

# Do androids dream of legislative drafting? The use of AI and new technologies in legal drafting

## The Legislative Study Applying Social Big-data Analysis: on Maritime Safety

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- Lisbon Centre for Research in Public Law (ICJP)
- Korea Legislation Research Institute (KLRI)
- International Association of Legislation (IAL)

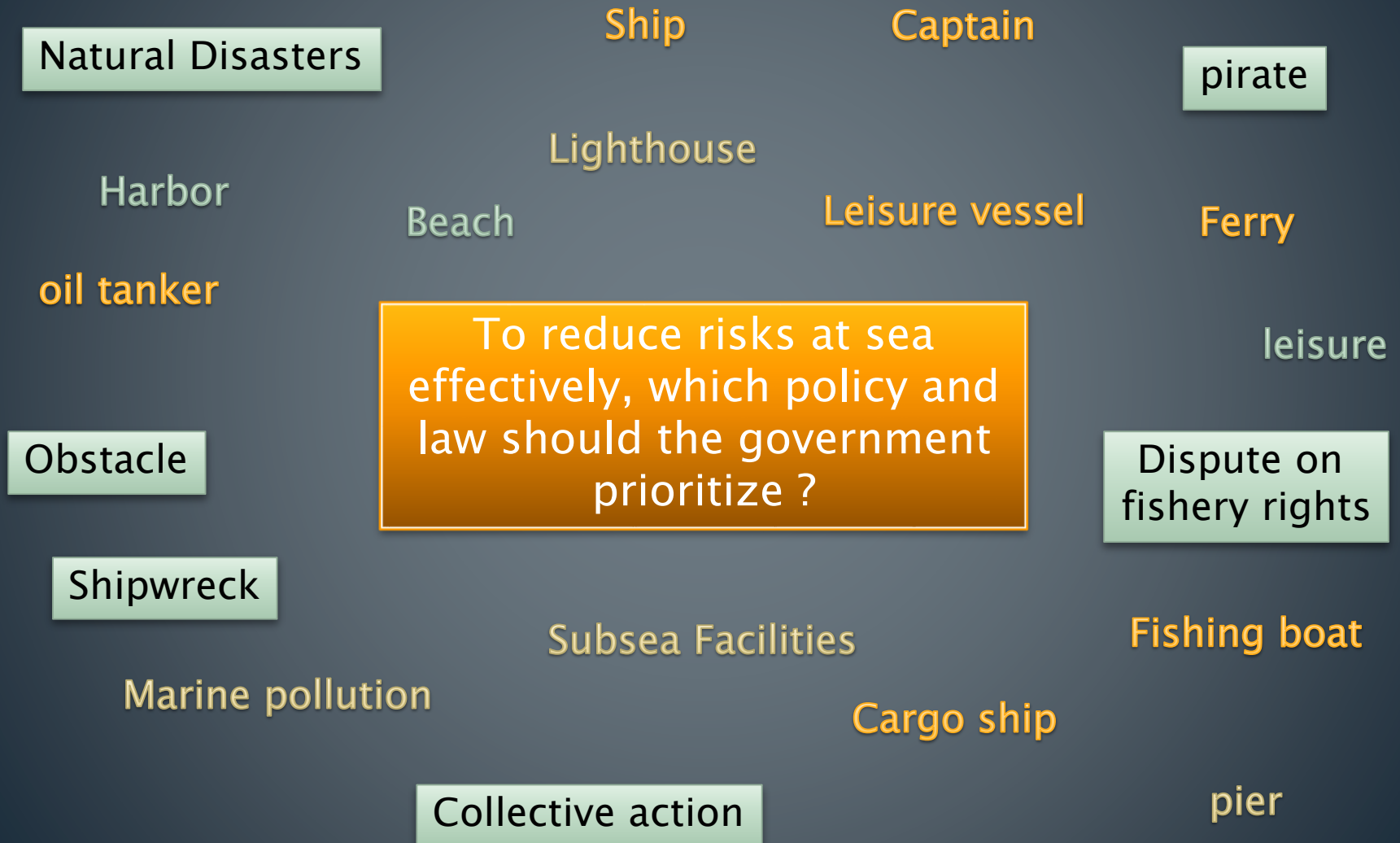
# –List–

- I. What is the difference? Experts vs. Social-data
- II. What Have We Gone Through?
- III. From Social Big-data to Legislative Reform
- IV. What did the Social Big-data show?

# Research Aims and Scope

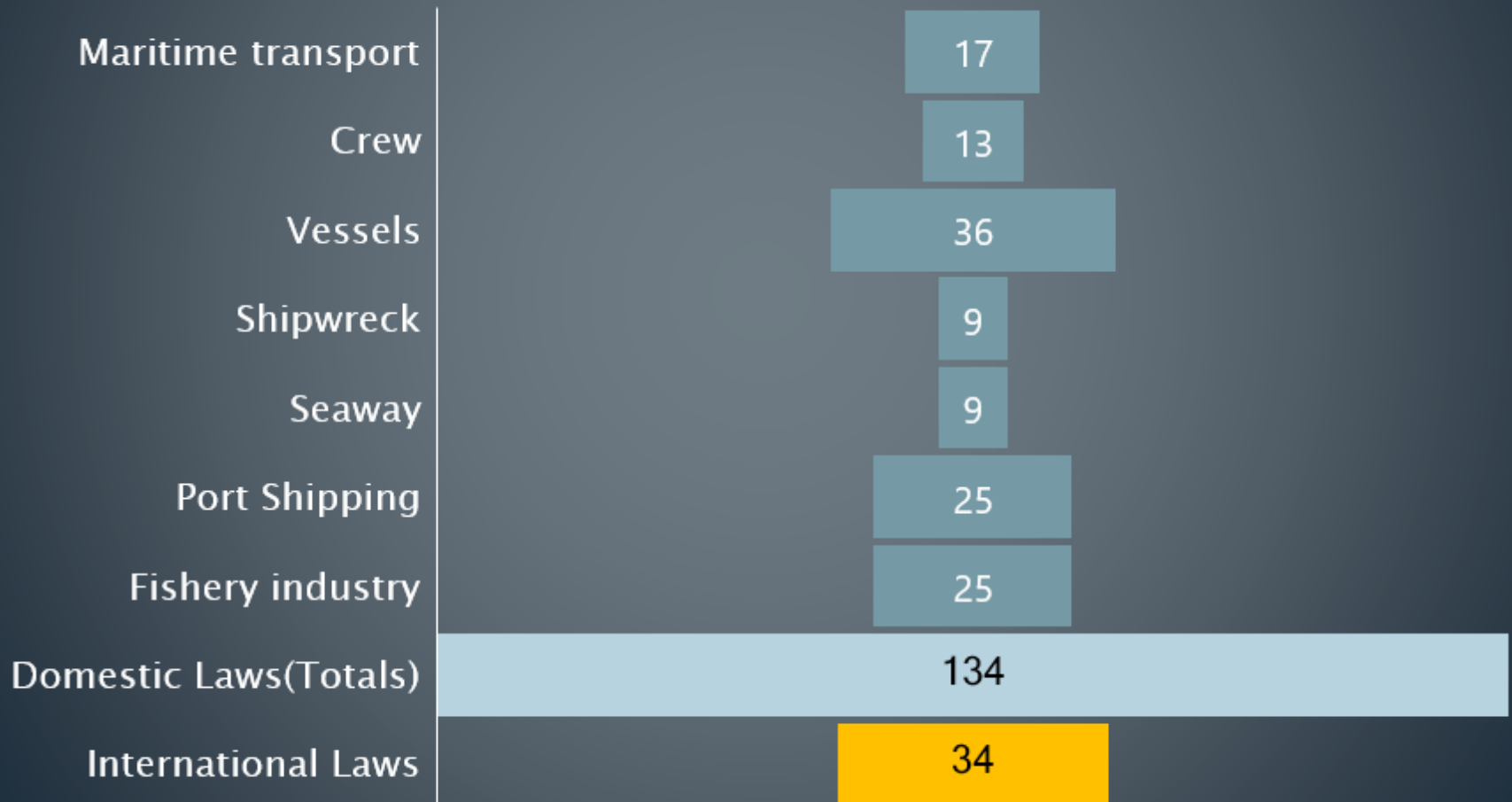
- To analyze maritime risks and seek out ways to better respond to such risks through appropriate policies, government agencies, administrative action, and related legal framework.
- As laws related to maritime safety are spread out in different sectors, including maritime traffic, shipping, crew management, and maritime disaster response.
- This research also aims to identify major risk factors and assess whether existing legal framework allows appropriate responses or not.

