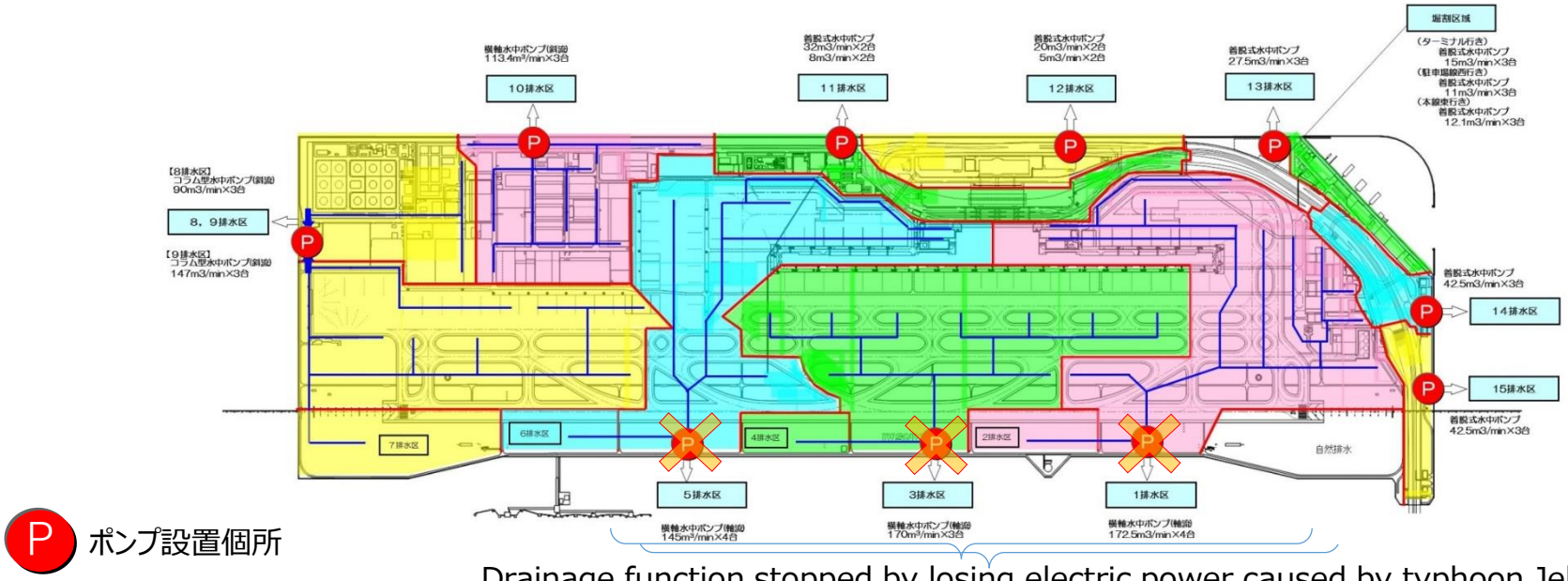
Tilted seawall

Rain water draining system of KIX island

Large drainage pump is installed to forcibly drain water not to affect the airport operation despite in the heavy rain.



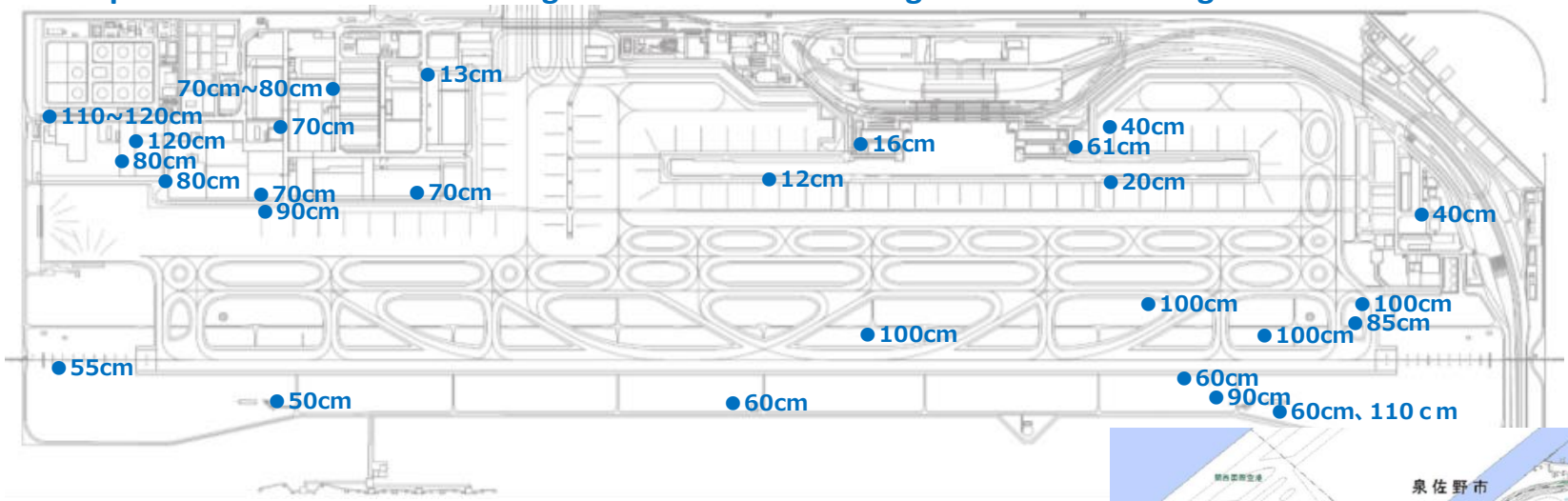
(Facility overview)
- Number of pump　:　37pumps, 10places
- Designed rainfall :　10年確率降雨（55mm/h)
- Pump capacity　:　0.2Mm³/h
  (during rated operation)



Drainage function stopped by losing electric power caused by typhoon Jebi
(0.11Mm³/h（during rated operation）)

