Policy Development And Implementation Strategies

Contemporary Issues In The Indonesian Fish Logistics

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Introduction

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  - Transport Analyst, World Bank, Jakarta 2013-2014
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  - Civil and Environmental Engineering, Universitas Gadjah Mada 2009-2013
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Outline

- Introduction
- Background
- Global Review of Marine Production
- Review of Marine Production in Indonesia
- The National Fisheries Logistics System (SLIN)
- Method to Locating Production, Distribution, and Buffer Stock Location
- Analysis of Location
- Sensitivity Analysis
- Conclusion and Lesson Learned

Background

The healthy ocean mean jobs, food and protection for billions of people around the world

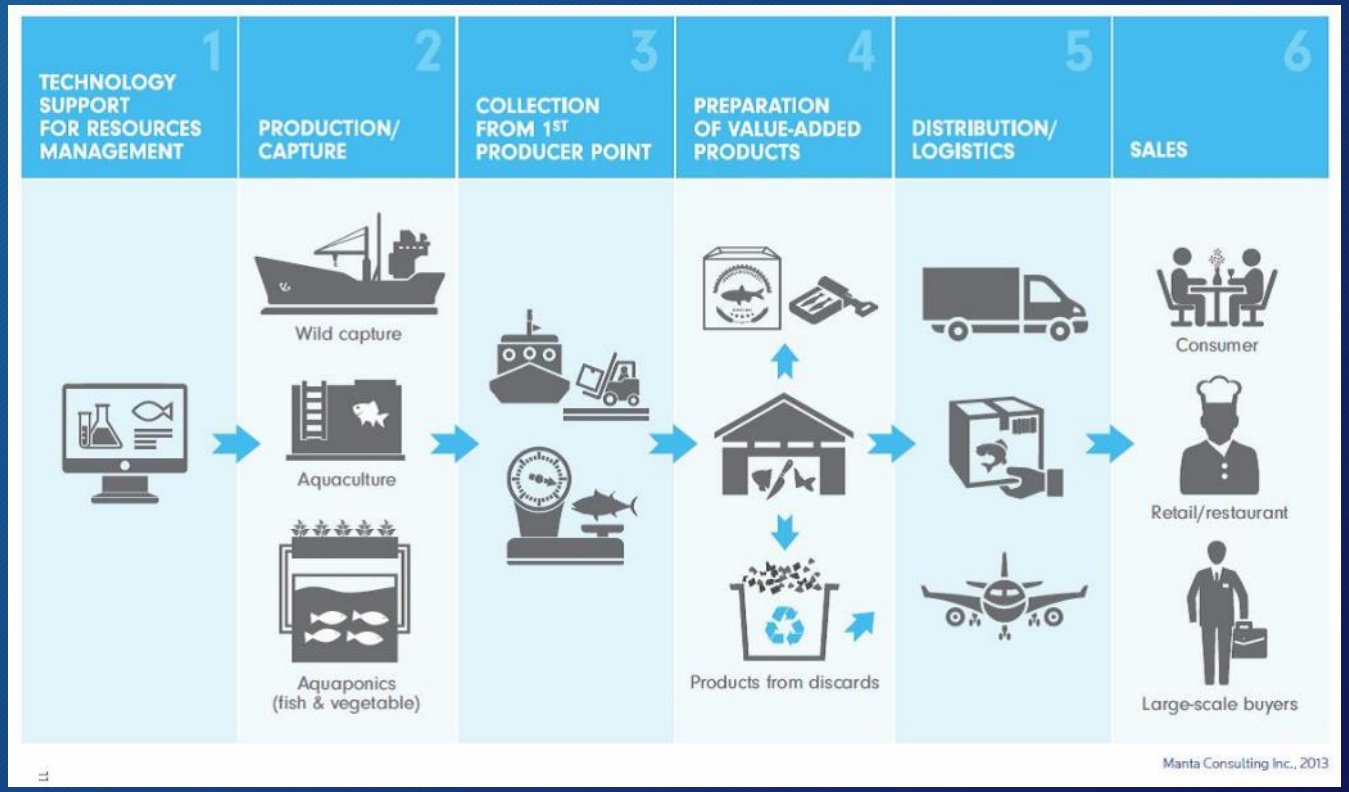
- Jobs in the ocean: 10-12 percent of the world's population
- FAO in 2006 estimated that 87% of persons engaged in fisheries production is in Asia (41.4 million)
  - 13 million Chinese
  - 6.2 million Indonesians
- The fisheries production in 2018= 96 million tons (FAO) = US$436 billion

It induces a real complexity of the supply and distribution chain

- The fisheries production= 17% of total global animal protein
- Optimal distribution leads to the reduced total cost of these products
- Final price refers to the quality of fish

A macro study of supply chain location of fish product

- Production center
- Distribution center
- Buffer Stock



Global Review of Marine Production

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The growing production and consumption of marine production in recent 65 years

