

4차 산업혁명과 해운산업 대응

성결대학교
동아시아물류학부
한 종길

목차

1. 해운비즈니스모델의 변화
2. 현대해운이 직면한 과제
3. 해운산업의 IoT활용: Eco Ship에서 Smart-Shipping으로
4. 외국의 대응방안
5. 제안 : Smart Shipping을 위한 관계자의 역할

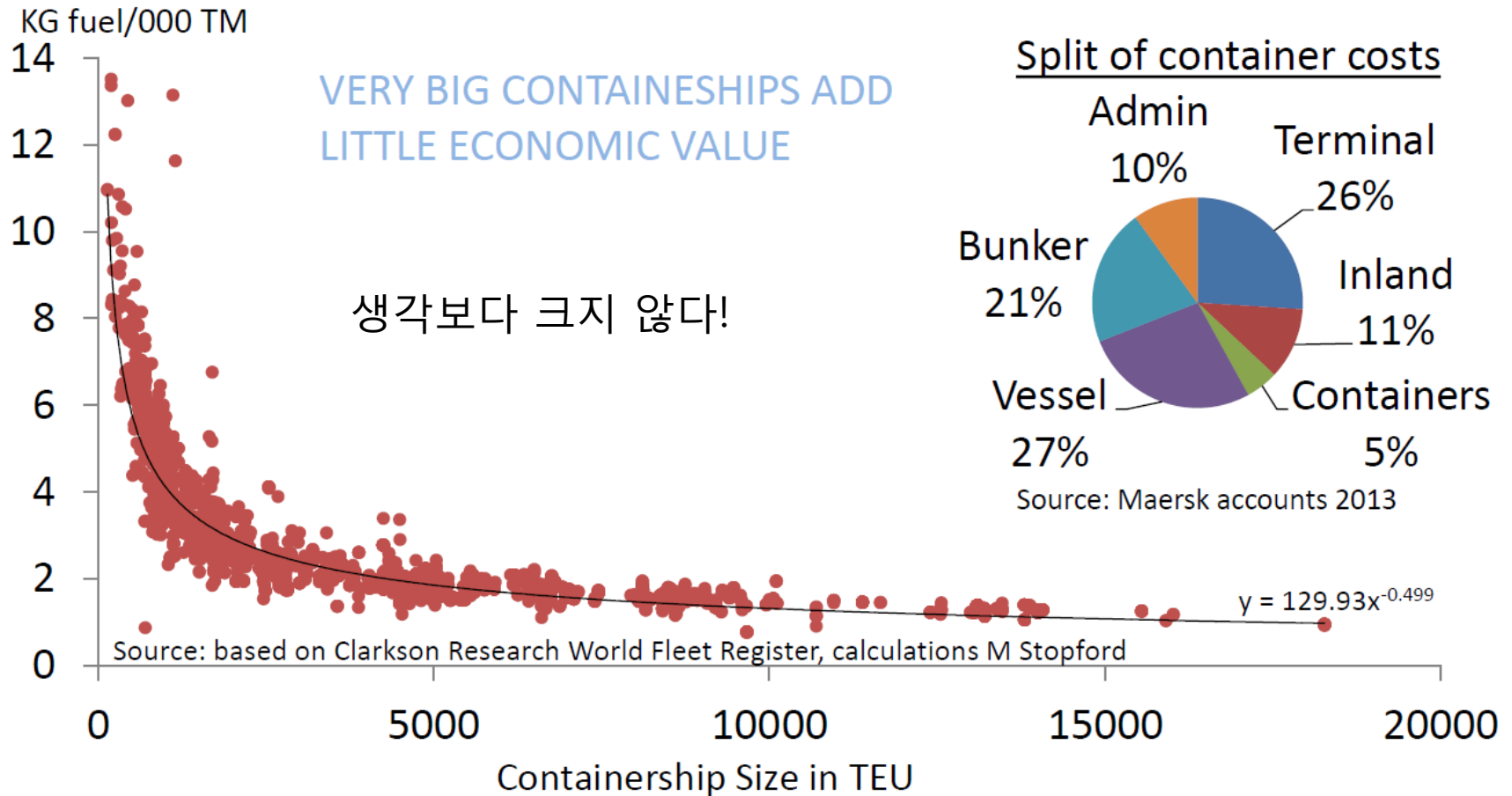
1. 해운비즈니스 모델의 변화

- **Model 1: 1490-1790:** Merchant Traders –voyages of discovery & maps of the world created a business model based on global trade
 - 1497 Trade went global
- **Model 2: 1790-1950** –Liners & Tramps -steam engines, iron hulls, propellers, cables etc. made this imperial business model possible
 - 1865 Agamemnon 1st Liner
- **Model 3: 1950-2015** –Bulk shipping –multinationals used oil, diesel engines & welded steel hulls to build a new low cost model
 - Early VLCC Built 1973
 - its key principles were –1) bigger ships 2) better engines 3) better terminals

제3단계 비즈니스 모델의 한계

- 과거 65년간에 이루어진 해상운송의 엄청난 변화에 비하여 정체가 길어지고 있음
 - 1865~1975년까지의 거대한 기술진보(디젤엔진, 초대형선, 전용선)에 비하여 1987~2015년까지의 진보는 크지 않음)
- 친환경 부담의 증가 : EEDI & carbon footprint
 - 성과향상을 위한 선택지가 slowing down을 제외하고는 별로 없음

