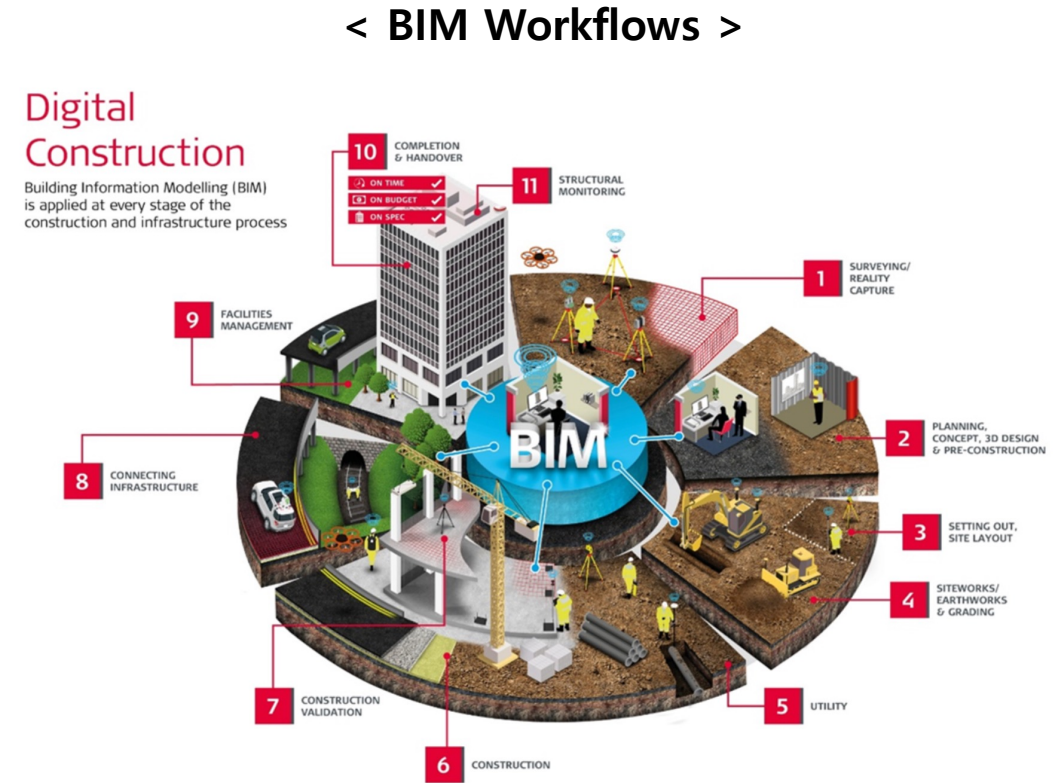


# Application of BIM Technology in Ports

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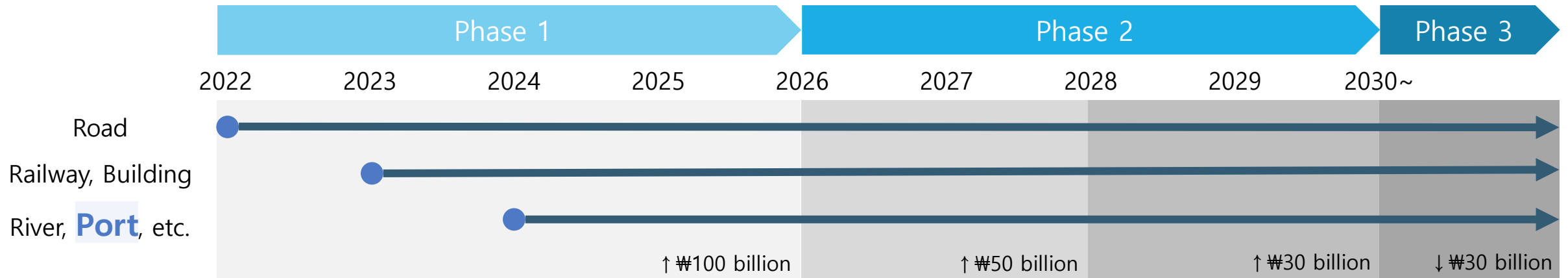
- BIM (Building Information Modeling) ?
  - ➔ A Key enabler for smart construction
  - ➔ A 3D model-based approach
  - ➔ A digital representation of physical and functional attributes of assets throughout their lifecycle