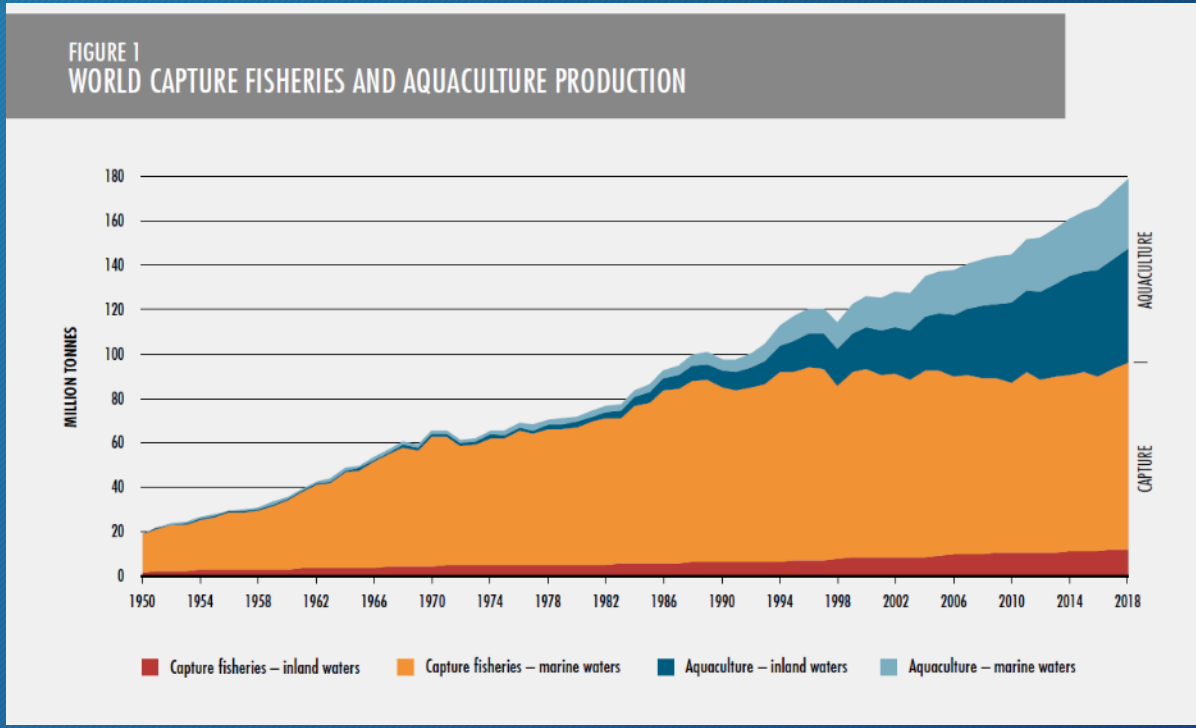

Figure 1: Global growth of marine products
(Source: FAO, 2016)

- In 1975: aquaculture product is 7 percent of fish for human consumption → 26% in 1994 → 39% in 2004 → 46% in 2018
- Decline in 2000s by climate change effect, population growth

