Seabed Security

defining the threat to critical undersea infrastructure assets

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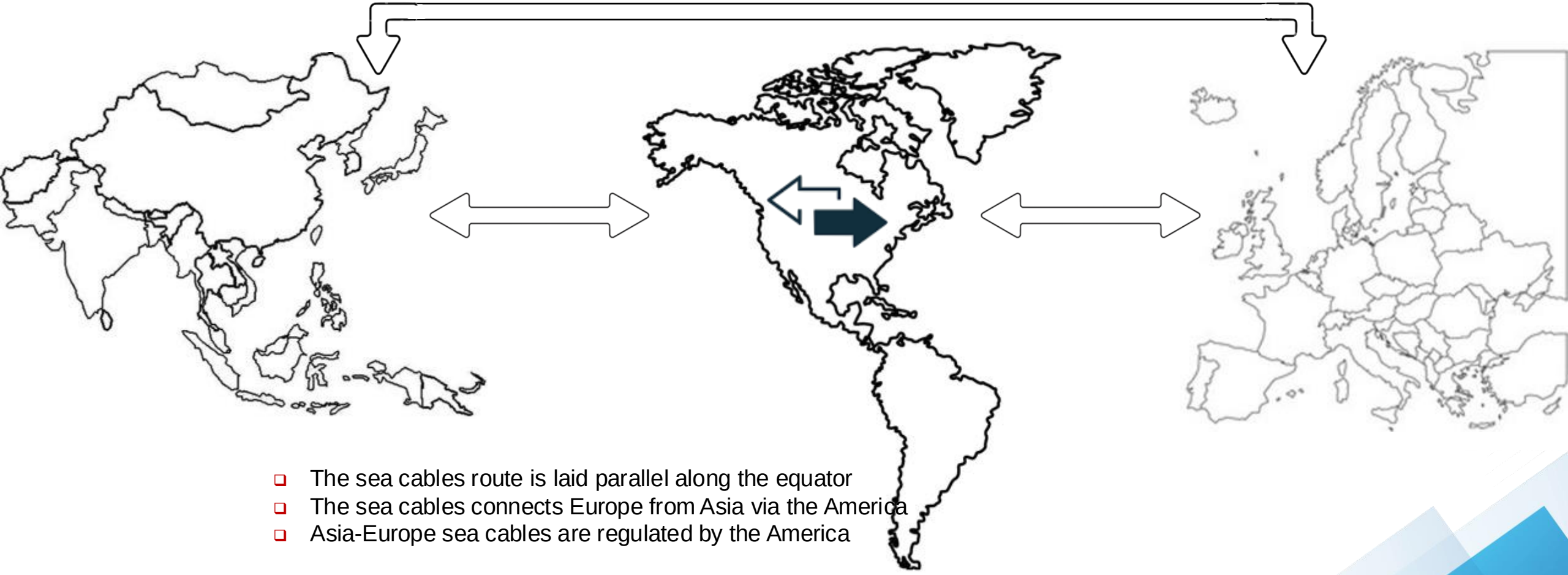
Global warming and cyber geopolitics

- Global warming is causing the Arctic ice to melt, creating new sea routes
- The newly opened Arctic sea routes expand the feasible paths for sea cables
- Asia-Pacific sea cables can connect to Europe through the newly opened Arctic sea routes
- The new route bypasses the telecommunications regulations of intermediary countries.



- The sea cables route is laid parallel along the equator
- The sea cables connects Europe from Asia via the America
- Asia-Europe sea cables are regulated by the America