Confirmation of flood depth and estimation of flood volume

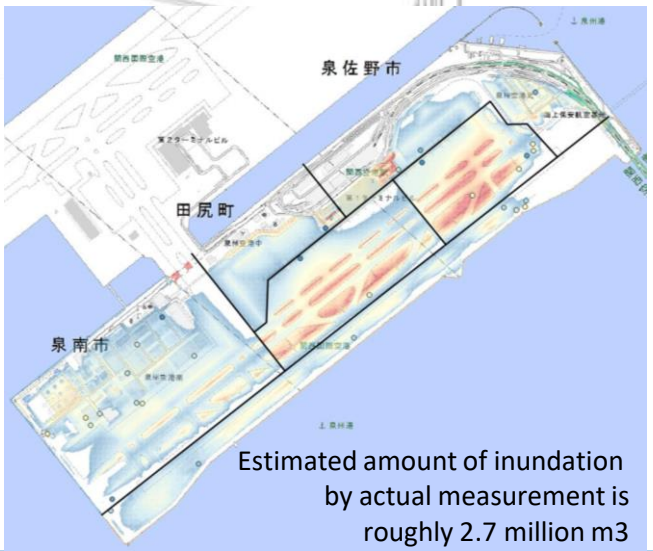
● Flood depth（Measured the remaining traces and also referring to the camera images）