# Risks at Sea



# Too Many Laws!

## The Numbers of Maritime Laws in Korea



## The Tragic Sinking of Sewol ferry

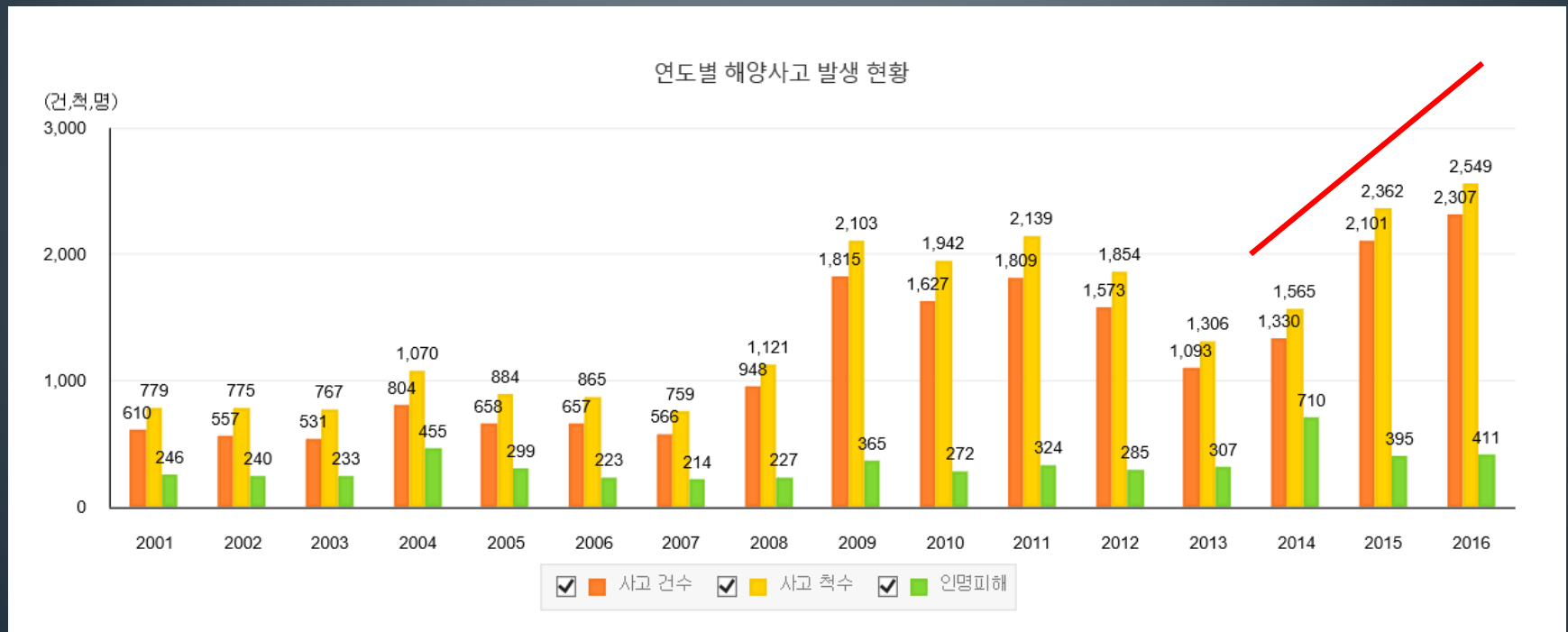
It is not the end!

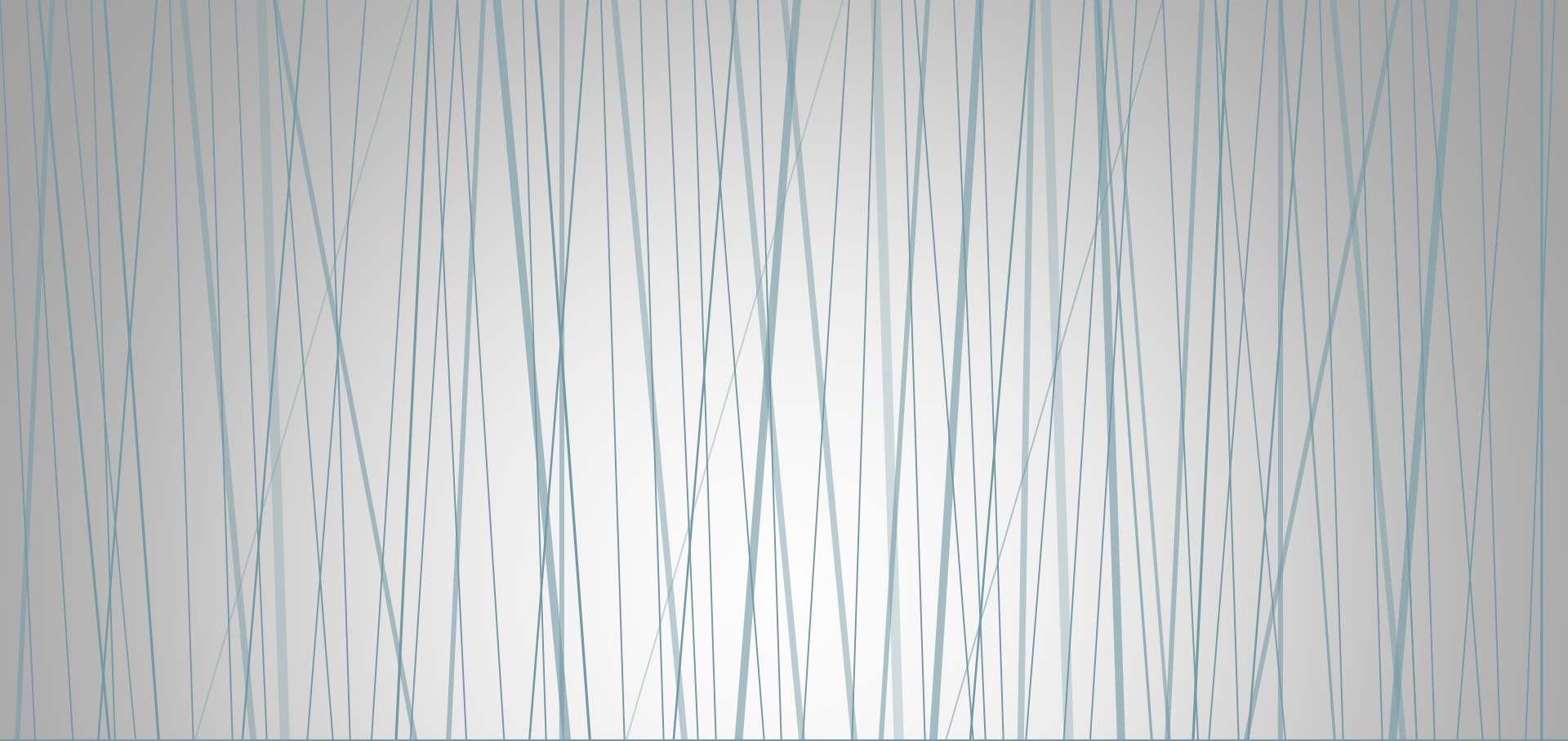


- It is worth noting that the number of maritime safety accidents in South Korea has been on a steady rise since the Sewol ferry sinking in 2014.
- Apparently there are problems in the overall safety management system in the maritime.
- It needs a more fundamental and comprehensive review of maritime safety regulations.

# The Maritime Accidents in Korea

Since 2014, the numbers of accidents have been increased.



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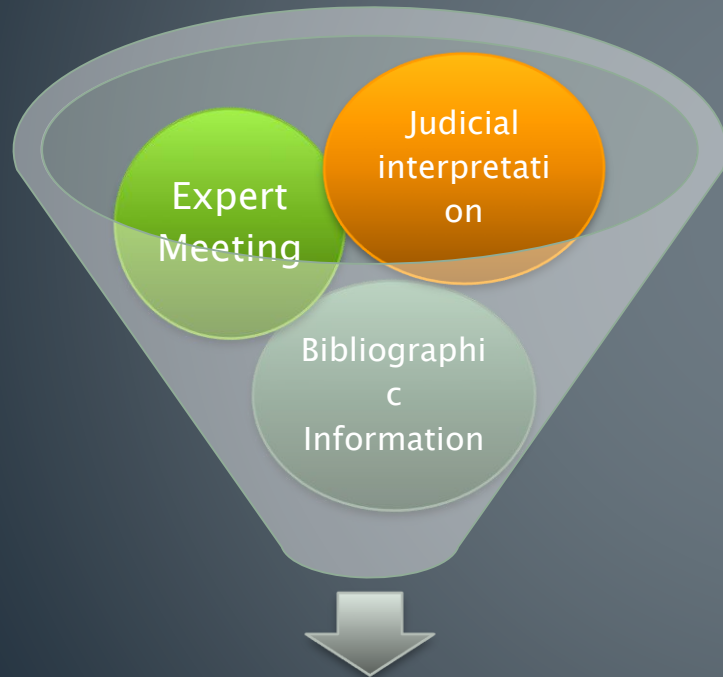
# I. What is the difference? Experts vs. Social-data

# Research Methodology

- This research took a **practical approach** and focus on maritime risk factors on which the **public expresses biggest concerns**, identifying their causes and corresponding preventative measures.
- This research analyzed “**social big data**” available on social networks to identify **the biggest maritime public safety concerns** and any **issues raised in responses** to such concerns.

