CSG method (Cemented Sand and Gravel)
~A material made mixing water and cement with sand or gravel obtained near the site~

CSG공법 (모래와 자갈을 시멘트와 배합)
~인근지역의 모래나 자갈을 물과 시멘트에 배합한 재료~

Natsui district coast of Iwaki City, Fukushima Prefecture, was damaged by the tsunami in the Great East Japan Earthquake. Here in 2013 , a length of about 1km, of a new type of Coastal Levee of height up to 9m "CSG Levee" was completed . "CSG Levee" can be applied not only for infrastructure development in disaster prevention, but also for the broad field including roads, .

🌐 What is CSG (Cemented Sand and Gravel) ?

A material that is produced by simply mixing cement and water with gravel readily available in the site surrounds.
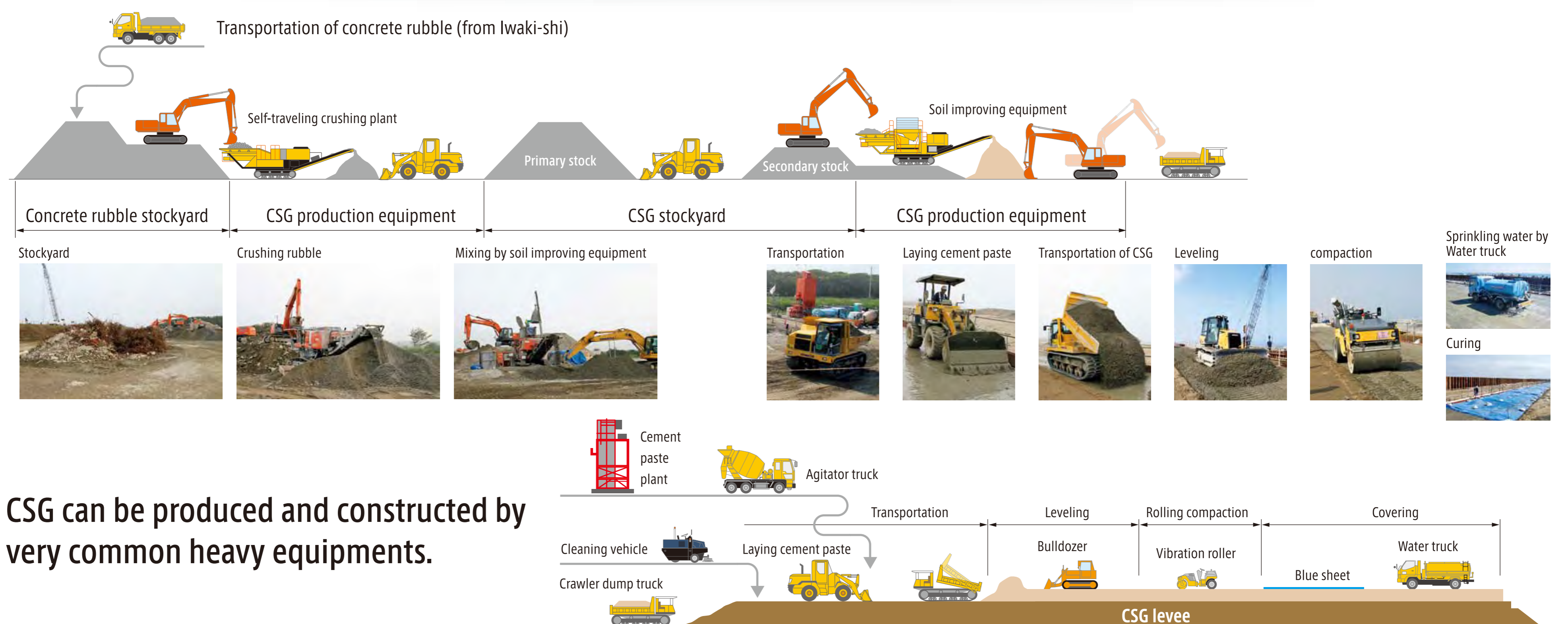· Also used as material for the levee body of a permanent trapezoidal CSG dam.
· Ensuring the required strength
1) Techniques for defining and determining strength are available.
2) Quality control standards are available.
3) 1) and 2) ensure the required design strength of CSG.
· Contributes to reduction of environmental impact, cost reductions and shortened construction periods.

🌐 Construction of the first CSG levee in Japan by effective usage of rubble from the Great East Japan Earthquake disaster
~Construction of the Coastal Levee on the shore of the Natsui region~

When the Great East Japan earthquake struck, in many cases, it was observed that conventional Coastal Levees collapsed, because internal soil was swept away by tsunami, and therefore, it was required to construct the levees which would not collapse immediately after overflow of tsunami. There was also another urgent issue of disposing of, or reusing concrete rubble. To address these issues, it was decided to construct CSG levees that would ensure not to collapse immediately, and at the same time, make it possible to use 40,000m3 of the 500,000m3 of rubble left by disaster that struck Iwaki-shi.

Levee Crown Concrete
Protective concrete
Embankment

Cross section

Close-up of completed Levee

Length: 920m
Volume: 60,000m3
Height: 9m max.

Client:
Iwaki District Public Works Office, Fukushima Prefecture

Panoramic view

🌐 Example of CSG construction flow

Transportation of concrete rubble (from Iwaki-shi)

Self-traveling crushing plant

Soil improving equipment

Primary stock

Secondary stock

| Concrete rubble stockyard | CSG production equipment | CSG stockyard | CSG production equipment |

Stockyard

Crushing rubble

Mixing by soil improving equipment

Transportation

Laying cement paste

Transportation of CSG

Leveling

compaction

Sprinkling water by Water truck

Curing

CSG can be produced and constructed by very common heavy equipments.

Cement paste plant

Agitator truck

Transportation

Leveling

Rolling compaction

Covering

Cleaning vehicle

Laying cement paste

Bulldozer

Vibration roller

Water truck

Crawler dump truck

Blue sheet

CSG levee