초대형 컨테이너선의 연비향상



2. 현대해운이 직면한 과제

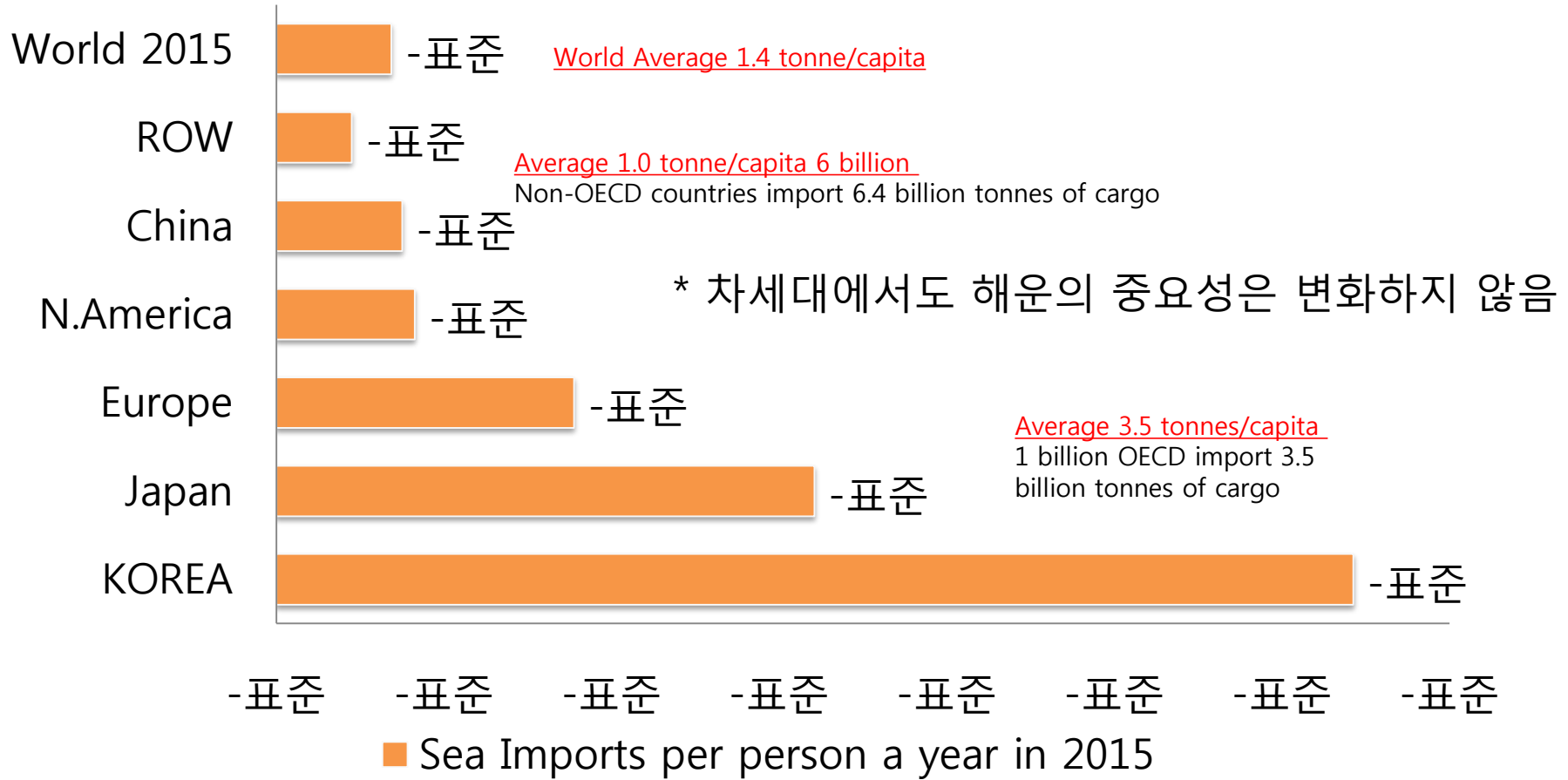
- 4가지 도전

1. 해상물동량의 지속적인 증가: Another 10-20 bn tonnes cargo?
2. 연료비용 : Energy cost (\$50 oil won't last)
3. 기후변화 : Climate change
4. 수익율이 낮은 비즈니스 : Low financial returns

