

WCFS2023 Japan

A Design Proposal of Floating Leisure and Culture Facilities
in Saemangeum Area

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Bio

- Born in 1955, is an architect(CEO, Balance Architecture Studio) and professor emeritus of Kunsan National University, Korea since September 2021.
- He was a professor at the department of architecture and building engineering, Kunsan National University, Korea since 1995 and also he was a principal investigator of Floating Architecture Research Group, funded(USD 6,000,000) by the ministry of land, infrastructure and transport, Korean Government. Research period was about 5 years from December 2010. Around 15 professors from 3 Universities and 12 industries participated in the research. After the research, he wrote two books "Floating Architecture as a New Building Paradigm" in 2015 and "Floating Architecture as a Sustainable Building" in 2021.
- He consulted several floating building projects for waterside developments, and taught floating architecture design such as floating public information center, floating parking building for islands, floating guest house as term projects in the University.

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1. Introduction

- Background

- Climate change : a rise in sea and river water level + natural disasters
- People like to enjoy water based leisure activities
- Relevant region so-called “Water City”,
- High possibility of floating architecture due to large calm water space
- Research project from local buoyant material company

- Aim and method of the study

- Propose a conceptual design on the water
- Review the regional requirements
- Analyze the site condition and surroundings
- Refer the examples of the floating leisure and culture facilities in domestic and abroad
- Team research : Balance Architecture Studio, The Ham Architects, and professors of Kunsan National University

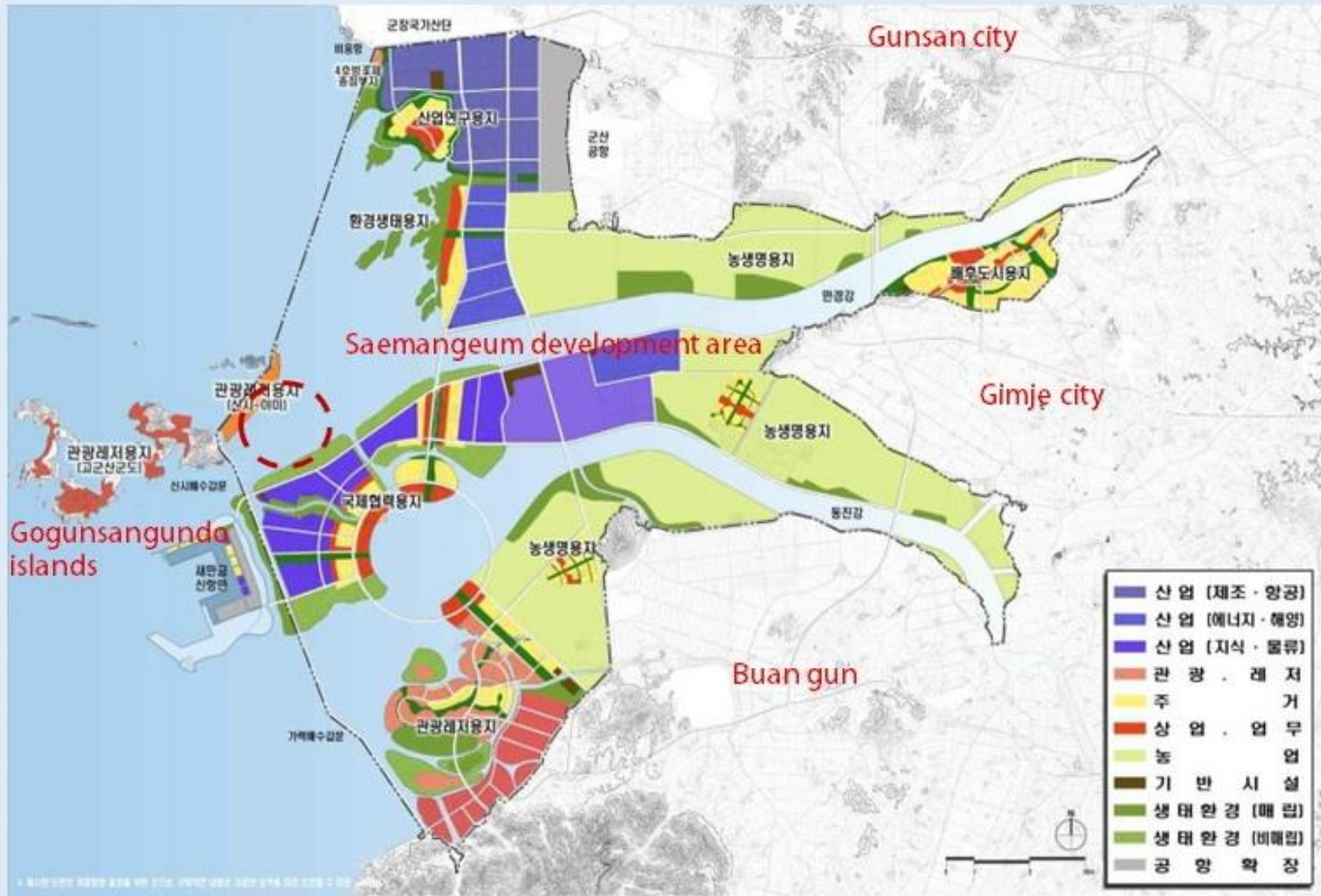
- Scope of the study
 - Spatial scope : limited for the Saemangeum Lake
 - Contents : focused on the floating building design and site plan for leisure and culture facilities
 - Demand survey, operation plan, and financial program were excluded

2. Situation of the Site

- Saemanguem area
 - 290,000 target population, southwest part of Korean Peninsula
 - Reclaimed by long seawall(33.9km) as a national mega project since 1991
 - Project area (409km²) under reclaiming, land (291km², 71%) + lake (118km², 29%)
 - Under development : smart and green waterfront city of international cooperation area, industry-research area, agro-bio area, leisure-tourism area and hinterland city and other facilities
 - Near existing cities, Gunsan city(270,000 population), Gimje city (82,000 population) and Buan gun (50,000 population) have not enough leisure and culture facilities
 - Inland water space in Saemanguem area can be regarded as a best place for floating architecture due to calm water surrounded by constructed seawall.



