

Current Status of Food Loss in Fishery Supply Chain

- Lessons, Implications from Korea Case -

July 16, 2015

Jung Hee Cho

jcho5901@kmi.re.kr

Contents

I

Overview of Korean fisheries

II

Handling stages of post-harvest

III

Generation of fishery by-product and treatment

IV

Improvement methods of post-harvest management

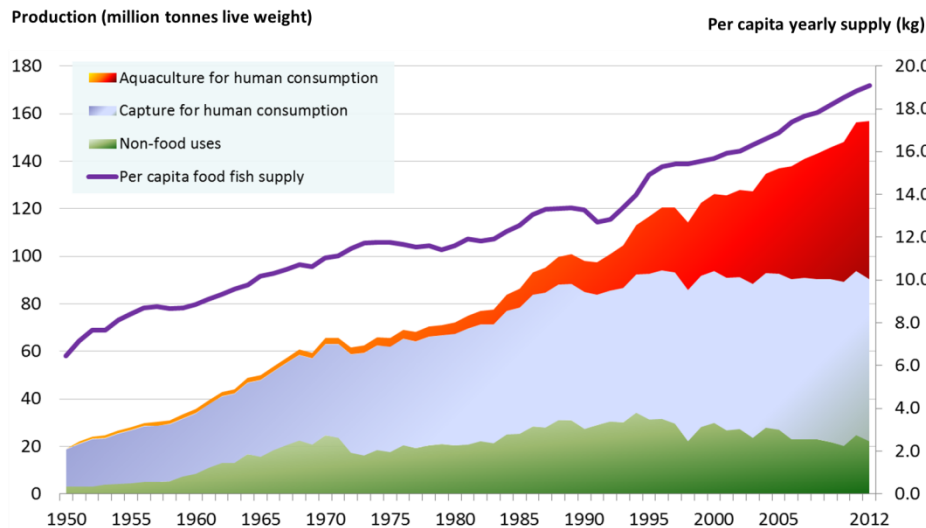
V

Conclusions

I . Overview of Korean fisheries

Current situation in the world

- Over 200 million people in developing countries depend on fisheries for their food
 - Fish provides essential nutrition for over one billion people
- Most of the global fish trade flows from poor to rich nations
- **Over 75% fisheries are considered fully exploited or overexploited**
- In 2030, 50% of all fish supply would come from aquaculture
 - 62% would come from aquaculture in terms of edible fish
- **In the future fish supplies will be dominated by aquaculture**



	Total supply		consumption	
	2008	2030	2006	2030
Fishing	89,443	93,229	64,533	58,159
Aquaculture	52,843	93,612	47,164	93,612
Total	142,285	186,842	111,697	151,771

Note: FAO, FISH TO 2030(Prospects for fisheries and aquaculture) 2013

Food supply

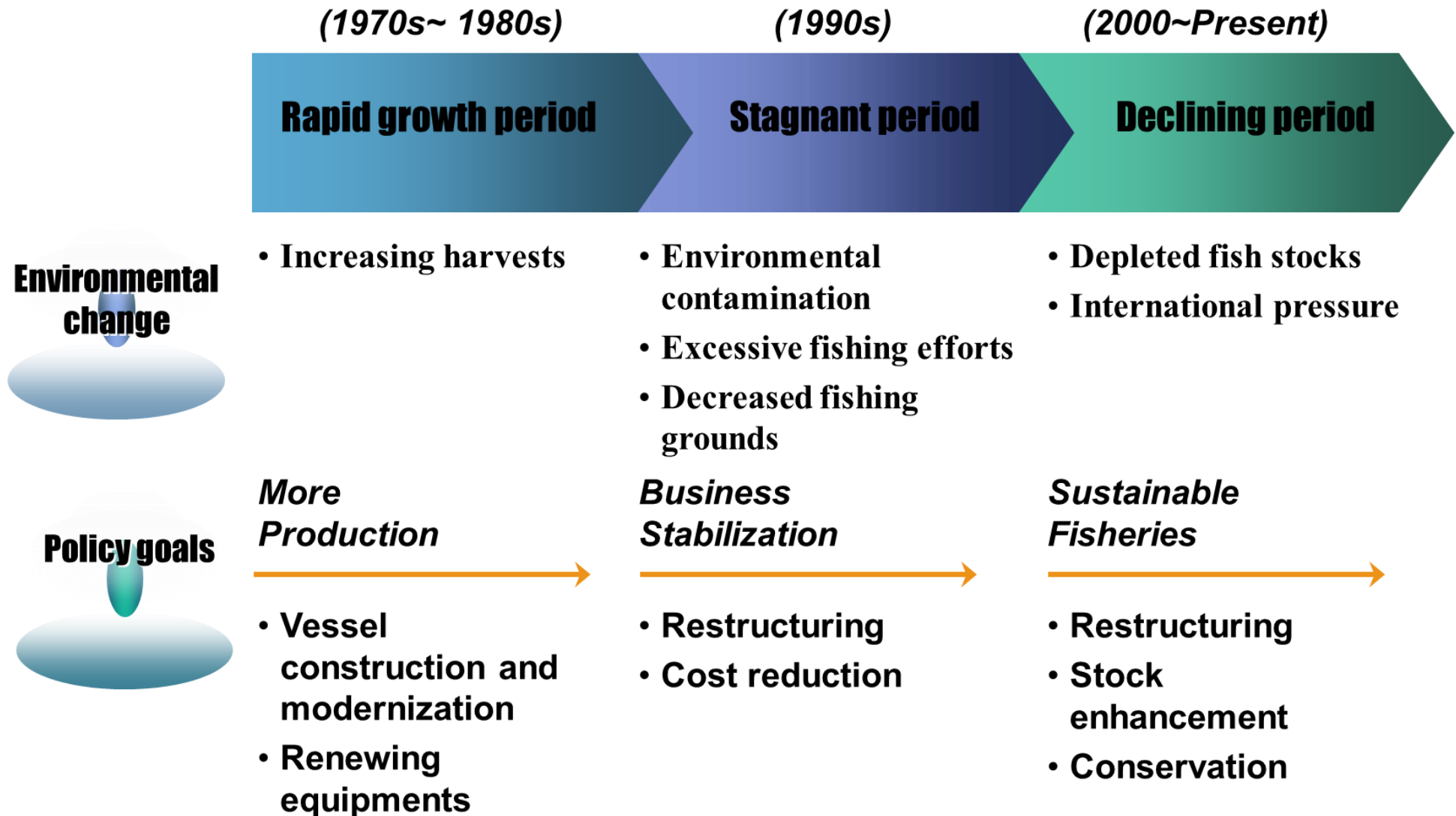
- **Global Food Production(2009) : CROPS(86%) , LIVESTOCK(12%), FISH(1.8%)**
- **World Food Supply : CROPS(76%) , LIVESTOCK(21%), FISH(3%)**