Control board
（near by E 1 taxiway）

Security fence
（South of airport/
truck waiting area）

Int'l Cargo Agent
Bldg. 1,2,3

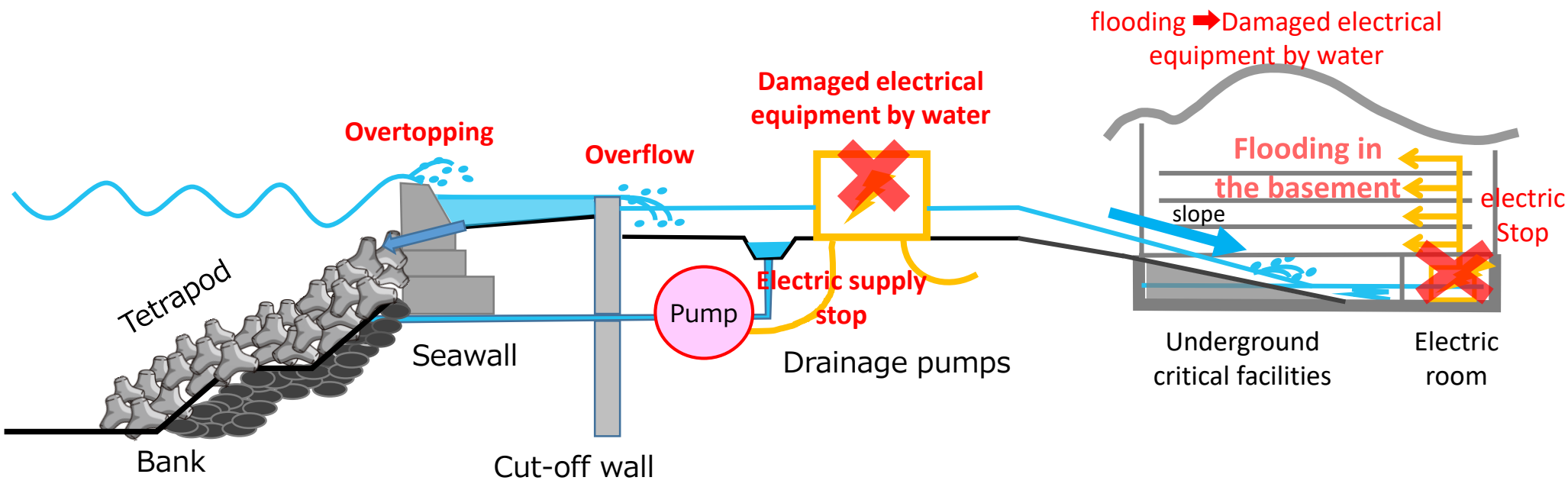


Estimated amount of inundation by actual measurement is roughly 2.7 million m3

Damage from Typhoon Jebi

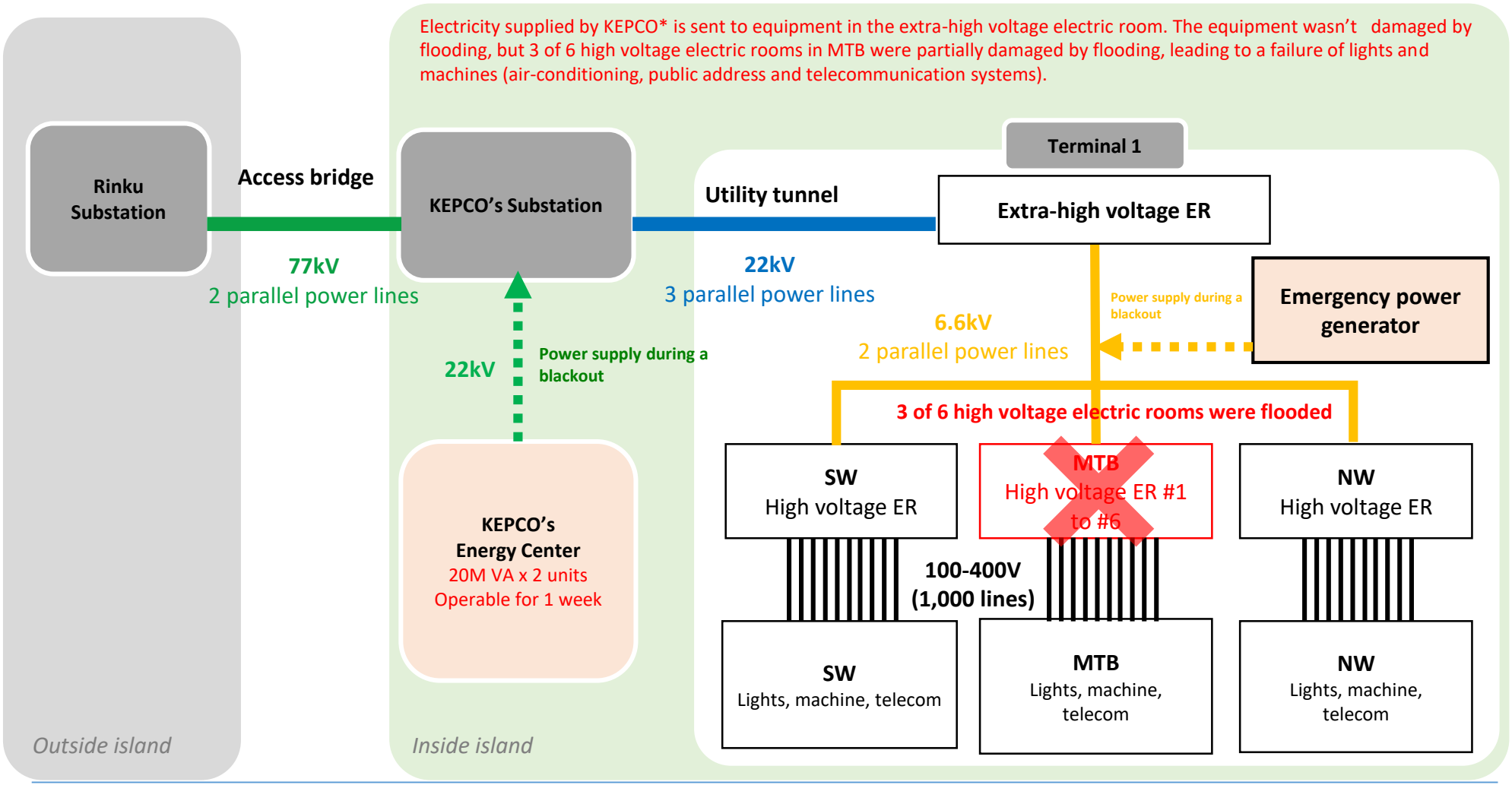
Cause of damage

overtopping → Flooding・Water damage → Power loss → Drainage pump stop, Terminal function stop, Air conditioning stop, Public announcement systems stop, Telecommunication systems stop



Power line for T1

Electricity supplied by KEPCO* is sent to equipment in the extra-high voltage electric room. The equipment wasn't damaged by flooding, but 3 of 6 high voltage electric rooms in MTB were partially damaged by flooding, leading to a failure of lights and machines (air-conditioning, public address and telecommunication systems).

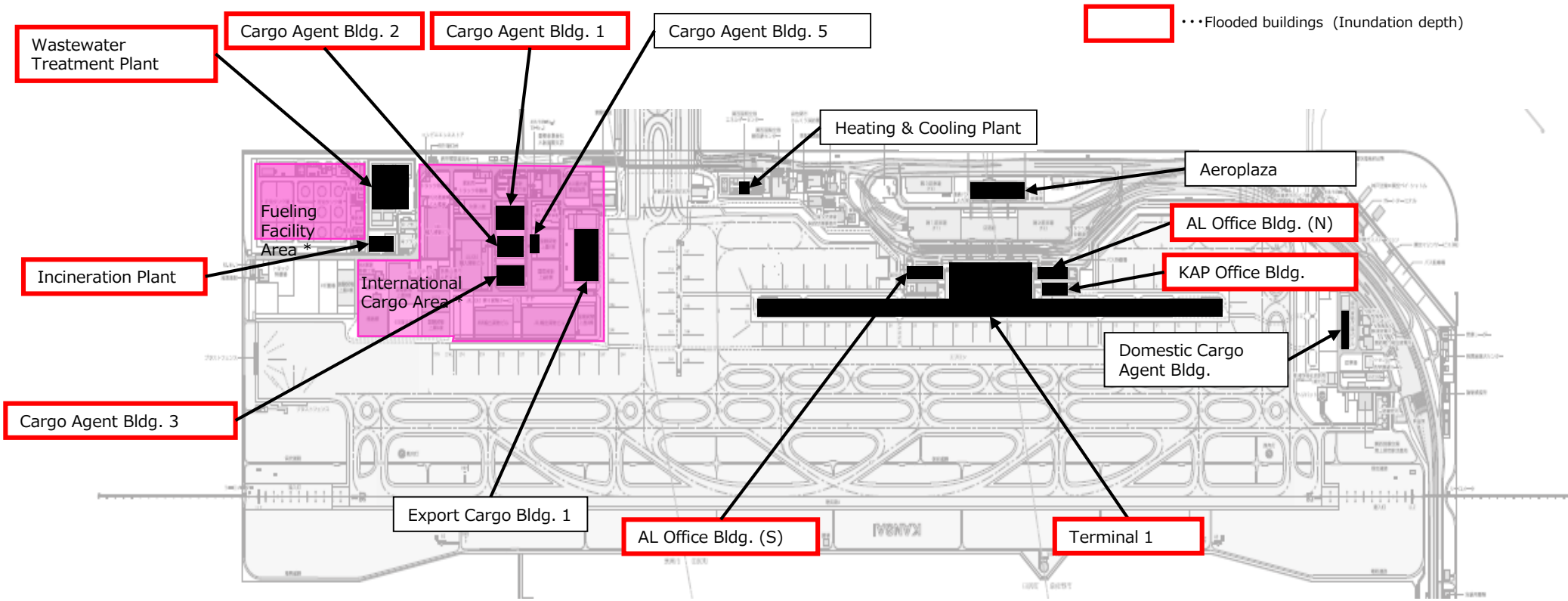


MTB：main terminal building　NW：north wing　SW：south wing

*KEPCO: Kansai Electric Power Co., Ltd.

Buildings with Basement

There are basements in 22 out of 139 buildings (14 buildings owned by KAP group) on the island (there are no buildings with basement on Phase II island). The inundation depth of buildings are as below. Besides, road underpasses and utility tunnels are located in the basement.



* Most of the Fueling Facility Area (no buildings with basement) and International Cargo Area were flooded as their level of ground was lower.

