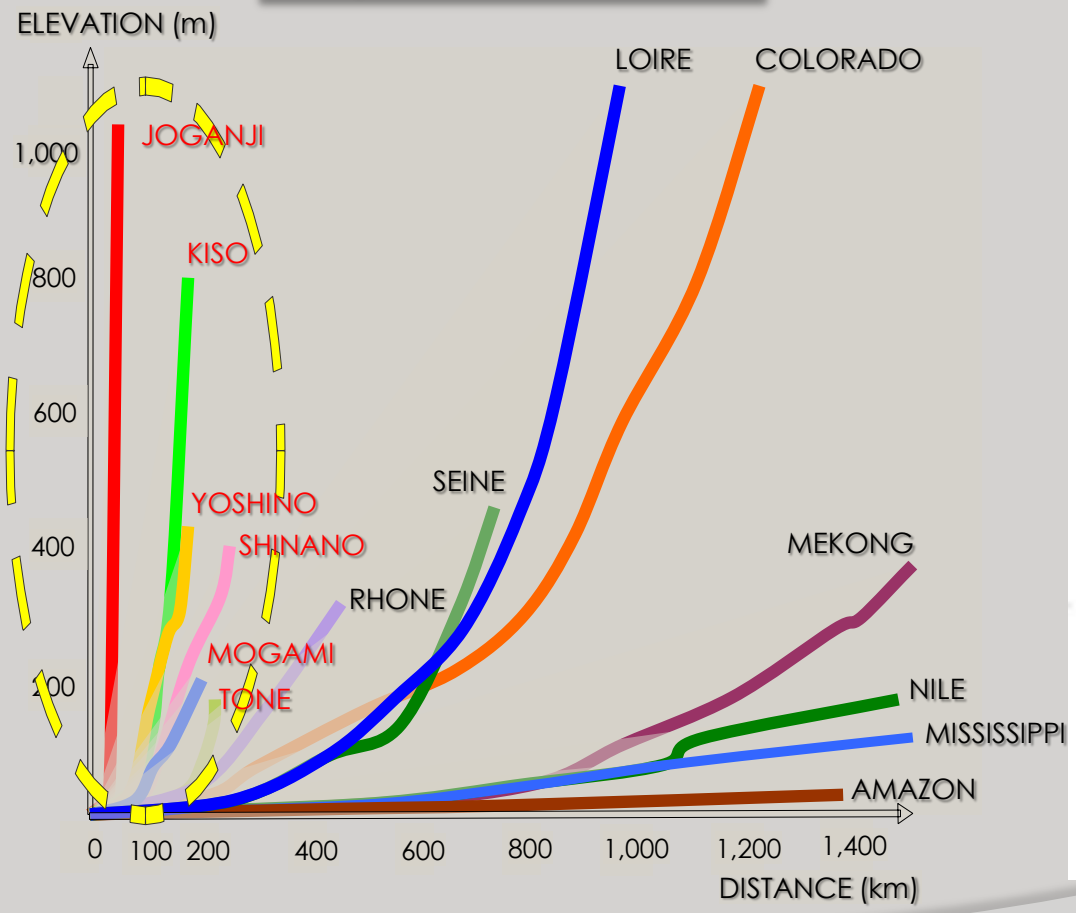