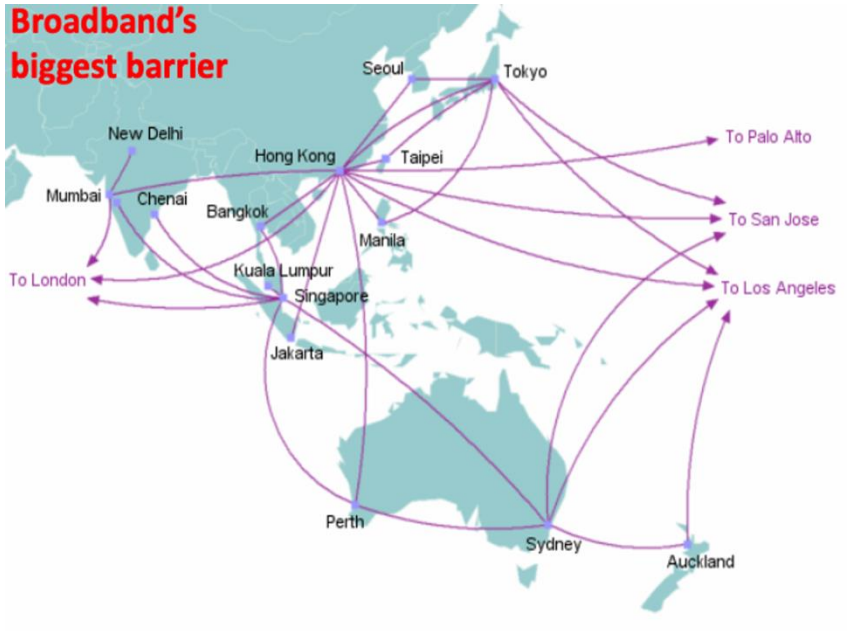
CUI & Terrestrial Tx

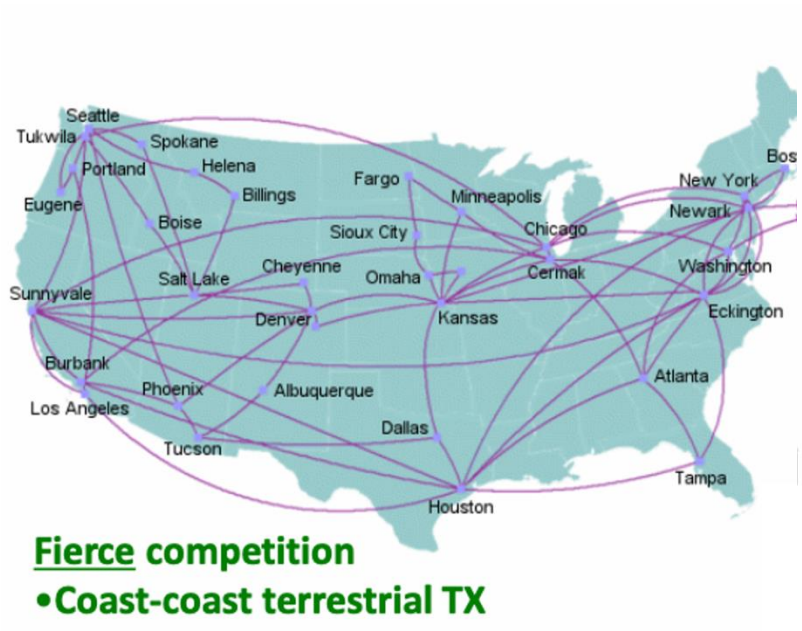
(critical undersea infrastructure)