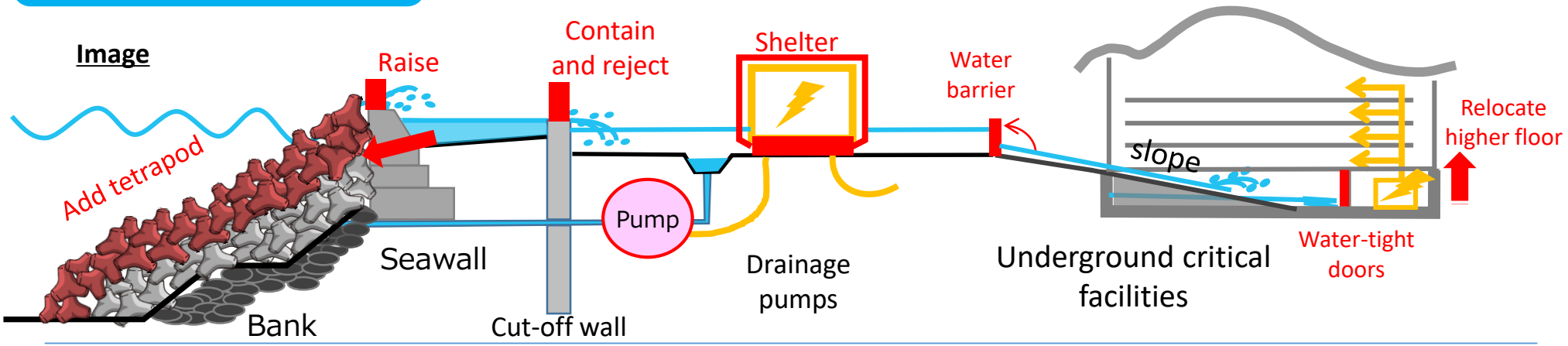
3-step strategy against flooding

Basic idea

- In response to typhoons (storm surge, high wave), tsunami, etc., it prevents water from entering the island due to seawalls and overflow retaining walls surrounding the airport island.
- Resist measures and restart measures will be implemented in case of inundation due to some event.

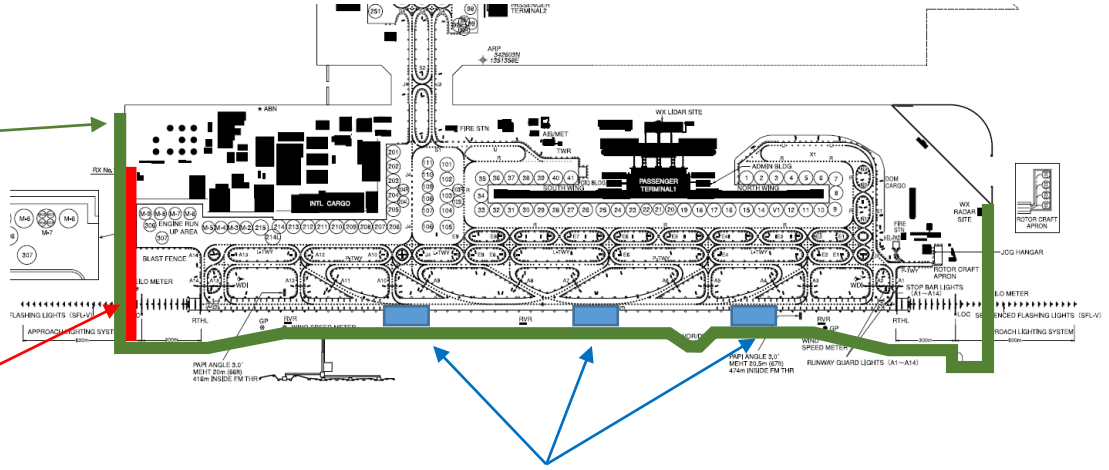
Prevent	• Avoid flooding to occur 1. add tetrapods to break waves 2. raise seawalls 3. use cut-off wall as second layer and reject to sea 4. reinforce power supply of drainage pump
Resist	• If flooding occurs, minimize damage & interruption of service 1. install water barriers 2. raise and protect electric boards & control panels 3. install water-tight doors 4. relocate critical facilities (ER and generators)
Restart	• Speedy recovery 1. drainage vehicles 2. potable drainage pumps 3. emergency runway lights

Image



Main measures against flooding
－Prevent－

○Raise seawall

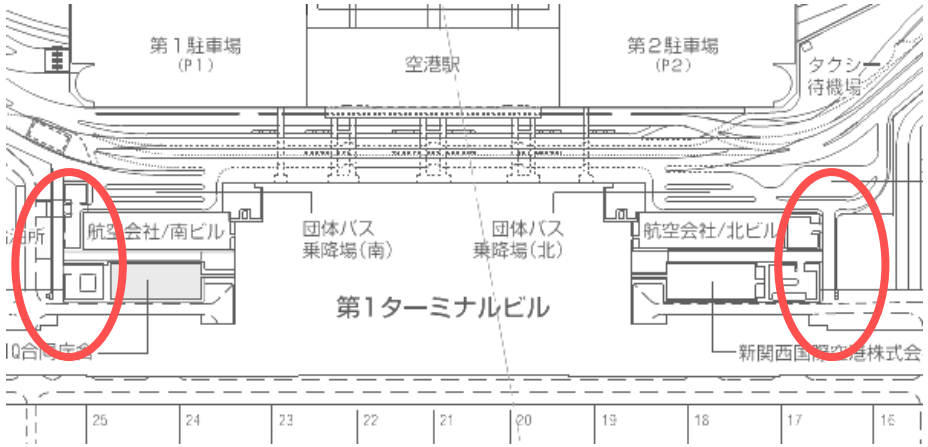


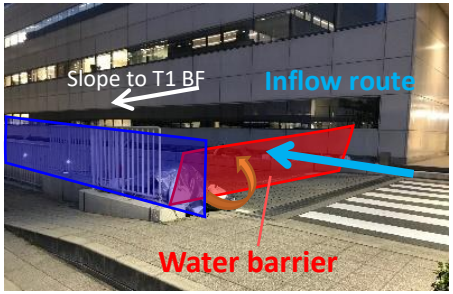
○Raise cut-off wall

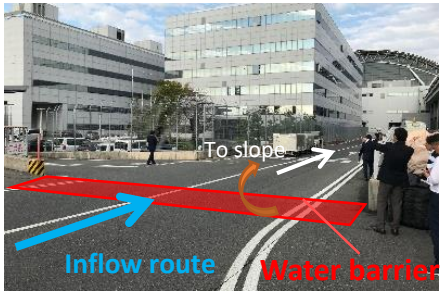
○Measures to prevent flooding pump drainage