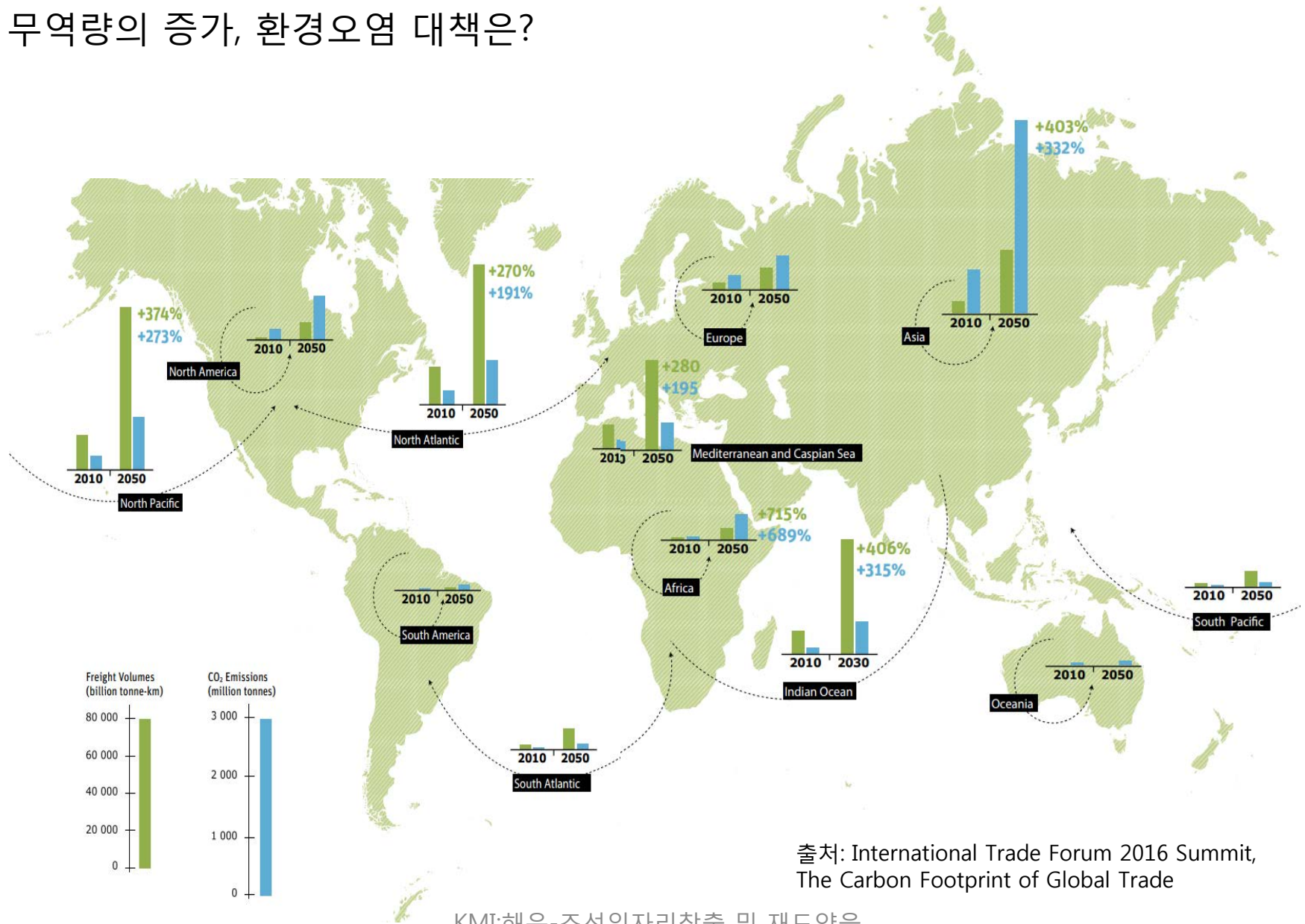
- 3가지 문제점

1. 기술진보의 한계(Slim Technical capability)
2. 우수선원인력 확보의 한계(Future crew shortages)
3. 고객관계관리의 한계(Weak customer relationship)

해상물동량의 증가



무역량의 증가, 환경오염 대책은?

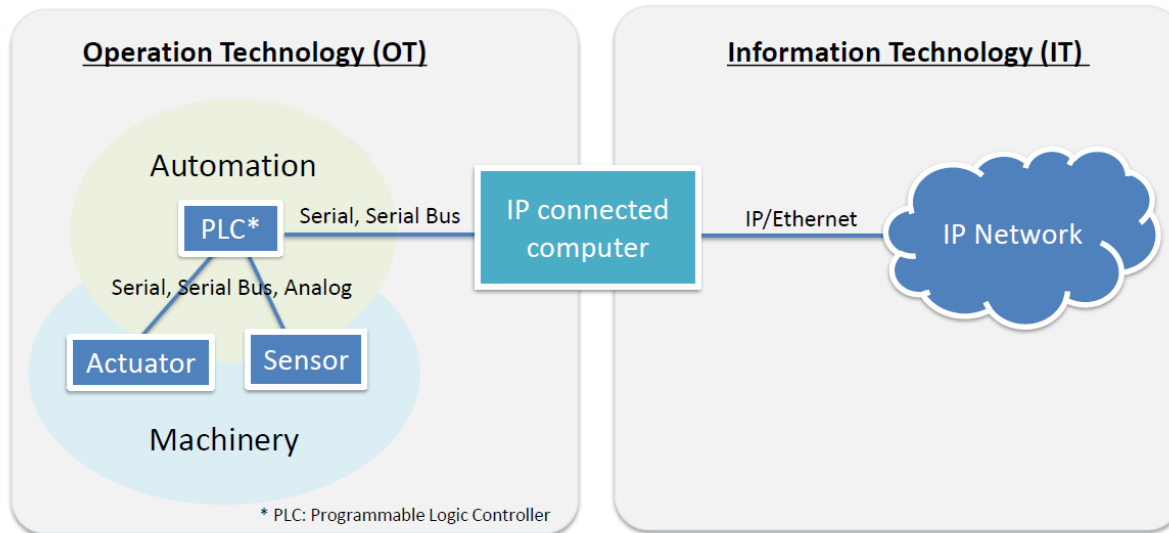


출처: International Trade Forum 2016 Summit,
The Carbon Footprint of Global Trade

3. 해운산업의 IoT활용

-Eco-Ship → Smart Shipping-

IoT (Internet of Things)



“Operation Technology (OT)” and “Information Technology (IT)” are to be bridged.
The era of “transparency” where user can access field data.