\*Source: <https://www.construction-europe.com/news/what-is-bim-and-how-can-it-improve-construction-/8017518.article>

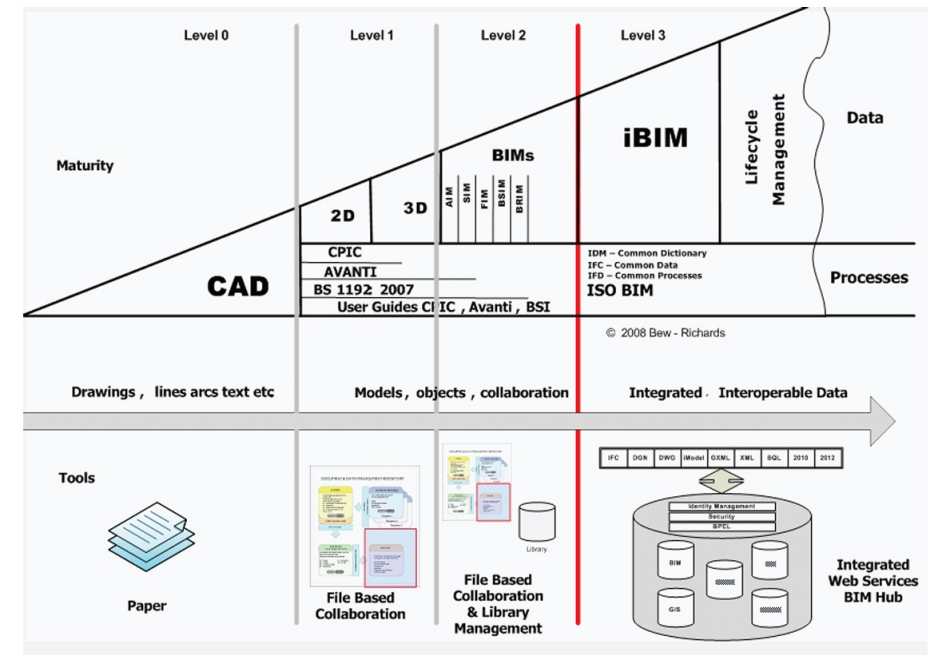
## Introduction

- BIM for Infrastructure
  - ➔ The applications of BIM is **expanding to civil engineering** such as ports, roads, rails, and airports
- BIM Mandatory In Korea
  - ➔ BIM will be required to the entire lifecycle of construction project
  - ➔ BIM adoption **is being mandated in public project until 2030**



- BIM in port construction projects
  - ➔ The ports sector is **lagging behind** other civil engineering sectors in BIM maturity
    - Level of integration and linkage of information generated during the port construction project is low
- So..
  - ➔ examines the application of BIM technology in port construction projects

### < Bew-Richards BIM maturity model >



\*Source: Bew M.(2012), BIM Strategies in the UK Public Sector



## Benefits of adopting BIM technology for port infrastructure

### Lead to Smart Ports

Can evolve into a digital twin, which is the way to smart ports

Share and collaborate on the project with all stakeholders electronically

### Improved Collaborate & Communication

### Mitigated Risks & Reduced Costs

Prevent planning and design mistakes by identifying and addressing potential issues before construction begins