Location of Saemanguem area in Korea



Proposed location of the project in Saemangeum area

3. Some Advantages and Disadvantages of Floating Architectures in Saemanguem Lake

- Advantageous aspect

- Initial cost reduction through the cost of renting public water space instead of that of the land reclaiming and construction
- Minimization of environmental destruction from the artificial reclaiming
- Easy responding to the water level change due to flooding
- Differentiated unique and signature building only in Saemanguem Lake could be realized through floating architecture concepts with the water backdrop
- Superior aspects in terms of sustainability like renewable energy (especially, hydro-thermal energy) to reduce the use of fossil fuel
- Possibility of easy expansion and dismantling through modular construction, and relocation using movement when required

- Disadvantageous aspect)

- Regular maintenance to keep them in good condition, including checking for leaks and repairing or replacing parts that are damaged or worn out.

4. Design Proposal

- Design process

- Establishment of the main points of the floating leisure and culture facility complex plan
- Reviewing the introducing functions by reflecting the needs of the local community and the surrounding environment
- Referring the examples in domestic and abroad
- Development of various alternatives, and some proposals of a conceptual plan.

- According to the proposed plan

- Architectural drawings and images together with structural & energy system are presented
- Building cost of the facilities and the usage fee of public water space were estimated based on year 2022
- Legal and administrative requests to the related Authority are suggested.

4.1 Prime Points of the Planning

- Pursuits of eco-friendliness and sustainability in architectural planning
- Concentrated arrangement of leisure and culture facilities with supporting functions
- Consideration of vehicle entry and exit to/from the facilities through parking building
- Possibility of step-by-step development with building separation design by functions through the realization of small-scale pontoon modulation
- Connection to city infrastructure services or a proposal of self-sufficiency
- Preparation for future expansion and relocation