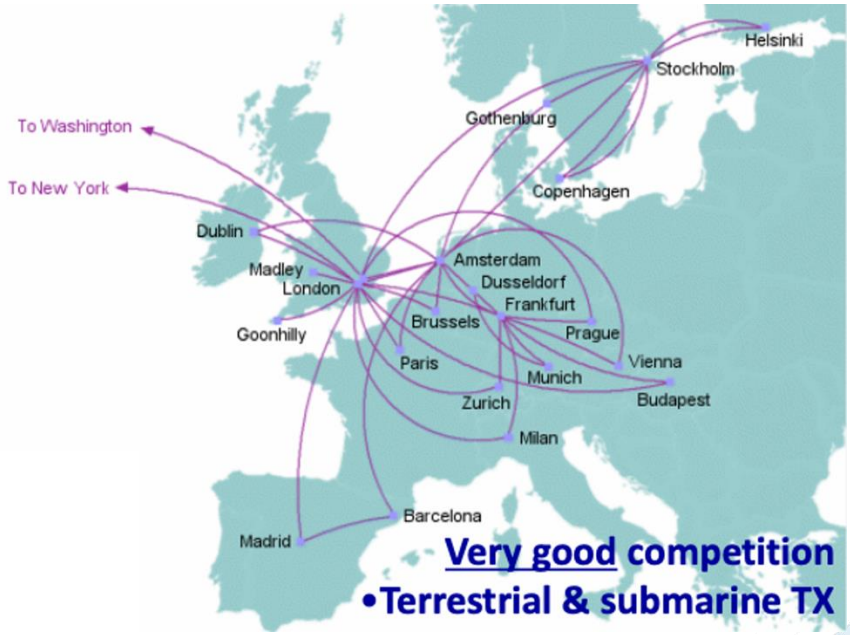
Sea cables are dominant

Terrestrial cables are dominant

Hybrid model







Threats distribution

Common threats

- hygine & capacity building
- ISMS
- technologies

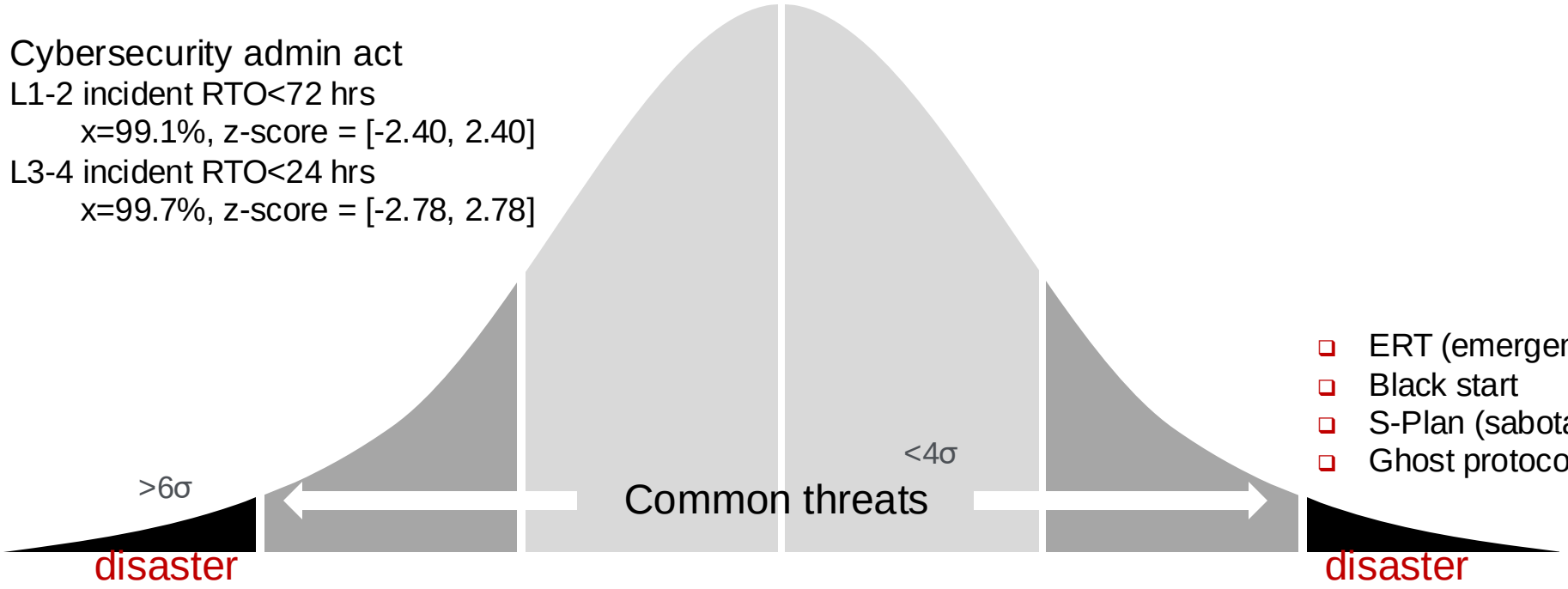
Cybersecurity admin act

L1-2 incident RTO<72 hrs

x=99.1%, z-score = [-2.40, 2.40]