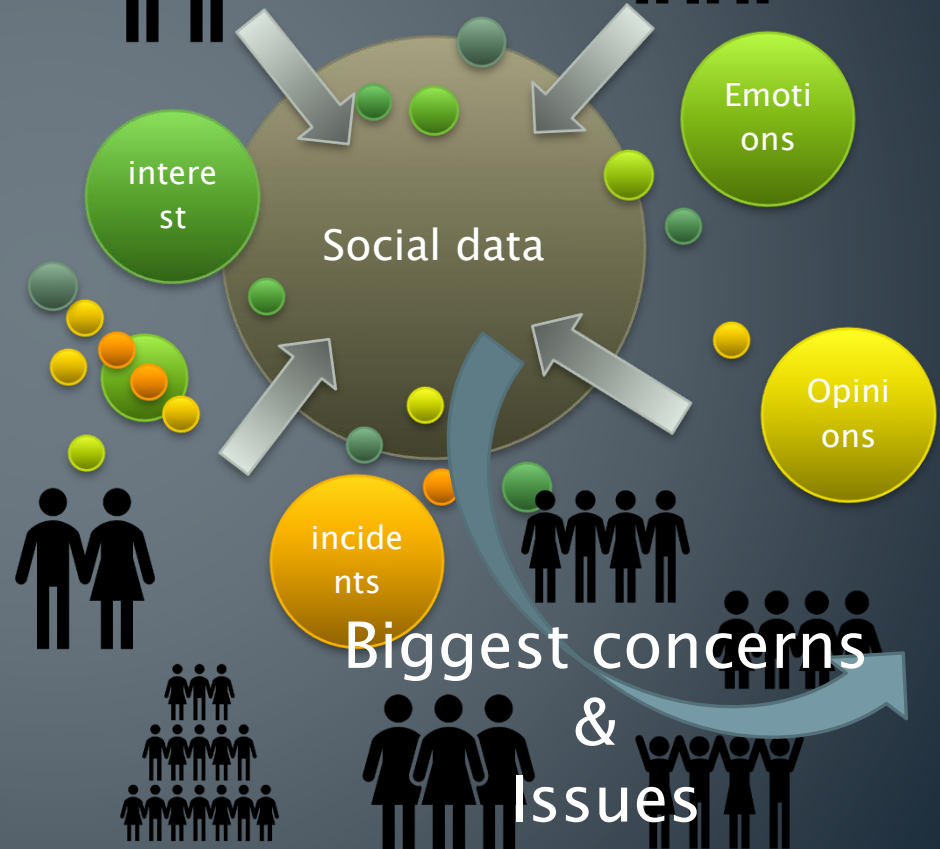
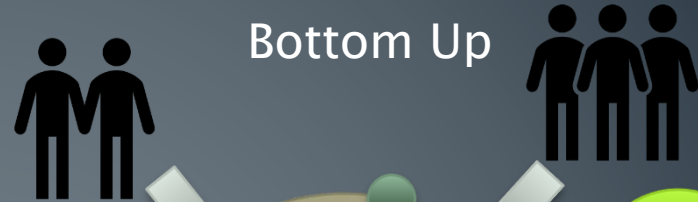
# Legislative Works Process

Top down



Drawing Issues

Bottom Up



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## II. What Have We Gone Through?

# From Data to Better Legislations

- Researchers identified keywords related to maritime safety issues and **composed population** to retrieve **relevant social data** from social data sources(online and network sources).
- Based on the 8th National Basic Plan on Traffic Safety and 2015 Maritime Accidents Statistics Yearbook, the researchers **made an index for keyword analysis** on the factors of accidents.
- **Keywords analysis** was conducted using **text mining** based on the selected index.
- Based on the result of **keyword analysis and scenario analysis**, researchers were able to make **policy recommendations** and conduct further **review of existing legal framework**.

# Procedures and methods of this research

Collecting social data for **population** composition

Making and labelling **index**

Selection of Major policy target  
for maritime safety

8th National Traffic Safety Basic Plan

Selection of evaluation index  
for maritime safety

Statistical Yearbook of Marine  
Accidents(2015)

Derive **influence factors** through SPSS  
based on **frequency analysis**

**Scenario analysis** through keyword analysis  
based on **evaluation index**

Presenting **the policy and legal improvement direction** for marine safety  
based on the scenarios and influence factors

# Fishing at Sea of Social Data



**100 million data**

**Population  
of Social Data  
for Analysis on Maritime Safety**

Fly Fishing in the Big Data Lake | 1to1 Media  
<http://www.1to1media.com>

# Data analysis scope to compose population

- The population selection for the keyword analysis is as follows.

data analysis scope	1 Year	from January to December 2015
collection channel	Over 100 million data (total)	<ul style="list-style-type: none"><li>8 million news articles</li><li>95 million social articles including tweets</li></ul> <ul style="list-style-type: none"><li>257 online news sites</li><li>Online community cafes(Naver, Daum)</li><li>Twitter</li><li>Blogs (Naver, Daum, Tstory, Igloos)</li><li>15 bulletin boards(Agora, Bbomppu, etc)</li></ul>

## Selection of key words to Make up a population

Subject term	Key word		
Basic words	(Ocean or sea – 2), (Ship or Fishing boat/vessel or Passenger ship – 3) (Marine police or Marine policy or Marine safety or Marine management organization or Ship safety – 6)	and	(Problem or Measure or Accident or Fire – 4)
Meaning similar to the word 'Accident'	(+) Marine pollution, Marine fire, Maritime burglary, Maritime terrorism, Marine leisure accidents,		
Meaning similar to the word 'Marine police'	(+) Marine security, Marine rescue team, Marine guards		
Meaning similar to 'Marine management organization'	(+) Navy, National Oceanographic Research Institute, Ocean Policy Department and Office, Marine Environmental Policy, Marine Environment Management Corporation		
Exclusion of idioms (Unused language)	(–) Recruitment, Academy, Examination, Notice, Passing, Expo, Experience, Cultural center, Program, Fair, Competition, Annual salary		

# Analysis to find out “what causes maritime risk” and “the way to reduce”



Ship size

Ship type

Type of  
Accident

Cause of  
Accident

Rescue  
body

Weather

- Evaluation index 1:
- Death and Missing Weight(%)
- Evaluation index 2:
- Death and Missing scale(people/ships)



- Main key words  
(Online terms)

# Making Index

Evaluation index based on reduction targets

Evaluation index 1 (Death and Missing Weight)	Evaluation index 2 (Death and Missing scale)
Death and Missing Weight(%) = Deaths and missing persons(people) / Total number of casualties(people)	Death and Missing scale(people/ships) = Deaths and missing persons(people) / Total number of accident(ships)

**8th National Traffic Safety Basic Plan**

**Statistical Yearbook of Maritime Accidents (2015)**

## Selection of key words to measure evaluation index

Division	Ship size	Ship type	Weather	Monthly	Rescue organization	Type of accident	Cause of accident	Occurrence area	Ship's material
Death and Missing Weight(%)	less than 5 tons	Fishing vessel	Hwang cheon	7~10month	Marine police	Capsizing	Weather deterioration	Within EEZ30 miles	FRP
	1.2	1.2	4.2	1.0	0.7	30.7	6.4	5.9	0.85
Death and Missing scale (people/ships)	100 to 500 tons	Fishing boat	Hwang cheon	11~2month	Marine police	Capsizing	Weather deterioration	Within EEZ30 miles	ship or iron
	3.0	10	6.8	1.9	1.2	5.4	3.8	3.7	1.7
Main key word (Online terms)	Small type, 5 tons	Fishing vessel and boat	Typhoon warning	SPSS (Statistical analysis)	Marine police	Capsizing	Weather deterioration	EEZ	Technical terms(drop)

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## IV. From Social Big-data to Legislative Reform

# Analysis Process on Risk at Sea

## step1

- Keyword analysis

## step 2

- Grouping analysis (similar meaning)

## step 3

- Marine safety impact analysis
- Scenario analysis

Impact analysis standard	Target, Location Cause, Action plan Related organization
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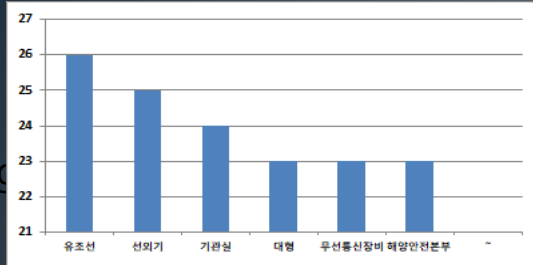
## step 4