Indonesia is the 2nd leading global capture producers in 2018

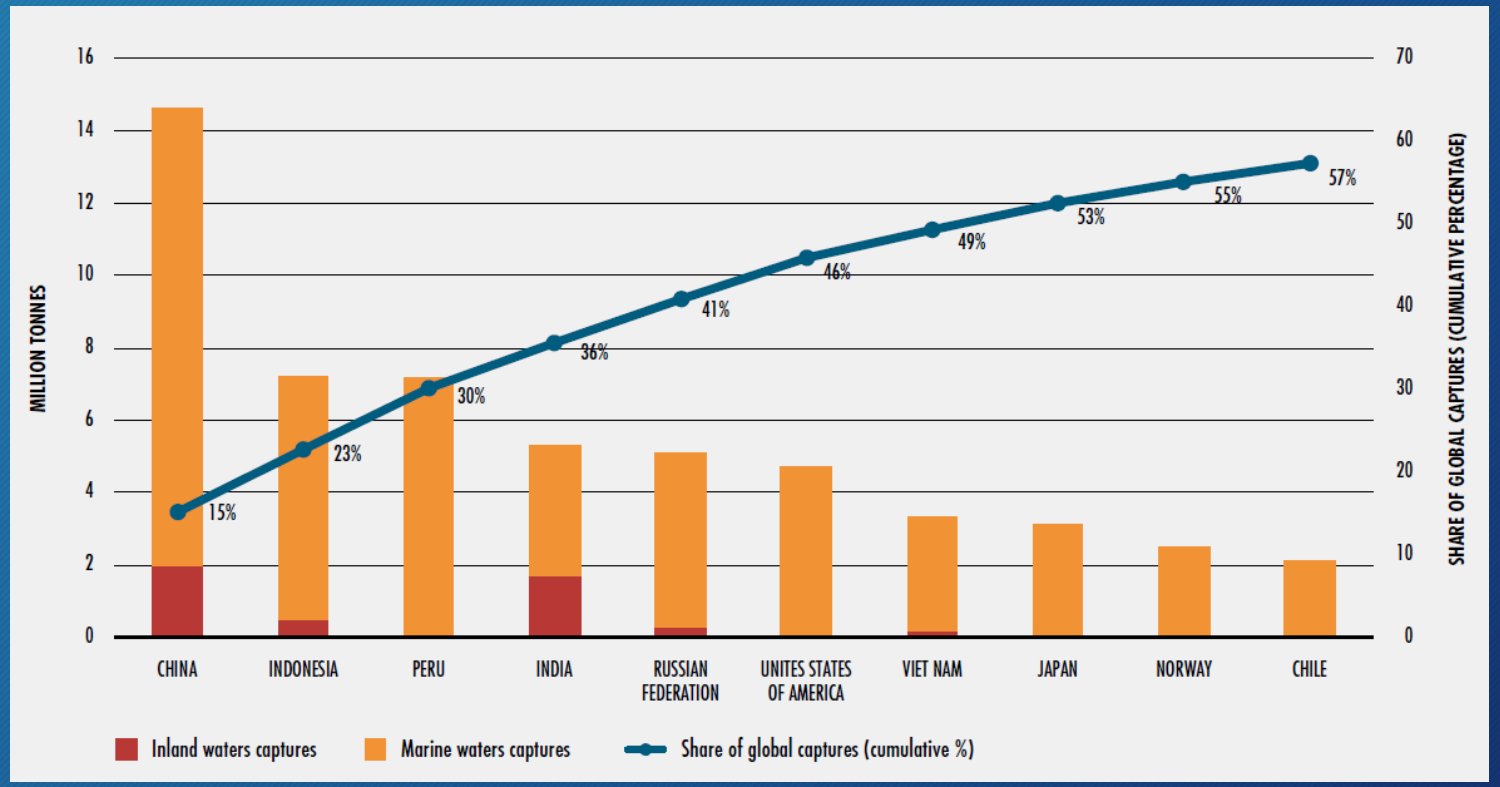

Figure 2: Top Ten Global Capture Producers *(Source: FAO, 2020)*

Indonesia is the 2nd leading global aquaculture producers in 2018

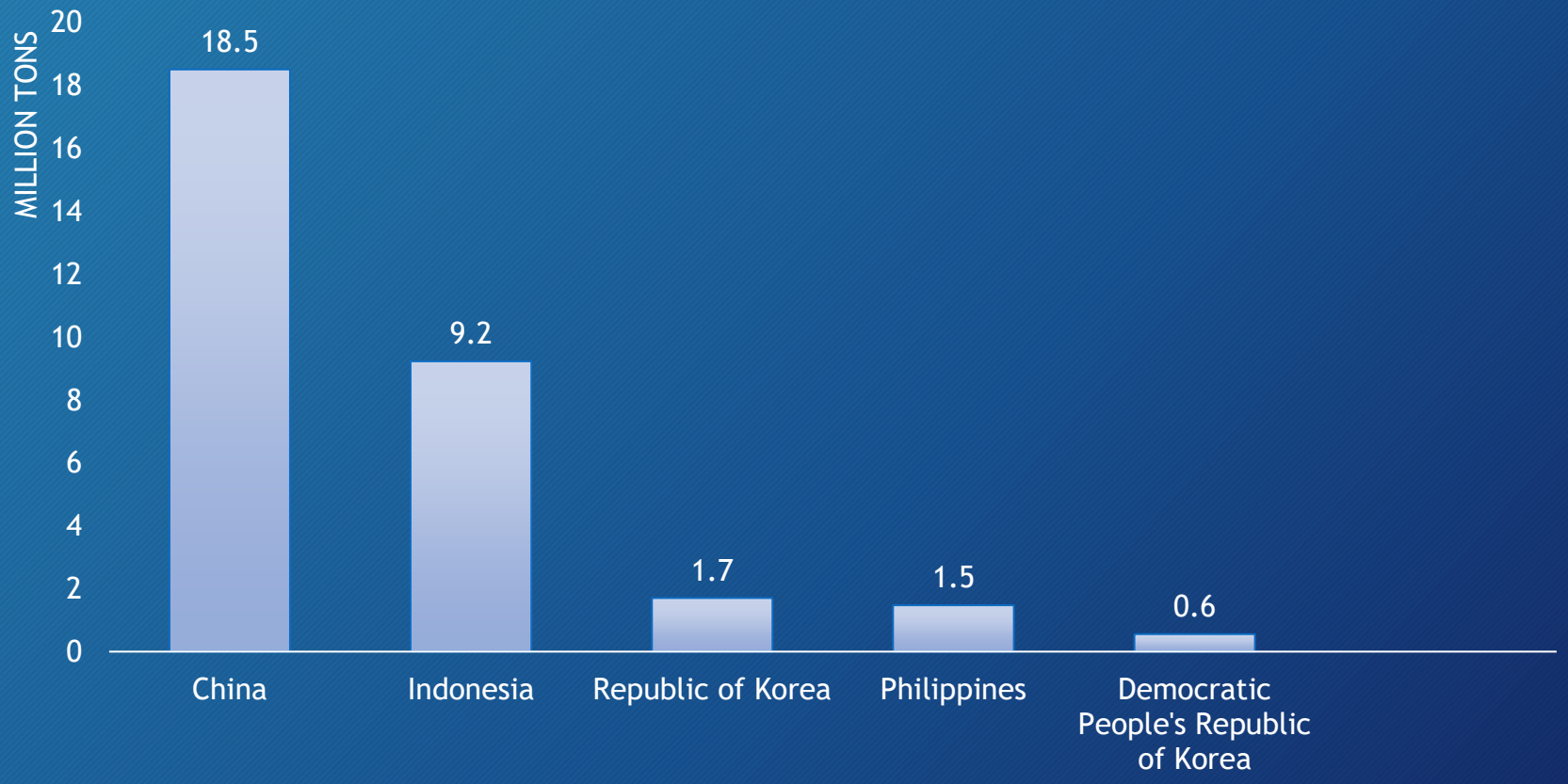

Figure 3: Top Five Global Aquaculture Producers *(Source: FAO, 2020)*

National Review of Marine Production

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Indonesia is as top five countries that producing both capture fisheries and aquaculture commodities