출처: Ando(2016) : **Smart Ship Applications**

Examples of Big data in shipping

Voyage data

- Automatically collected data (IoT)
- Noon report

Machinery data

- Automatically collected data (IoT)
- Manual report data
- Maintenance data

AIS data

- Satellite AIS / shore AIS

Weather data

- Forecast / past statistics

Business data

- Container transport data

Smart-Shipping의 3가지 가능성

1. Use assets more efficiently

1. Automate & de-skill ship operations & navigation
2. Manage ship/shore personnel into a single more productive team
3. Integrate fleet systems (like BMW factory) to improve asset performance
4. Use big data to find ways to improve performance & reduce accidents
5. Inform management on how the business is performing

2. Produce regulatory information digitally (no more manual reports)

3. Develop global through transport system (Amazon, UBER, UPS)

출처: Stopford(2015)-Smart Shipping

IoT와 빅데이터기술의 활용가능성

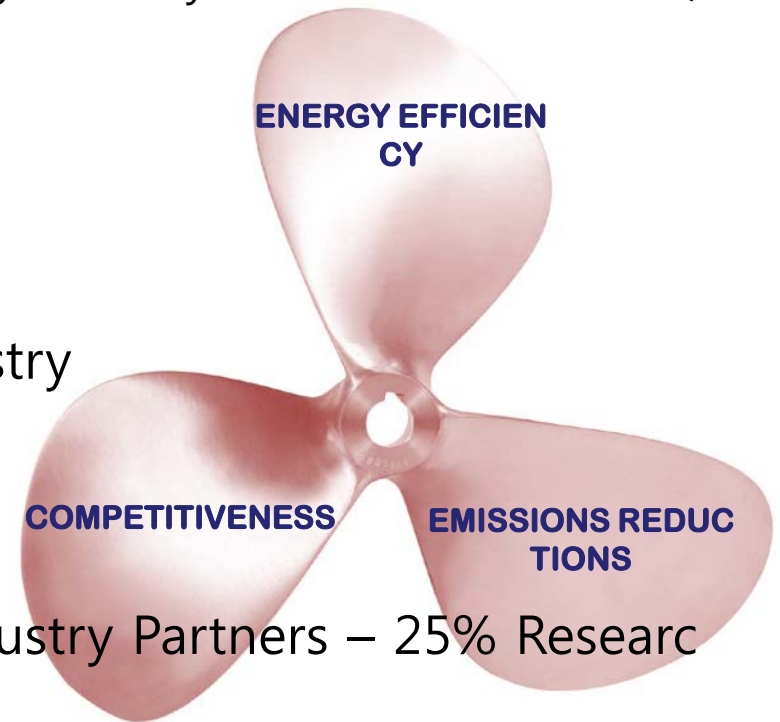
Role	Function	Example of Big data application
Ship owner	Technical management	• Safety operation • Condition monitoring & maintenance • Environmental regulation compliance • Hull & propeller cleaning • Retrofit & modification
	New building	• Design optimization
Ship operator	Operation	• Energy saving operation • Safe operation • Schedule management
	Fleet planning	• Fleet allocation • Service planning • Chartering