		WORLD		KOREA	
		PRODUCTION	FOOD SUPPLY	PRODUCTION	FOOD SUPPLY
2001	CROPS	85.7%	76.3%	77.7%	80.1%
	LIVESTOCK	12.5%	20.9%	14.4%	11.7%
	FISH	1.8%	2.8%	7.9%	8.2%
2009	CROPS	85.9%	75.6%	75.3%	78.0%
	LIVESTOCK	12.2%	21.3%	14.9%	12.2%
	FISH	1.8%	3.1%	9.9%	9.7%

Challenges

- Rapidly increasing population and consumers' demand
- **Vulnerable marine and coastal ecosystems**(pollution, habitat degradation)
- **Poor governance** of both capture fisheries and aquaculture
- **Global climates change**(impacts fish habitats, distribution and abundance)
- Depletion of fish stocks

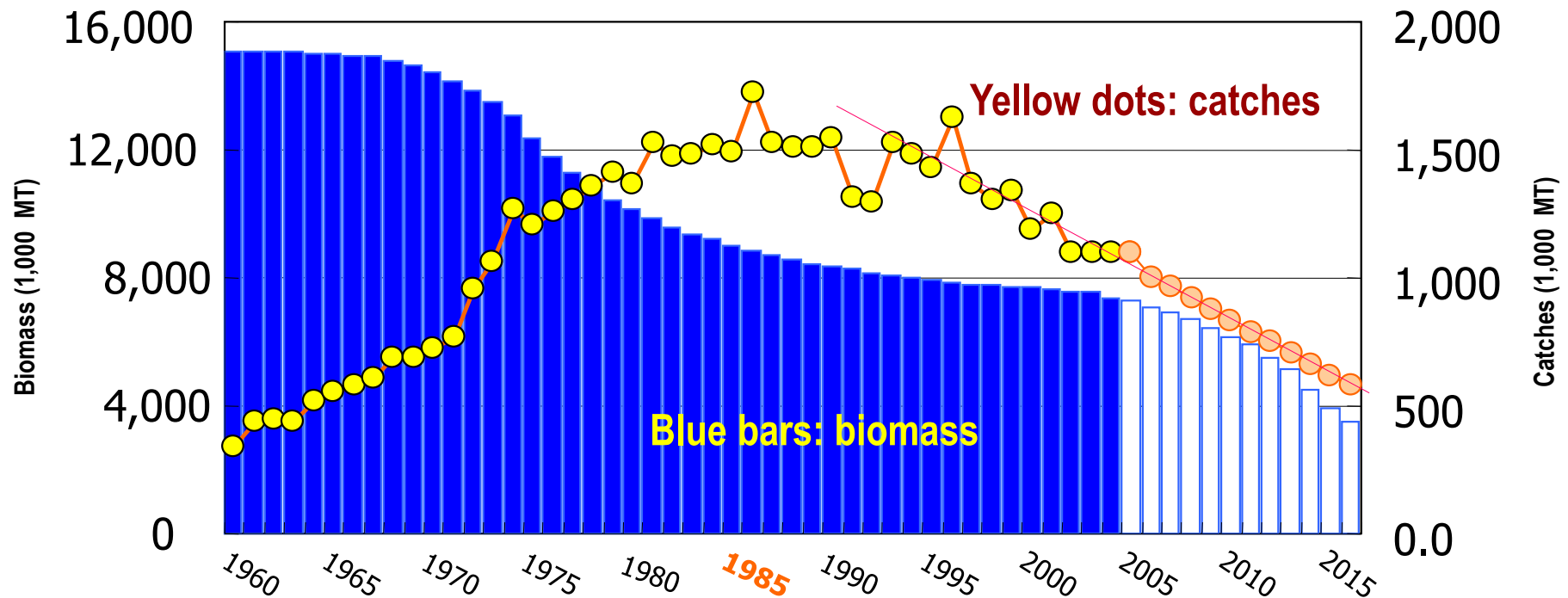
Transition of policy goals in Korea



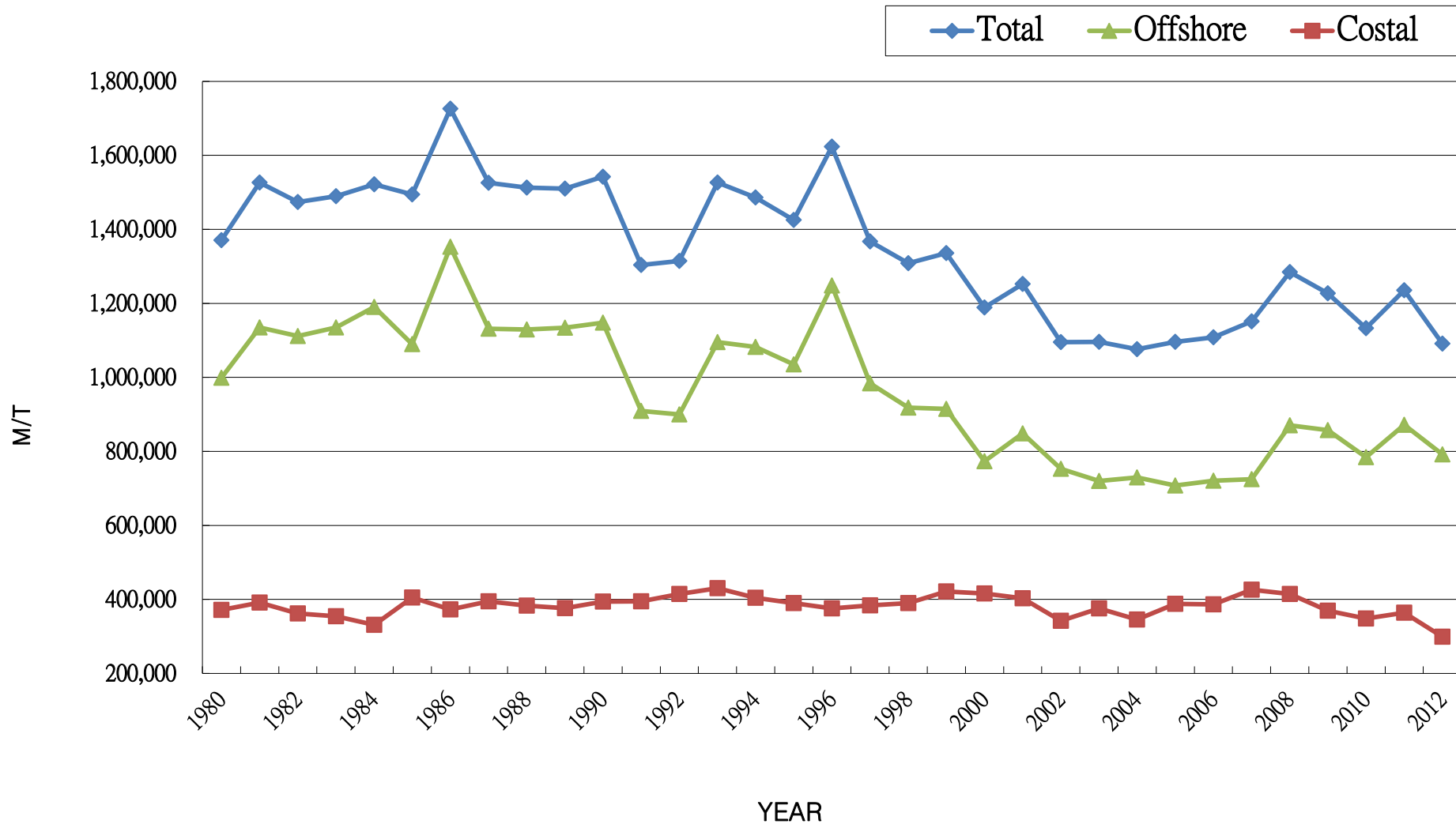
Fish stock and catch

Decline of fish stocks and catch

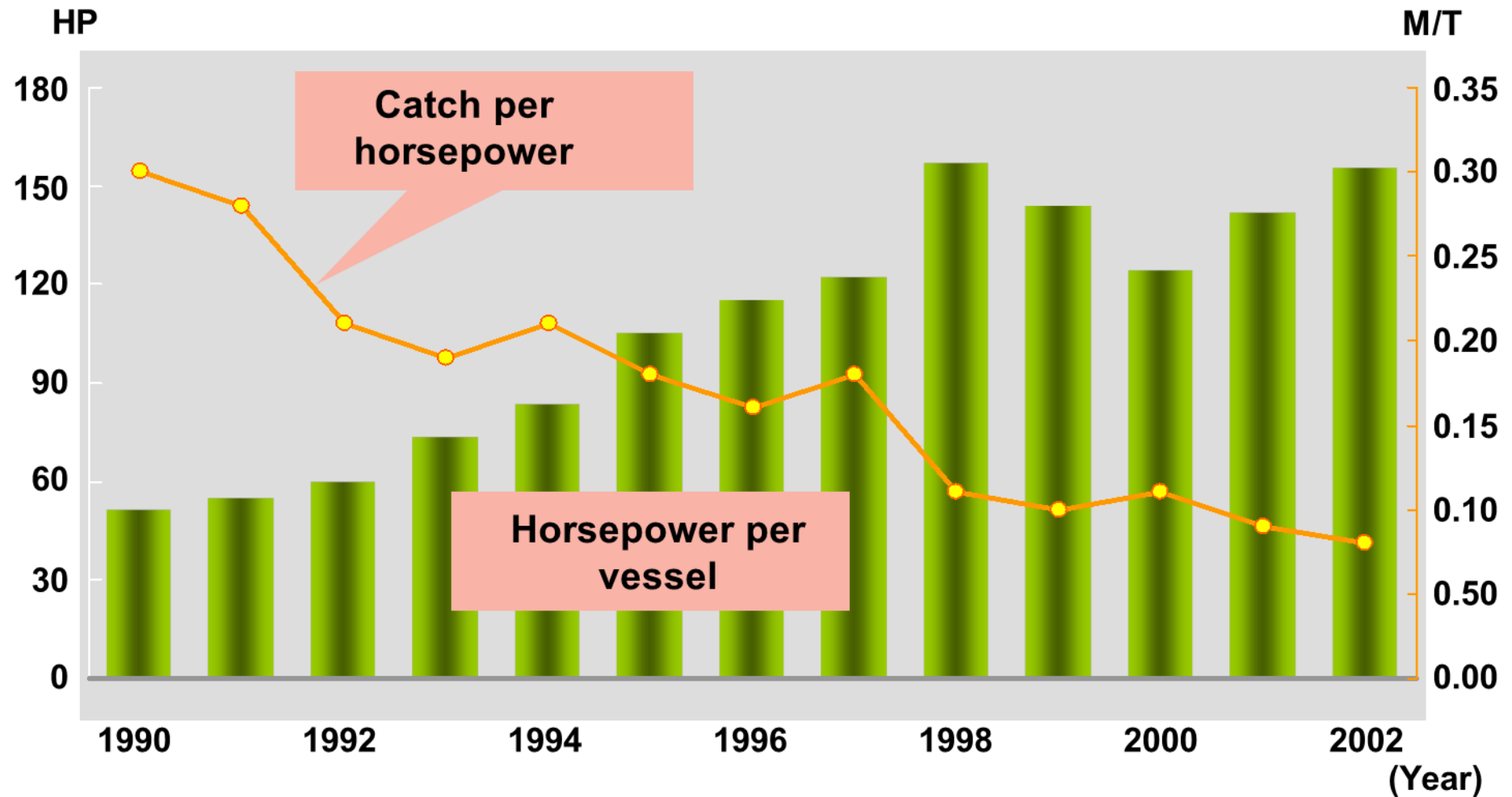
- Reduction in Stocks (0,000 M/T) : ('80) 1,000 → ('04) 790 → ('15) 390 (expected)
- Reduction in Catch (0,000 M/T) : ('86) 170 → ('04) 108 → ('15) 66 (expected)



