

**MAINTENANCE PROCESS  
BEING REFLECTED IN DESIGN  
PROCESS  
ON PUBLIC WORKS**

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# 1.Introduction

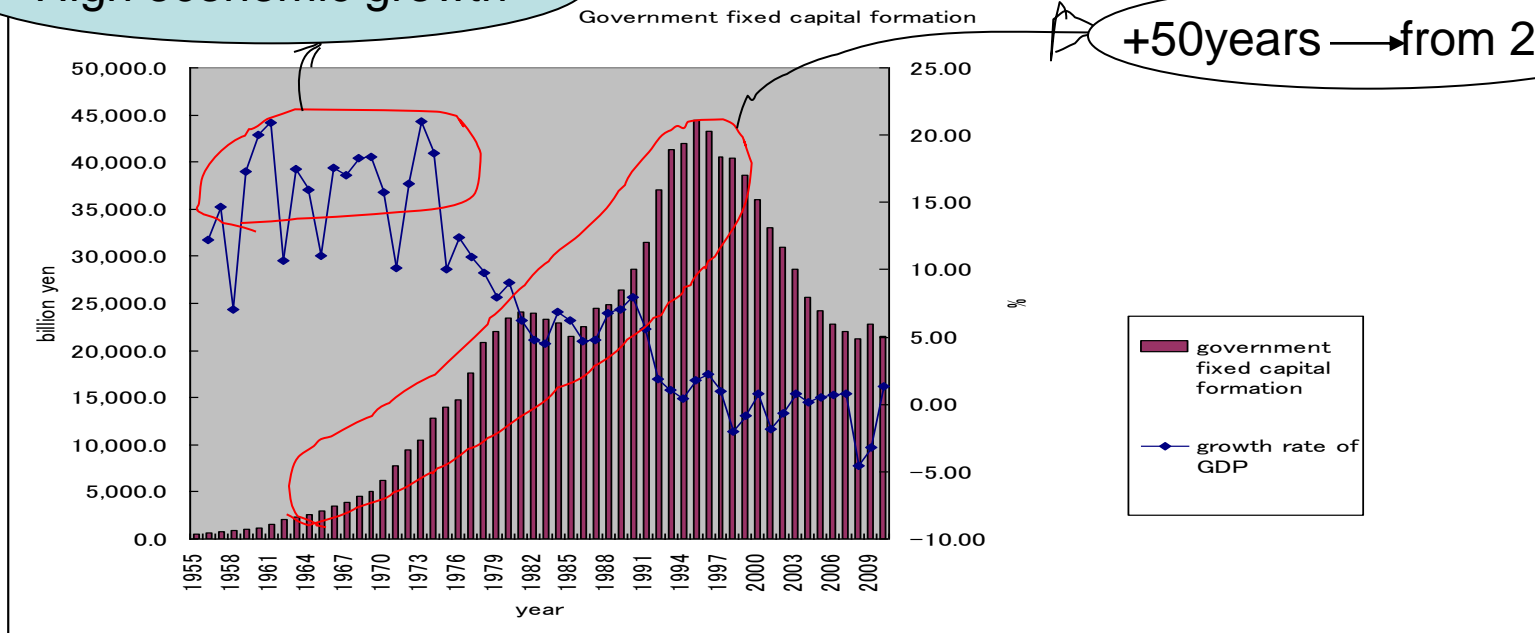
- In the Life Cycle of public works, construction process has been thought important. a big issue in the area where the people live and how much money it costs is also a big financial issue.
- But other processes, especially maintenance(running) process, should be given greater consideration than present.