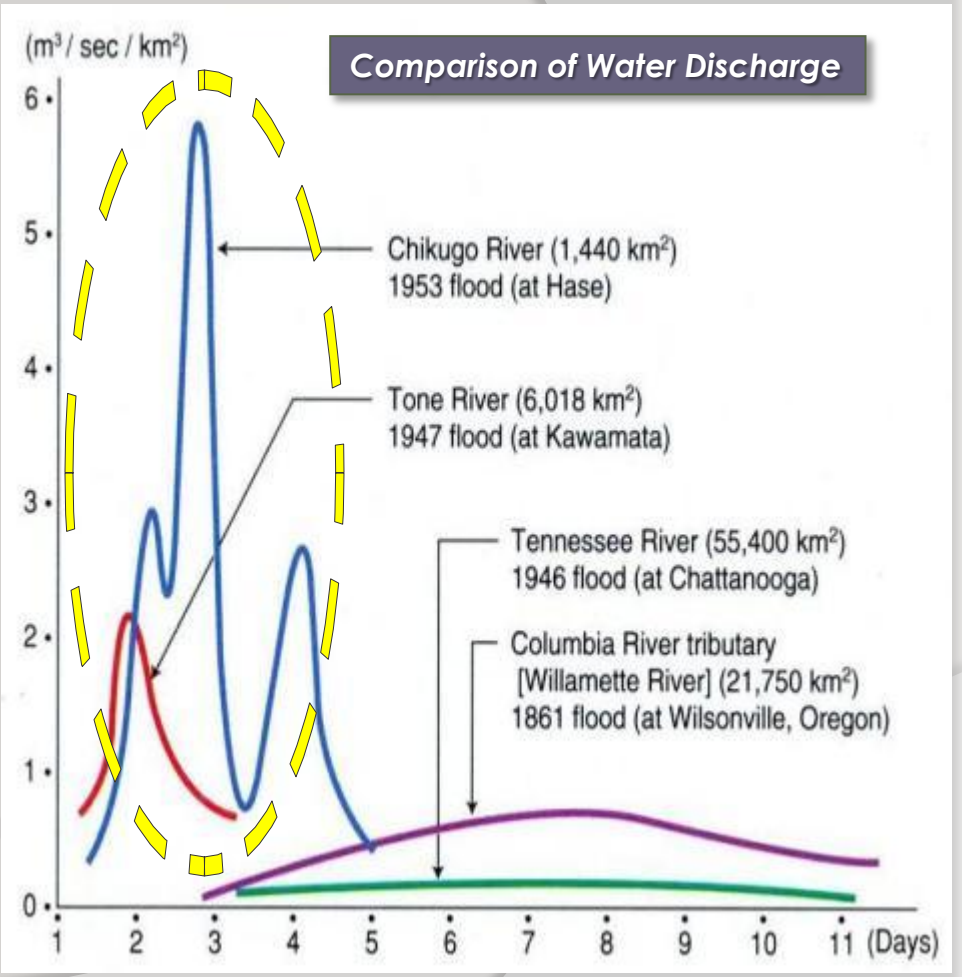
CHARACTERISTICS IN JAPAN'S RIVERS