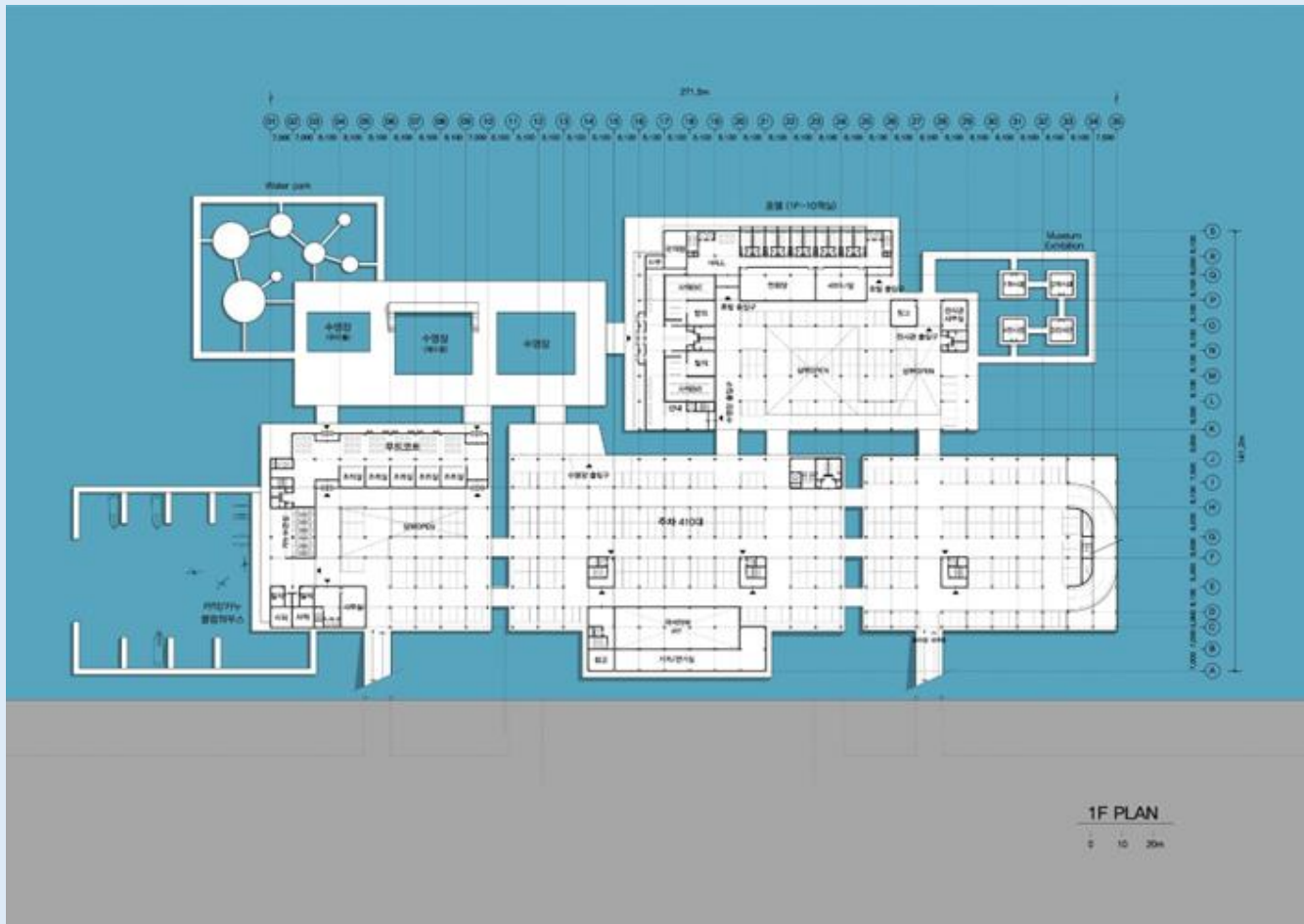
4.2 Suggested Architectural Programs

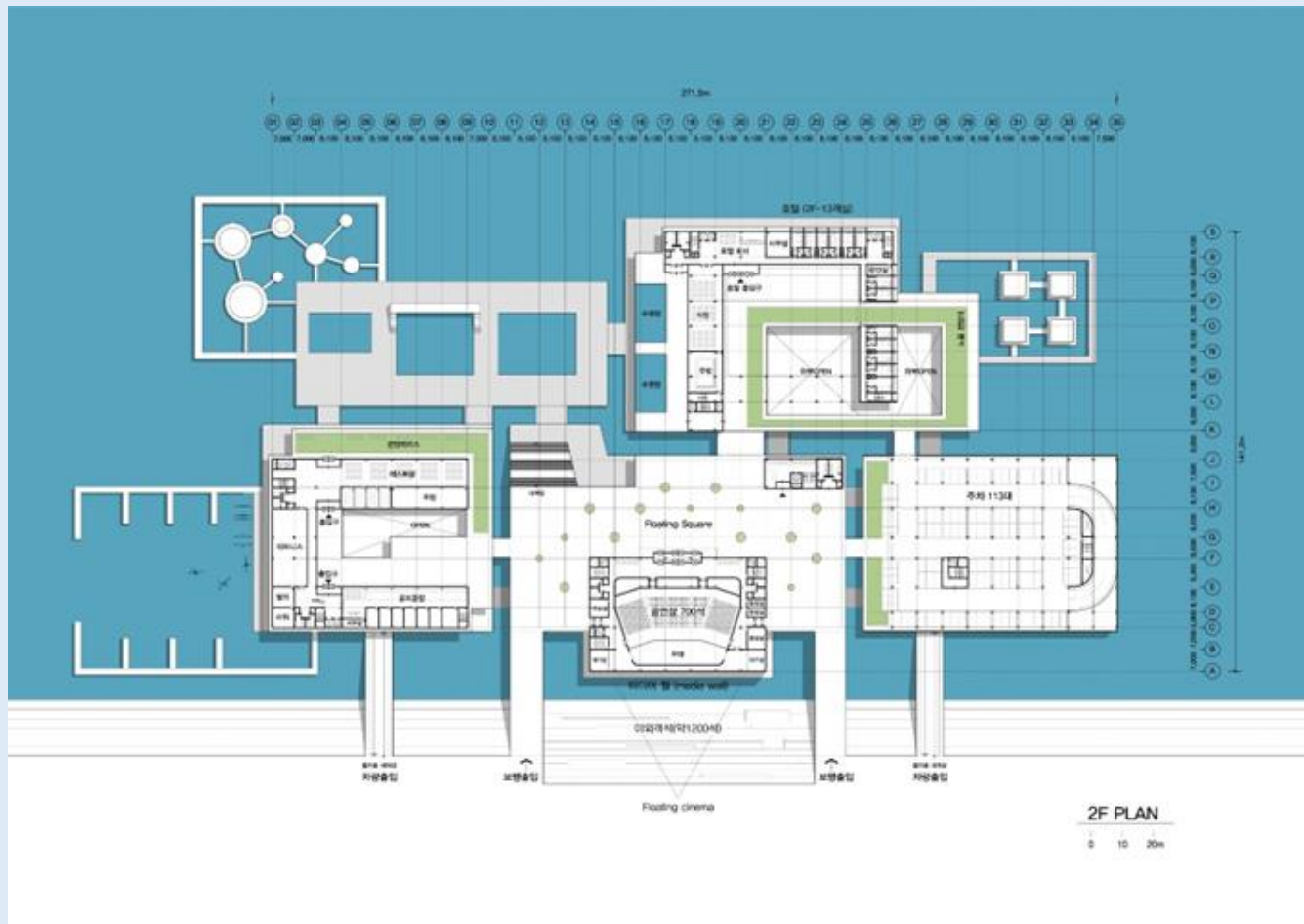
Name of Facility	Major Rooms	Area(m ²)
Auditorium	seat(700ea), stage, practice room, dressing room, meeting room, waiting room	9,500
Convenient Facility	marina club house, food court, restaurant, fitness center, conference room, indoor golf club	8,600
Hotel	bed room(100ea), lounge, business center, dining room	10,300
Parking	parking lot(640ea)	10,800
Exhibition	exhibition hall(4ea), office, storage, WC	600
Swimming Pool & Water Park	outdoor swimming pool, outdoor water park, locker room, shower room, office	7,900
Total		47,700