- The annual average fish consumption in Indonesia (51 kg per capita) is higher than the global average (21 kg per capita)
- Indonesia locates in the important crossroad of numerous marine commodities: salmon, crustaceans, pelagic, and fishmeal and fish oil

The increasing of fish consumption in Indonesia

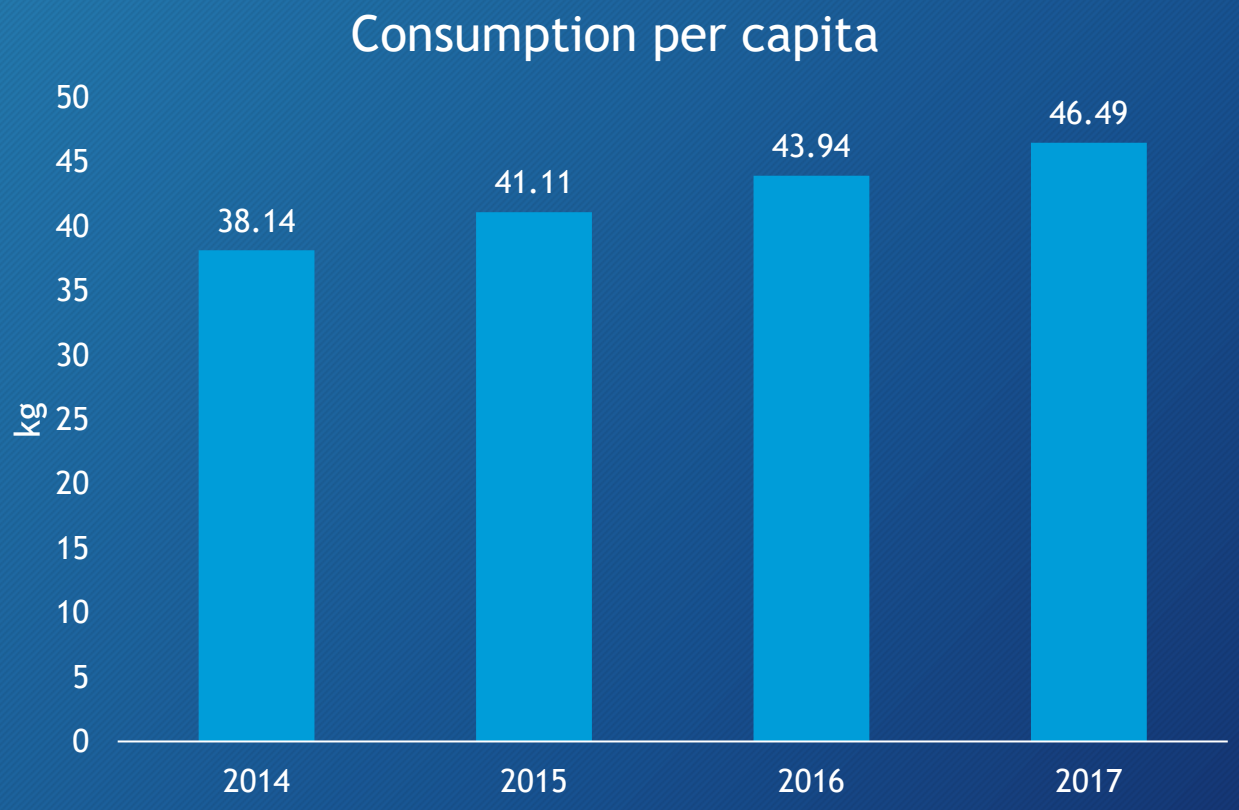

Figure 4: Fish consumption per capita in Indonesia *(Source: Ministry of Ministry of Maritime Affairs and Fisheries, 2019)*