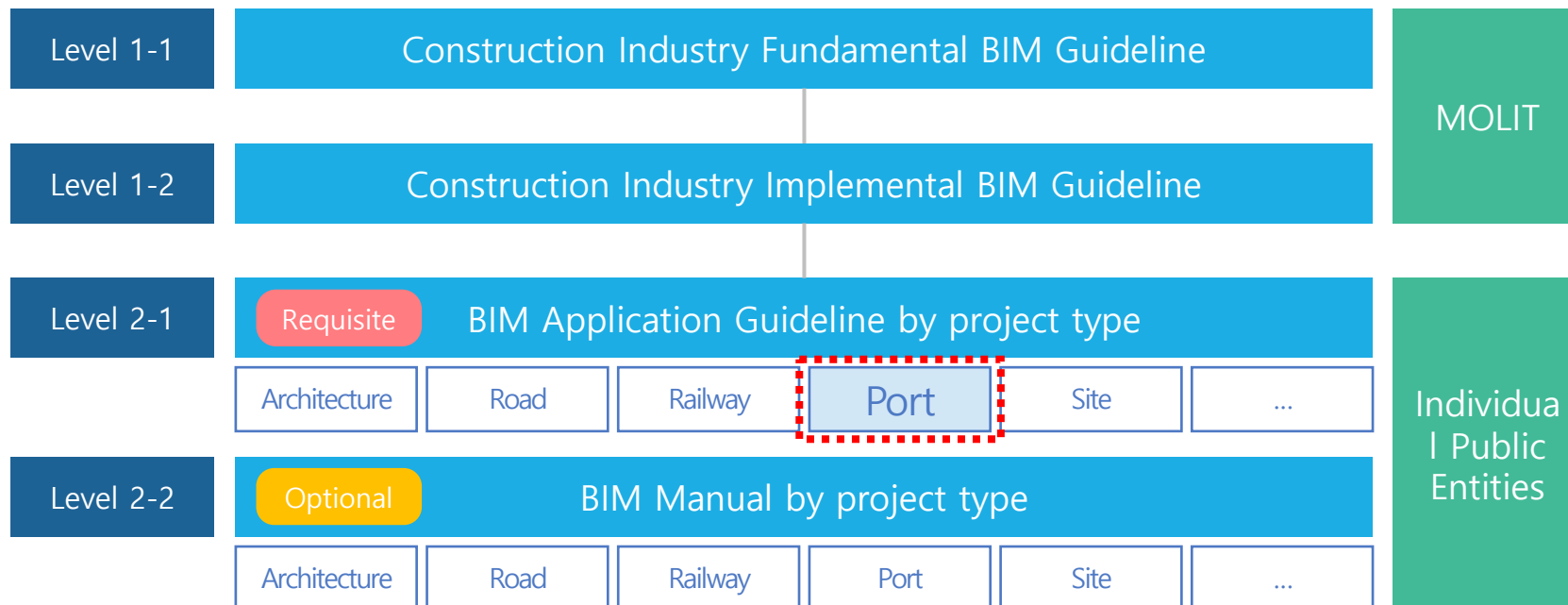
Provide a complete record of asset from planning to operations

### Improved Asset Management

## Features of BIM for port construction projects

- The port sector need to develop BIM application guidelines  
➔ "Different from general construction projects"

### < Hierarchy of BIM guidelines for the construction Industry in Korea >



\*Source: MOLIT(2022), Construction Industry Fundamental BIM Guideline

## Features of BIM for port construction projects



\*Source: BPA(2023), Brochure of Busan port

### Specialized facilities

Dredging, marine structure, road, yard, architecture, civil structure, electric, drainage, and so on

### Spatial Scope

Maritime areas as well as land side areas

### Construction Process

Have long period and multiple phases of continuous work

### Useful life

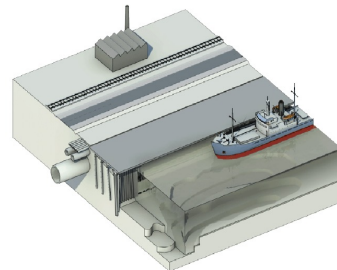
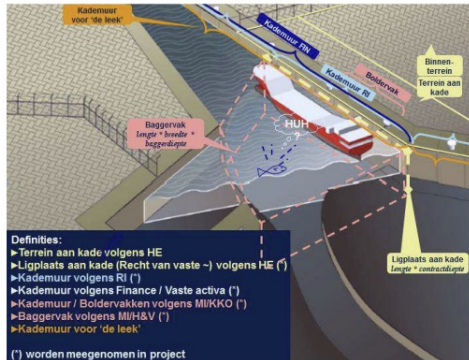
Need to maintain the performance requirements over the long period