# 2. Social overhead capital (formation) historical trend in Japan

- Japan

High economic growth

+50years → from 2010s

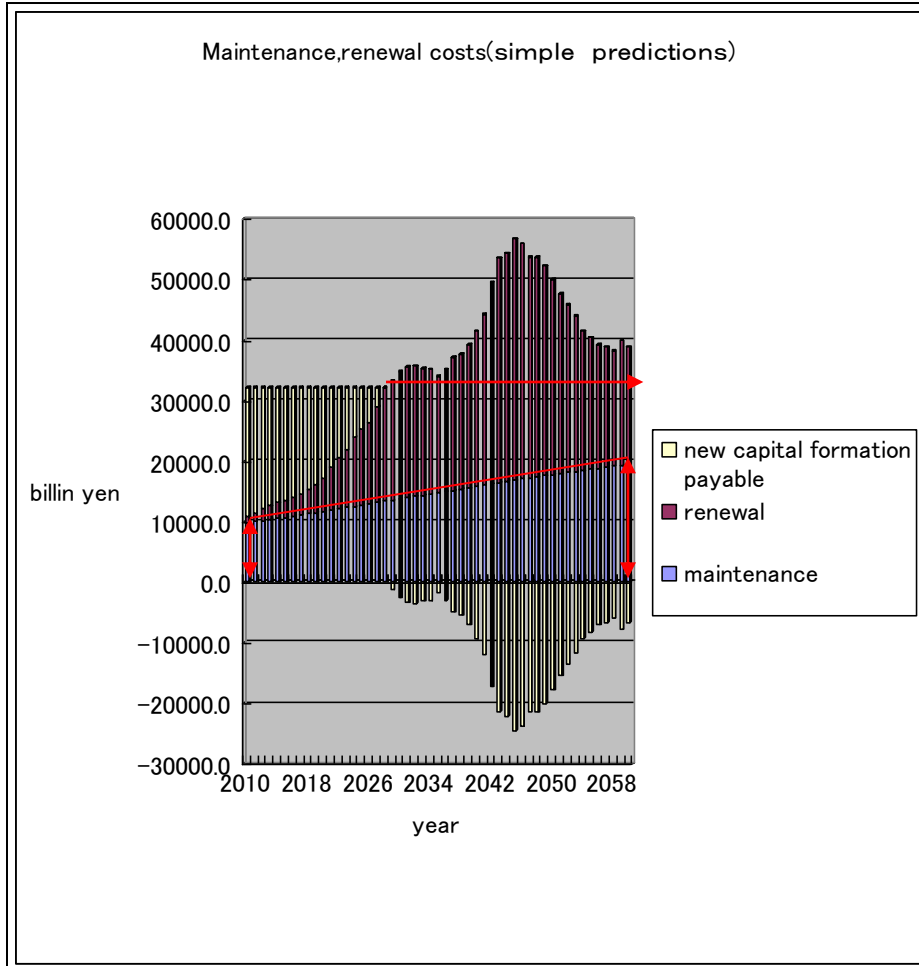


● The U.S.