Main measures against flooding
－Resist① －

○Install water barrier

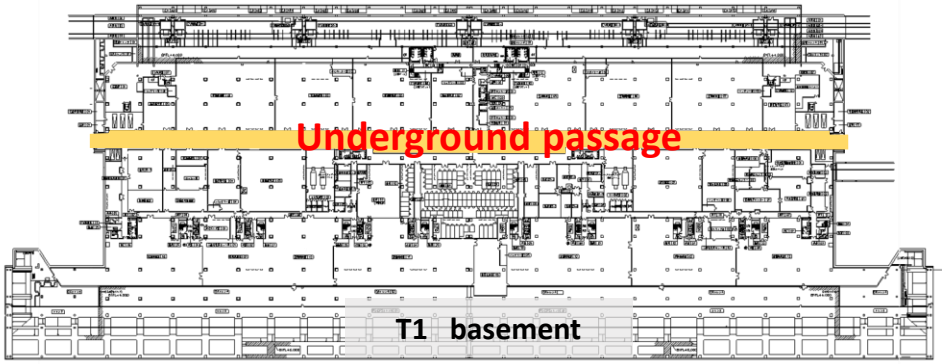






Installation of large automatic derricking water barrier on the inflow path to T1

○Water tightening

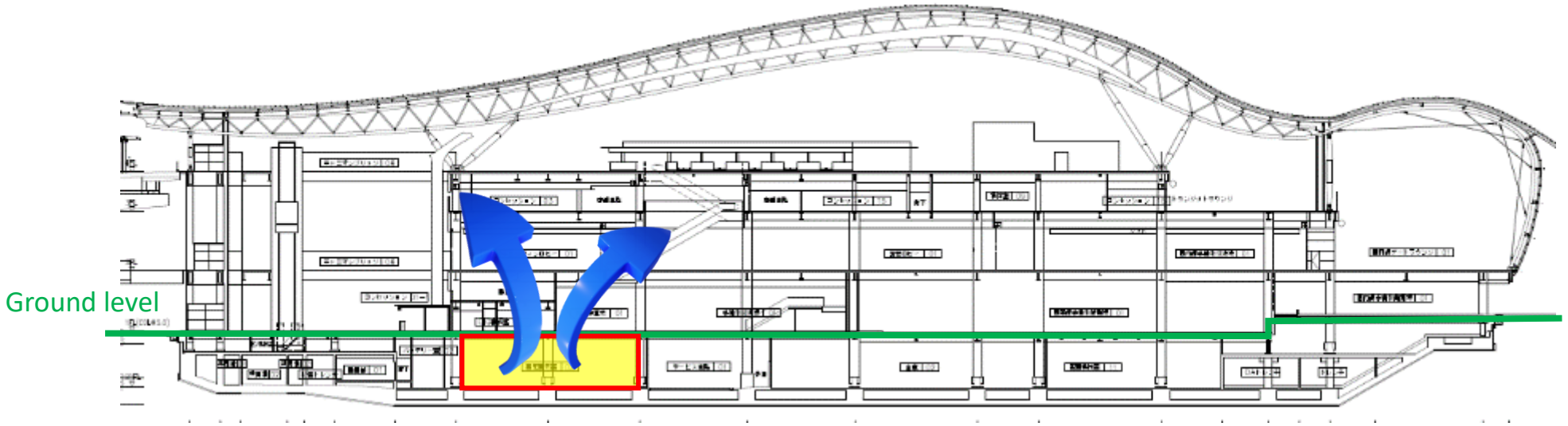


Water tightening of important facilities other than T1 basement accordingly

Main measures against flooding
－Resist② －

○Relocate electric equipment

Sectional drawing of T1



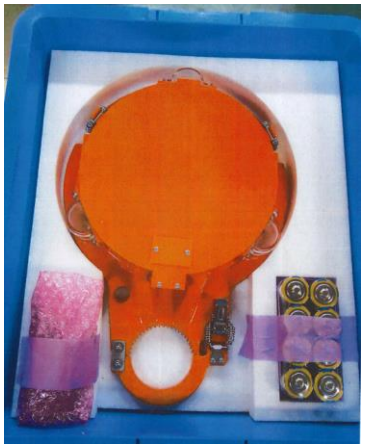
Relocate electric rooms in the T1 basement (Extra-high voltage ER, high voltage ER, Central monitoring room･Security and disaster prevention center･Automatic broadcast equipment room)

Main measures against flooding
－Restart－

○Large Pump Vehicle

○Potable drainage pumps

○Emergency runway light



Outline of implementation plan

How to proceed

- In preparation for the next typhoon season, we will implement preliminary emergency measures such as installing water-tightening that can be constructed and procured in a relatively short period, making watertight, water barrier, deploying large pumping vehicles, etc.
- While taking into account the results of the committee's discussions, we will raise the seawalls and relocate basement facilities to make our airport more resilient to flooding.

	Measures	FY2018	FY2019	FY2020～
Prevent	Seawall raising, Tetrapod, etc.			
	Overflow retaining wall			
	Enhance drainage pump system, etc.			
Resist	ER relocation			
	Water barrier			
	Raise and protect electric boards & control panels, Measures against flooding of electric facilities etc. (Water-tightening)	Emergency measure		
Restart	Potable drainage pumps, drainage vehicles, spare equipment			

Crisis Management Task Force

Development of new BCP

We conducted interviews and surveys with airport stakeholders (central govt, municipalities, airlines, cargo operators, tenants, mass media) in the wake of Typhoon Jebi

Issues raised

- Insufficient emergency information sharing with stakeholders including airport-based business operators
- Poor coordination with stakeholders during the restoration process (of passenger and cargo handling facilities)
- KAP's emergency decision-making process and coordination with stakeholders
- Passenger handling during emergencies (e.g., evacuation of stranded passengers, accurate understanding of stranded passenger numbers, multilingual services)

Based on feedback and inputs from everyone involved and with support from stakeholders,

New BCP

\+ <Measures in terms of material>
Raise seawalls
Relocate basement facilities to above the ground

Planning of emergency responses and speedy restart for each scenario, and development of various operational manuals

Establishment of New BCP

Current Crisis Management

1. Prevention/preparation phase (until Sept 3)

Integrated disaster preparedness in daily operations

2. Emergency response phase (mainly on Sept 4 & 5)

Established a plan/structure that enabled an automatic initial response to the emergency

*Current crisis response plan sets out mainly emergency responses

3. Speedy repairs phase (from Sept 6 onwards)

Resumed operations to serve as an emergency base (assuming a huge earthquake)

*Business Continuity Plan (BCP) sets out procedures for all phases from disaster prevention to speedy repairs phases

Current BCP

- Covers only earthquakes/tsunami (including evacuation & speedy repairs plans)
- Speedy repairs plan assumes the airport will not be flooded but serve as an emergency base in the region (There is another speedy repairs plan assuming more serious flood damage than the BPC scenario)