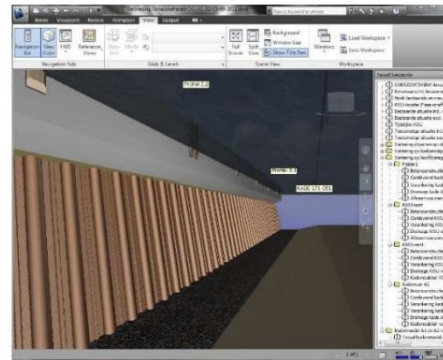
## Case study

# ■ Port of Rotterdam

## PLAN&DESIGN

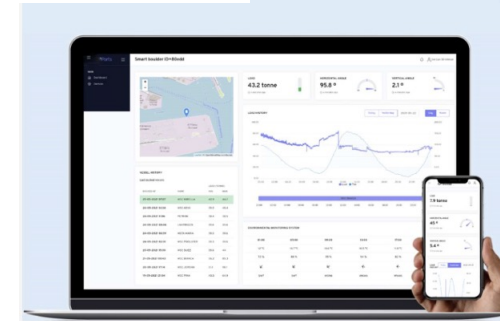


## BUILD



## MAINTAIN

- 10 quay walls equipped with sensors.
- Input for advanced modelling or reliability-based assessments.
- Digital twin => Inspector of the future is a sensor!



\*Source: Sisi Zlatanova et al(2014), 3D Spatial Infrastructure for the Port of Rotterdam

\*Source: Alfred Roubos(2023), SMART QUAY WALLS PORT OF ROTTERDAM

## Case study

### ■ Port of Barcelona

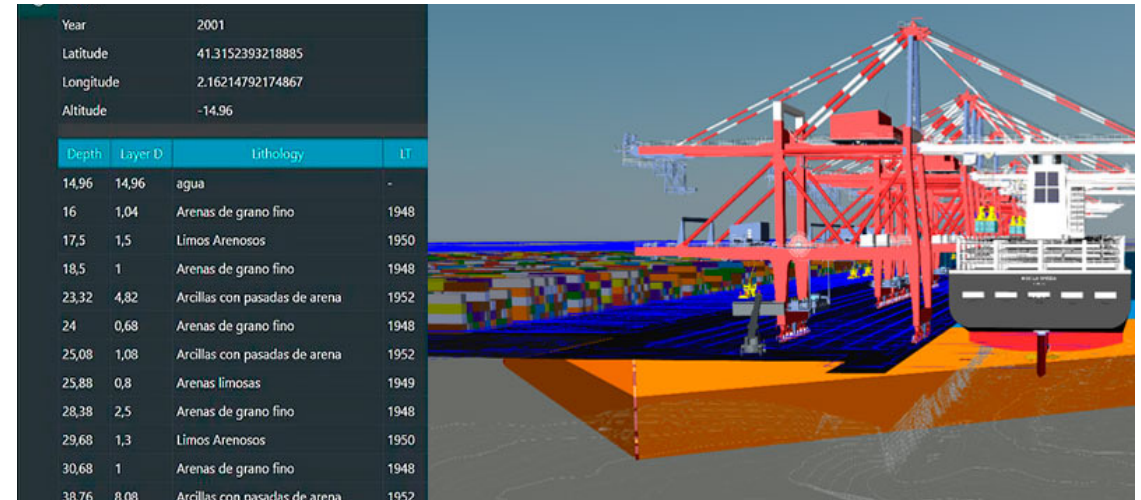
PLAN&DESIGN

BUILD

MAINTAIN



\*Source: <https://www.idp.es/en/communications/idp-completes-the-digitalization-of-the-aquifer-of-the-port-of-barcelona/>



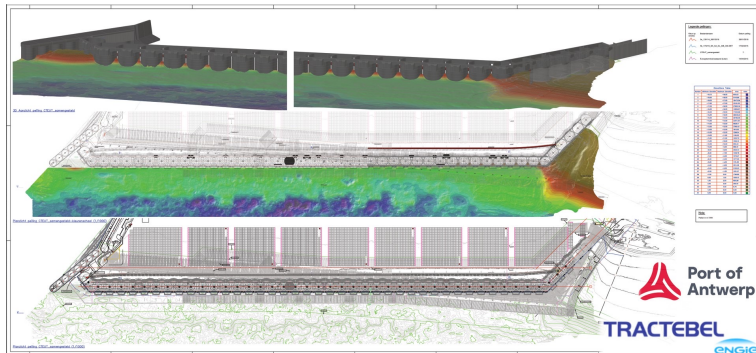
\*Source: <https://www.idp.es/en/communications/idp-completes-the-digitalization-of-the-aquifer-of-the-port-of-barcelona/>