출처: Ando(2016) : Smart Ship Applications

4. 외국의 대응방안

Norway: SFI Smart Maritime

- Norwegian Centre for improved energy efficiency and reduced harmful emissions from the maritime sector.
- Centre for research-based innovation (SFI) granted by The Research Council (SFI-III)
- Main goals:
 - Improve energy efficiency
 - Reduce harmful emissions
 - Strengthen the competitiveness
 - of the Norwegian maritime industry
- Duration: 2015 - 2023
- Budget: 24 MNOK / year
- Financing:
 - 50% Research Council – 25% Industry Partners – 25% Research Partners
- Host institution: SINTEF Ocean AS (former MARINTEK)



Norway: Smart Maritime Network

INDUSTRY PARTNERS

Design, shipbuilding & equipment

- Rolls-Royce Marine
- Bergen Engines
- Vard Group
- Havyards
- Norwegian Electric System (NES)
- ABB
- Siemens
- Jotun
- Wärtsilä Moss

Ship operators

- Wilh. Wilhelmsen
- Solvang
- Grieg Star
- KGJ Skipsrederi

Other partners

- DNV-GL
- Norwegian Shipowners' Association
- Norwegian Maritime Directorate
- Kystrederiene

RESEARCH PARTNERS

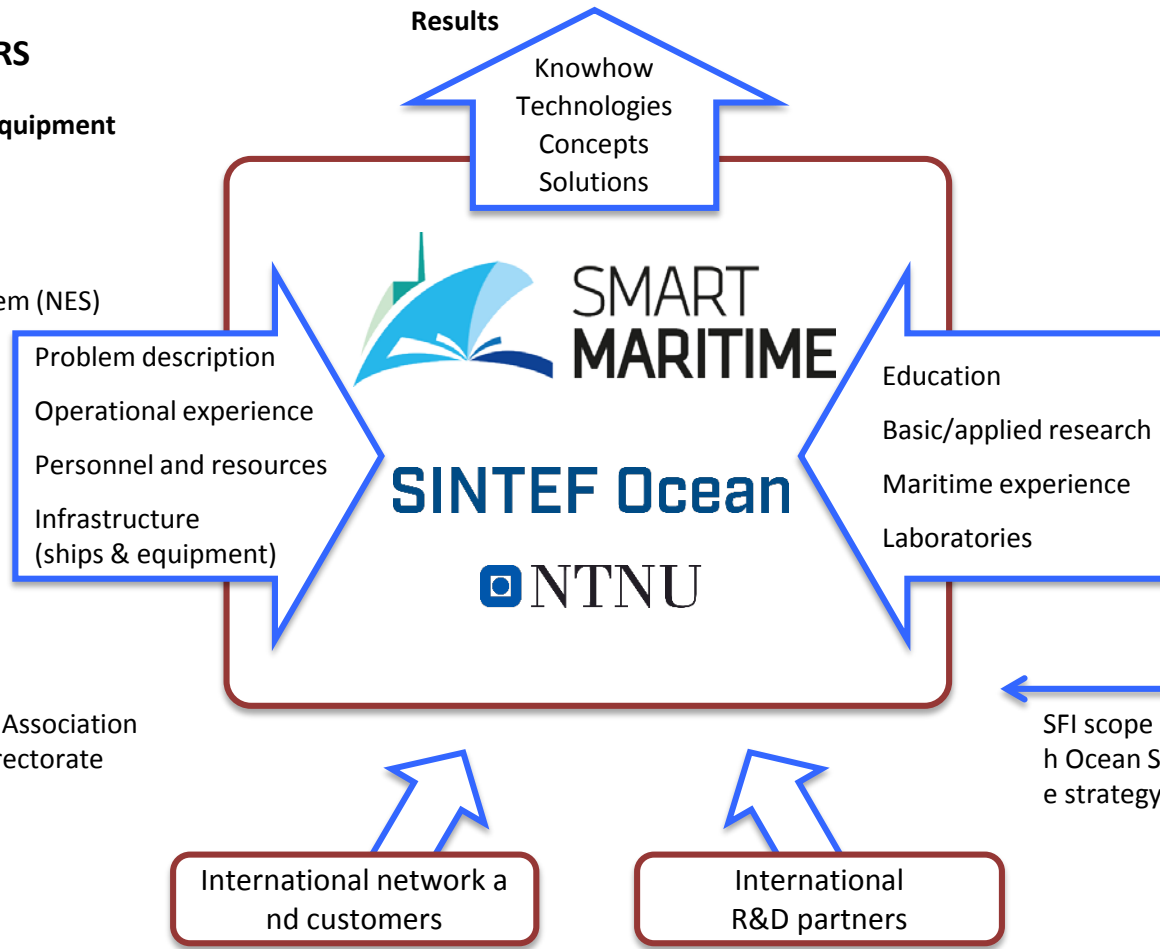
SINTEF Ocean (host)