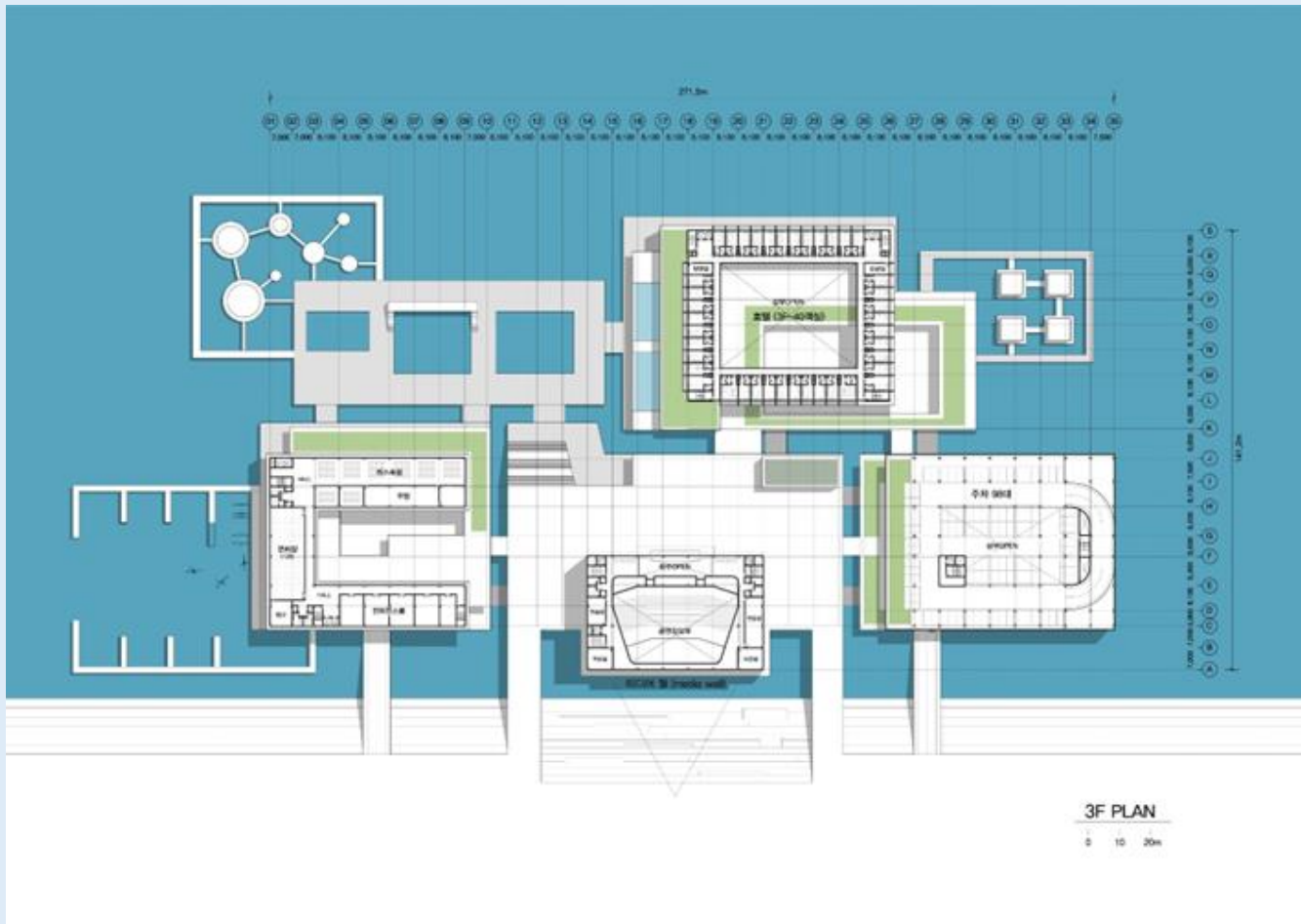
4.3 Concept Drawings

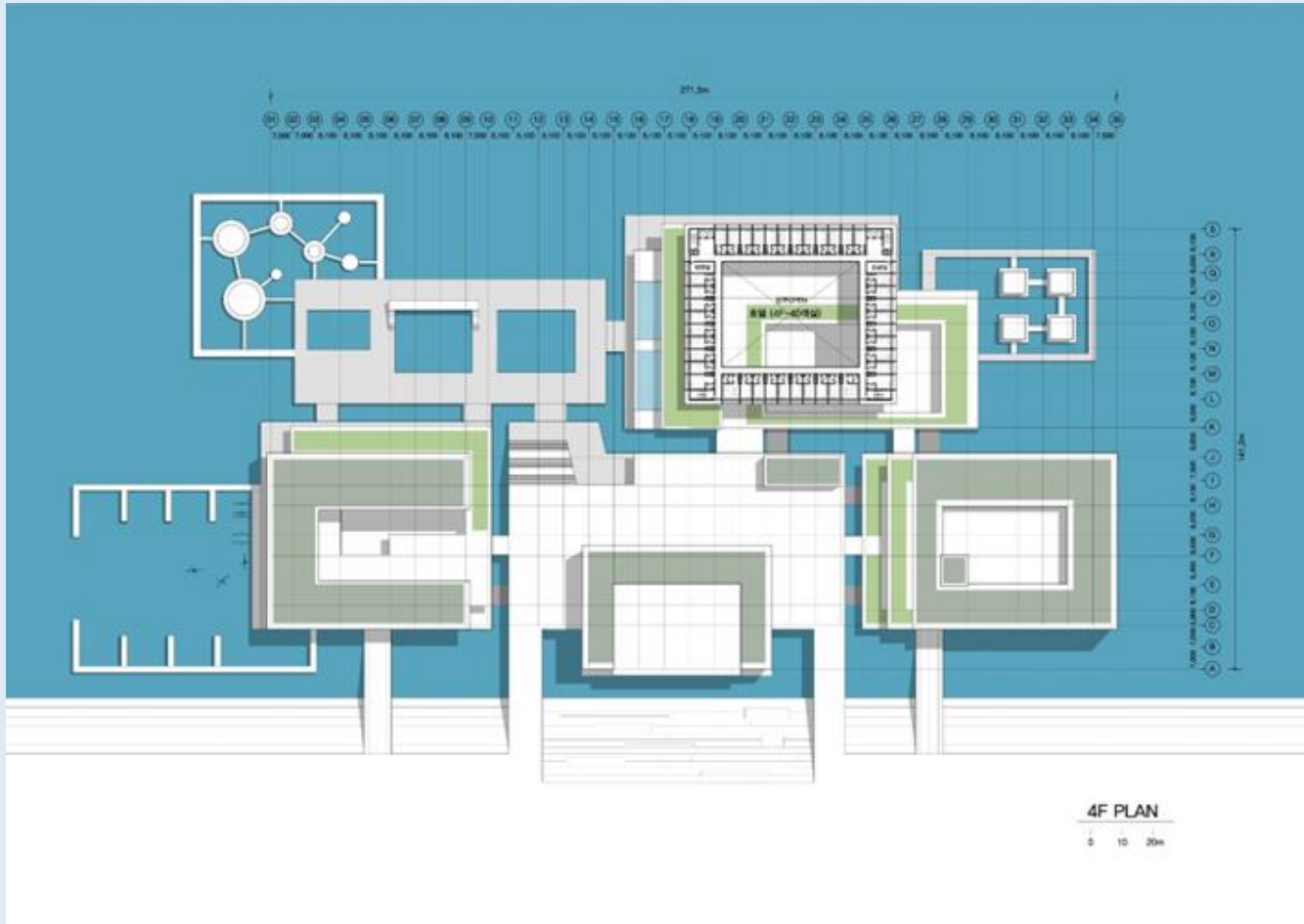


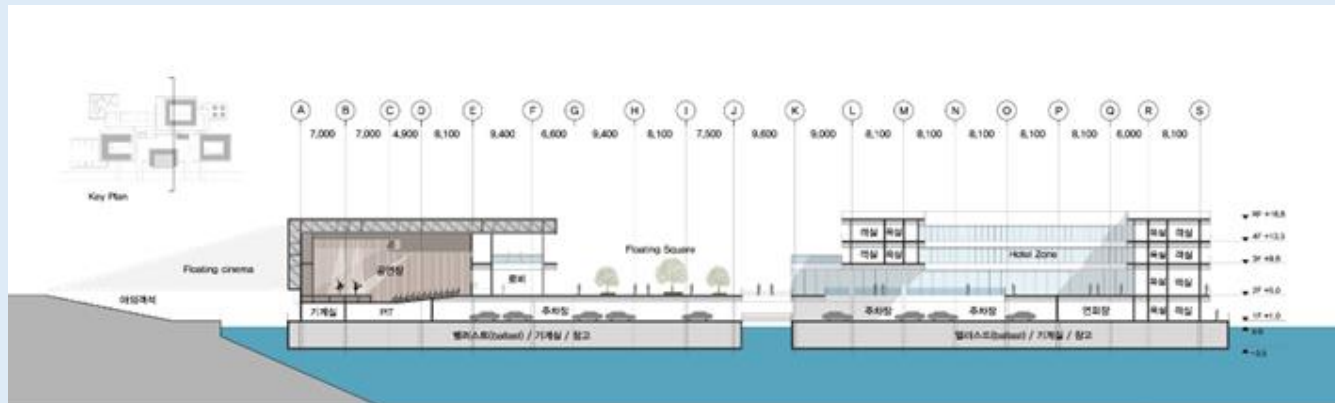
Site Plan





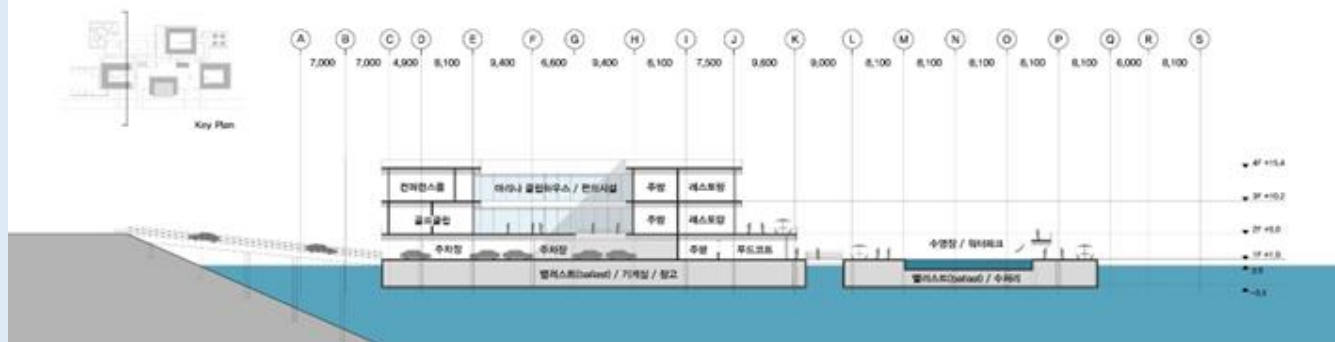






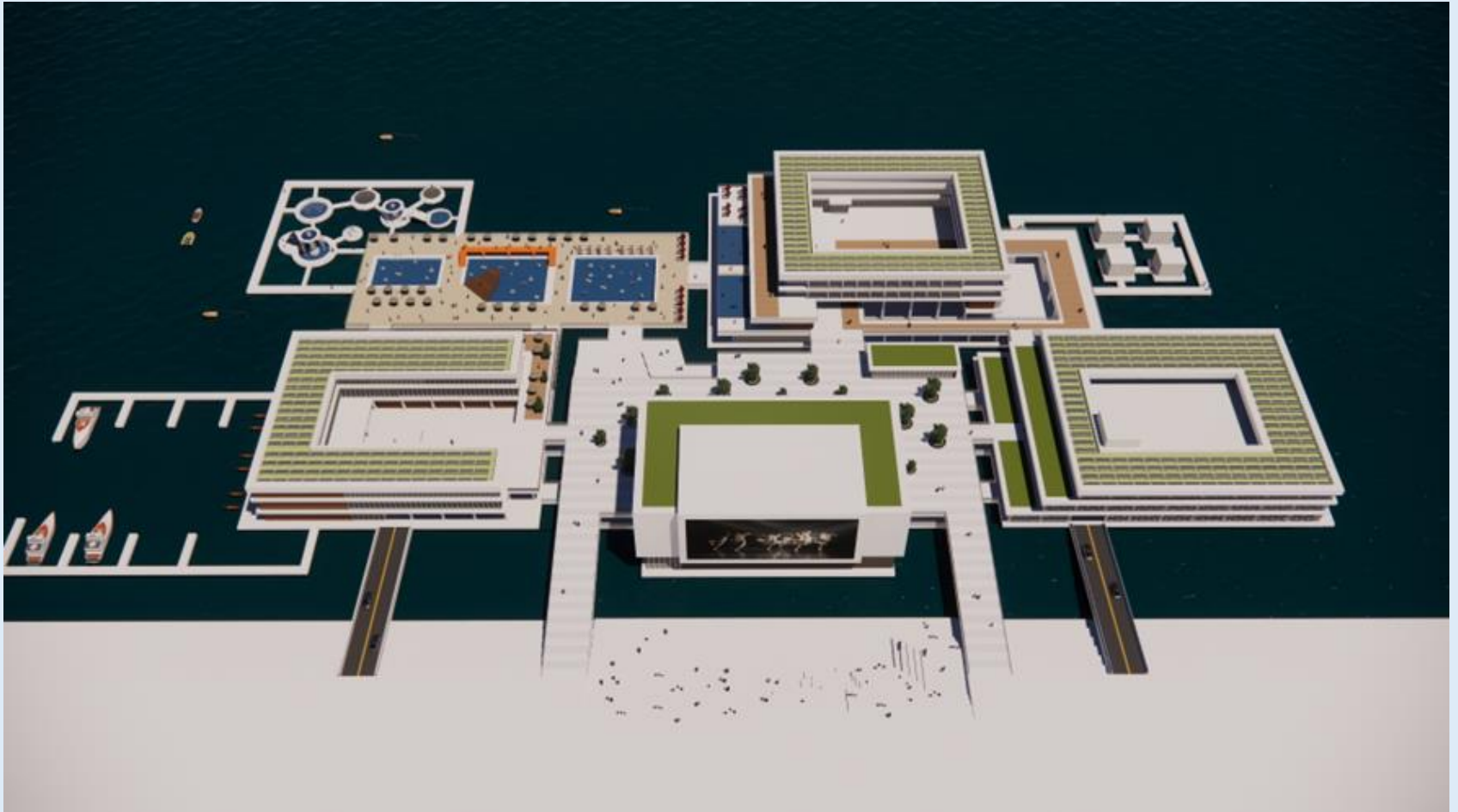
Section - 1