Fisheries production



Horsepower per vessel & catches per horsepower



Fisheries management measures

- **License system**
(Maximum limited license system)
- **Technical regulations**
(Mesh size, Trap limits,
Vessel size limits etc.)
- **Vessel Buy-back program**



- **TAC system**

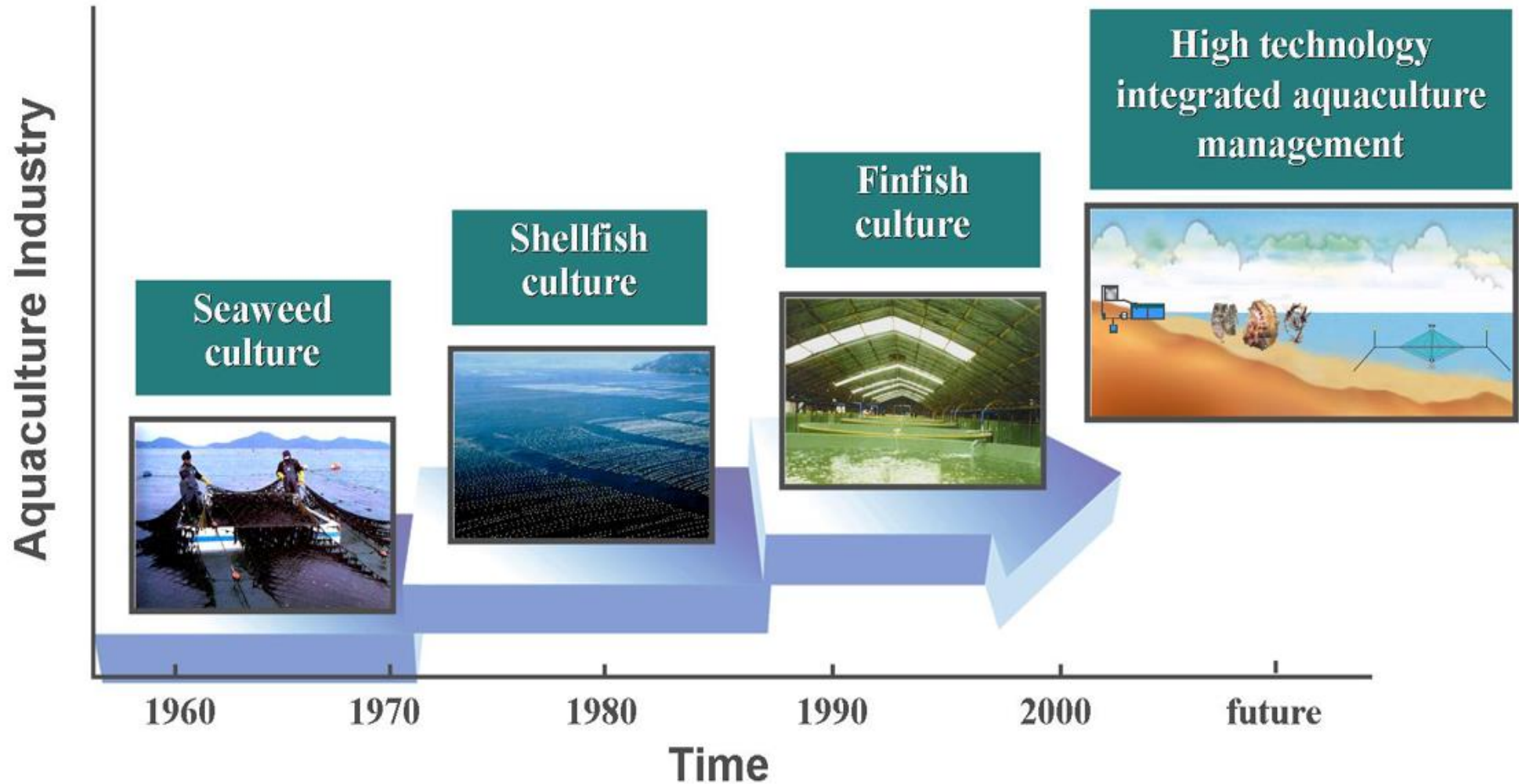
Input control

Output control

Limitations of conventional fisheries management

- Fish stocks in the coastal water have been depleted
- Real fishing efforts have increased and offset the effects of vessel and gear restrictions
- Technical regulation methods were not flexible in rapidly changing fisheries circumstances
- **Direct and Indirect causes of such reduction may include;**