1930s New Deal 1980s "America in ruins" 2013 "Fix-It-First" program

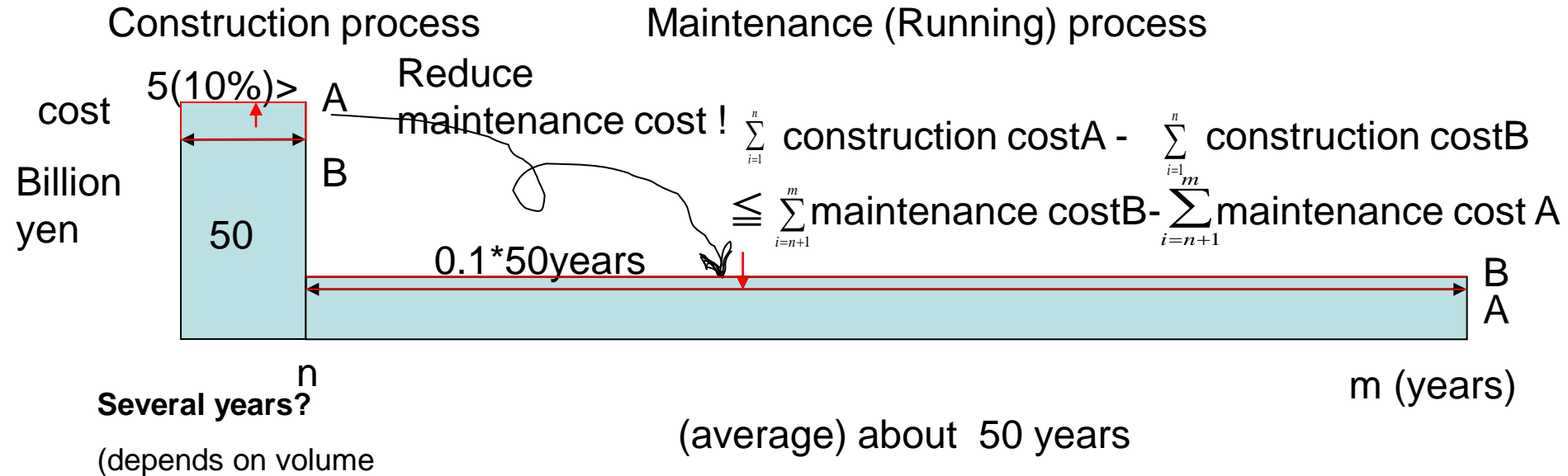
-50years ← from 1980s

# 3. Maintenance(Renewal) costs will increase rapidly



- If new government capital formation is permitted under the total cost of 2010 (about 32000 billion yen (320 billion \$)), it will reach to this maximum point in 2029!
- Maintenance cost / total cost 2010 = from 30% (2010) to 61% (2060)
- (under several preconditions that
  - average durable period is 50 years
  - renewal cost** is past figures \* 0.9 (efficient construction means & population decline)
  - using figure on White paper of M.L.I.T of maintenance cost / new government capital (stock base) ratio.

# 4. Reducing maintenance cost will decrease total Life Cycle Cost



●Users (ordinary people) are given services & give evaluations to owners of public facilities.

and may be able to inform owners of a hole on roads by photo with GPS ,using smart phone.

●Accident (disaster) will happen?

Necessary to prepare measures!

# 5 .Design-reflecting maintenance (running)process

## ● Design easy to maintain & run

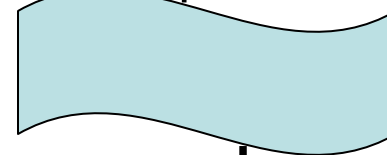
design of walls



Maintenance ○ easy to clean  
( floors)

Run (prison) ○ easy to monitor

sophisticated?



× (deep curved place)

× space to hide themselves

## Maintenance (design should reflect below)

○ things inspected : assembled together  
distance from above: appropriate to watch & judge.


○ lights (restroom) : with sensors

○ glasses (windows) : double-glazing (hot in winter)