- Legislative analysis

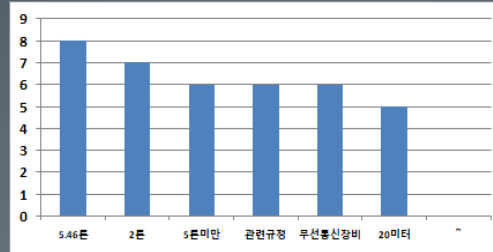
# STEP 1

## Ship size

Main key word: Small type

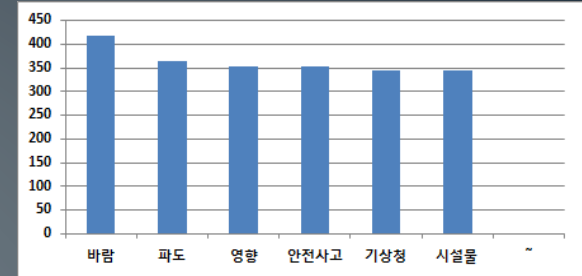


Main key word: 5 tons



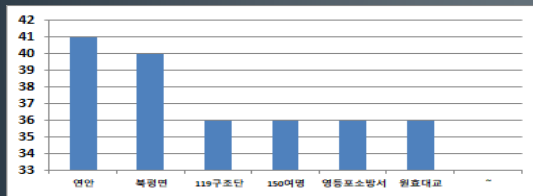
## Weather

Main key word: Typhoon warning

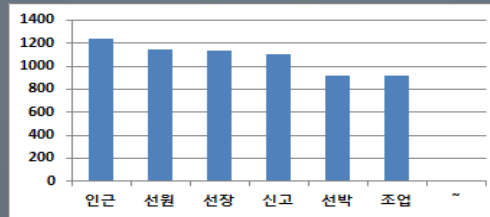


## Ship type

Main key word: fishing boat  
(Large type)

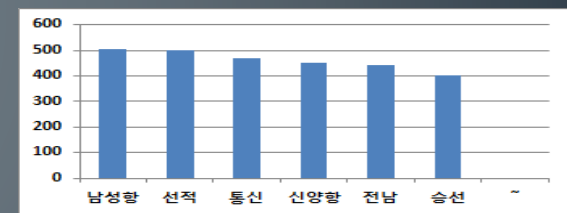


Main key word: fishing boat  
(Small type)



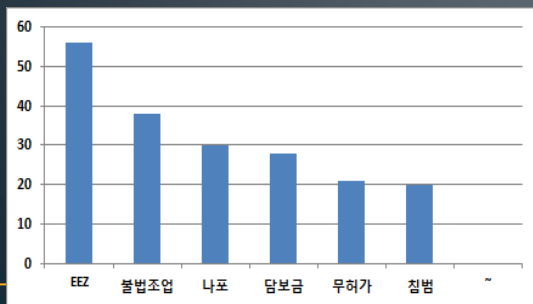
## Rescue organization

Main key word: Marine police



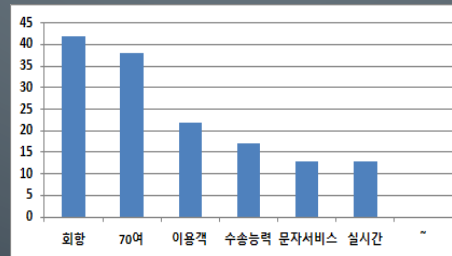
## Type of accident

Main key word: Overturn



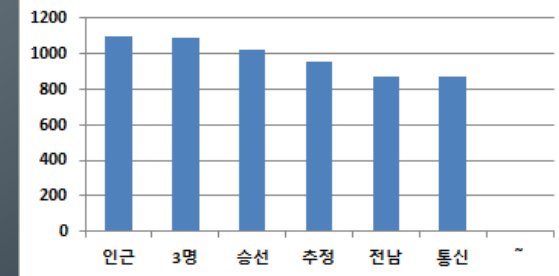
## Cause of accident

Main key word: Weather  
deterioration



## Occurrence area

Main key word: EEZ



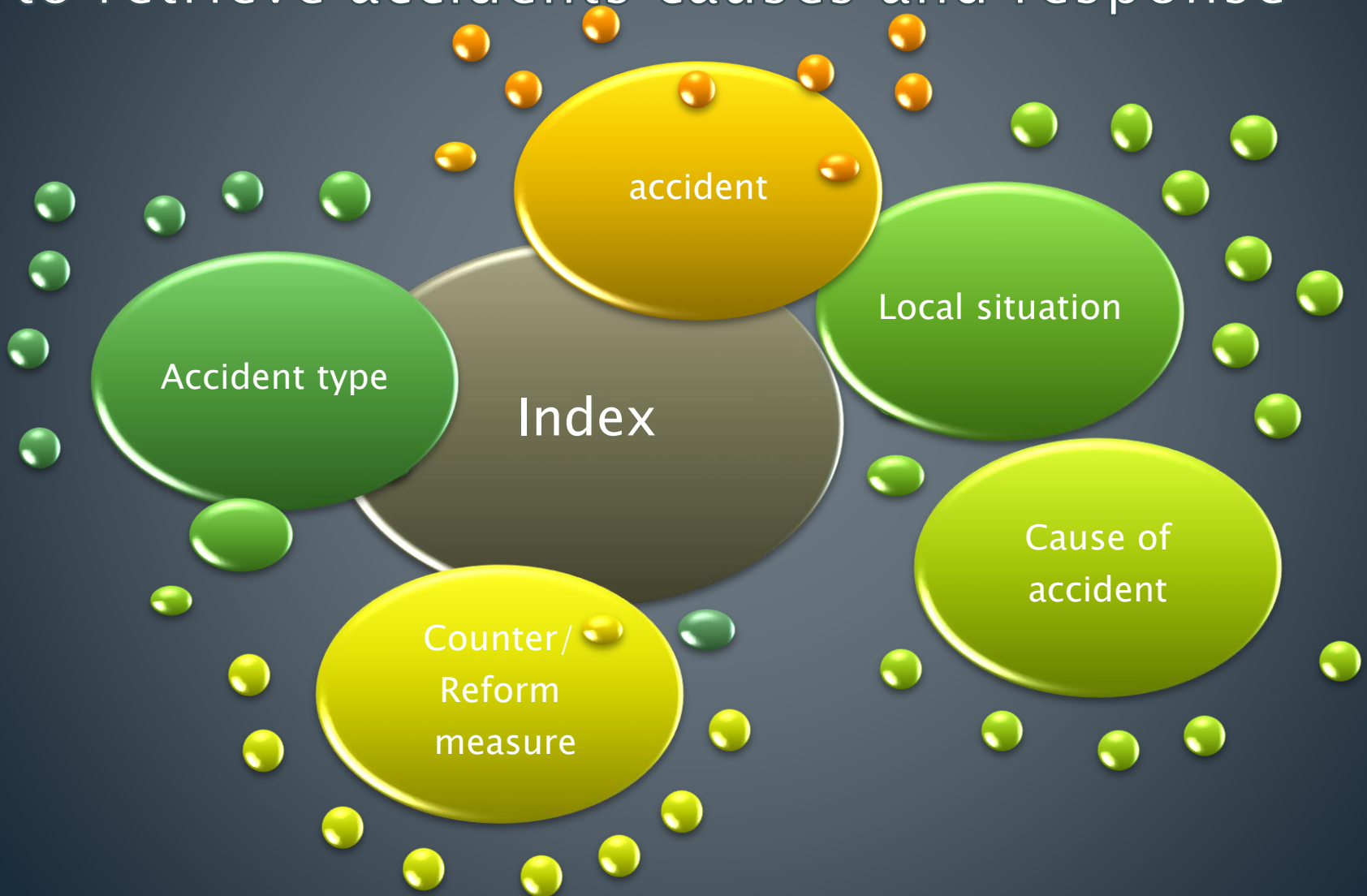
## STEP 2

# 1st grouping result based on key words

Word derived from more than 9 months(Similar meaning)	Group (1)
Wind, Weather, Wave	Weather influence
South, Jeonnam, Jeju	South
President, Park Geun-hye, Park Geun-hye president, Park president	president
Saenuri Party, Opposition party, Minister, Government, Politics, Cheongwadae	Minister
Mobile, Service, System	Information
Accident occurring, Boating accident, Safety accident, Marine accident, Naval accident, Marine traffic accident	Accident occurring
Dead, Children, Missing, Missing person, Damage, Victim, Students	Victim
Ship, Vessel, Fishing boat, Fishing vessel	Small sized ship
Passenger ship, Cruise ship, Travel	Sightseeing boat
Ferry Sewol, Ferry Sewol incident, Sewol disaster, Sewol accident , Ferry Sewol sunk, Special Sewol act	Ferry Sewol
Sinking, Sinking accident	Sinking
MOF(Abbreviation), MOF, NSA NIS, Police, Maritime police, Navy	Government agency
Helicopter, Patrol boat, Diver	Security investigation
Japan, China	Foreign country
Safety, Equipment, Hospital	Safety equipment
Capsizing, Crash, Fire, Illegality	Cause of accident