 - ✓ Destruction of habitats by contamination of marine environment and climate changes and ecological changes in fish species
 - ✓ Due to geographical characteristics of fishing grounds, an individual nation has limitation in management and recovery of fishery resources
 - ✓ Due to the 'multi-species/multi-fisheries' characteristics of coastal and offshore fisheries of Korea, there were limitations in establishing policy management measures according to characteristics of each fish species

History of Korean aquaculture

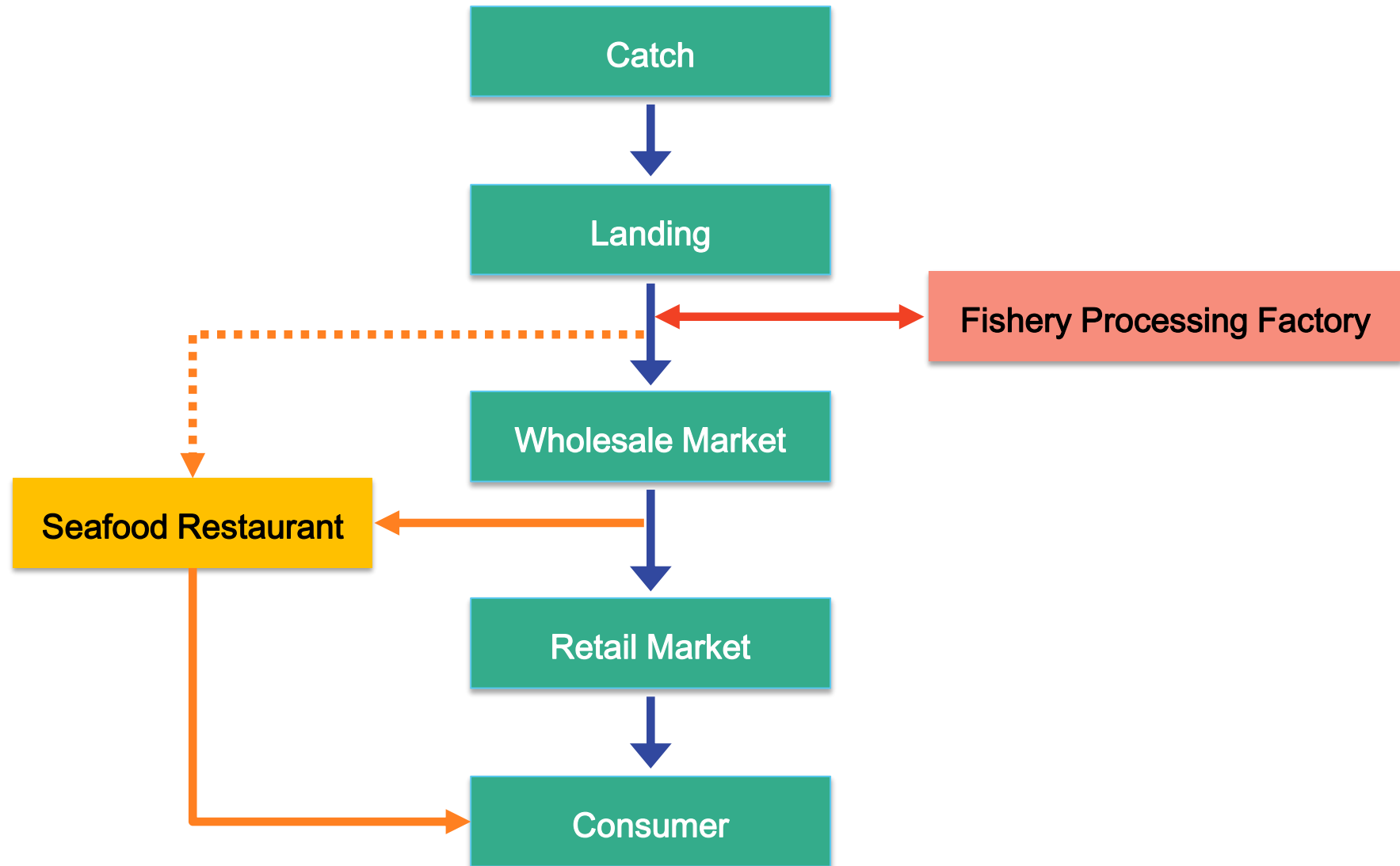


Various aquaculture types



II. Handling stages of post-harvest

Distribution of fishery products



Landing system

▪ Landing process of capture fisheries

unloading → **selection** → **packing** → **carry** → **arrangement** → **auction** → **transport**