Issues: Not all hazards are covered
Operational resumption plan for scheduled private carriers is not sufficiently detailed in the speedy repairs phase

New BCP

- Redesign the current crisis management plan based on assessment
- Strengthen procedures in each phase
- Set out proper procedures for all phases at the time of any emergency

New BCP

Specific policies

Prevention
(incorporate better crisis preparedness in day-to-day operations)

- Improve crisis preparedness in day-to-day operations
- Improve information sharing with stakeholders/employees
- Enhance training system
- Leverage 3 airport network for mutual support

Resist & emergency response
(customer assistance)

- Improve communication/cooperation with relevant stakeholders (General HQ)
- Improve customer guidance and assistance (in multiple languages)
- Develop a response plan for different scenarios
- Cooperate with local communities in the event of an emergency

Speedy restart
(restore airport functions)

- Develop a speedy repairs plan for different scenarios
- Secure equipment and materials for speedy repairs
- Cooperate with local communities in the event of an emergency

Improve crisis preparedness in day-to-day operations

- Different responses in each area by cooperating with stakeholders -

Create a framework to share information with stakeholders by day-to-day communication

- **Improve functions in each area**
  (understanding situations of stranded people, communication with cargo operators)
- ➡ **Set up a base for pax guidance/security/disaster prevention in the central area on Level 2 in T1 (safest area) for speedy information sharing with pax**
- **"Special Disaster Corps" to conduct emergency response and Speedy restart activities in the event of a disaster is newly established**

<Area Management Plan>

KOC (KIX Operation Center)

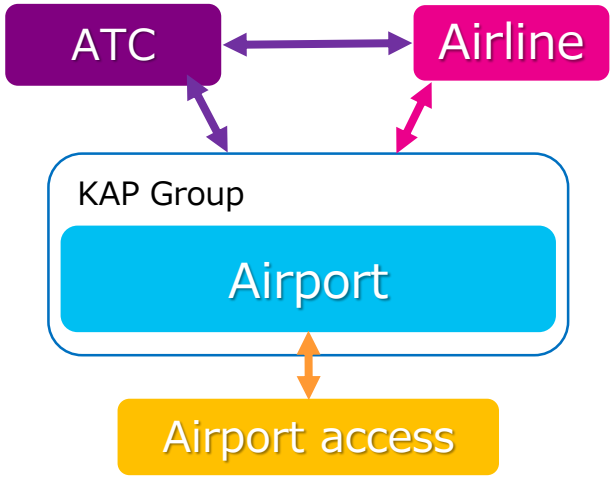
T1 area SC (AP area)	T2 area SC	Int'l cargo area SC (Phase II Island Cargo area)	Airfield SC	Ph.1 Island Northern area SC
Location: T1, Level 2 (South side Available Counter) Serve as a subcenter for providing assistance to stranded/remaining people in T1 area	Location: T2 Domestic Its functions to be enhanced to serve as a substitute for KOC Serve as a subcenter for providing assistance to stranded/remaining people in T2 area	Location: #5 int'l cargo bldg. "Cargo Operation Center" Serve as subcenter for supporting operators in int'l cargo area	Location: Airport firefighting HQ Vehicles, equipment & materials to be prepared there Serve as a recovery subcenter	Location: Observation hall Knowledge center Vehicles, equipment & materials to be prepared there Serve as a recovery subcenter Special Disaster Corps

Improve information sharing with stakeholders/employees

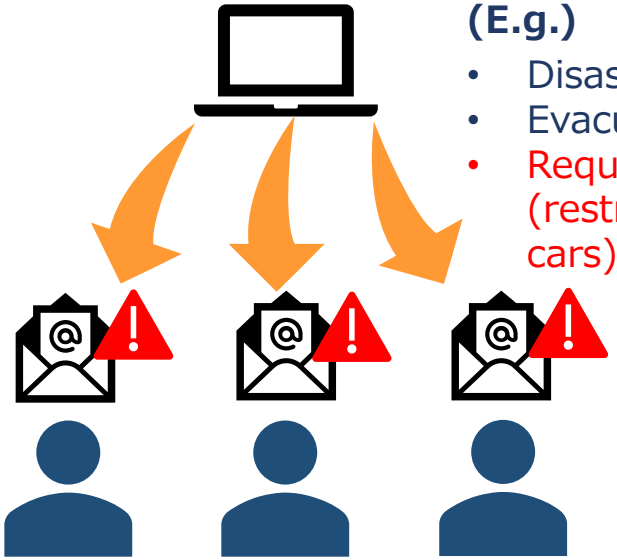
- **Create a framework to share information with stakeholders**
- **Share information with all airport employees**

Improve information sharing at KIX

Collaborative Decision Making (CDM):
Efficient airport operation through information sharing & interaction



Emergency information sent to airport staff



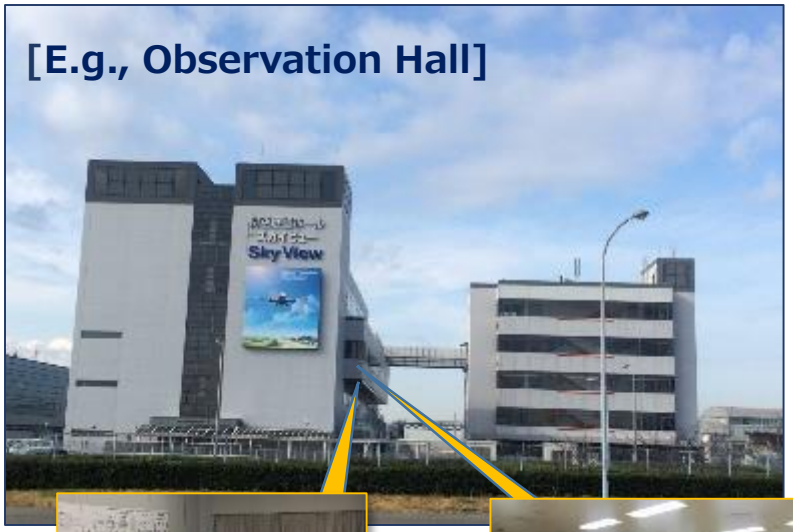
(E.g.)