## STEP 2

Grouping Associated keywords  
to retrieve accidents causes and response



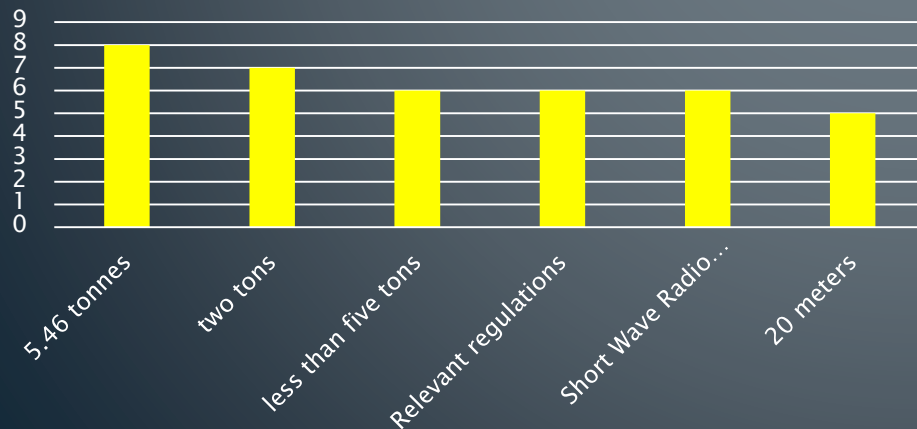
# 2nd grouping result based on 1st grouping result

Group(2)		2015												Total	Average	SD	SD/Avg.
Group (1)		01	02	03	04	05	06	07	08	09	10	11	12				
Accident	Accident occurring	1488	940	1300	2381	963	1999	2119	1039	2237	541	857	1310	17174	1,431	586	41%
	Victim	3303	1847	3552	4421	489	2423	1572	1192	5152	1164	1099	1565	27779	2,315	1,406	61%
	Sightseeing boat	707	895	546	822	299	2033	696	272	499	434	387	367	7957	663	457	69%
	Ferry Sewol	5597	3216	4103	11260	3785	3693	3859	1978	3174	1551	3490	4059	49765	4,147	2,360	57%
	Small sized ship	2204	964	1402	2011	1136	1940	1504	1437	4890	1618	1553	1634	22293	1,858	974	52%
Local situation	Foreign country	792	512	795	753	796	2956	1023	893	597	698	860	845	11520	960	615	64%
	South	1395	461	2127	920	521	630	1022	607	4264	755	590	623	13915	1,160	1,039	90%
	Capsizing	348	308	232	393	-	237	-	-	1998	243	-	-	3759	537	599	112%
Accident type	Crash	320	474	257	524	205	169	306	234	459	196	219	153	3516	293	121	41%
	Sinking	2204	1643	1212	2273	679	2947	872	526	958	674	610	976	15574	1,298	756	58%
	Fire	476	141	180	425	178	-	-	210	267	120	352	335	2684	268	117	44%
	Illegality	-	-	157	297	189	299	-	153	403	252	190	175	2115	235	80	34%
Accident cause	Government agency	5146	3113	6593	7292	3896	3416	4051	3346	9486	3347	3764	4756	58206	4,851	1,891	39%
	president	1138	907	793	2490	772	1205	848	189	587	377	1557	959	11822	985	573	58%
	Minister	3211	2451	2699	4966	2434	2427	2699	965	2073	1420	3532	2241	31118	2,593	975	38%
	Weather influence	1011	387	420	630	343	699	1117	967	1850	641	690	646	9401	783	398	51%
Reform Measures	Security investigation	1193	150	2159	364	462	233	131	388	1581	501	379	623	8164	680	606	89%
	Safety equipment	1271	487	852	1531	830	1377	1246	971	1633	910	997	645	12750	1,063	337	32%
	Information	381	409	644	650	481	267	271	302	666	228	428	329	5056	421	151	36%

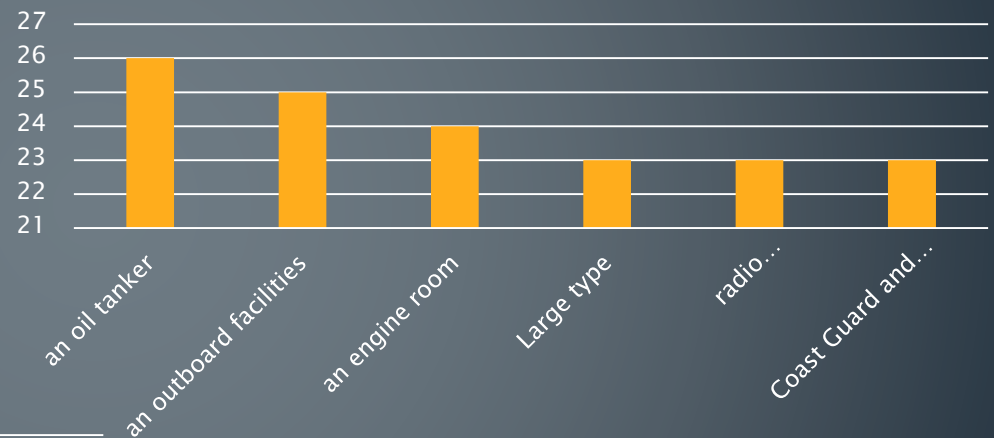
## STEP 1

# Key words Analysis based on ship size

Frequency of associated keywords regarding **5 tonnage**

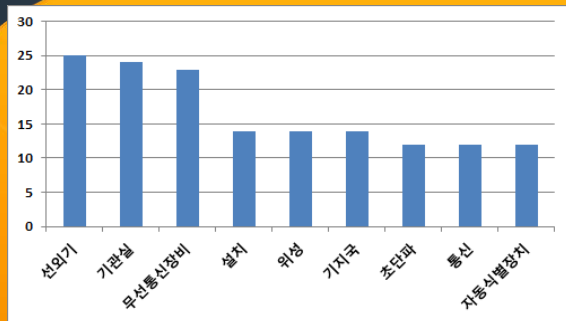


Frequency of associated keywords regarding **Small vessel**

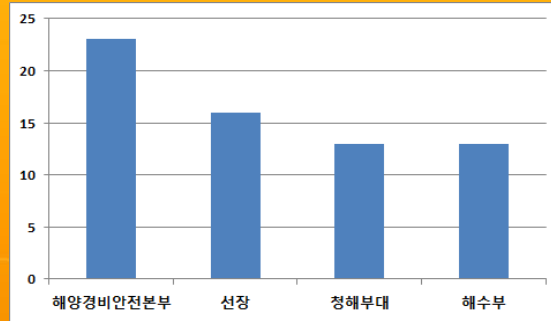


## STEP 2

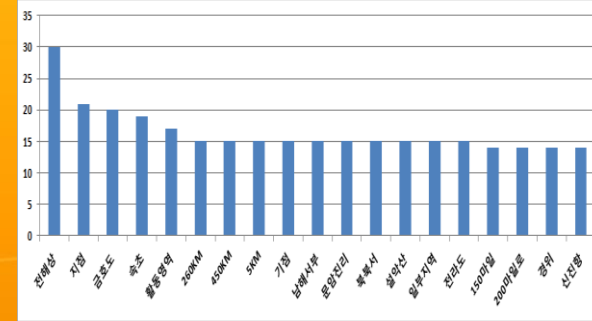
## Grouping result based on ship size



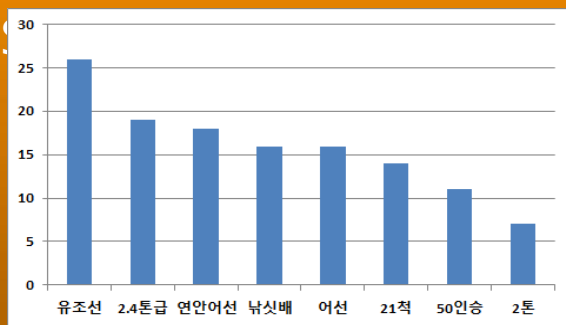
Machinery &amp; Equipment



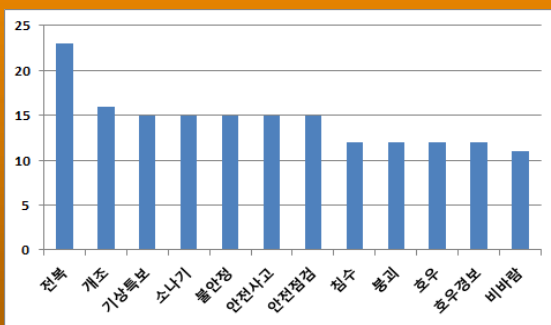
Institutions &amp; administrators



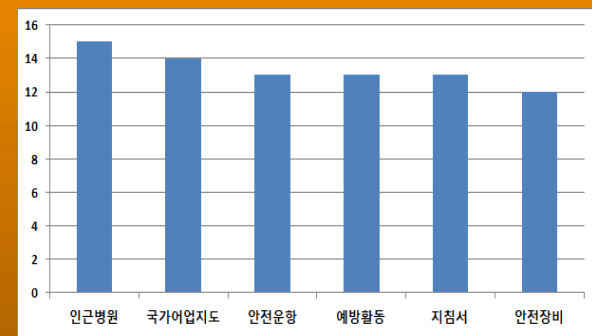
Accident location



Boats scale



Accident cause



Preparation plan

### STEP 3

# Scenario analysis for improvement of accident by ship size

Target (reference value)	Cause	
<ul style="list-style-type: none"><li>• Within 2 tons</li><li>• Fishing boat/ Fishing vessel</li></ul>	<input type="checkbox"/> Machine related:	<ul style="list-style-type: none"><li>• Engine check</li><li>• communications equipment</li><li>• Remodeling</li></ul>
	<input type="checkbox"/> Other related:	<ul style="list-style-type: none"><li>• Safety check</li><li>• Weather</li></ul>



