The Center of Excellence as a Strategical Investment in Estonia

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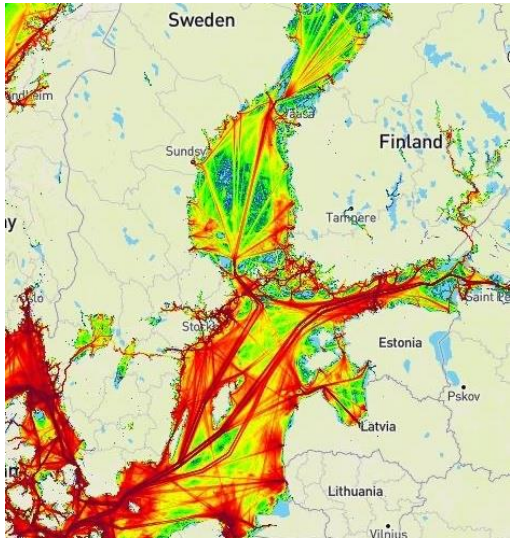
TAL TECH | SMART SEA CENTRE OF EXCELLENCE

WHY WE ARE HERE?

The growing significance and reliance on the seas:

- maritime logistics
- emerging offshore wind industry
- aquaculture and fishing
- infrastructure & connections



LONG-TERM CHANGES

1. Rising temperatures
2. Increasing freshwater Inflow
3. More carbon dioxide to be absorbed
4. Acidification
5. Oxygen Depletion
6. Eutrophication and the algal blooms
7. Noise & visual pollution
8. etc

"The change we are seeing in the marine environment is extremely fast. So we have to find shortcuts so that new knowledge is quickly made available and used for scientifically well-grounded decisions on the future of the Baltic Sea."

Helén Andersson, SMHI

SHORT-TERM ANOMALIES

Soome hoidis ära ka Estlink 1 lõhkumise ja Balticconnectori uue lõhkumise

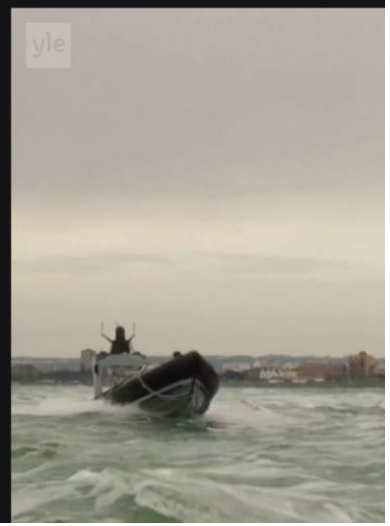
08.01.25, 12:33

Allveedroonide arendaja: Eestil ei ole mingit võimekust kaabliriketele reageerida

Turvallisuus

Kaapelien katkominen on vain yksi turvallisuusuhka merillä – huippuasiantuntija listaa neljä muuta riskiä

Nato-maiden johtajat kokoontuvat tiistaina He
toimia Itämeren turvallisuusuhkiin. Kysyimme
voi olla edessä ja miten uhkia voi ehkäistä.



ENERGIA JA TRANSPORT 13.01.2025, 05:00

Ulatuslik naftareostus Soome lahes on vaid aja küsimus. Kulukas ja keeruline reostustõrje tuleks Eestil esialgu ise kinni maksta (77)

Reostuste ennetamiseks vajavad varasemast enam tä
kütusepaagid on lekkima hakanud.

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Orpo: Vene varilaevastik tuleb kontrolli alla saada

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World / Europe

NATO to boost Baltic Sea presence after power, internet cable damage

Story by Reuters
4 minute read · Published 9:24 AM EST, Fri December 27, 2024

Fingrid's EstLink 2 transformer station in Anttila in Porvoo (Borga), Finland, operation between Finland and Estonia, March 6, 2014. Markku Ulander/ Images/File

Helsinki, Finland (Reuters) — NATO said on Friday it would boost its presence in the Baltic Sea after the suspected sabotage this week of an undersea power cable and four internet lines, while alliance member Estonia launched a naval operation to guard a parallel electricity link.

Finland on Thursday seized a ship carrying Russian oil on suspicion the vessel had caused an outage of the Estlink 2 undersea power cable linking it with Estonia and fibre optic lines, and on Friday said it had asked NATO for support.

BBC

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Germany suspects sabotage behind severed undersea cables

19 November 2024

Henri Astier & Paul Kirby
BBC News

The undersea cable between Helsinki and Rostock was laid in 2015

is to blame.

A 1,170km (730-mile) telecommunications cable between Finland and Gern severed in the early hours of Monday, while a 218km internet link between and Sweden's Gotland Island stopped working on Sunday.