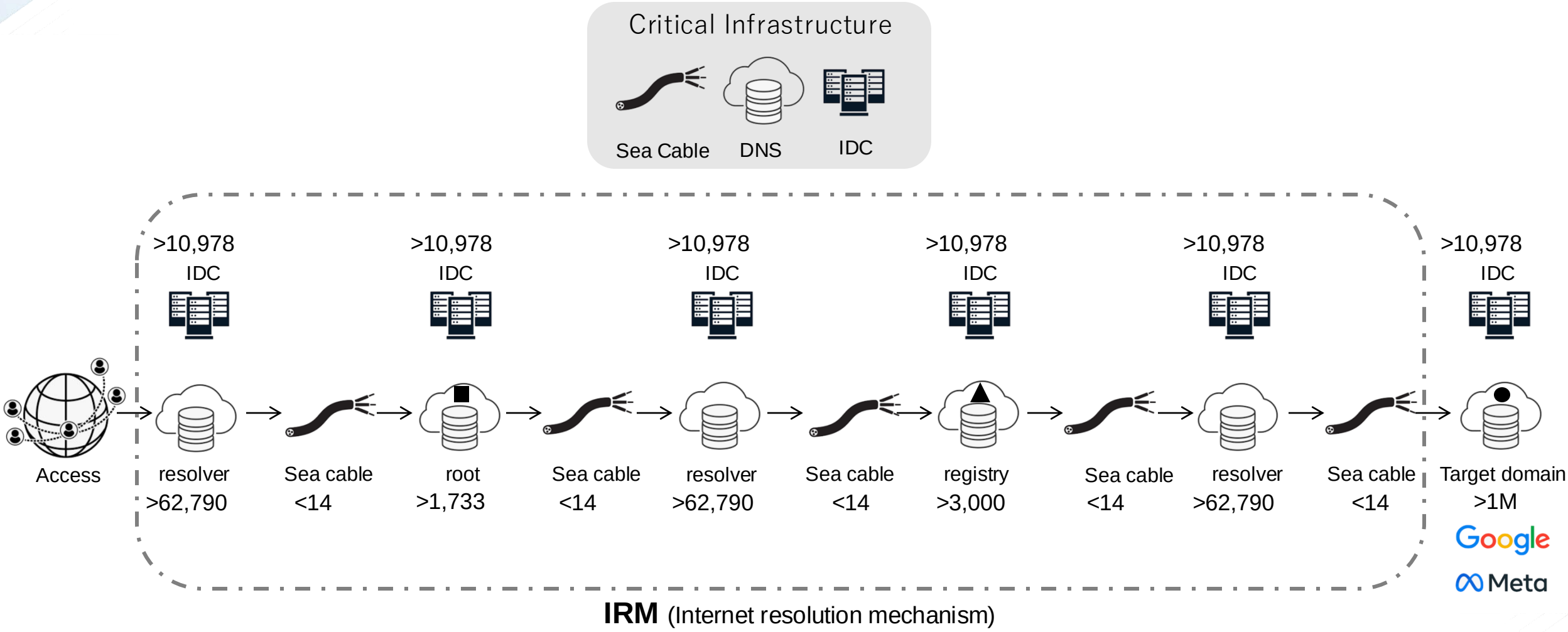
L3-4 incident RTO<24 hrs

x=99.7%, z-score = [-2.78, 2.78]



- ERT (emergency response team)
- Black start
- S-Plan (sabotage plan)
- Ghost protocol