0 5 10m



Section - 2

0 5 10m



3D Image_01



3D Image_02



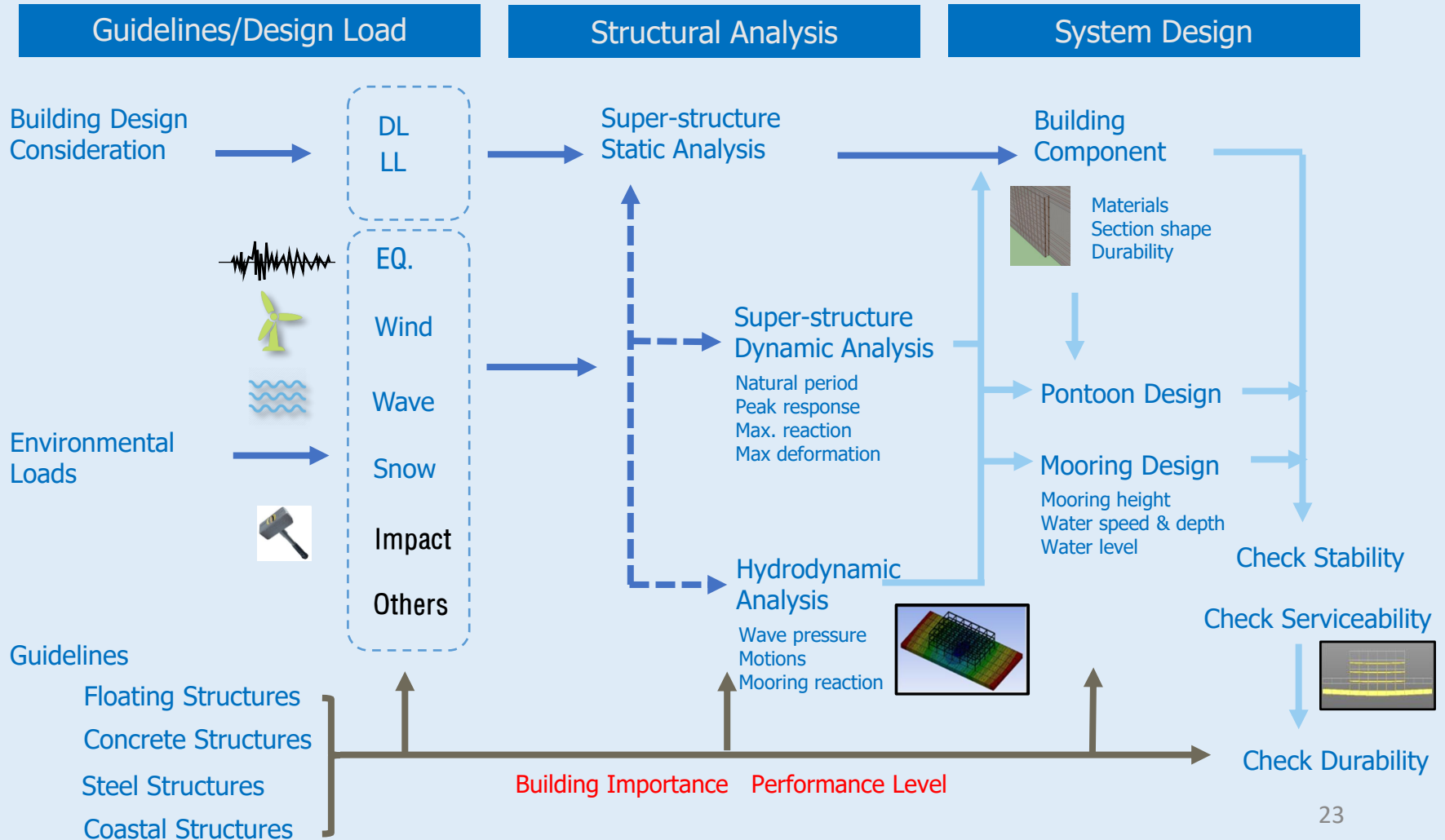
3D Image_Partial_01



3D Image_Partial_02

Structural System

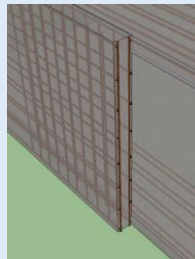
Procedure for structural design



Structural system/ component design

Pontoon/Mooring Design

Durability Design
 Use CFRP
 High Performance Concrete

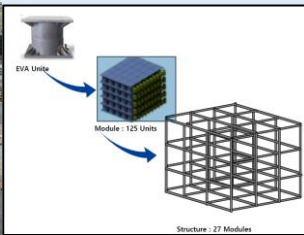


Modular Pontoon

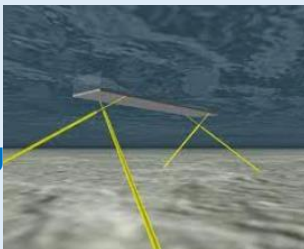


Stabilization of pontoon
 Improve Workability

Modular Buoyancy(opt.)