Solution plan
<ul style="list-style-type: none"><li>• Prevention activities</li><li>• safety equipment</li><li>• Hospital accessibility</li></ul>

# Legal Frameworks Related to Maritime Safety Threats

Vessel Location System

Not applied to below 2t

§ 5-2  
§ 53①

Fishing Boats Act

§ 5

§2②, § 8

Wireless Communication facilities

Outboard facilities,  
engine room,  
wireless communication  
equipment,  
ship automatic  
identification system

a small vessel

Vessel Safety Act

2.4 ton,  
fishing boat

Remodeling

Safe sailing  
preventive activities  
fishing guidance

Maritime Safety Act

§29

§15

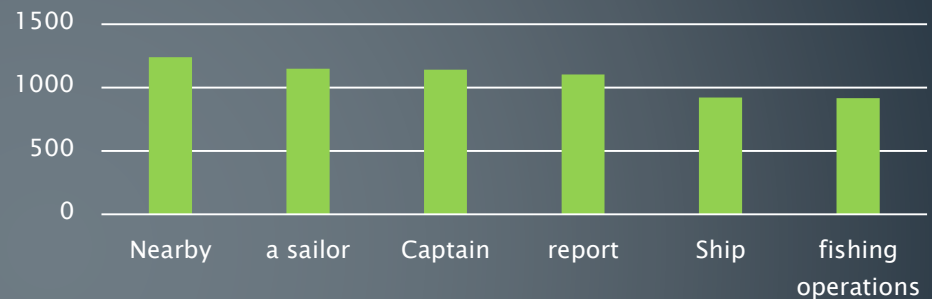
Not applied to below 2t

Vessel Remodeling

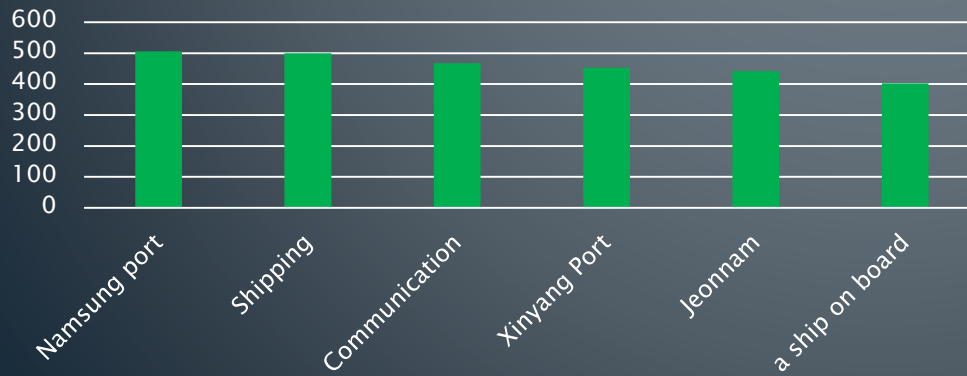
## STEP 1

# Key words Analysis based on ship type

Frequency of associated  
keywords  
regarding fishing boat(general)



Frequency of associated  
keywords  
regarding Fishing boat  
(angling type)



### STEP 3

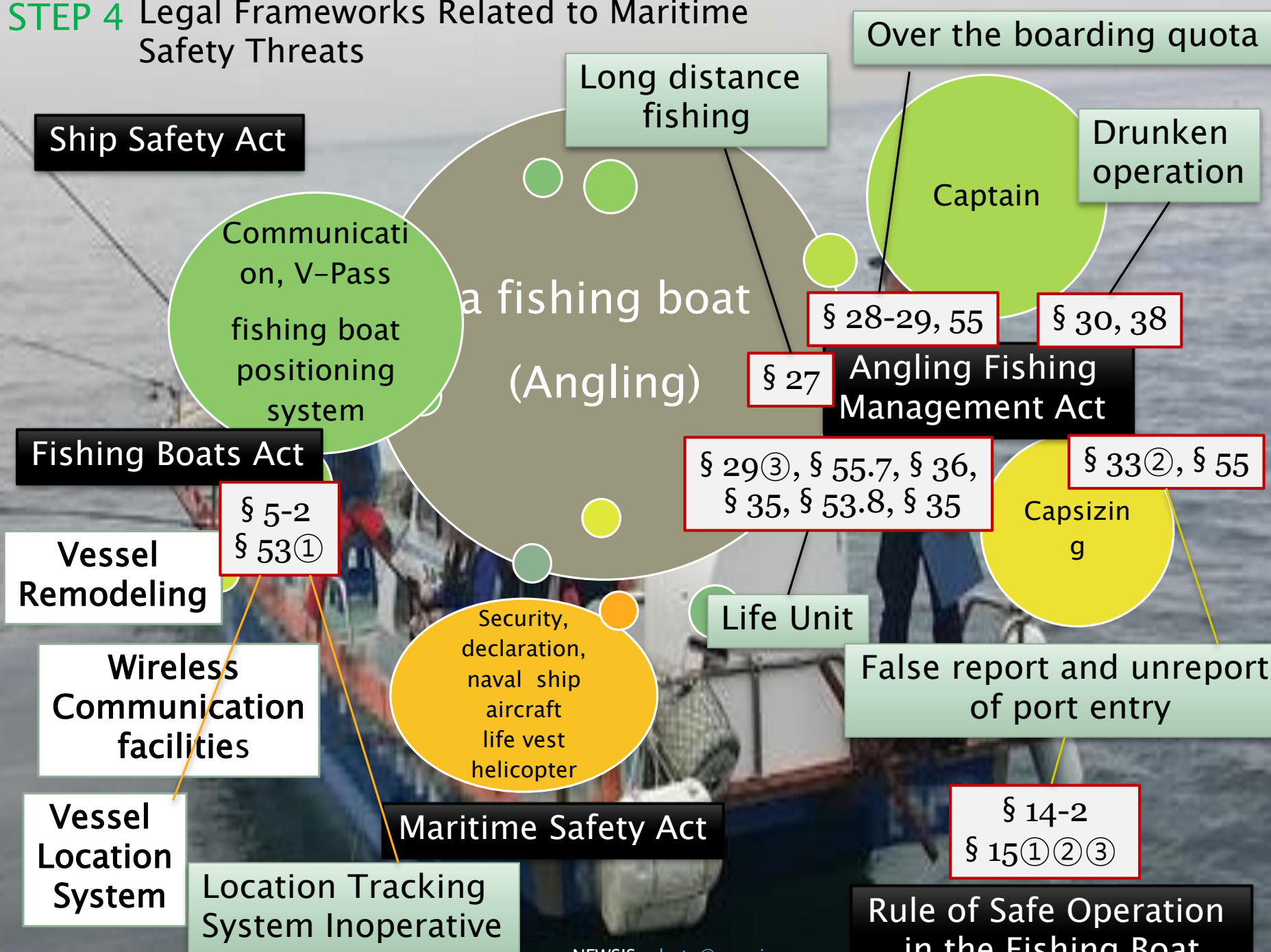
## Scenario analysis for improvement of accident by ship type

Target (reference value)	Cause		Related organization
<ul style="list-style-type: none"><li>• Ship</li><li>• Fishing boat</li></ul>	<input type="checkbox"/> Human factors	<ul style="list-style-type: none"><li>• Crash</li><li>• Fire</li></ul>	<ul style="list-style-type: none"><li>• Ministry of oceans &amp; fisheries</li><li>• Marine police</li><li>• Maritime safety &amp; security division</li></ul>
	<input type="checkbox"/> Natural factors	<ul style="list-style-type: none"><li>• Waves</li><li>• Wind</li></ul>	



Solution plan
<ul style="list-style-type: none"><li>• Communication</li><li>• Fishing location</li><li>• V-PASS</li><li>• Patrol boat</li><li>• Helicopter</li></ul>