Critical infrastructure and data flow

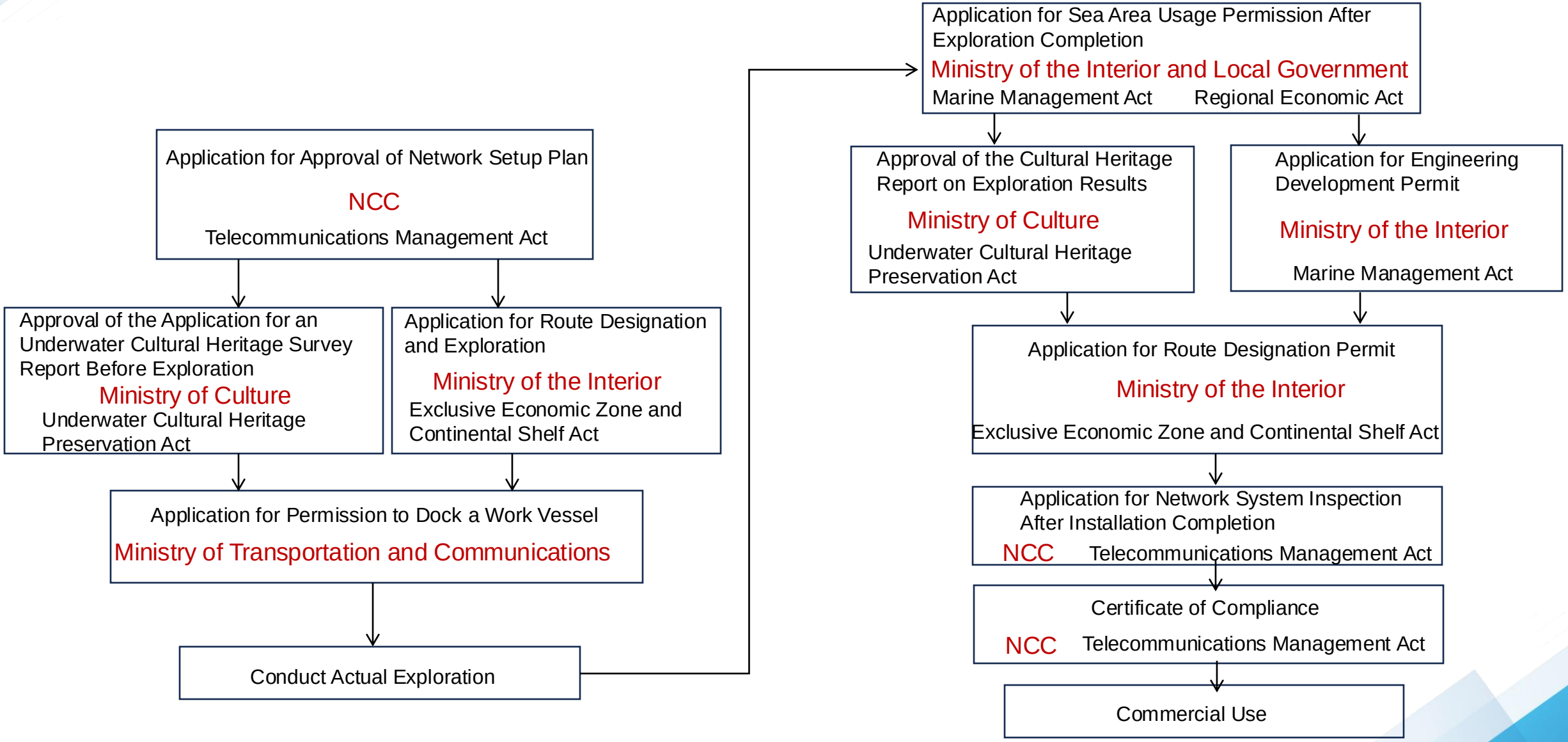


IRM (Internet resolution mechanism)

Supply chain resilience mapping for IRM

	>10,978  IDC	<14  Sea cable	>62,790  resolver	>1,733  root	>3,000  registry	>1M  domain
★ Ownership	no	no	?	no	no	no
★ Manageability	no	no	?	no	no	no
★ Jurisdiction	?	no	?	no	no	no
★ S/C risk	L	**VH**	L	L	L	L
★ Cost	no	no	no	no	no	no
★ Alternatives	H	**VL**	VH	VH	H	M