NTNU

- Department for Marine Technology
- Industrial Ecology Programme

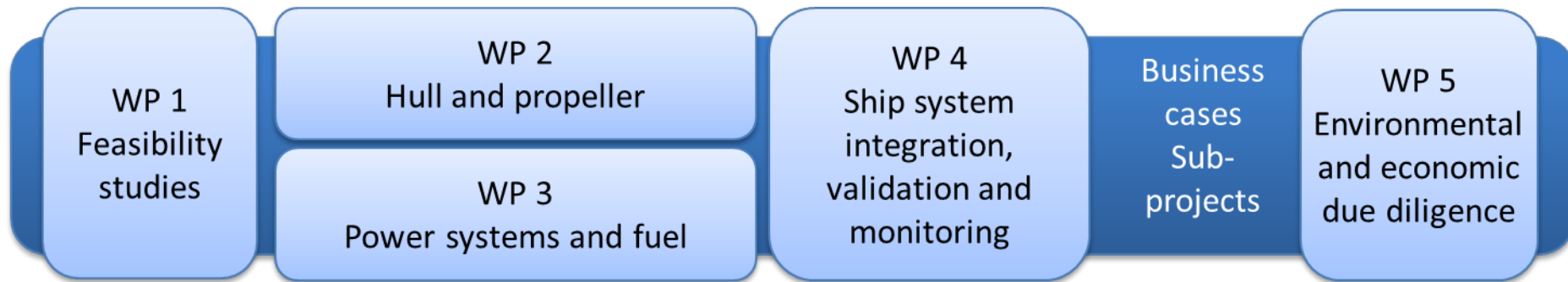
NTNU - Ålesund

- Faculty of Maritime Technology and Operations



Smart Maritime Structure

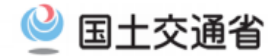
- 5 Work Packages (WP) integrated through business cases (Sub-projects) in cooperation with industrial partners
- Multidisciplinary and holistic approach



9 PhD
8 Post Doc

일본정부의 대응

1-3(1) 海事産業の生産性革命(i-Shippingとj-Ocean)



我が国を支える海事産業

【造船】

- 国内部品調達 91%
- 地方で生産 94%

【海運】

- 日本の輸出入貨物輸送 99.6%



新たな市場である海洋開発分野

- 世界市場 40兆円
- 今後の成長市場
- 日本の成長と資源確保に貢献
- 海洋開発分野は多くの船舶が用いられるため、我が国海事産業にとって重要

探査船



提供:三菱重工業(株)

ドリルシップ



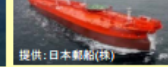
提供:日本郵船(株)

FPSO



提供:三井海洋開発(株)

シャトルタンカー



提供:日本郵船(株)

※ FPSO: 浮体式石油生産貯蔵積出設備
※ O&M: 操業及び保守整備

・innovation
・Information
・IoT ...

i-Shipping

海事産業の既存リソースを
最大限に活用

相乗効果

新市場獲得で海事産業の
魅力・競争力向上

j-Ocean

・Japan 日本の成長・資源確保
・joint 連携
・J-Curve Jの文字のように伸びる

- ◆ 船舶の開発・建造から運航に至るすべてのフェーズにICTを取り入れ、造船・海運の競争力向上を図る

新造船建造量世界シェア(売上)

2015年20%(2.4兆円)→2025年30%(6兆円)