## Case study

### ■ Port of Antwerp

PLAN&DESIGN



BUILD



\*Source:  
<https://d2csxpduxe849s.cloudfront.net/media/50F7038E-CFB4-473E-9C8FE4CE8F6870E5/1EAEFDF7-AC26-42E6-83E9FCAADF8739F5/2CCB9470-6F83-4E29-9E2F8901A79A8A46.mp4>

MAINTAIN

\*Source: <https://blogs.autodesk.com/aec/2022/11/07/parting-the-land-from-the-sea-a-story-of-reinforced-concrete-revit/?redirected=1>

## Case study

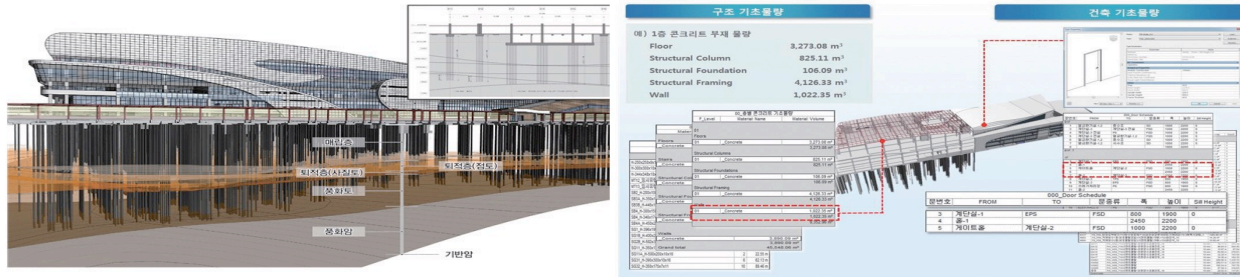
- Port of Busan, etc.

PLAN&DESIGN

BUILD

MAINTAIN

### Busan port International Passenger Terminal



### Pohang Yeongil Bay breakwater



### Jeju Naval Base

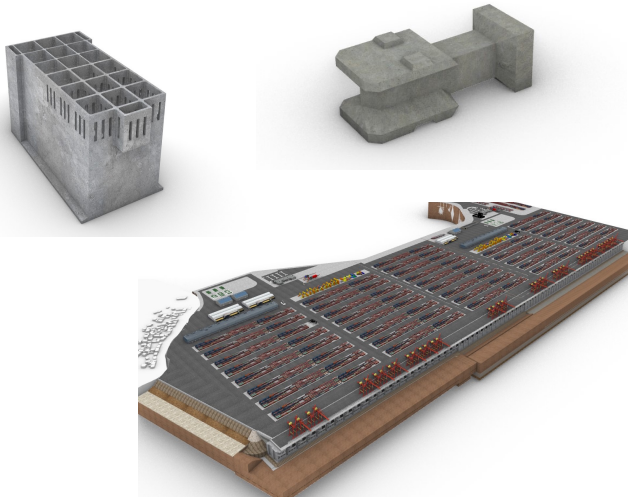


## Basic directions for BIM application in the port sector

### ■ Toward Smart Ports

BIM

Digital Transformation



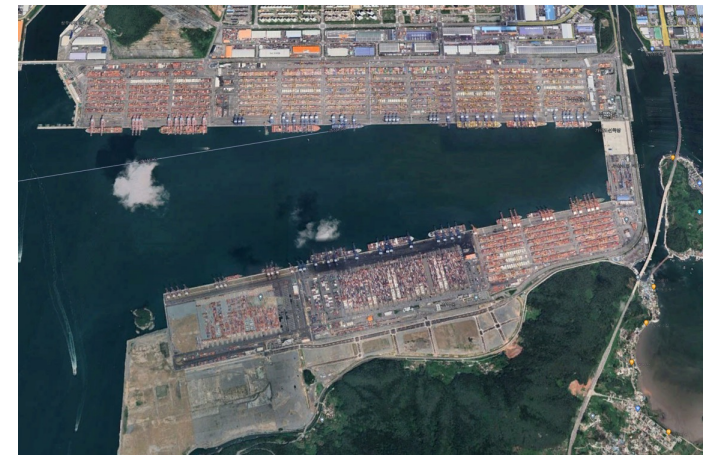
Digital Twin

Digitalization



Smart Ports

Intelligentization



\*Source: (left, mid) Ministry of Oceans and Fisheries(2022), Research on introduction of construction project management plan using GIS • BIM technology  
(right) google earth pro



