EMERGENCY RESPONSE AND SAFETY EVALUATION OF DAMS ON THE 2011 GREAT EAST JAPAN EARTHQUAKE

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1. Emergency Response of JWA on the 2011 Great East Japan Earthquake

2. Safety Evaluation of JWA Dams after the Earthquake

3. Latest Achievement in India by JWA

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1. Emergency Response of JWA on the 2011 Great East Japan Earthquake
The 2011 Great East Japan Earthquake

2:46 pm 11 March 2011

Mw=9.0

Naramata Dam (JWA)
Kusaki Dam (JWA)
Epicenter

Seismic Intensity *

7
Upper 6
Lower 6
Upper 5
Lower 5
4
3
2
1

* in JMA scale

Source: Japan Meteorological Agency (JMA)

Source: Ministry of Land, Infrastructure, Transport and Tourism (MLIT)
JWA’s Emergency Headquarter

11th March 2011
2:46pm Earthquake
2:48pm Investigation Started
2:50pm Set up the EOC

12th March 2011
7:30pm Decision on rehabilitation

Board for latest information
Real-time Monitoring

Prompt Information of the status of Dam is required

Emergency Operation Center at JWA HQ on 11 March 2011
Dam Safety Inspection in Japan

- Inspection by Dam Owner
  - Usual Inspection
    - Daily
    - Monthly
    - Yearly
  - Extraordinary Inspection
    - After flood hit
    - After earthquake occurred
  - Comprehensive Inspection
    - Every 30 years
- Inspection by External Specialist
  - Periodic Inspection
    - Every 3 years
Extraordinary inspection aftermath of great earthquake

- Acceleration at dam foundation
  - Under 25 cm/s²
  - Over 25 cm/s²

- Seismic intensity
  - Under 4
  - 4
  - 5 lower and over

Quick check
- Quick check
  - within 1 h

First check
- First check
  - within 3 hrs

Second check
- Second check
  - within 24 hrs

Detailed check
- within 3 days

End

No problems on safety in all JWA's dams
2. Safety Evaluation of JWA Dams after the Earthquake
Safety Evaluation of Dams based on Long-term Monitoring

- **Kusaki Dam (JWA, Gravity, H=140m)**
  - Situated 354 km from the epicenter
  - Max. acceleration of dam base=77 cm$^2$/s (upstream/downstream)
  - No damage in the dam body and facilities

Change of leakage from the beginning of the first impounding

2011 Great East Japan Earthquake
Safety Evaluation of Dams based on Long-term Monitoring

Leakage amount after the Earthquake is small enough compared to that in the first impounding.

Impact of the earthquake is not large compared to the effects of seasonal changes.
Safety Evaluation of Dams based on Long-term Monitoring

- **Naramata Dam (JWA, Rockfill, H=158m)**
  - Max. acceleration of dam base=7 cm²/s
  - (upstream/downstream)
  - No damage in the dam body and facilities

Seepage volume right after the Earthquake was kept within the regular trend.

**2011 Great East Japan Earthquake**

Increase of Seepage 116→141 liter/min
ICOLD Bulletin 166 (2016)

- Variation of leakage/seepage can be experienced at very long distances from large earthquakes.
- Leakage/seepage and pore pressures often change as a result of ground shaking. Usually they increase after an earthquake.
- In most cases the increase is only temporary and will decrease or become stable over time, and it may last from several days to a few years until a stable condition is reached.

Changes in the leakage/seepage of the Kusaki Dam and the Naramata Dam in the 2011 Great East Japan Earthquake showed the same tendency.
3. Latest Achievement in India by JWA
Preparation for Seismic Event

Field Drill at Ichari Dam, Uttarakhand on 18 Oct. 2016

Assumed Earthquake M 7.4 at Uttarkashi

Ichari Dam

UJVN-Dakpathar

UJVN-HQ

Info flow

Inspection of Civil / Mech. / E&T facilities

Central Water Commission

Field Drill at Ichari Dam, Uttarakhand on 18 Oct. 2016
Earthquake Emergency Response Drill and Workshop on Disaster Preparedness of the Dams Conducted in India

October 18-22, 2016
Uttarakhand, India

Activities conducted as part of the World Bank’s Dam Rehabilitation and Improvement Project (DRIP) with technical assistance from the Disaster Risk Management Hub, Tokyo’s Country Program’s “Improving Service Delivery of DRM in India” Project.

Please visit The World Bank Site!
4. Conclusions
Conclusions

**Key for success on emergency operation**

- Preparedness before the disaster
- Organizational governance on decision making
- Implementation after the disaster

- Capacity development and raising awareness on risk management
- Grasp of the normal state of the facility

*Thank you for your attention.*