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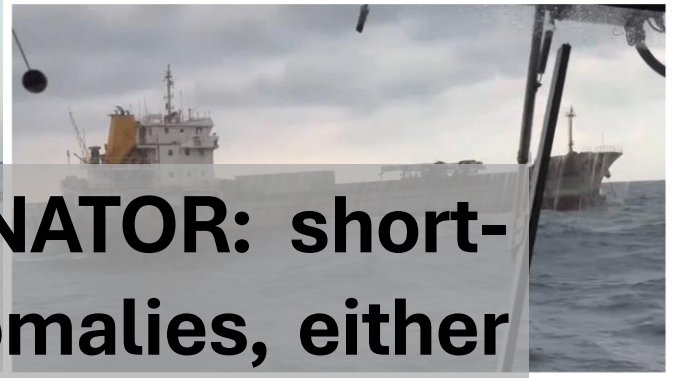
World / China

A cut undersea internet cable is making Taiwan worried about 'gray zone' tactics from Beijing

Analysis by Wayne Chang and Simone McCarthy, CNN
6 minute read · Updated 12:48 AM EST, Fri January 10, 2025



The Cameroon-flagged Shunxin39 cargo ship sailing in waters near Taiwan. Taiwan Coast Guard/AP/Getty Images

Kong (CNN) — When a Taiwanese telecoms company detected that that an undersea cable was damaged earlier this month, it worked to divert internet traffic from the broken line to keep customers on the island connected.

But the company, Chunghwa Telecom, also went to Taiwan's Coast Guard to report the incident – and a "suspicious vessel" observed on the same route as the affected cable, according to a statement from the company, a major local internet provider.

Taiwan Coast Guard officials in the days since have said they suspect that the Shunxin39 – a Chinese-linked cargo vessel – could have cut the cable, in an incident that has

COMMON DENOMINATOR: short-term man-made anomalies, either intentional or unintentional

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PROBLEM

When managed improperly, these resources, opportunities, and connections can **exhaust unexpectedly and permanently.**

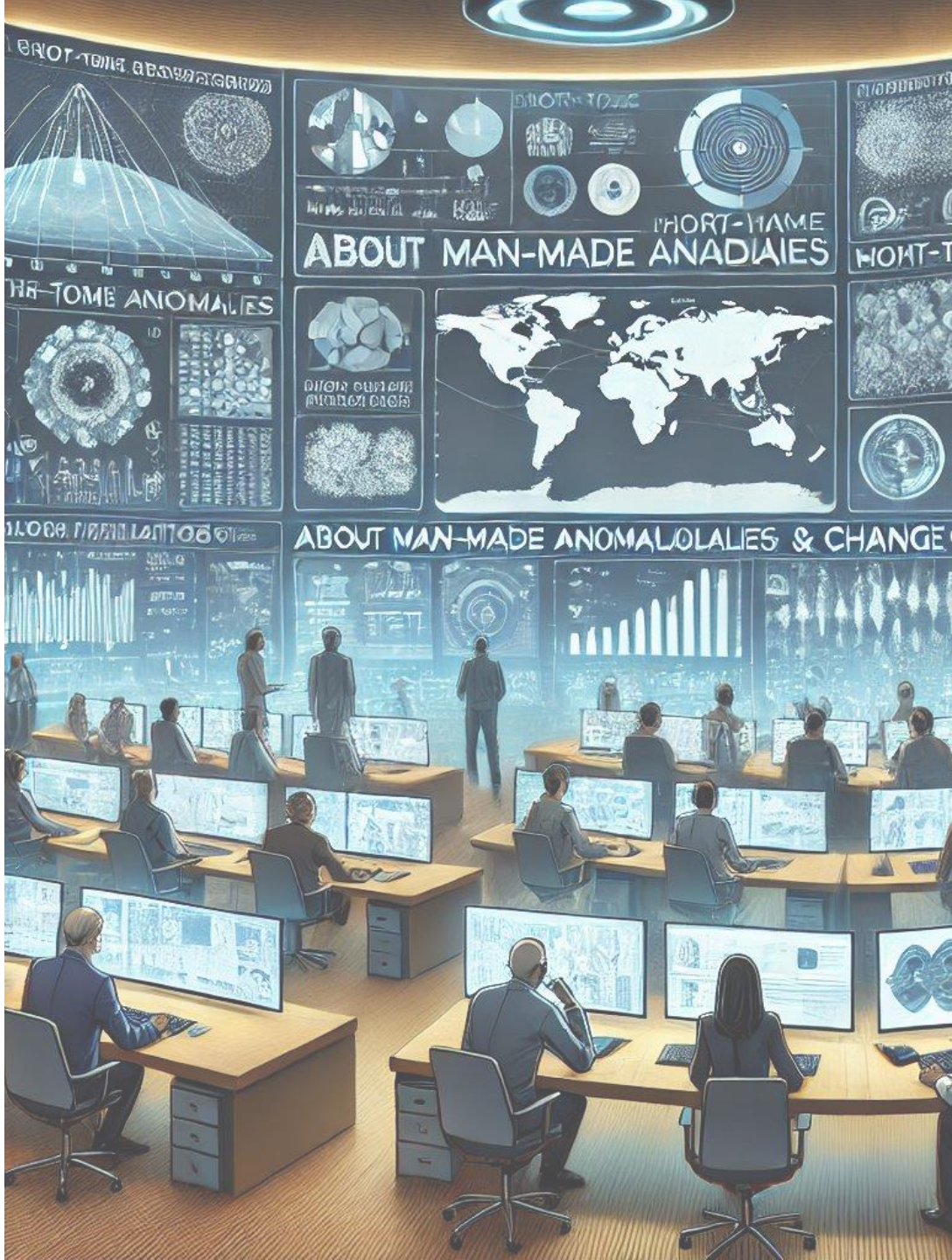
- the **utilization** is divided among various nations
- **fragmented** approach to data and information
- **lack of cohesion** limits the effectiveness
- **individualistic approach** rather than considering the whole shared maritime domain