## Basic directions for BIM application in the port sector

# ■ Integrated Information Management System

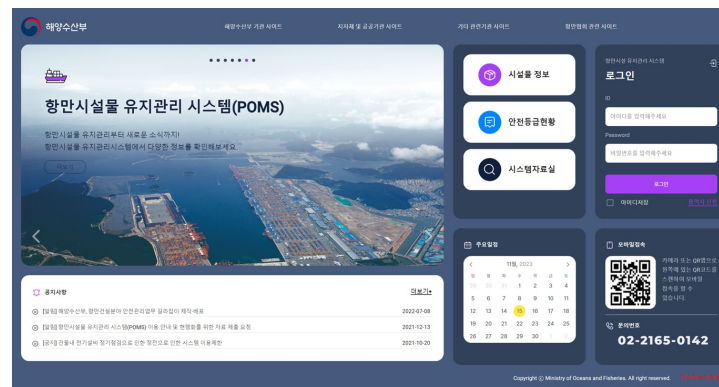
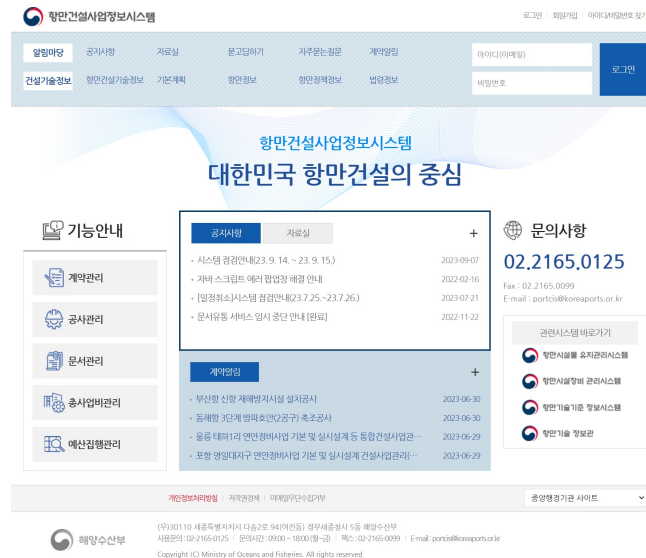
AS-IS