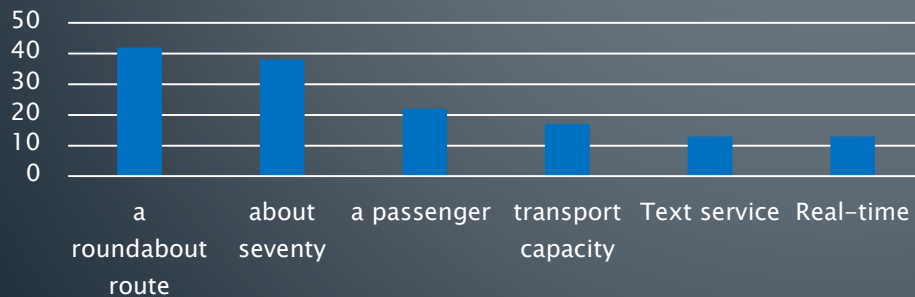
# STEP 4 Legal Frameworks Related to Maritime Safety Threats



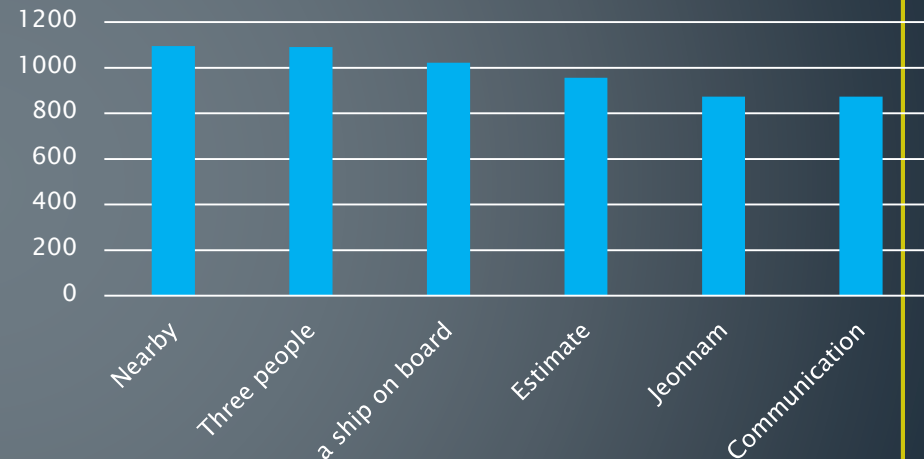
## STEP 1

# Key words Analysis based on cause of accidents

Frequency of associated keywords regarding weather



Frequency of associated keywords regarding capsizing



### STEP 3

## Scenario analysis for improvement of accident by cause of accidents

Cause	Related organization
<ul style="list-style-type: none"><li>• Increase</li><li>• Overboard</li><li>• Number of flights</li><li>• illegal operation</li><li>• Neglect</li></ul>	<ul style="list-style-type: none"><li>• Marine police</li><li>• Private diver</li><li>• Marine safety supervisor</li><li>• Flight manager</li></ul>



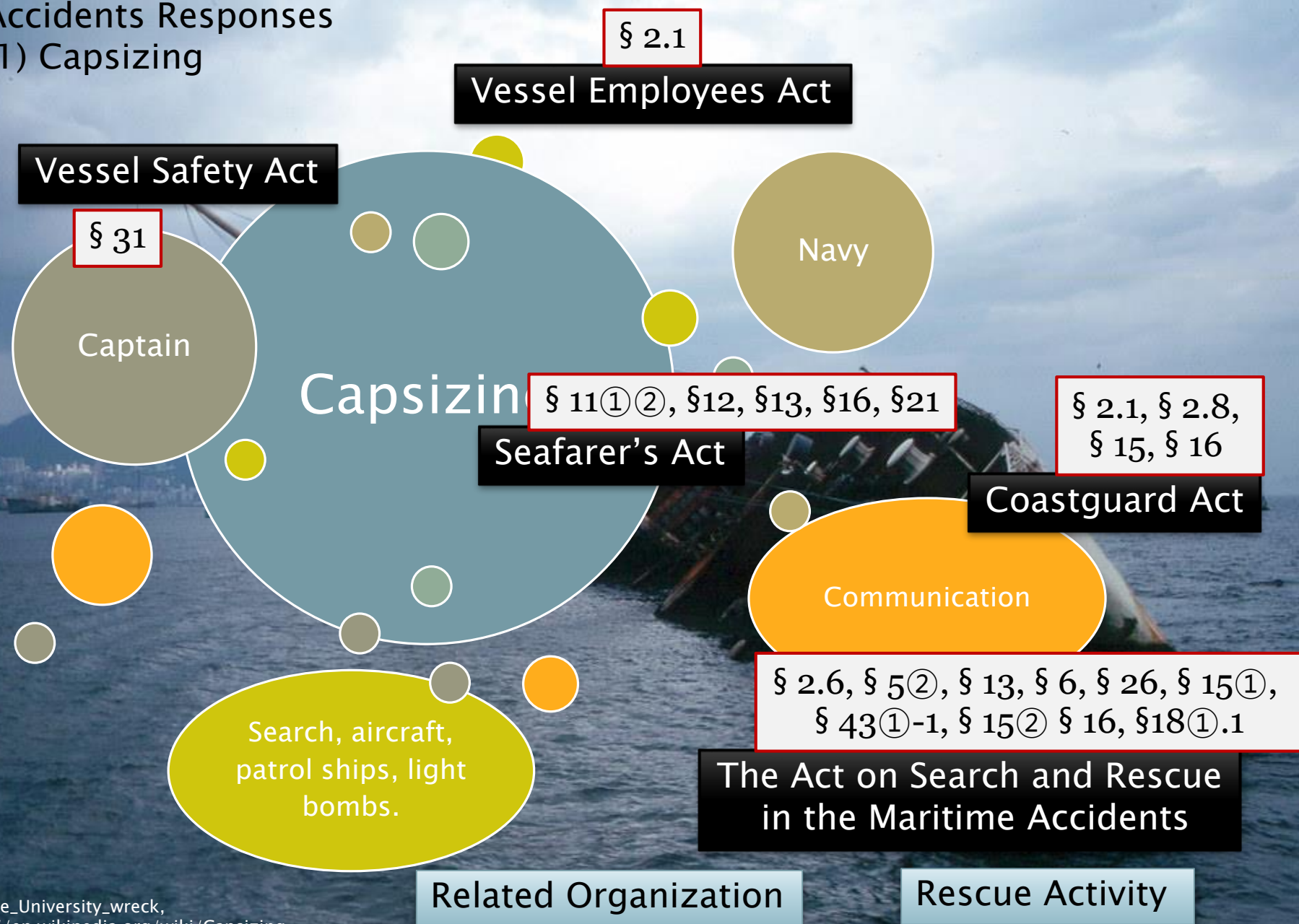
Solution plan	
<input type="checkbox"/> Control	<ul style="list-style-type: none"><li>• Sail back</li><li>• Flight control</li><li>• Text service</li></ul>
<input type="checkbox"/> Rescue equipment	<ul style="list-style-type: none"><li>• Evacuation tips</li><li>• Life-saving equipment</li><li>• Machinery equipment</li><li>• Special inspection</li></ul>

# Legal Frameworks Related to Maritime Accident Response

- Accident response and specifically responses to **capsizing** of vessels are covered by “**Vessel Safety Act**”, “**Vessel employees Act**”, “**Seafarer’s Act**”, “**Maritime Safety Act**”, and “**Act on Search and Rescue in the Maritime Accidents**”.
- Responses to accidents caused by weather conditions are covered by “**Maritime Safety Act**”, “**Seafarer’s Act**”, “**Act on Search and Rescue in the Maritime Accidents**”, and “**Coast Guard Act**”.
- Investigations and **ex facto** accident management are covered by “**Act on Maritime Accident Investigation and Tribunal**” and “**Act on Search and Rescue in the Maritime Accidents**”.