- ◆ 海洋開発分野で用いられる船舶等の設計、建造から操業に至るまで、幅広い分野で我が国海事産業の技術力向上等を図る

海洋開発分野の売上高見込

2010年代 3.5兆円→2020年代4.6兆円

2つのプロジェクトからなる「海事生産性革命」を省の生産性革命プロジェクトに位置づけ、強力に推進



1-3 (3) i-Shippingにおける一般商船分野の主要対策

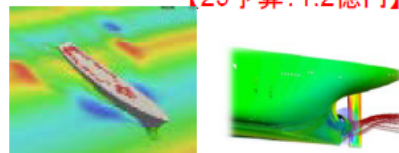
【開発・設計】

i-Shipping (design)

性能と時間の競争力

① 船体周り流れの数値シミュレーション手法の確立
→ 新船型開発を迅速化

② 数値シミュレーションによる性能評価の国際ルール化
→ 不正の排除
【28予算:1.4億円】
【29予算:1.2億円】



③ 試験水槽の共同利用・新設

・ 既存施設の分社化・共同事業化
→ 産業競争力強化法に基づき大臣認定、登録免許税軽減

・ 地方研究所新設
→ 地方拠点強化税制や研究開発設備向け加速償却を活用



【建造】 i-Shipping (production)

コストと品質の競争力

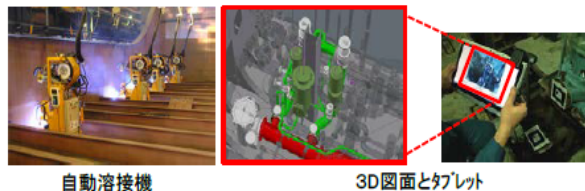
① IoT等を活用した革新的生産技術の研究開発補助
【28補正予算:0.9億円】【29予算:3.6億円】



② 中小造船業における生産設備(自動化など)投資促進

中小企業等経営強化法※に基づく国交大臣指針策定、投資計画認定 固定資産税軽減

※平成28年5月24日成立、平成28年7月1日から施行

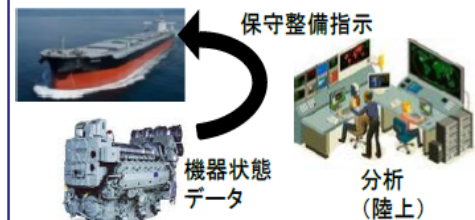


【運航】 i-Shipping (operation)

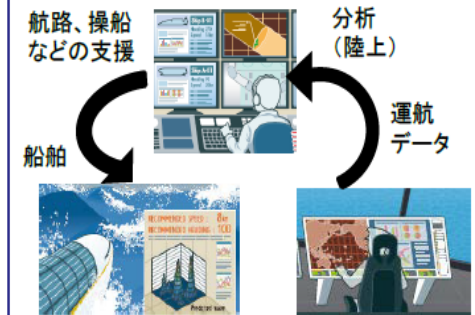
顧客サービスの競争力

① IoT等を活用した先進的船舶、サービス等の研究開発補助
【28予算:0.7億円】【29予算:1.3億円】

■ 壊れる前の予防保全



■ 陸と船との協働による運航



② 安全性等に係る認証制度創設

格付けロゴ(イメージ)

i-Shipping S⁺



5. 제안 : Smart Shipping을 위한 관계자의 역할

관계자	기대되는 역할
해운 Shipping	Ship owner and operator needs applications for energy saving, minimize downtime, safety transport and environmental conservation
생산자 Manufacturer	Remote diagnosis, preventive maintenance and self diagnostics
조선소 Shipyard	Data analysis services for ship owners, life-cycle support and feedback to new design
Service Provider	Fleet management system, big data analysis services, condition monitoring services and IoT platform
연구기관 Academy	Research on big data analysis, numerical simulation methods and digital twin. Education and trainings
선급 Class	Shore data center. Class inspection
정부 Government	utilization for e-navigation and MRV(Monitoring, Reporting, Verification)