Steep gradient in Japan's rivers causes floodwater quickly flow down and water level abruptly rise.

Comparison of River Gradient



Comparison of Water Discharge

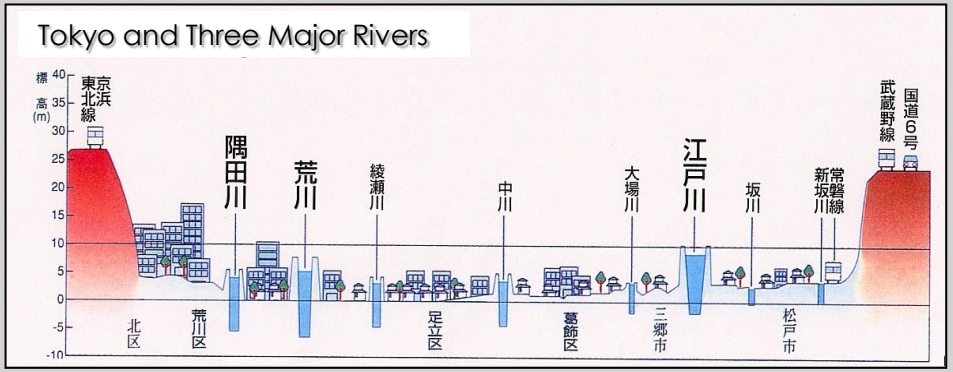


VULNERABLE LAND TO FLOOD – GEOGRAPHICAL FEATURES

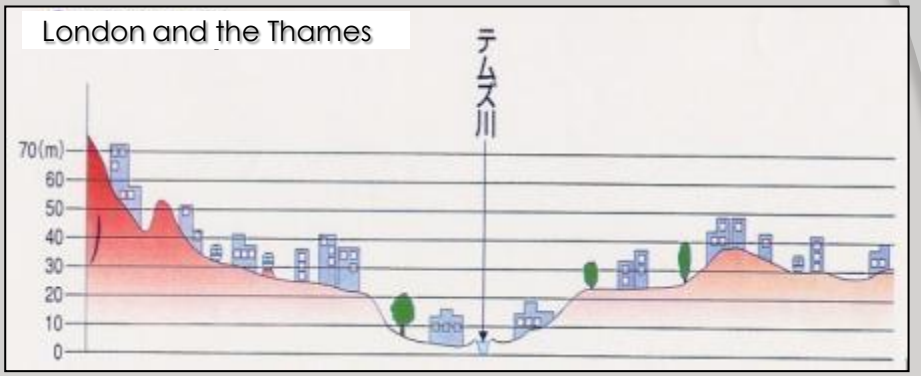
High concentration of population and assets will bring about serious damages at possible embankment collapse.