Sea cable network application process



Policy recommendations for cable applications

Sea Cable Application Timeline

1 Sea Cable Permit Estimated at 1.5 Months
1.1 Application for Installation Plan Approval (NCC) Estimated at 1.5 Months
2 Exploration Permit Estimated at 8 Months
2.1 Lawful Interception Permit (CIB) Estimated at 6 Months
2.2 Application for Underwater Cultural Heritage Survey Report Approval (Ministry of Culture) Estimated at 8 Months
2.3 Application for Route Exploration (Ministry of the Interior) Estimated at 6 Months (With Potential Optimization to 2 Months)
3 Applicant's Exploration and Report Estimated at 4 Months
3.1 Work Vessel Docking Permit Estimated at 1 Month+ Operational Permit Estimated at 1 Month+ Survey Report Estimated at 2 Months, total estimated at 4 months
4 Exploration Report Approval Estimated at 12 Months
4.1 Cultural Heritage Report Approval (Ministry of Culture) Estimated at 12 Months
4.2 Application for Engineering Development Permit (Ministry of the Interior/Local Government) Estimated at 12 Months
4.3 Application for Route Designation Permit (Ministry of the Interior) Estimated at 12 Months
5 System Installation Estimated at 2 Months
5.1 Work Vessel Docking Permit
5.2 Installation Construction
6 Inspection
6.1 Network System Inspection (NCC)
6.2 Certificate of Compliance (NCC)

Suggestions for Improvement

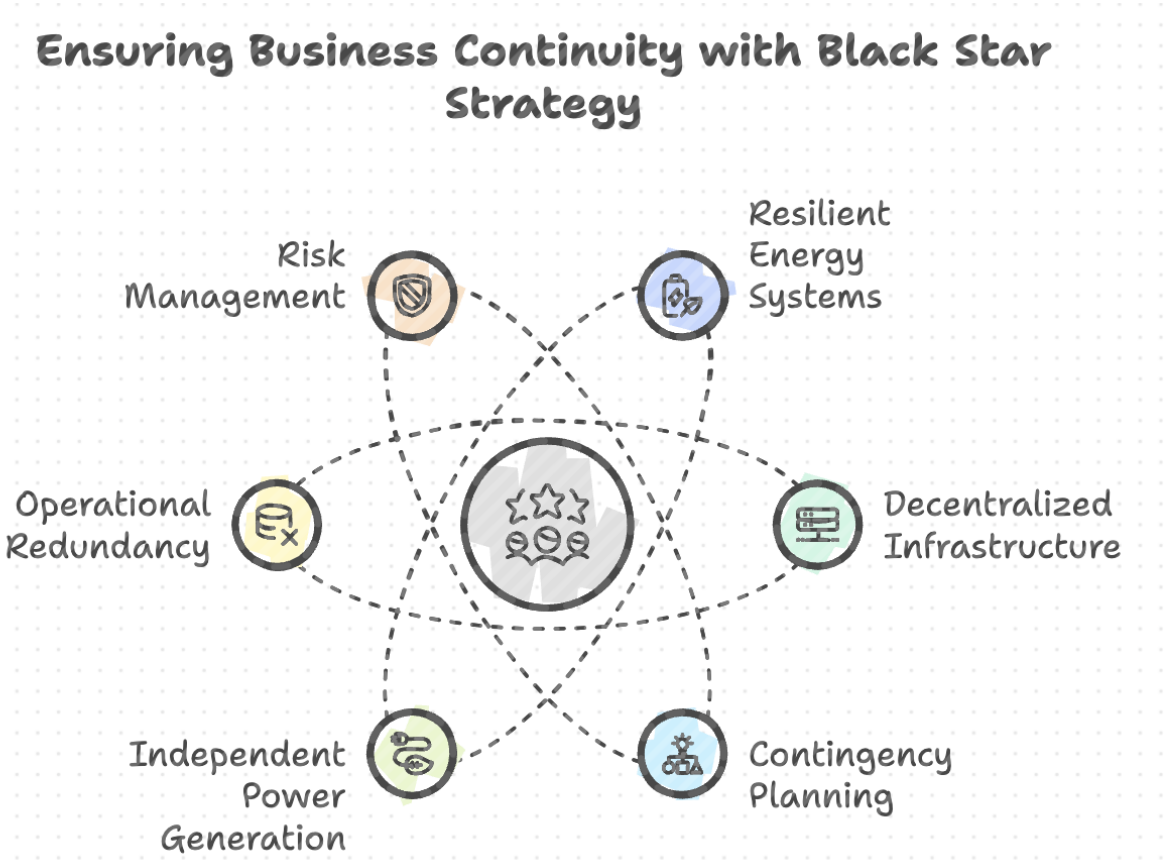
1. Remove item 2.2, 4.1
   Explanation: Cancel the pre-approval for underwater cultural heritage review and replace it with a requirement to submit a cultural heritage report after discovery.
   Jurisprudence : **Comparative Law Legislative Reference Basis** (Japan, Philippine, Australia, Singapore) 法理依據: 比較法立法參考依據
2. Optimize Procedure 2.1, 4.2, 4.3
   Explanation: Responsible Authorities: 2.1 CIB; 4.2, 4.3: Ministry of Interior;
   Jurisprudence : **Principle of Administrative Efficiency**
   法理依據: 行政法效能原則