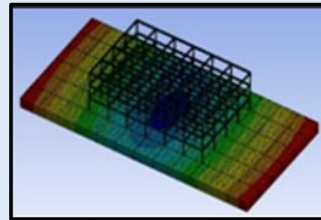


Elastic Lope Mooring
 For the change of water level



Super-structure Design

Structural System
 -Moment resisting frame
 Short Natural period
 Light weight



Curtain Wall
 Light weight of ext. finishing



Light Weight Slab
 Use light-weight concrete
 Steel deck plate



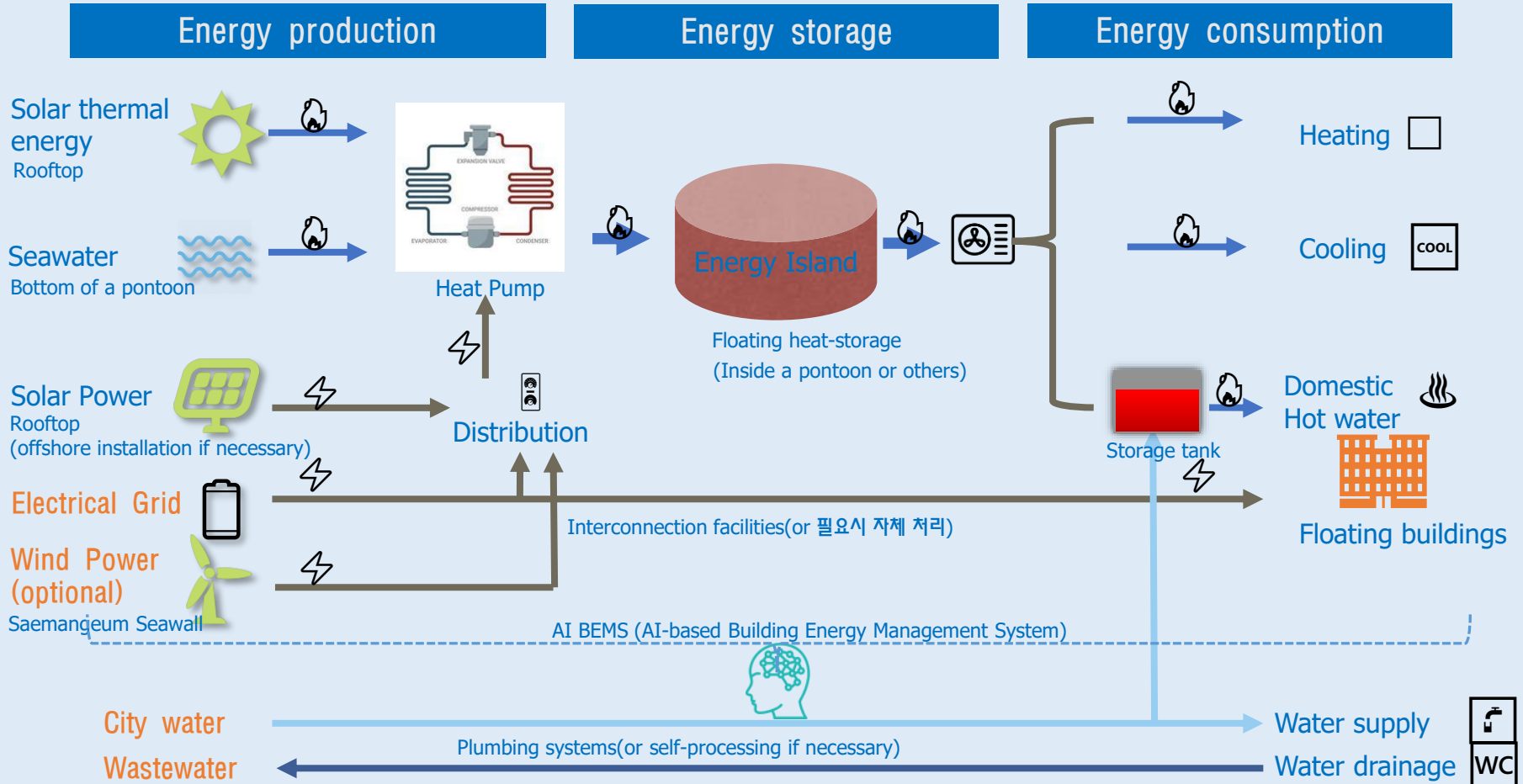
Connection Bridge
 Permit drift for each direction



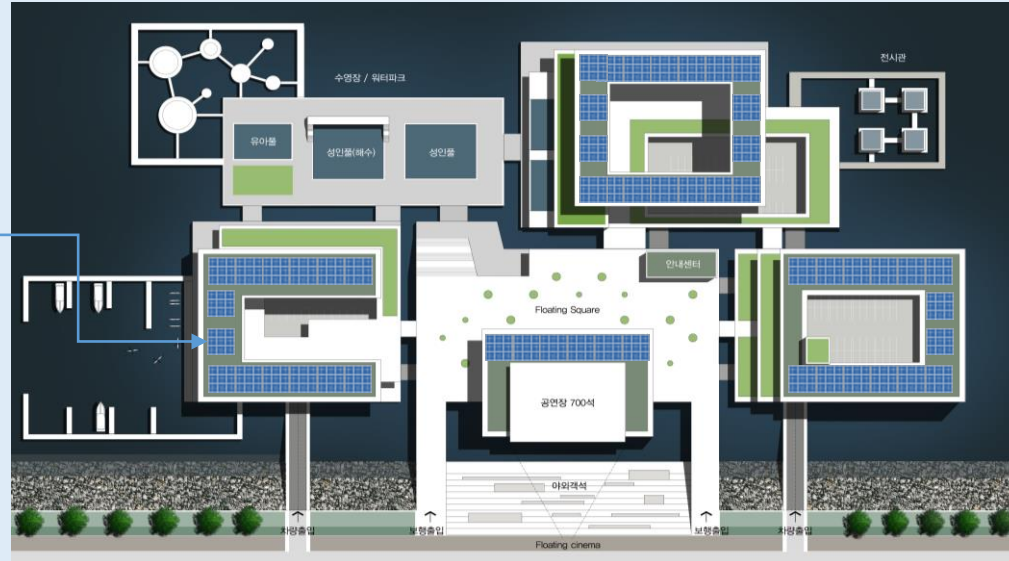
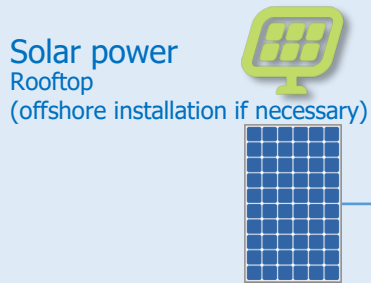
Energy Systems