High fish consumption per capita around Indonesia

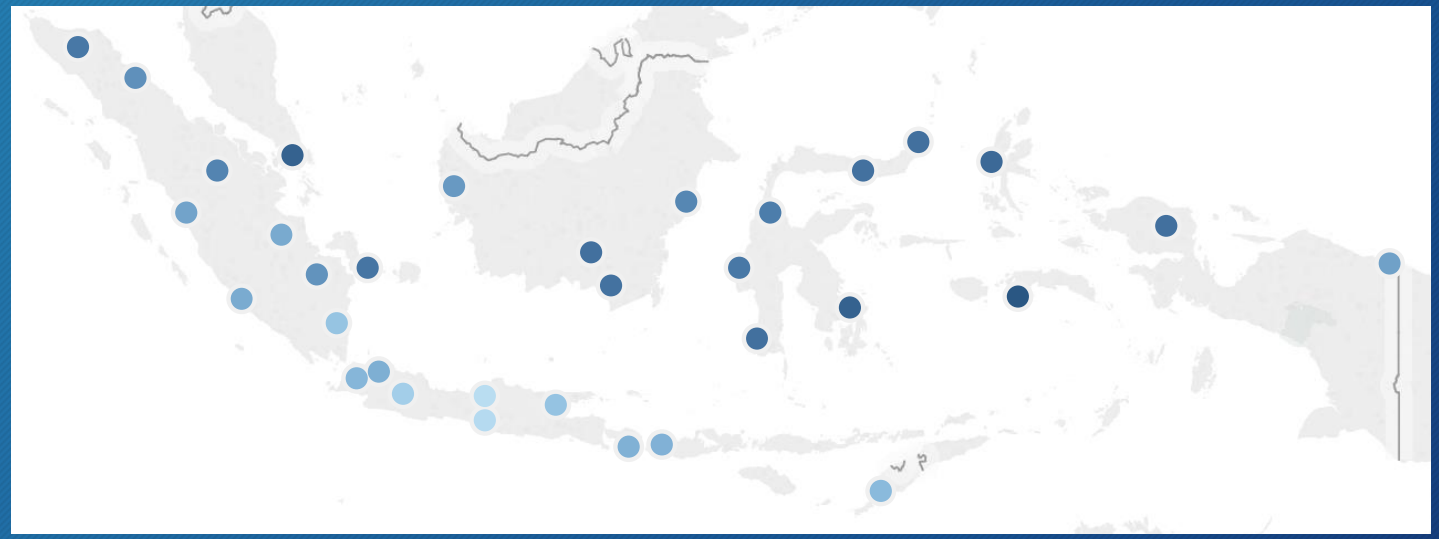

Figure 4: Average fish consumption per capita in Indonesia
(Source: Author's own creation with data Ministry of Ministry of Maritime Affairs and Fisheries, 2015)

Top 5 consuming provinces:

- Maluku (55.35 kg)
- Southeast Sulawesi (52.6 kg)
- Riau Islands (52.58 kg)
- North Maluku (50.750)
- North Sulawesi (48.99 kg)