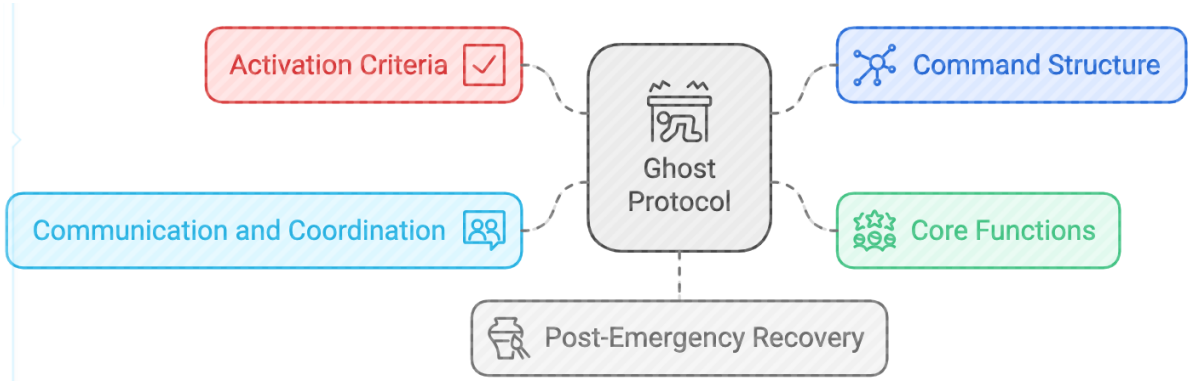
Mid-term and Long-term Suggestions for Improvement

1. Promote **Specialized Submarine Cable Legislation**
   Explanation: Submarine cable safety involves national security and public interests. The current application process for submarine cables is fragmented across different government agencies based on business functions, leading to mismatched responsibilities and affecting investment willingness and national security.
   Jurisprudence: **Principle of Unified Authority and Consistent Jurisdiction** 法理依據: 事權統一, 管轄權恆定原則