< unloading with fish boxes >



< purse seine unloading >



< Fish Pump >

Landing system

▪ Selection and Packing



▪ Arrangement and auction



Problems

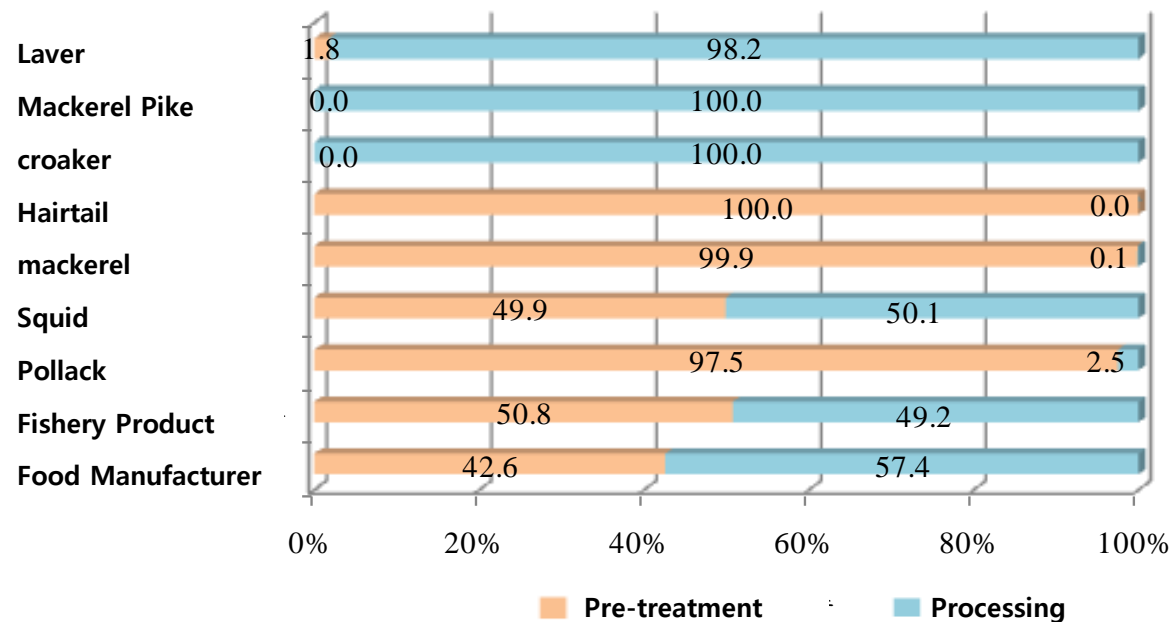
Hygiene, Fish packing boxes,
Washing water, Transportions



Enhancement of Freshness
- Minimizing Fishery loss

Pre-treatment processing

- Recently, most consumers prefer to buy fishes with pre-treatment processing, not live fishes
- Ready to Cook, Ready to Eat, Home Meal Replacement etc.



<Portions of buying pre-treatment fishes>

Local logistics

- Fishery products are perishable ⇒ Necessity for refrigeration, freezer containers etc.

❖ Problems

- ① Insufficient of freezers in local area
- ② Insufficient of hygiene management in transportation
- ③ Insufficient of temperature control during shipping

Survey on the recognition

The survey on the recognition of post-harvest management in fisheries and its benefit

- Conducted on both fishermen and consumers for their recognition of post-harvest management in fisheries

➤ Survey Results

- Consumer as well as fishermen realize the need for post-harvest management
- However, respondents have different idea about food hygiene and quality management under post-harvest management
- Their evaluation of the quality and hygiene of fisheries at production areas is average
- Fishermen expect costs to increase by 10% in case of post-harvest management
- Consumer tolerance level for price increase is 10-20% in case of post harvest management

➤ Benefit-Cost Analysis : mackerel and oyster

- Estimating the Improvement after post-harvest management
 - ✓ Decrease in distribution cost: mackerel(20.3%) and oyster(50.2%)
 - ✓ Increase in producers' price ; mackerel(13.7%- 25.4%) and oyster(10.6%- 23.8%)

Current post-harvest management in fisheries and problems

- **Comprehensive studies on 'post-harvest management' in fisheries are not enough**
- **A gap between the current landing system(fish market at production areas) and post-harvest management(unsanitary system, wooden boxes, and undesignated section)**
- **Inadequate response to demand for pre-treatment(due to the low pre-treatment share)**
- **Improper cold chain caused by general cargo transportation**
- **Lack of technology and equipment for post-harvest management and lack of their practical use**
- **Unconcern to fisheries policies**

III. Generation of fishery by-product and treatment

Fishery by-product

▪ Definition of fishery by-product

- ✓ Fishery by-products have not been clearly defined so far and few studies were conducted on generation and treatment of by-products out of the whole fisheries.
- ✓ **Definition : materials generated during the process of fishery production, distribution, processing and marketing incidentally.**
- ✓ It was not limited to certain fishery by-products in certain areas but analyzed generation and treatment of the whole fishery by-products in Korea.

▪ Methodologies

- ✓ To conduct literature and statistics analyses, field investigation, joint research and consultation with experts.
- ✓ For field investigation, researchers visited Busan, Tongyeong and metropolitan areas which created the bulk of fishery by-product.

▪ Fishery by-products

- ✓ **Fish** : bone, fin, internal organs, skin etc.
- ✓ **Shellfish** : shell, internal organs, etc.(oyster, pen shell etc.)
- ✓ **Crustacean** : shell etc.(blue crab, king crab, shrimp, etc.)
- ✓ **Others** : skin etc.