Capture fisheries area production in Indonesia

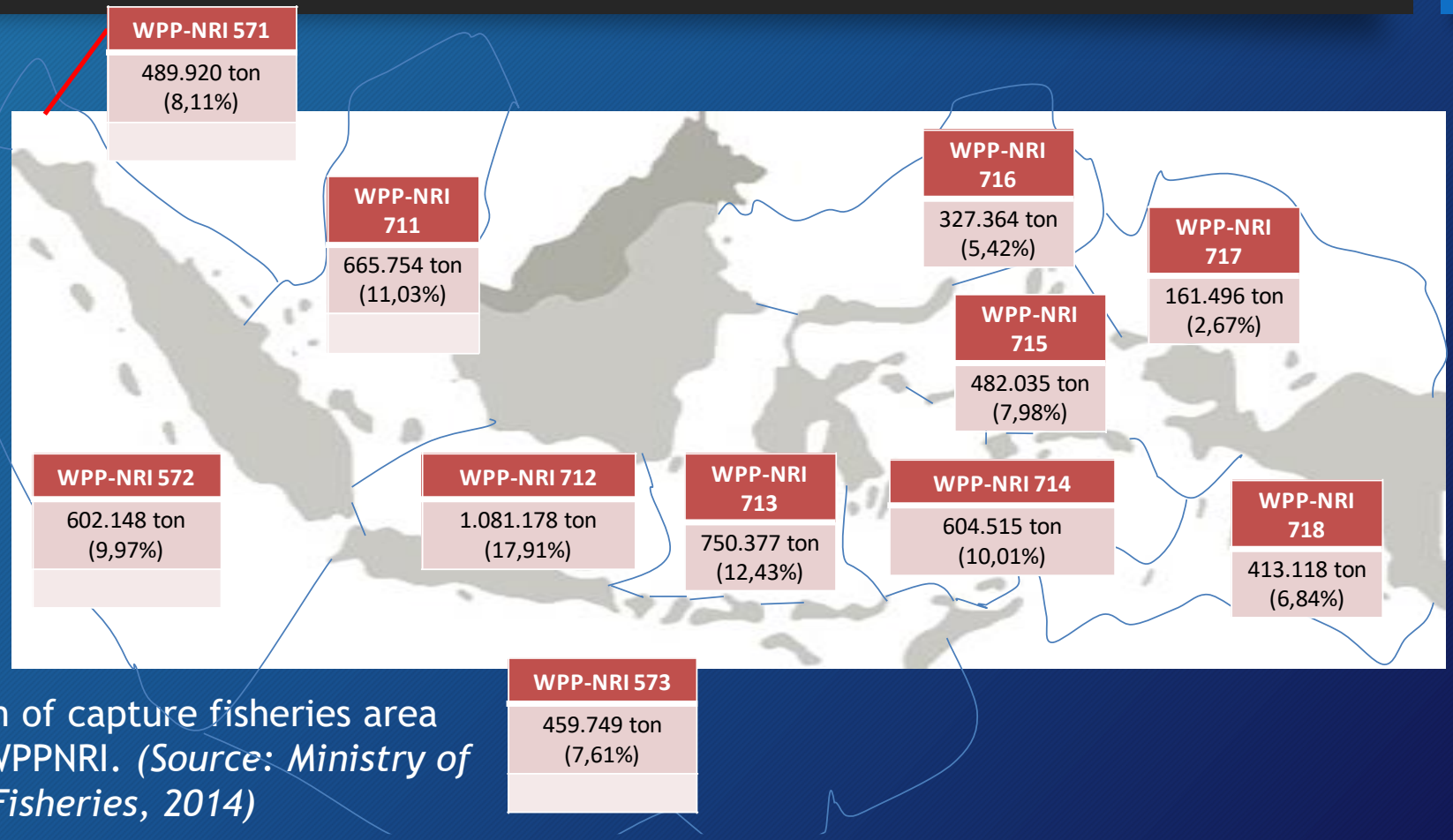

Figure 5: Classification of capture fisheries area production based on WPPNRI. *(Source: Ministry of Maritime Affairs and Fisheries, 2014)*

The problems of fish logistics in Indonesia

- The deployment areas of production and consumption is very broad,
- Activities of illegal, unreported, and unregulated (IUU) fishing,
- Fishing fleet is still dominated by small size vessels,
- Facilities and infrastructure are still limited, and
- **Production systems hasn't been integrated from upstream and downstream** → we try to answer this

The National Fisheries Logistics System(SLIN)

The National Fisheries Logistics System (SLIN)

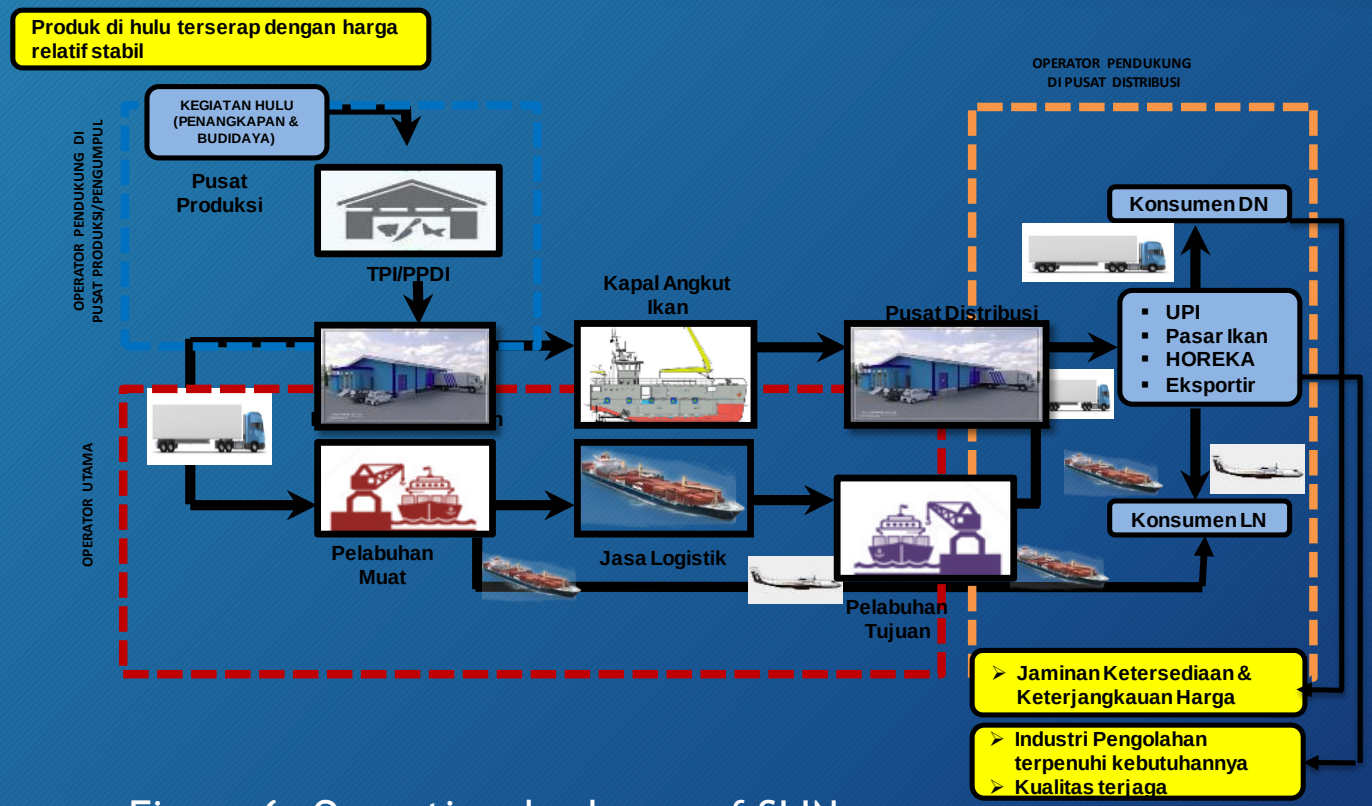

Figure 6: Operational scheme of SLIN
(Source: Ministry of Maritime Affairs and Fisheries, 2016)

- SLIN: the supply chain management system of fish and fishery products, materials, and production equipment, as well as information of the procurement, storage, and distribution