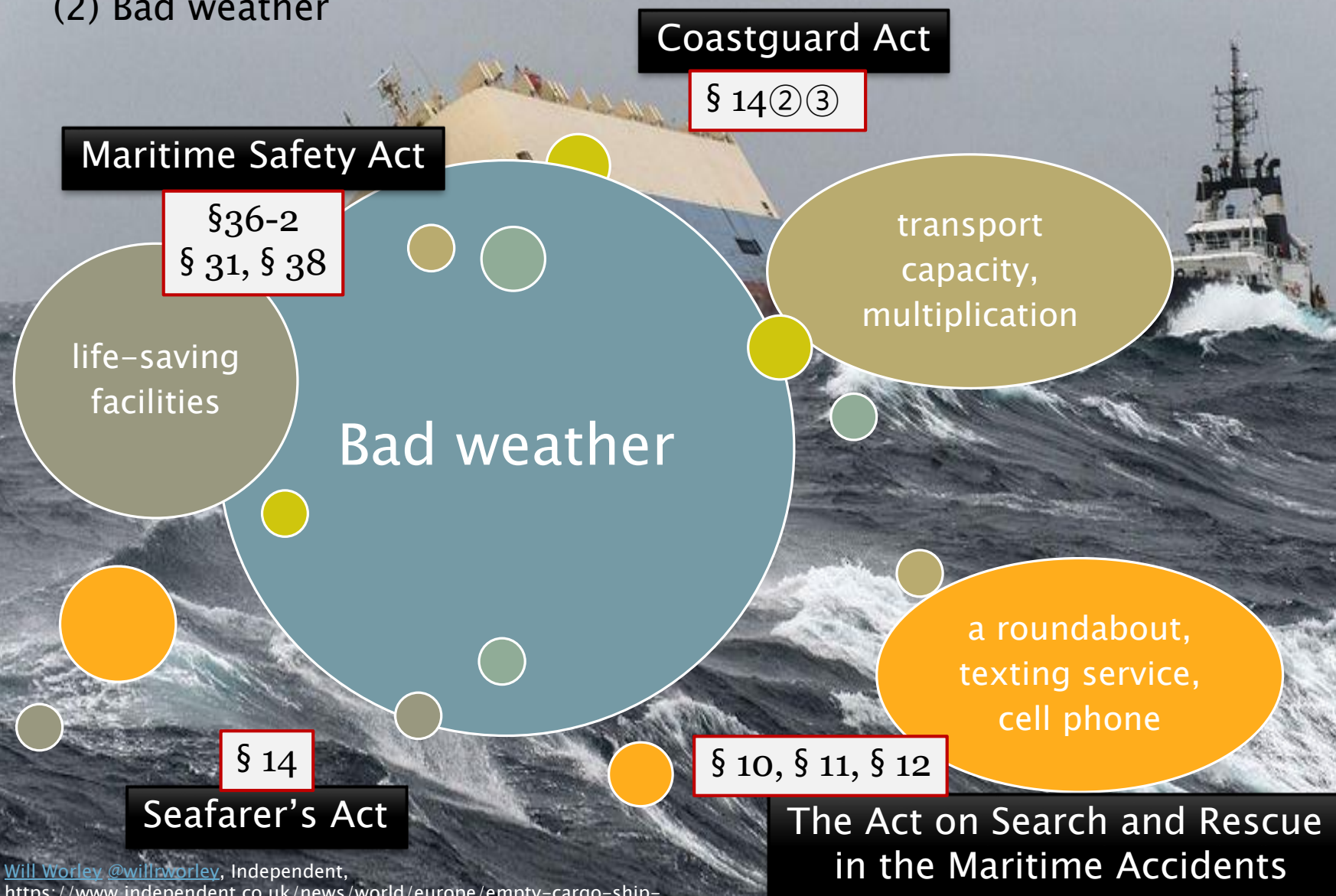
# Legal Frameworks Related to Maritime Accidents Responses

## (1) Capsizing



# Legal Frameworks Related to Maritime Safety Responses

## (2) Bad weather



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# III. What did the Social Big-data show?

Words vs. Factual Records

# Policy Suggestions for Legislative Improvement

## Small Vessels and Fishing Boats

- Small vessels and fishing boats represent a particular weakness in current safety regulations. Because exemptions in existing legal frameworks create blind spots in safety regulations when it comes to smaller vessels, there is a need to strengthen regulations on small vessels and small fishing boats.

## Communication

- There is a need to introduce stronger regulations and appropriate technical developments to better respond to threats posed by a lack, malfunctioning, or deliberate misuse of communication devices on vessels.

## Captain

- Taking into account the fact that the ship's captain plays an important role in maritime disaster response, there is a need to clarify the responsibilities and authorities of the captain, as well as penalties against any illegal actions.

# Policy Suggestions for Legislative Improvement

## Responsible Agencies

- In the case of Korea, the fact that regulatory responsibility is divided between the Coast Guard and MOF may cause redundancy and confusion in the establishment and administration of maritime regulation.
- Specifically, there exists overlap in the areas of maritime pollution prevention, maritime accident and disaster response, and maritime traffic regulation.
- In the area of maritime accident and disaster response, there is a need to reorganize existing administrative structures to better reflect the needs on the field, to allow for rapid and efficient accident and disaster response.

# Significance of Big Data Analysis

## Reflecting the Views of the “Legislative Consumer”

- This research aims to take a comprehensive review of existing legal framework and administrative organization on maritime security and safety, focusing on the needs and concerns of the public as the final “consumers” of all legislative action.

## Finding the Blind Spots in Maritime Safety Regulation

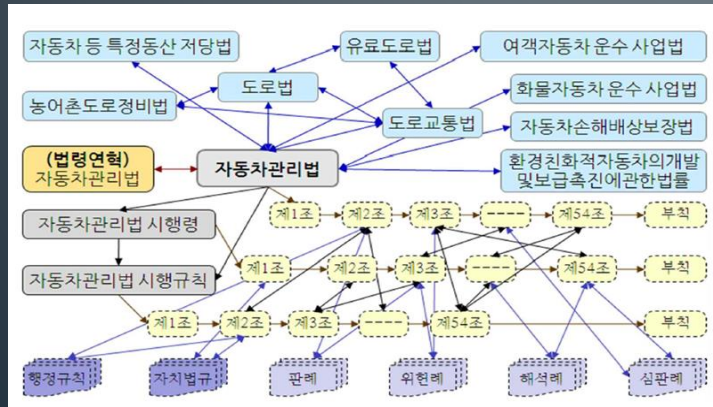
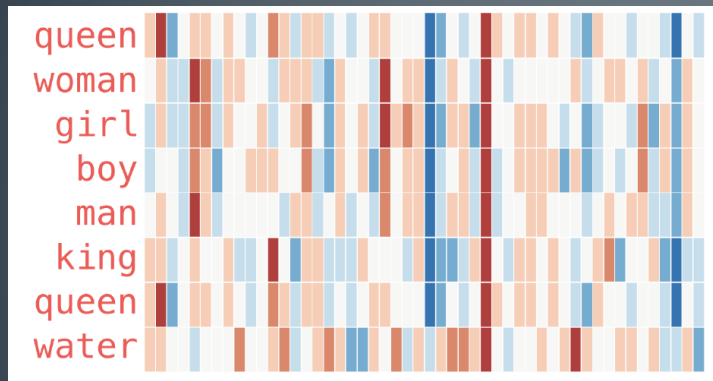
- The research identifies small vessel and small fishing boat safety regulation as blind spots in current regulations, and highlights the need for improvement in these areas.

## Effective Legislative Analysis Research Approaches

- This research used Social big-data to derive essential issues to achieve policy and legislative goals based on pure public concerns without experts’ advices and suggests the most urgent and effective approaches for legislative renovation.

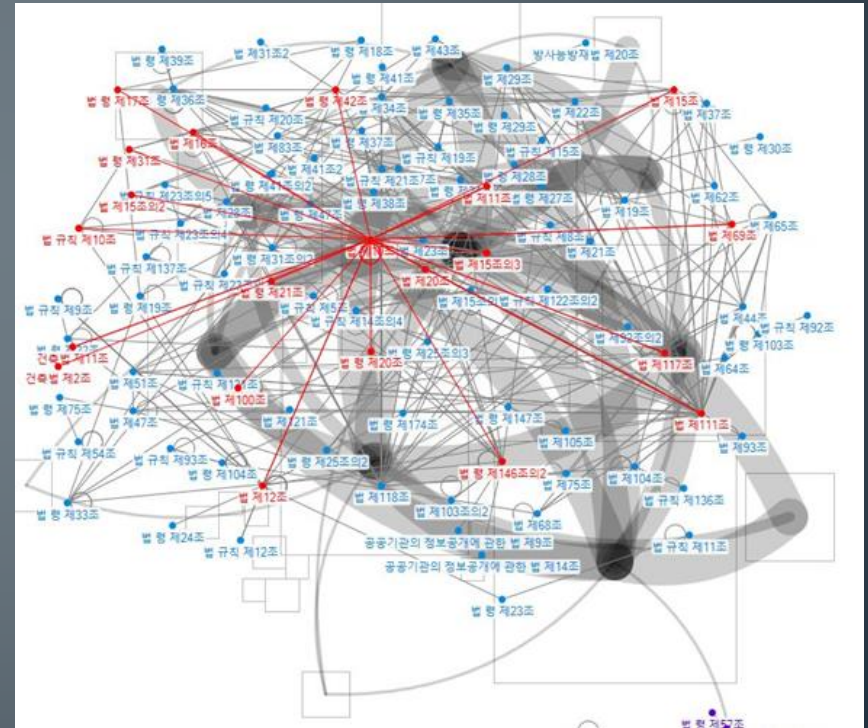
## Further Research Remaining

# Natural Language Analysis and Word Embedding



JEONG, Seungteak (2019)

# Legislative Network Analysis



JEON, Jieun (2018)

# Thank you!

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