Planning, Design and Construction stage

Just document management system

Maintenance stage

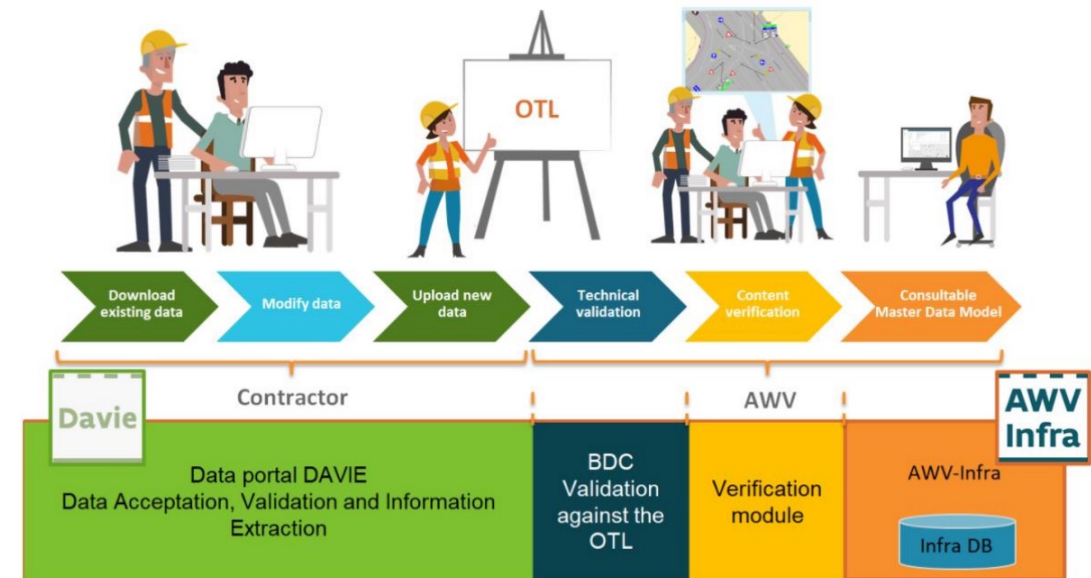
Monitoring by facility inspectors



TO-BE

Planning, Design, Construction and Maintenance stage

Integration and intelligence of information



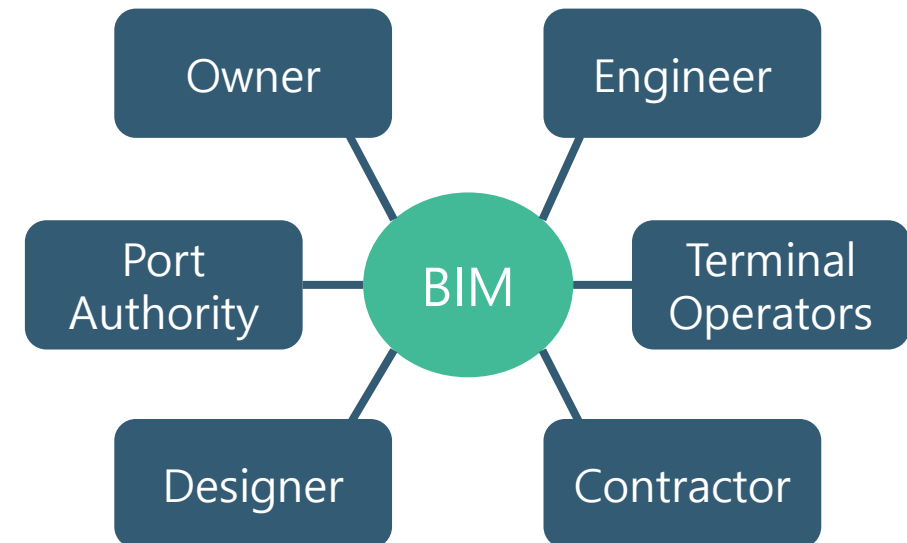
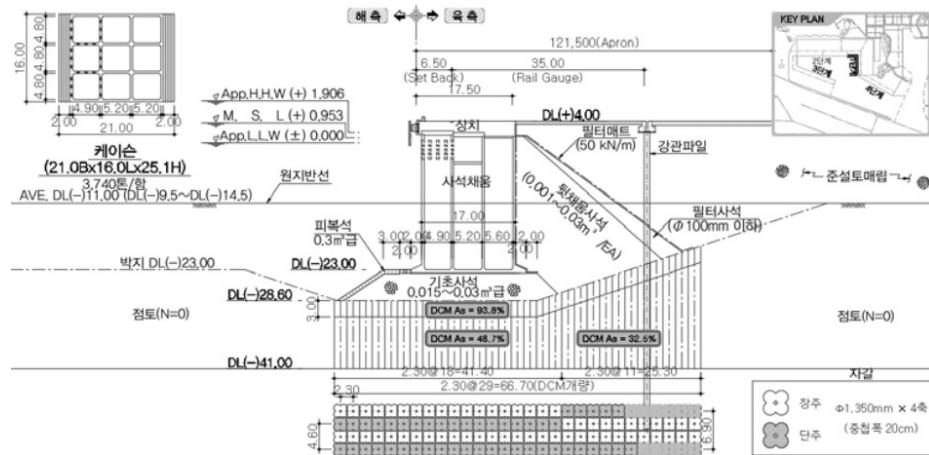
\*Source: Natasha Blommaert, Timothy Nuttens, Leading the BIM way, 2020.

- Collaboration system

# TO-BE

## Digital platform based

Collaborate with stakeholders based on a common data environment, standards (ex. WBS, LOD, Filename ...)