Components of SLIN

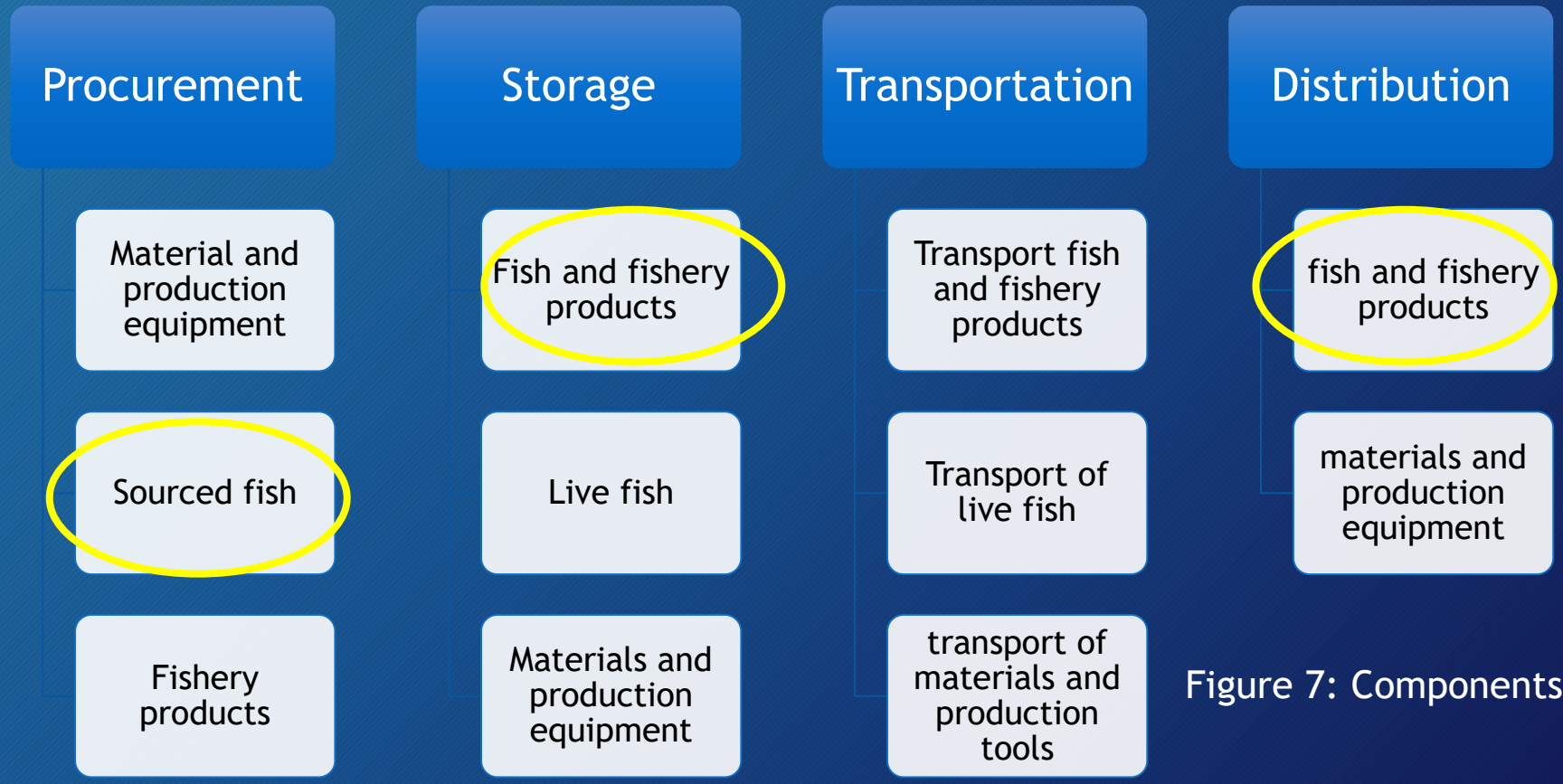

Figure 7: Components of SLIN

Method in Locating Supply Chain Points

Comparing several methods

Selected Method 22

MCA
internal consistency and logical soundness, transparency, ease of use, and quantifiable

CEA
Requires precise monetized data in each criterion

AHP
Time limitation

FA
Requires precise monetized data in each criterion

Figure 8: The methods

The selected criterions in two assessments

1st assessment	2nd assessment
• Draft of port • Production of city/district • Production of province • Consumption of city/district • Fisheries processing facility capacity	• Draft of port • Production of city/district • Production of province • Consumption of city/district • Fisheries processing facility capacity • Population • % of infrastructure spending in APBD • % of labour supply • Congestion

Figure 9: The type of criterions

Analysis of Location

Creating the interval of parameters of each criterion

First assessment

Criterion	Interval (m)	Score	Description of Parameter Interval
Draft	< 6 6-9 9-12 12-15 > 15	2 4 6 8 10	The interval is determined based on the nearest port's draft (from the shallowest to the deepest)

Table 1: Interval of parameter in Draft criteria

Criterion	Interval (ton)	Score	Description of Parameter Interval
Production of City/District	< 30,000 30,000-60,000 60,000-90,000 90,000-120,000 > 120,000	2 4 6 8 10	The interval is determined based on the highest and lowest production inside the City/District
Production of Province	<200,000 200,000-300,000 300,000-400,000 400,000-500,000 <500,000	2 4 6 8 10	The interval is determined based on the highest and lowest production inside the Province