- Disaster information
- Evacuation information
- Request for cooperation (restriction of private cars)

Enhance training system for airport employees

- Develop *Knowledge Center* -

- **Provide training** for all business operators in/outside the airport, including KAP group companies
- Externally disseminate information about KAP's crisis management efforts



Professional training

Education to business partners

Development of specialized training space for KAP Group and related organizations (Aircraft accidents, terrorism, natural disasters etc.)

Education on airport disaster responses for airport business operators

Education on airport operations (Academy)

Information on KAP's efforts delivered to airport users

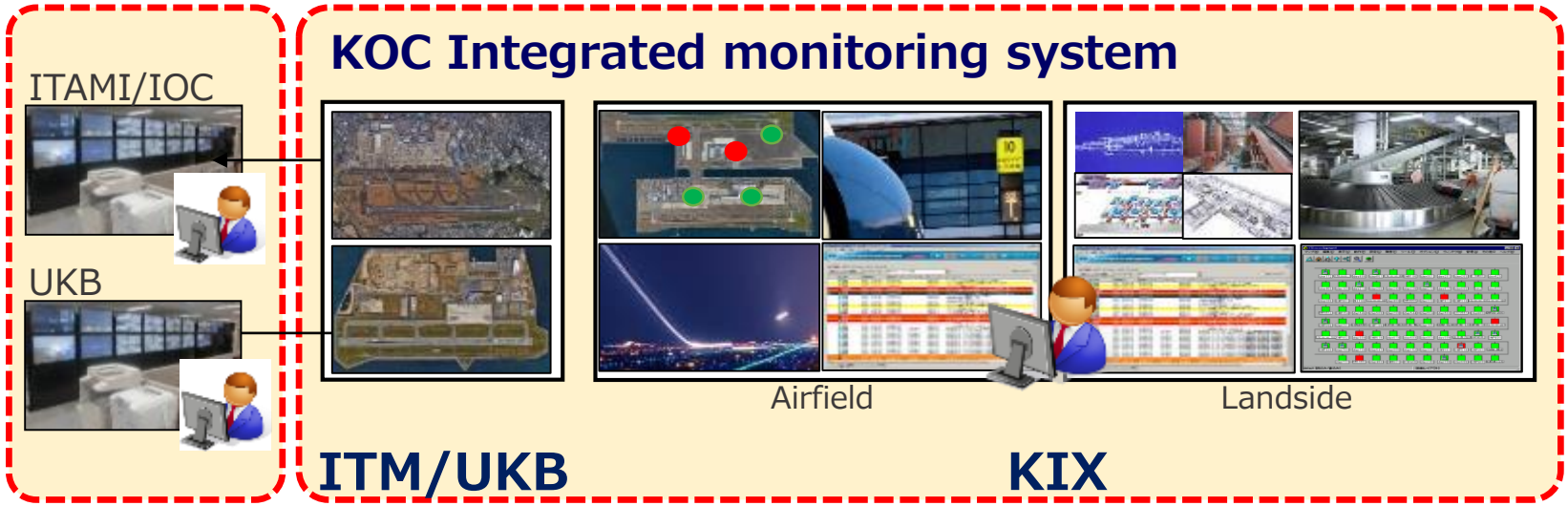
Working space that can be used by everyone working at the airport on a daily basis

Leverage 3 airport network for mutual support

- Secure resources and share information during an emergency -

- **Establish a staff support system** during an emergency
- **Provide resources** for recovery efforts
- **Share operational information** of each airport **in daily operations**

<Information sharing among the 3 airports>

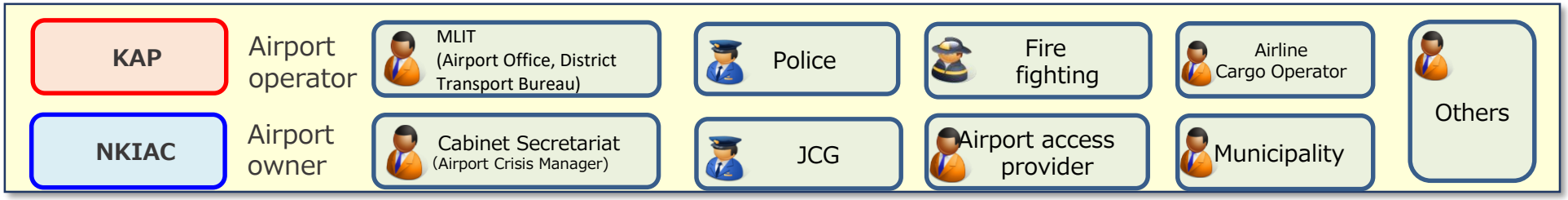


Cooperation with relevant stakeholders and unified/speedy decision-making during emergency

I. Strengthen cooperation with relevant stakeholders: Establish General HQ in all emergencies

- Coordinate with relevant stakeholders to establish General HQ in all emergency events
- Gather competent authorities to work closely together in dealing with the events

[General HQ]



II. Enhance unified/speedy decision-making during emergency

KAP Crisis HQ

GOLD Team

- **KAP CEO to make final decisions**
- If a decision-making leader is absent, the second person in the predefined order will make decisions necessary for speedy actions
- As an airport owner, NKIAC President will be stationed at KAP Crisis HQ and support KAP CEO in taking command of emergency responses. NKIAC's Staff also will be stationed at KAP Crisis HQ and play a their role of liaison who aims for smoothing its communications with government including MLIT

Branding & Communications

- Stationed in KAP Crisis HQ to accurately understand info centralized at HQ and send it out to the public in a timely manner and if needed, in coordination with related organizations
- Enhance the internal support team to make sure the above function can be fully executed

*'Emergency' timeframe is from when GOLD Team is convened until major airport functions are recovered

*For CEO's final decision, crisis management members shall speedily make study/discussion within time period allowed.