Flood levels in Japan are higher than the elevations of highly populated area

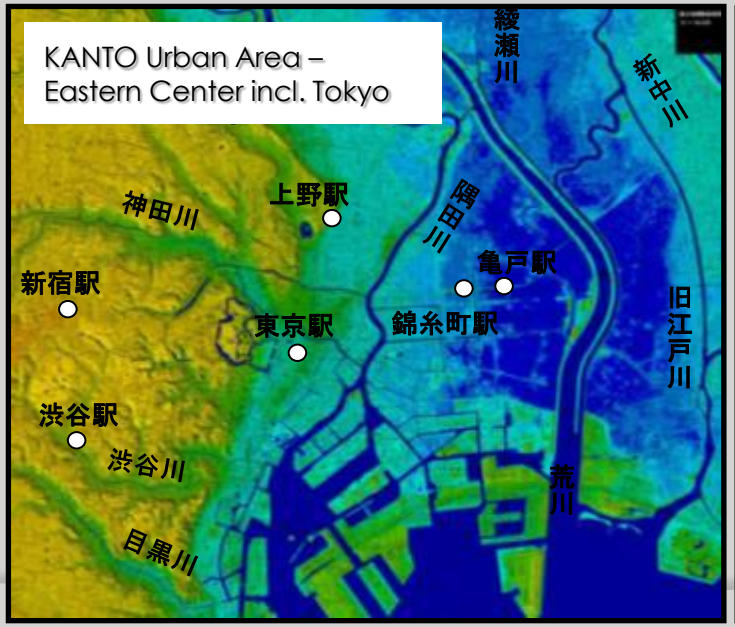
Tokyo and Three Major Rivers



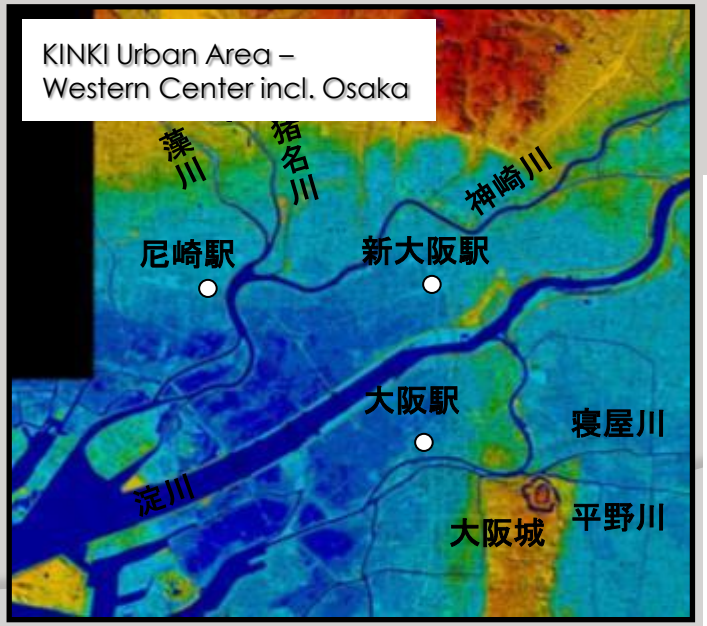
London and the Thames



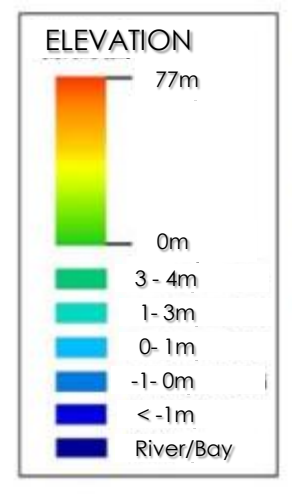
KANTO Urban Area –
Eastern Center incl. Tokyo



KINKI Urban Area –
Western Center incl. Osaka



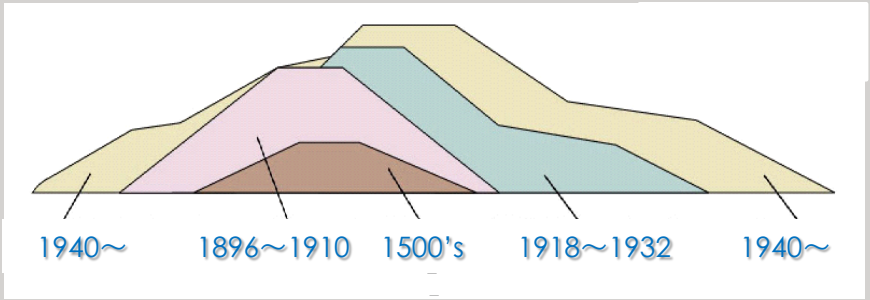
Approx. 2.9 million people reside in below MSL 0m in three major urban areas.



RIVER MANAGEMENT – EMBANKMENT

Embankment was formed by repeating earth-fill in many years in its history. While simple application of available soil at every fill, un-uniformity remained in material composition.

Bank Section Transition of the YODO in KINKI



The EDO in KANTO – Flood level is higher than populated ground elevation at Typhoon No.15 in 2001.

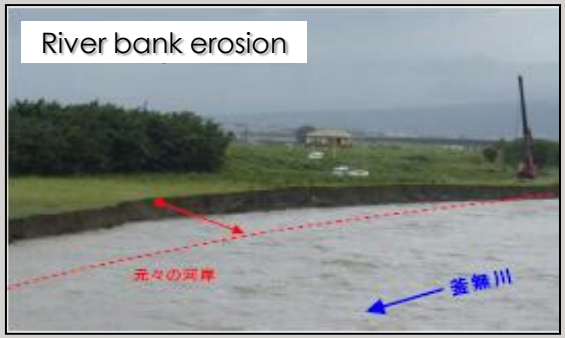
Bank Top higher than Houses

RIVER MANAGEMENT – PATROL & INSPECTION

Embankments expose various deformation caused by high pressure and erosion force at floods in steep rivers.

Embankment Deformation


Piping to leak




Slope slide at rains and floods

Patrol & Inspection

Patrol & inspection on daily changing deformation leads to early detection and proper treatment.