Table 2: Interval of parameter in Production of city and province criteria

Creating the interval of parameters of each criterion

Criterion	Interval (kg/capita/year)	Score	Description of Parameter Interval
Consumption of City/District	< 20 20-40 40-60 60-80 > 80	2 4 6 8 10	The interval is determined based on the highest and lowest fish consumption inside the City/District

Table 3: Interval of parameter in Consumption criteria

Criterion	Interval (ton)	Score	Description of Parameter Interval
Fish Processing Facilities Capacity	< 120,000 120,000-240,000 240,000-360,000 360,000-480,000 > 480,000	2 4 6 8 10	The interval is determined based on the available fish processing facilities

Table 4: Interval of parameter in Fish processing facility capacity criteria

Weighing each criterion

Decision	Criterion	Weight
Production Location	Port Draft	0.2
	Production of City/District	0.35
	Production of Province	0.3
	Consumption of City/District	0.05
	Fish Processing Facilities Capacity	0.1
Distribution Location	Port Draft	0.2
	Production of City/District	0.2
	Production of Province	0.15
	Consumption of City/District	0.15
	Fish Processing Facilities Capacity	0.3
Buffer Stock	Port Draft	0.25
	Production of City/District	0.15
	Production of Province	0.1
	Consumption of City/District	0.2
	Fish Processing Facilities Capacity	0.3

Table 5: Weight of the criteria

Again, the process of creating the interval and weighing criterion are repeated for the second assessment

Candidate from the clusters

Cluster	Production and Distribution centre
1	Sabang City, North Aceh District, Medan City
2	Pemangkat District, Natuna District, Anambas District
3	Indramayu District, Bandung City
4	Semarang City, Demank District, Pati District
5	Surabaya City, Pacitan District
6	Mataram City, East Flores District
7	Pahuwato District, Banggai District
8	Makassar City, Kendari City
9	Bitung City
10	South Halmahera District, Ambon City
11	Sorong City
12	Aru Islands District, Tual City

Table 6: Candidates of Production and Distribution Center

Buffer Stock Candidate
Medan
Sibolga
Pontianak
Bandung
Surabaya
Sorong
Semarang
Bali
Makassar
Bitung
Kupang
Ambon
Sorong

Table 7: Candidates of Buffer Stock

Production centre results

Candidate	Cluster	Score in 1st assessment	Score in 2nd assessment
Medan City	1	6.4	5.6
Pemangkat District	2	3.4	4.2
Indramayu District	3	4.6	5.3
Pati District	4	3.5	4.2
Surabaya City	5	6.5	6.8
Mataram City	6	4.3	4.8
Banggai District	7	3.5	4.2
Makassar City	8	4.0	4.4
Bitung City	9	7.4	6.6
Ambon City	10	8.2	6.2
Sorong City	11	3.7	4.2
Tual City	12	6.1	5.4

Table 8: Scoring result of production centre

Figure 10: Map of scoring

Distribution centre results

Candidate	Cluster	Score in 1st assessment	Score in 2nd assessment
Medan City	1	4.8	Sabang City: 4.3
Anambas District	2	3.3	4.1
Indramayu City	3	4.6	4.3
Pati District	4	3.4	4.1
Surabaya City	5	5.3	5.8
Mataram City	6	4.2	4.2
Banggai District	7	3.4	3.9
Makassar City	8	4.0	4.1
Bitung City	9	7.5	6.3
Ambon City	10	6.2	4.7
Sorong City	11	3.8	3.9
Tual City	12	5.0	4.4

Table 9: Scoring result of production centre

Figure 11: Map of scoring

Buffer stock results

Ranking	The 1st assessment	The 2nd assessment
1	Bitung	Surabaya
2	Surabaya	Bitung
3	Ambon	Ambon
4	Denpasar	Denpasar
5	Makassar	Makassar
6	Medan	Sibolga
7	Sibolga	Sorong
8	Sorong	Semarang
9	Semarang	Medan
10	Pontianak	Pontianak
11	Kupang	Kupang
12	Serang	Serang
13	Bandung	Bandung

Table 10: Scoring result of buffer stock

Figure 12: Map of scoring

Sensitivity Analysis

Changing the weight of each criteria for second assessment

Criterion Change	Action
Infrastructure ++ Social --	Add weights of port draft, congestion, % of infrastructure budget Reduce weights of population and labor supply
Infrastructure – Social ++	Add weights of population and labor supply Reduce weights of port draft, congestion, % of infrastructure budget

Table 11: changing weight in each criteria

After changing the weight, the results are the same

Conclusion and Lesson Learned

Conclusion

- Both methods result the same priority locations of production center
- Distribution center → almost the same between both methods, except in cluster 1
- Buffer stock → in the 2nd method sets Surabaya as the highest one
- The additional socio-economics criterions reduce the gap between the highest and the least ranking in each cluster
- These criterions also add more score in each location, except the Eastern Indonesia locations
- The 2nd method → more robust analysis

Lesson Learned

- Logistics and supply chain for the Indonesian marine resources needs to plan and managed properly
- The assessment of 20 possible marine logistics hubs reveals that prioritization is needed to ensure that the commercial viability of the investment
- Further study should include the criterion of the availability land and supporting infrastructure

Jalesleva Jayamahe! Thank you