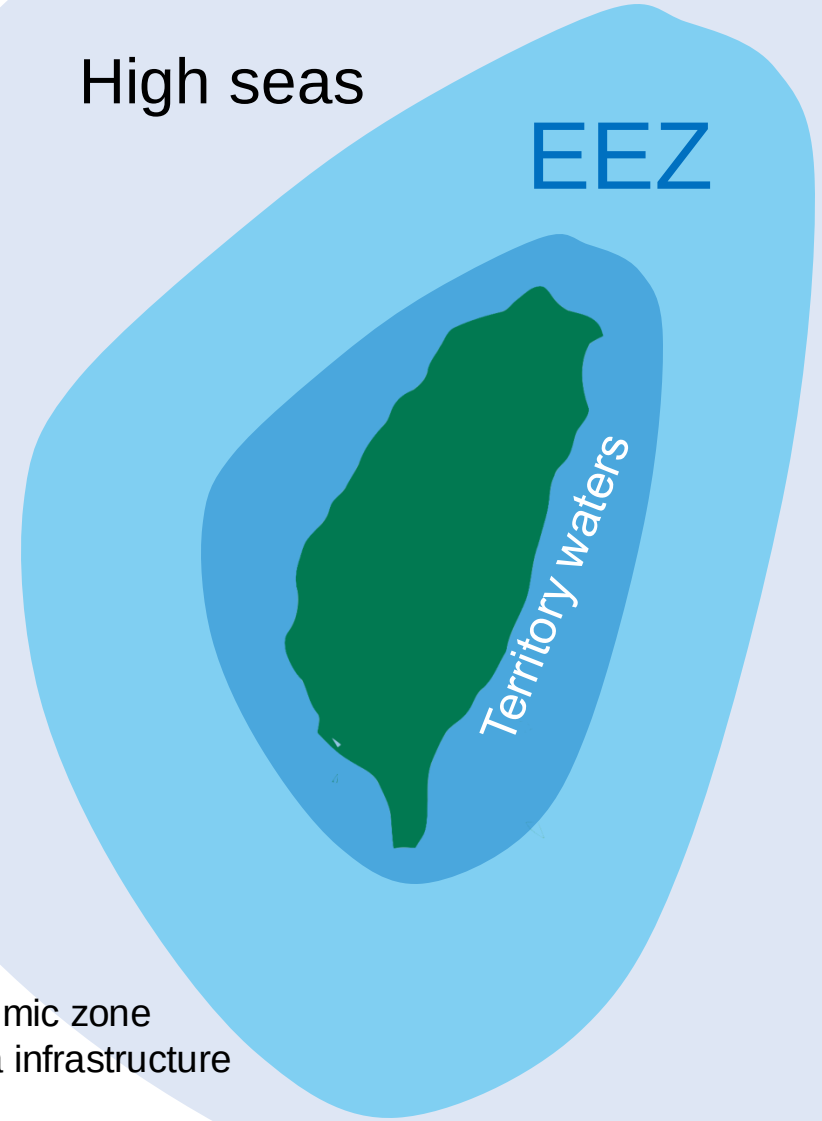
Notes:
Taiwan's application for permit to system inspection takes approximately **29 months**
Average time for countries in the Asia-Pacific region is **14 months.**
Average time for countries in the North America region is **17 months**.

Black start & ghost protocol





EEZ CUI security



EEZ : Exclusive economic zone
CUI : Critical undersea infrastructure

Seabed operations

- Commercial use
  - Resilience of the production of energy and the security of communication.
  - Increase resilience, awareness and new capabilities
- Military use
  - Protection of the production of energy and the security of communication.
  - Improve protection, awareness and new capabilities
- Underwater is grey zone
  - Underwater is a hidden environment.
  - Threat level can quickly change from calm to aggressive.
- AI and autonomy
  - Uncrewed vessels, unmanned underwater vehicles

The anatomy of a CUI attack

1. Reconissance

- Gather Intel: OSINT, SIGINT, HUMINT, GEOINT, cyber probes.
- Analyze Target: Identify critical cables, assess vulnerabilities, consider environment.
- Plan Operation: Route, assets, personnel, comms, contingencies.

2. Dispatching to the target area

- Mobilize Platform: Acquire/prepare vessel/submersible, load gear.
- Transit: Navigate, avoid detection, maintain security.
- Final Position: Locate cable precisely, assess local conditions

3. Initiating attack

- Access Cable: Surface, submersible/ROV deployment.
- Position Tool: Align cutter/charge on cable.
- Activate Attack: Deploy cutter, detonate charge.

4. Destruction of target

- Damage Cable: Complete cut or significant disruption.
- Verify Damage: Monitor signal loss, visual confirmation (if possible).
- Withdraw: Depart quickly and covertly.

From JO (Joint Operations) to MDO (Multi-Domain Operations)

聯合作戰　　多域作戰

- **JO** emphasizes the integration of two or more military services operating together under single commander.
- **MDO** focused on the five primary domains of warfare: space, cyber, air, land, sea

Souce : NATO

Way Forward

- We need a full digital model of the EEZ based on sonar images.
- The EEZ is too big to fully protect with underwater sensors.
- Asset owners must share an up-to-date digital twin of their assets with the government.
- All companies active in the EEZ should share their imagery data with a central database.