Bank inspection


River patrol


Crack inspection by sonar

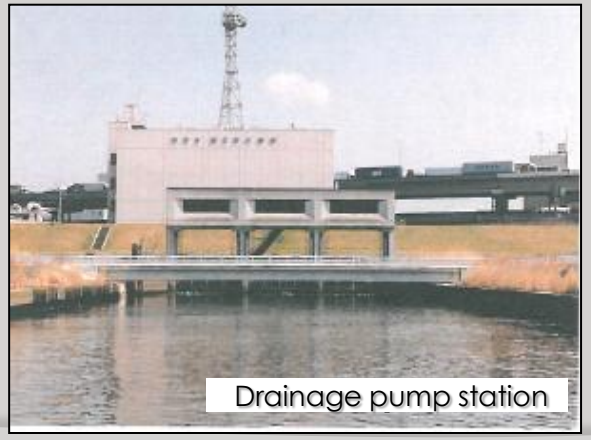
RIVER MANAGEMENT – EQUIPMENT STRUCTURES

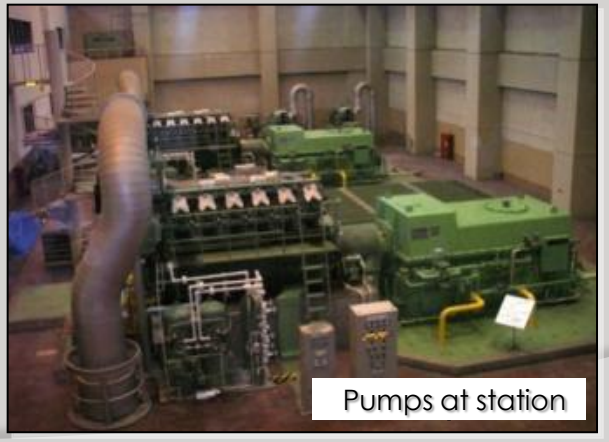
Various structures are equipped to function for river management.

There are many equipment structures including sluice gates and pipes, and drainage pump stations installed for blocking backward flow at high-water from main streams to their tributaries.