\*Source: KDI(2022), Pre-Feasibility Report–Jinhae New Port(Phase 1) Construction Project in Port of Busan



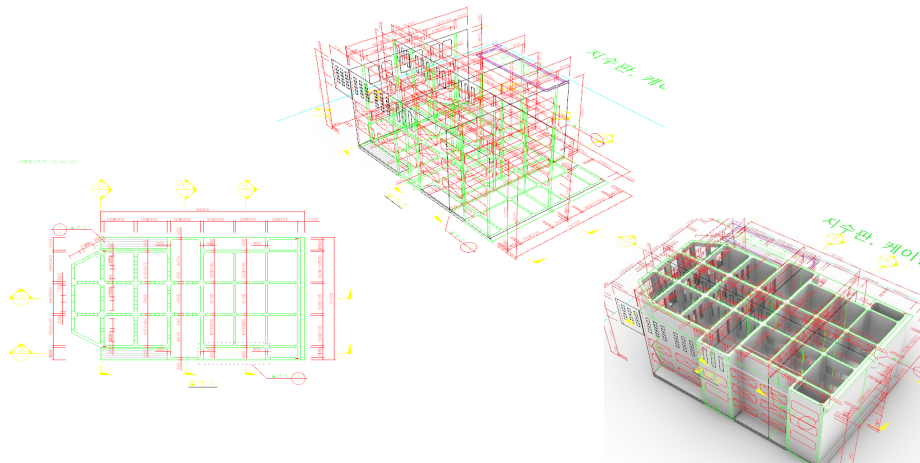
## Basic directions for BIM application in the port sector

### ■ BIM library

AS-IS

Build individual libraries

Build objects as needed for each contractor



\*Source: Ministry of Oceans and Fisheries(2022), Research on introduction of construction project management plan using GIS • BIM technology

TO-BE

Shared object library (Open-Source)

Improve project efficiency, Consistency, and quality using a shared library of BIM objects



\*Source: (left) <https://www.cedd.gov.hk/eng/publications/standards-spec-handbooks-cost/bim-objects-port-works/index.html>,  
(right) <https://www.calspia.go.kr/bimlibrary/Bim/index.jsp>

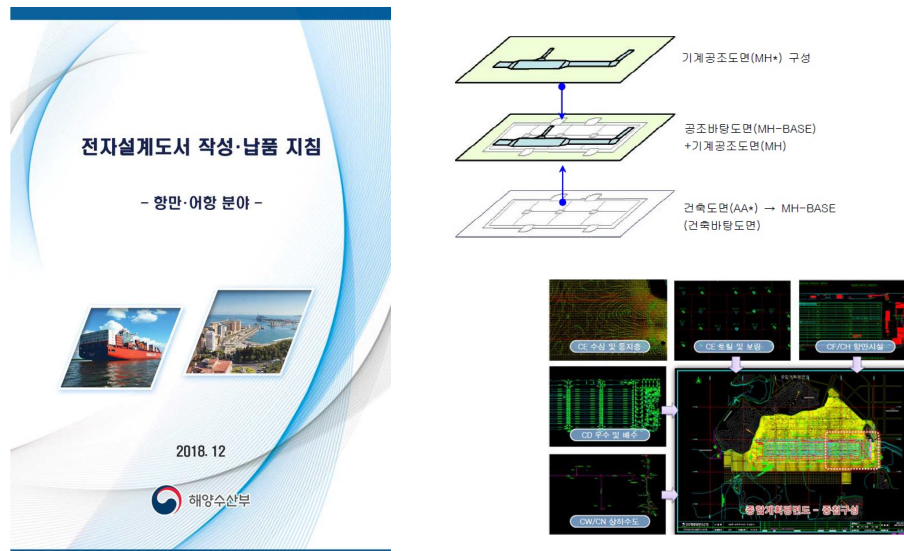
## Basic directions for BIM application in the port sector

# ■ BIM Application Guideline for port construction projects

AS-IS

## 2D electronic drawing guide

Based on traditional 2D CAD drawing



\*Source: Ministry of Oceans and Fisheries(2018), Guidelines for Electronic Construction Documents Delivery

TO-BE

## 3D modeling guide

Considering higher-level guidelines and port construction project characteristics



\*Source: LH(2022), LH BIM Application Guideline(site planning- civil engineering)



Thank you