Quantity of fishery by-product

- Estimating quantity of fishery by-products using the food balance sheet
 - ✓ Quantity of Fisheries By-product(QFB) is sum of each quantity of fishery by-product
 - ✓ Each QFB is estimated by production(q_i) X non - edible percentage

$$QFB = \sum_{i=1}^n (q_i \times \beta_i)$$

; Under-estimating problem when not considering import(I), export(E), carried in(N), carried over(O), decrease(L), feed(F), seed(S), processing(P)

➤ Therefore, new estimating equation as follow;

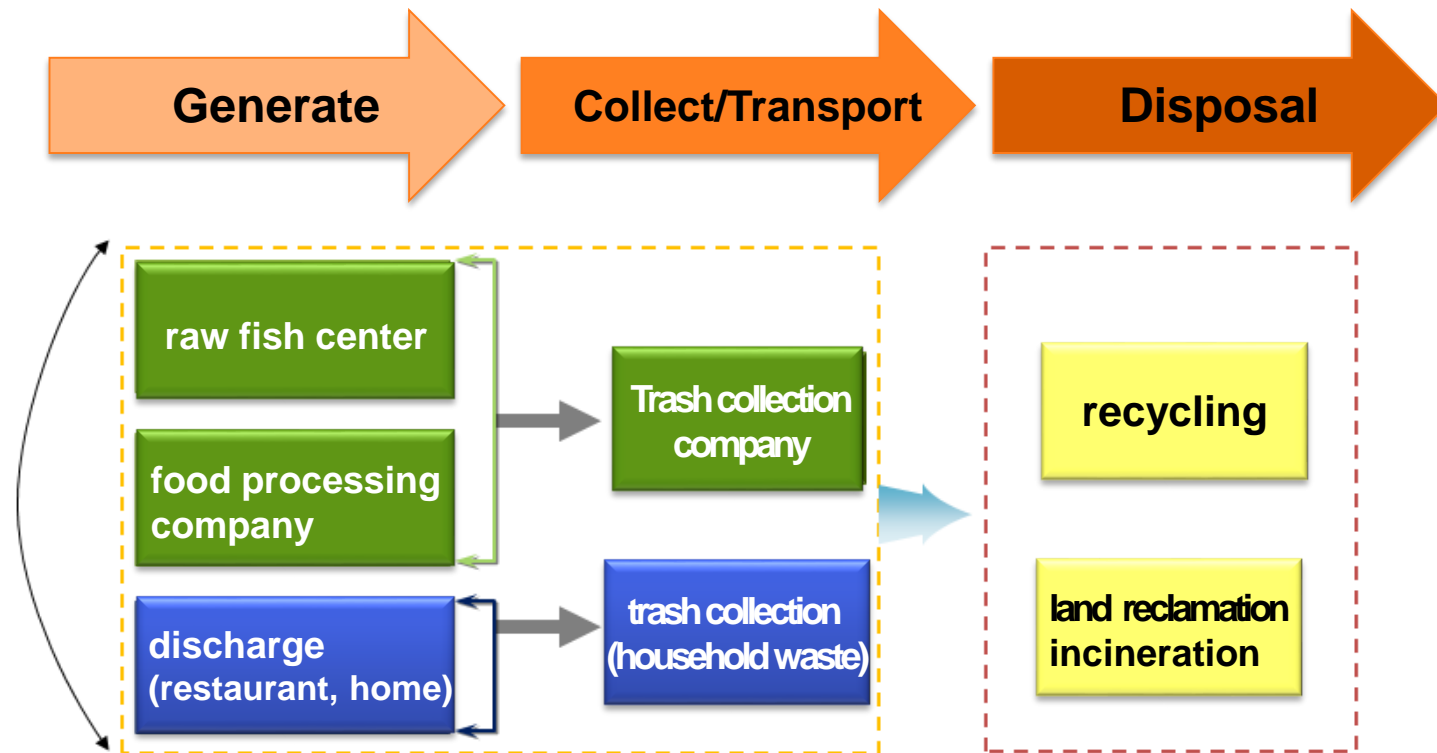
$$QFB = \sum_{i=1}^n ((q_i + I_i + N_i - E_i - O_i - L_i - F_i - P_i) \times \beta_i)$$

(unit : 1,000 ton)

Categories	production	import	Carried in	Total supply	Carried over	export	decrease	Edible supply	Non-edible ratio(%)	By-products
total	2,276.6	1,653.4	354.4	4,284.4	384.2	670.0	161.5	3,068.7	38.661	1,186.4
fish	1,383.3	983.8	283.0	2,650.2	314.1	388.3	97.4	1,850.4	39.159	724.6
shellfish	893.3	669.5	71.4	1,634.2	70.1	281.7	64.1	1,218.3	37.913	461.9

Treatment of fishery by-product

- In Busan city, fishery by-product are treated by two ways, recycling and dispose



- ✓ The by-products generated at processing facilities or large seafood restaurants are processed and used as fish meal or feed.
- ✓ However those from small restaurants or households are dumped as food waste.
- ✓ In adequate treatment of fishery by-product spoil urban landscape, creat odor and incubates pest.
- ✓ Oyster shells are recycled as fertilizers but they are often neglected or illegally dumped into the sea as their amount is increasing.