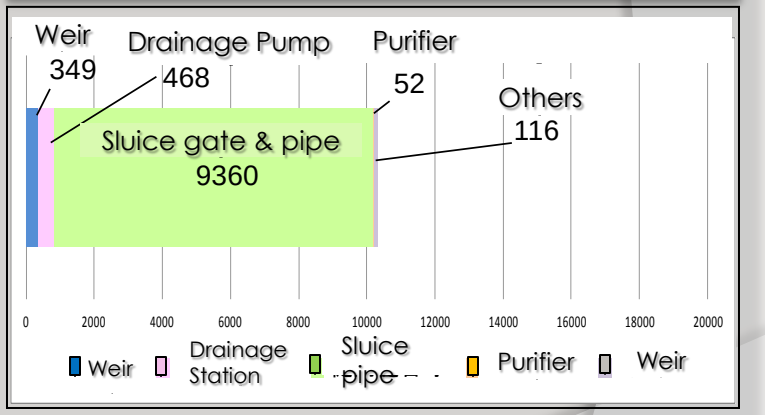

Sluice gate


Sluice pipe


Drainage pump station

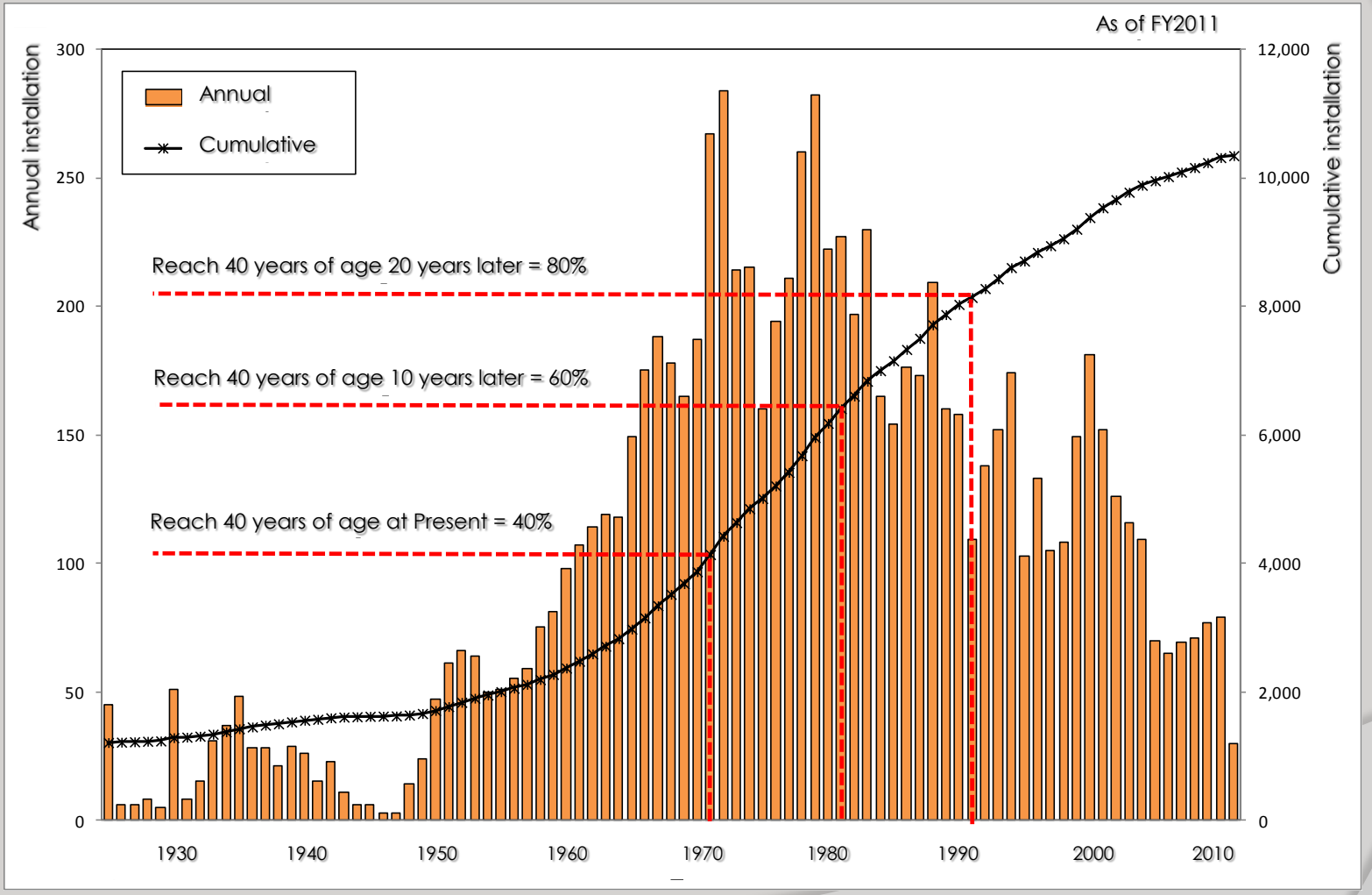

Pumps at station

Structures under Central Government's administration counts 10,000 approx.



PRESENT AGING STATE OF EQUIPMENT STRUCTURES

Among equipment structures installed during rapid economic growth period, ones above 40 years of age will progressively increase in number.



Counted in this table includes weirs, groundsills, lock gates, sluice gates and pipes, pump stations, drainage stations, land locks, purifier stations, dams and retarding basins.