Improve customer guidance & assistance (in multiple languages)

- **Speedily share information** with passengers in each building using a centrally-controlled emergency public address system
  Provide emergency information in multiple languages on displays in T1/T2

- Deploy **battery-powered and portable disaster prevention speakers**

- Increase multilingual loudspeakers
  (MegaSpeak: 2 → 72 units)

- Guiding staff and handling staff **work together to provide guidance in foreign languages**
  ＊Share information with passengers and people outside the airport using SNS

Develop response & speedy repairs plans for different scenarios

- **Assume events that could have an significant impact on airport operations (Loss of airport functions)**
- **Develop response & speedy reparis plans for multiple scenarios**

➡ Prepare manuals to accurately understand the number of stranded/staying people
➡ Consider making rules for operational resumption including partial resumption (coordination required)
➡ Assist passengers in cooperation with airlines (discussion required)
➡ Prepare manuals for public relations
➡ Consider making rules for removal of damaged cargos

- **Assign roles to KAP group companies' employees and train them**
- **Secure materials/equipment necessary for speedy recovery**

(Secure procurement networks for supplies that are difficult to arrange on our own)

[Possible cases]

＊＊＊＊＊＊＊＊＊＊＊＊

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Suspension of key systems (system failure)

Broken runway (long-term closure)

Suspension of clean water supply

Loss of power sources (blackout)

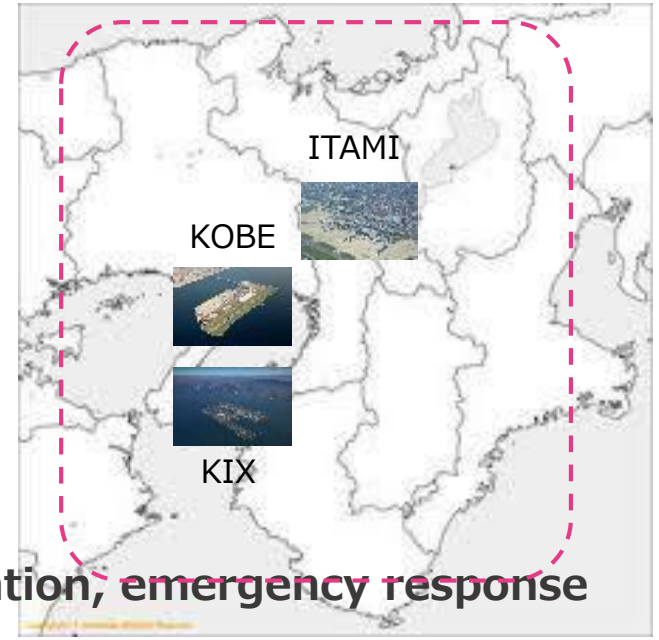
Damage to bridge (impassable)

[Image: NEXCO West Japan News Release]

Establish a framework to strengthen cooperation with local communities in the event of an emergency

Create a response plan to cooperate with local communities at the time of disaster

→ Focus especially on the following two points:



- **Secure safety of stranded/staying people**

  Create disaster response manuals that show how to cooperate with local communities based on discussion with stakeholders as well as disaster/safety situations in and outside the airport
  - Transportation of airport stayers during an emergency (e.g., transportation means, multi-lingual support)
  - Request for support from the Self-Defense Forces
  - Information sharing during an emergency, etc.

- **Secure materials, equipment and staff for disaster mitigation, emergency response and speedy repairs**
  - Deployment of a disaster medical assistance team (DMAT) for events other than aircraft accidents, etc. *DMAT (Disaster Medical Assistance Team) is the trained medical team that can response rapidly at the acute stage of disasters. Reference URL: (http://www.dmat.jp/)

➡ **In order to establish a new BCP, take initiatives for disaster mitigation, emergency response and speedy repairs in cooperation with local governments and other relevant parties while considering a *wide-area disaster prevention* point of view**
(Consider disaster prevention agreements with local communities, etc.)

Reference: Timeline

Prevention
(incorporate better crisis preparedness in day-to-day operations)

	Item & Response Policy	FY2018	FY2019	FY2020
Prevention	■ **Enhance KIX's operational control functions** ・Gather all operational info at KOC (AO-PT currently working) ・Develop a subcenter in each area ■ **Build 3 airport support network** ・Share operational information (AO-PT currently working) ・Establish a staff support system ・Provide resources for repair efforts • **Established a "Knowledge Center" to enhance training system** ・Establish specialized crisis management knowledge center in the observation hall ・Provide training for airport-based operators including KAP group companies ・Communicate KAP's crisis management activities to the public ・Make working space available for all staff within the airport ■ **Establish an information sharing system with relevant stakeholders** ・Establish an operation unit structure involving all stakeholders (A-CDM) ・Distribute emergency info to each airport employee (register contact details when ID card application is submitted)	(under development) Plan Development Plan Procurement/provision Consideration Coordination Spec consideration	Phased development of facilities/structure Education/training Facility/Structure development (* Implement sequentially)	System configuration

Reference: Timeline

Disaster mitigation & emergency response (customer assistance)

	Actions & Response Policy	FY2018	FY2019	FY2020
Disaster mitigation & emergency response	■ **Improve customer guidance and assistance (in multiple languages)** ・Implement a *Display Integrated Management System (DIMS)* for more efficient information sharing ・Manage emergency public announcements for each building centrally through KOC ・Install more outdoor loudspeakers (open-air carpark, northern area, area outside T2) ・Procure additional emergency multilingual *MegaSpeak* megaphones ・Provide assistance in non-Japanese languages jointly between information center staff and handling staff (pax guidance and social media) ■ **Maintain close communication with stakeholders** ・Establish General HQ within KAP (Anticipated members: KAP, NKIAC, CAB, police, Japan Coast Guard, Fire Department, AOC, ground transport operators and others) ■ **Share information externally with the public** ・Strengthen public-relations function within crisis headquarters ・Strengthen communication/cooperation with relevant stakeholders (central gov't/municipalities) ・Increase availability of information in multiple languages ■ **Develop response plans for different incidents** ・Anticipate what incidents may severely impact airport operations → Prepare manuals to accurately understand the number of people stranded or sheltering in airport facilities → Assign roles to KAP group company employees and conduct training	Development Development Development Development Development Development Manual creation Plan Plan	Implementation Education/training	

Reference: Timeline

Speedy repairs (restore airport functions)

	Actions & Response Policy	FY2018	FY2019	FY2020
Speedy repairs	■ **Develop an speedy repairs plan for different scenarios** ・Anticipate what incidents may severely impact airport operations ■ **Secure equipment and materials necessary for speedy repairs** ・Prepare and deploy equipment and materials necessary for speedy repair efforts (secure external means of procurement for equipment/materials difficult to prepare internally)	Development Procurement & deployment		