fishery by-product

Large raw fish center

- 193 stores
- Amount of waste(per day)
: about 11ton

Seafood processing factory

- 39 stores
- Amount of waste(per day)
: about 34ton



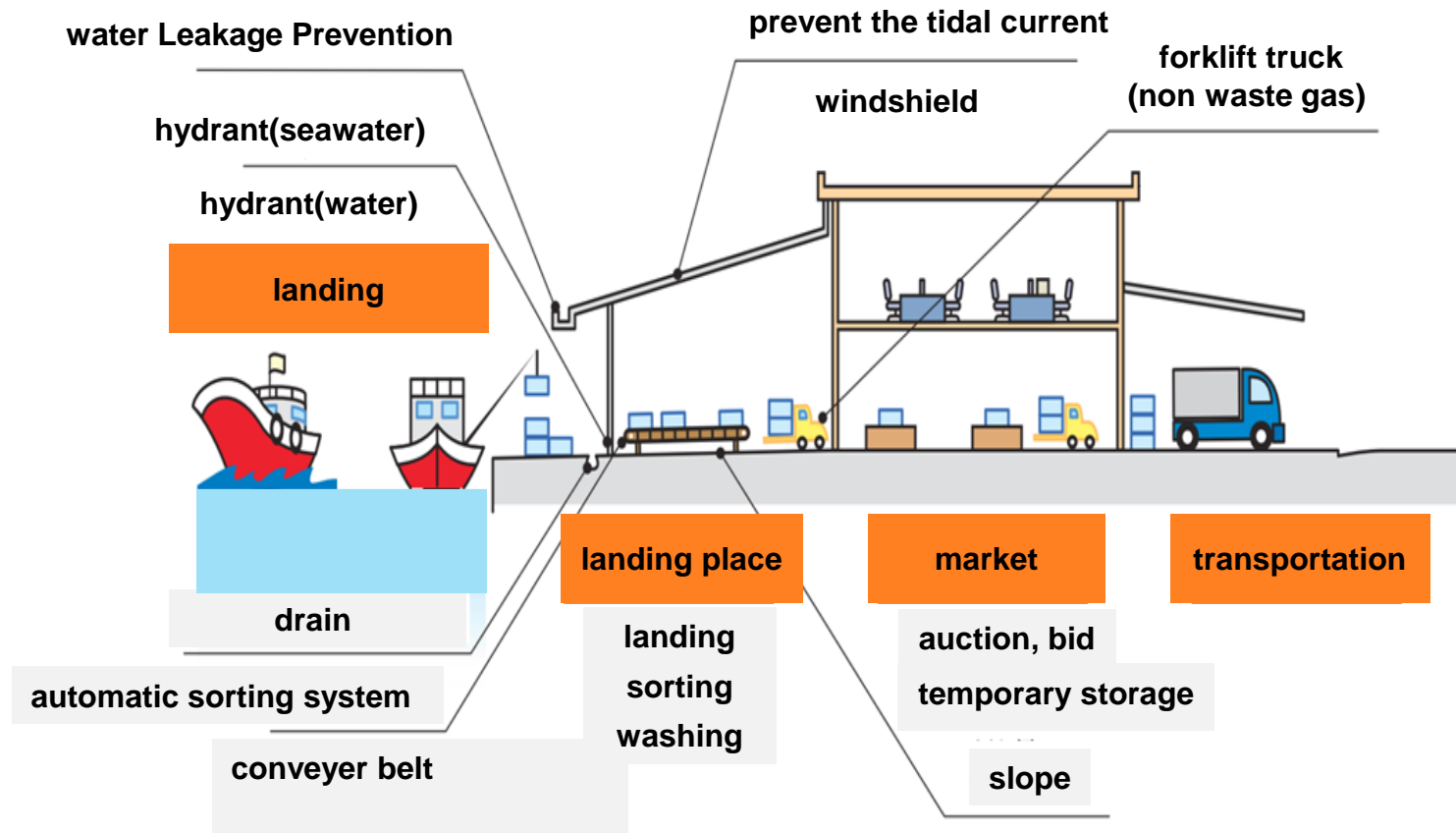
Regulations on fishery by-product

- **No domestic regulations which define fishery by-products and their treatment.**
- **The Water Treatment Act is the only fundamental law which regulates treatment of fishery by-product. However, they face many limitation in their recycling.**
- **In the US, materials destined for recycling are not defines as 'WASTES'. The clause of non-waste material hold if the materials are proven as part of production cycle and not to be discards.**
- **For eco-friendly utilization and commercial use of fishery by products, their separation from waste should be institutionalized.**

V. Improvement methods of post-harvest management

Improved landing system

- Distribution of ' the Fisheries Market Quality and Hygiene management Model



< Improved landing area Image >

Improved processing

- Improved Processing during ‘pre-treatment’
 - ✓ Support for distribution of cold storage, pre-treatment processing facility and other equipment
 - Improved Local logistics

- Introduction of fisheries SCM
 - ✓ Fisheries standardization and infrastructure establishment
 - ✓ Improvement on the fisheries transportation technology
 - ✓ The logistics Center Dispersed for Fisheries Consumption



Improvement on post-harvest management technology and equipment

- **development of technology(or others) to maintain freshness of fisheries**
- **development of graders for differentiated landing(fresh fish, live fish, shellfish and graders on board)**
- **high quality sea ice**
- **development of equipment for pre-treatment(fillet, round, shucking)**
- **development of automatic fisheries packers and improvement of freezing technology**
- **development of manual for post-harvest management by item, development of fisheries packing material**
- **small packing material pressed paper boxes, trays and flooring materials**

Improvement of 'post-harvest management' in fisheries' policies or system

- **Education and training**
- **Improvement of policy structure**
- **Amendment of the Act on Distribution and price Stabilization of Agricultural Fisheries Products**
- **Amendment of Quality Control of Fishery Products Act**
- **Amendment of the Food Sanitation Act**

The national goal for fishery by-product

▪ The national goal for fishery by-product

✓ “Eco-friendly utilization of fishery by-product and their development into a high value-added industry”

◆ Three major directions

- foundation of accelerated transition into resource circulation society
- minimization of waste and their eco-friendly utilization as resource
- diversification of fishery by-products and their development into a high value added industry

VI. Conclusions

Conclusions and suggestions

▪ Recent environmental changes regarding fishery by-products

- ✓ More seafood was being consumed and more by-products was being generated.
- ✓ One of major governmental projects was 'switch to resource circulation society'
- ✓ Technological advancement and changing recognition was booting value of fishery by-products.

▪ Suggestions

- ◆ Selective Gears(minimizing Discard)
- ◆ Enhance freshness of Fish
- ◆ Fishery by-product reused eco-friendly or developed as a type of resource with high added value.



Preventing environmental pollution and minimize socioeconomic costs by discouraging simple discarding of fishery by products which are be incinerated, ocean dumped or land filled.



Thank you