Energy system components

🔥 thermal energy
⚡ electric energy

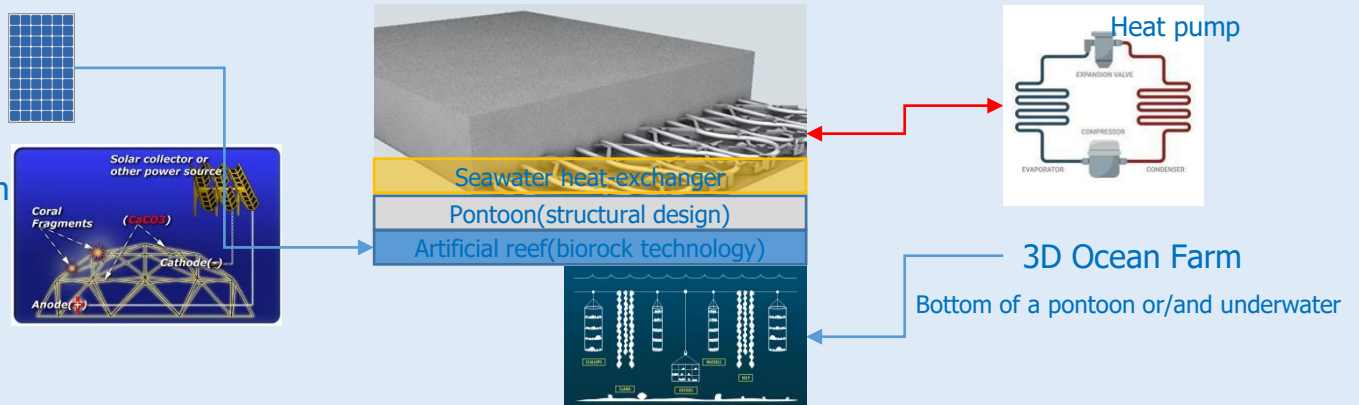


Energy systems and sustainable ecosystem



Artificial reef
(biorock technology)

Sustainable environment
→ Fish habitat regeneration
Bottom of a pontoon or/and
underwater



4.4 Outline of Project Cost (base year: 2022)

- Building Cost

Classification		Amount(1,000KRW)		Calculation Basis
Construction Cost	Architectural	125,193,000	58%	total floor area 47,700(m ²) x 4,525,000(KRW)
	Mechanical	28,060,500	13%	
	Electrical	38,853,000	18%	
	Communication	8,634,000	4%	
	Fire-fighting	8,634,000	4%	
	Civil/landscape	6,475,500	3%	
	Subtotal	215,850,000	100%	
Pontoon		25,308,000		pontoon area 27,800(m ²) x 909,000(KRW)
Media wall		2,000,000		30m x 15m
Renewable energy		3,500,000		
Interior + Furnishings		25,038,600		20% of construction cost
Expenses		32,377,500		15% of construction cost (permit, design, supervision, tax, miscellaneous expenses)
Total		304,074,100 (234,000,000 USD)		about 6,370,000(KRW)/m ²

- Usage Fee of Public Water Space

Usage fee:

= Renting area (m²) × Adjacent land price × Application rate × Usage period

- Renting area: 50,700m²(see Fig. 15)

- Adjacent land price: KRW 90,000/m²

- Application rate: 0.03 (3/100 of the adjacent land price)

- Usage period: 1 year

= 50,700m² × KRW 90,000/m² × 0.03 × 1 year

= KRW 136,000,000(USD 105,000)

4.5 Legal and Administrative Requests to the Saemangeum Development Authority

(Legal aspect)

- Floating construction projects can be implemented in the Saemangeum area if the relevant laws and regulations are actively applied.
- Designated as a special construction zone for sustainable and creative floating building construction, and the floating building gets the permission under the Building Act.
- For reference, Article 6-3 (Special Provisions for Floating Buildings) is included in the Korean Building Act, which was newly established on January 19, 2016.

(Administrative Aspect)

In order to vitalize the floating construction in the Saemangeum area, the following administrative measures are required.

- Establishment of eco-friendly and sustainable development (vs landfill) principles for the Saemangeum project area
- Consideration of related Authority's forward-looking and active introduction of floating construction project
- Institutional supplementation such as designation of special construction zones and establishment of floating construction and maintenance guidelines
- Preparation of unconventional and diverse incentives such as various tax support for the construction of floating buildings with the introduction of new and renewable energy

5. Conclusion

- A plan for the floating leisure and culture facilities with proper structural and energy system, composed of auditorium, convenient facility, hotel, car parking, exhibition, and swimming pool & water park, of about 47,700m² floor area and a project cost of about KRW 304,000,000,000(USD 234,000,000) was proposed in the Saemangeum Lake. The renting area for public water space is about 50,700m², and the usage fee is estimated at KRW 136,000,000(USD 105,000) per year.
- Some requests to the related Authority in terms of legal aspect such as special construction zone and active building permission under the Building Act, and administrative aspects such as sound development principles, policy direction, institutional supplementation, and diverse incentives were suggested.
- Further efforts may be required for the realization of floating leisure and culture building such as detailed feasibility study, investment attraction strategy, officials' positive attitude, and getting social acceptance.

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