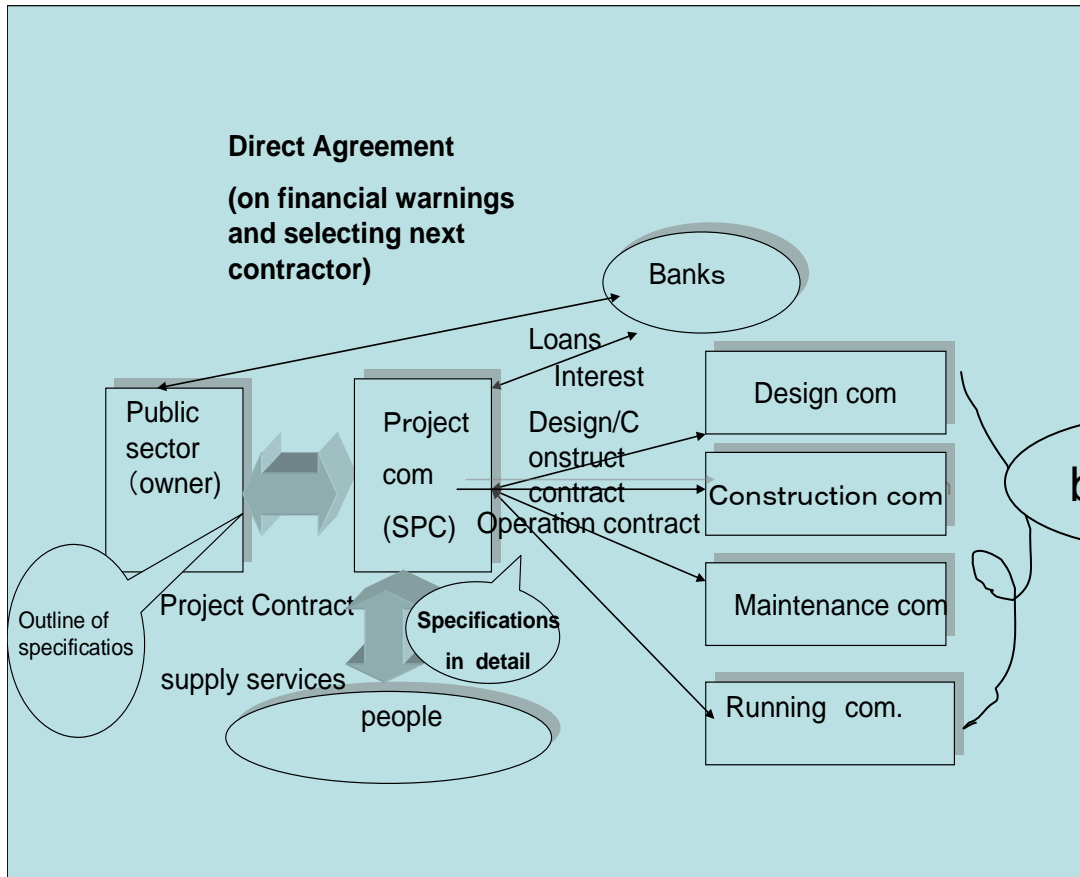
Easy to inspect

saving energy

# 6. The means of design process to reflect maintenance (running) process

- **2D CAD** design drawings : for only **professionals** who are able to imagine space by adding the information of height
- 
- **3D CAD** design drawings : for the **general workers** of maintenance firms who can **understand that structure easily**
  - By using 3D CAD design drawing, to construct passages for inspections, as there are several complicated ducts in the facilities, necessary to use crush detection. Installations of monitoring cameras also need accurate spatial simulations.
  - (Even in the planning process, it's also useful to use 3D CAD design drawing for **ordinary people** to select the appropriate form of public structures not to impair good landscape from important viewpoints )

# 7. PFI (PPP) with BIM



Submit proposals on the specifications of design, maintenance and running public facilities & life cycle costs together

BIM is a good tool for related to projects

- easily understand whole design of structures
- estimate life cycle costs quickly, by using database of materials

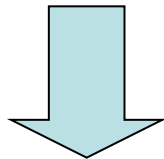


# 8.From BIM to CIM

- One of the difference between Building and Civil engineering field is
  - ①long distance
  - ②and therefore various undulations of land as coordinates
  - ③contents of underground (geological ,soil layers information) are different in long distance



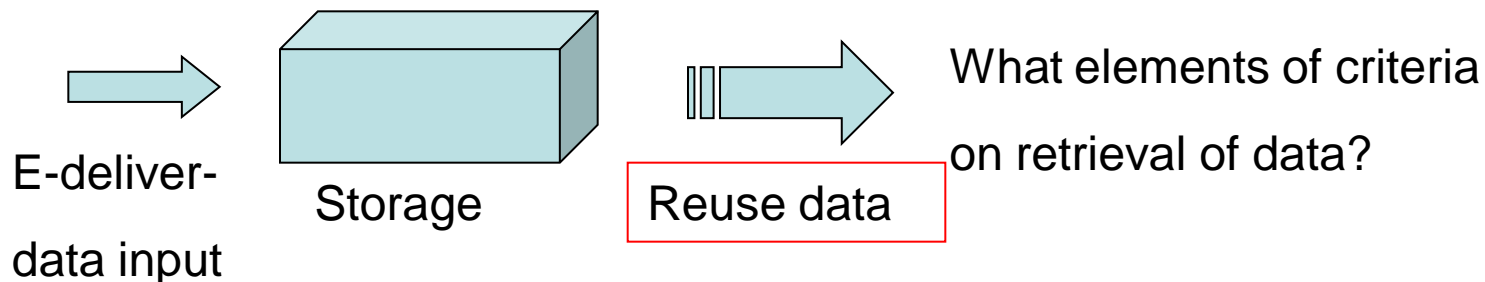
a" virtual assist site" to make reference surface.



- Accurate 3D maps (with geological information)
- Nowadays, laser-surveying system by airplane has developed rapidly.

# 9. To reuse construction data for maintenance process

- **CALS** : a fundamental idea to stress importance of exchange of information smoothly in different faze of process (plan, design, contract, construction, maintenance, running) in public works field
- If accidents happen unfortunately, owners (national or local government) must comprehend the place in detail by looking at these data quickly !
- But owing to lack of concrete ideas and means for reusing data, CALS at present doesn't make progress in concrete data circulation system、 though there have already been a lot of storage of data!



# 10. Main elements of criteria on retrieval quickly to reuse data for maintenance process

## (1) using (x, y) coordinate-2(3)D (positioning data)

- If accidents or disasters happen unfortunately, researches are going to be conducted and **(x, y) coordinates** are useful to look for the scene quickly.

## (2) Adding the 4th dimension “Time”

- There would happen in the same areas several **accidents, construction works**. So, at first we must consider which design drawing for these areas is the latest one .



Let's reuse usable data effectively!

Thank you very much  
for listening!