PROMOTE STRATEGIC MAINTENANCE OF RIVER MANAGEMENT FACILITY – FROM "TIME DEPENDENT" TO "AT-MONITORING" AND/OR "AT-OCCURRENCE"

Maintenance used to implement renewal by periodic replacement in time-dependent Program

Milestones achieved in full-scale introduction of At-monitoring and/or At-occurrence Maintenance
- *Prepared manuals for Gates and Pumps in 2008*
- *Stated full development of lifetime improvement plan for major equipment structures by 2016 in Infrastructure Development Policy 2012*

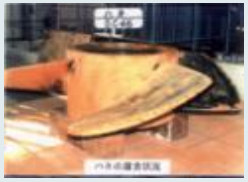
Equipment critical for facility function at breakdown and with difficult monitoring on conditions

Time Dependent Maintenance

Target
- ✓ Electric control equipment
- ✓ Major parts of pumps

Avoid functionally critical damages by periodic replacement and renewal

Control panel



Impeller

At improvement on condition monitoring, shift to At-Monitoring Maintenance

Equipment critical for facility function at breakdown but with possible monitoring on conditions

At-Monitoring Maintenance

Target
- ✓ Major parts of gates (roller gates and controllers
- ✓ Motor lubrication system at pumps

Implement preventive measures to assure optimum repair and renewal on evaluating operating values and inspection results

Gate wire rope

Gate

Equipment non-critical for facility function at breakdown

At-Occurrence Maintenance

Target
- ✓ Pump lubrication system at gates
- ✓ Backup generators for pumps
- ✓ Meters for pumps

Maximize cost effectiveness at non-critical devices by utilizing them till mail-function to reveal

Motor oil leakage

Fail-safe standby

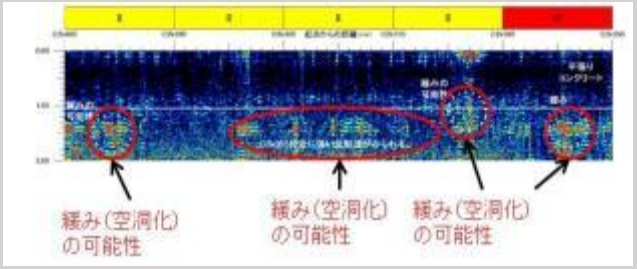
Needed budget must be maintained in parallel with cost reduction by asset management

REDEVELOPMENT OF RIVER MANAGEMENT TECHNOLOGY

Develop technology in river management including Inspection, degradation diagnosis, condition monitoring

Hollow detection at river walls and bank crowns by electromagnetic waves

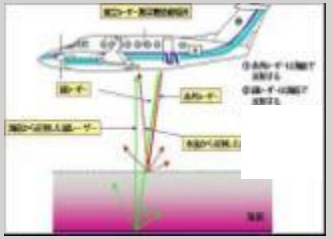
Portable device detection

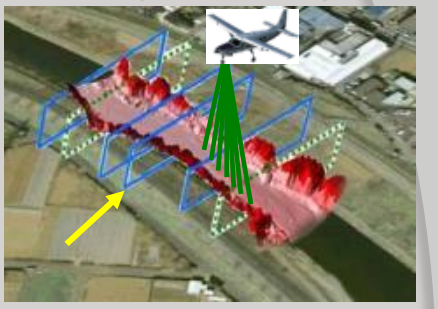


Example detection chart

Research on river bed profiling technology by aerial laser surveying system

Apply well-established system for land topography to 3D bathymetric survey by verifying applicable conditions like river water turbidity for implementing easier and more economical periodic survey than ever





Research on bank deformation detection technology by mobile mapping system

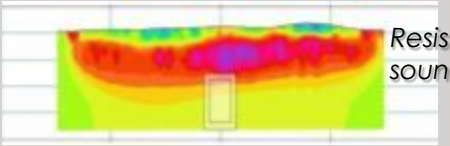
Develop long–distance scanning device with high precision plus density and its data processing software to detect existing and potential damages, deformation and settlement on embankments by high resolution cameras and laser scanners mounted vehicles

Challenges –
Innovate scanners to meet the above spec from 100 meter distance and data processing software to grasp 3D deformation

Example scanned and processed data

Probe embankment soundness by geophysical survey

Comparison of in-situ survey and resistivity sounding



Resistivity sounding

In-situ survey