For proper management, we need to **know beforehand what is going to happen** & how to **prevent it!**

OUR FOCUS

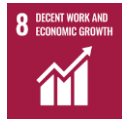
Real-time **identification, forecasting and mitigation of man-made anomalies and changes,** both short- and long-term, intentional and unintentional.

- the primary focus will be on the **effects to coastal and near-shore processes and activities**
- project focuses on the **direct exploitable capacities**
- **Direct Output:** DATA, FORECASTING MODELS, (MITIGATION) TECHNOLOGY



IMPACT CHAINS

- Topical project areas are **structured via impact chains**
- Impact chain describes an **interaction between external pressure, ecosystem component and impact**

PRESSURE/INFLUENCE	ECOSYSTEM COMPONENT	IMPACT
	MARITIME LOGISTICS (SHIPS & HARBOURS)	
	UW INFRASTRUCTURE	
	OFFSHORE ENERGY	
	AQUACULTURE & FISHING	
	MARINE HABITAT & BIOLOGY, BIORESOURCES	

CORE IMPACT CHAINS ....

- Safety of critical underwater infrastructure
- GHG emissions of ports and shipping
- Towards sustainable aquaculture in the Baltic Sea
- Maritime traffic risks close to windfarms & offshore infrastructure
- Safety of maritime border
- Changing environmental conditions and coastal processes due to climate change
- Good and improved health of the Baltic Sea
- ...

1	DESCRIPTION
2	DATA
3	DATA EXTRACTION
4	DATA ANALYTICS
5	MODELLING
6	MITIGATON MEASURES
7	TECH. FOR MITIGATION
8	BENAFICIARIES
9	DIRECT OUTPUT
10	PROJECT IMPACT

IMPACT CHAIN EXAMPLE

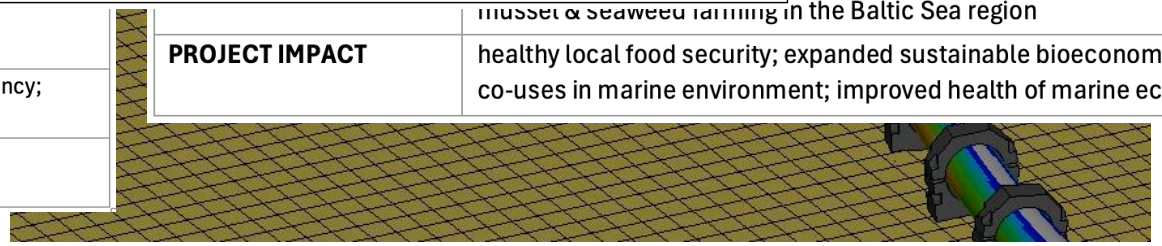
PRESSURE/INFLUENCE	ECOSYSTEM COMPONENT	IMPACT
• Man-made anomalies	UW INFRASTRUCTURE	• Environment • Economy

1	DESCRIPTION	SAFETY OF CRITICAL UNDE… INFRASTRUCTURE
2	DATA	ship traffic, underwater nois… bathymetry & imaginary
3	DATA EXTR…	AIS, VTS, satellite, camera/ra…
4	DATA ANAL…	
5	MODI…	
6	MITIG… MEAS…	
7	TECH… MITIG…	
8	BENA…	
9	DIREC…	
10	PROJ… IMPACT	economic loss

1	DESCRIPTION	WINDFARMS CLOSE THE FAIRWAYS WILL INCREASE THE RISKS
2	DATA	ship traffic, environmental data, ice conditions, bathymeter data
3	DATA EXTRACTION	AIS, VTS, camera/radar
4	DATA ANALYTICS	AI-based real-time, short-term near-miss detection
5	MODELLING	forecasting of vessel behaviour and interactions, collision avoidance
6	MITIGATON MEASURES	constant monitoring & rapid response
7	TECH. FOR MITIGATION	Near miss algorithms, collision avoidance, automatic camera images
8	BENAFICIARIES	wind park operators, ship owners, VTS
9	DIRECT OUTPUT	Near-miss detection service, collision avoidance, monitoring technology
10	PROJECT IMPACT	Wind energy reliability, prevention of accidents

DESCRIPTION	GHG EMISSIONS OF PORTS AN…
DATA	Emission data from ships, port … types, renewable energy use, ar…
DATA EXTRACTION	Automatic Identification Systen… audits; real-time fuel monitorin…
DATA ANALYTICS	Real-time emissions tracking; li… optimization models for port an…
MODELLING	Scenario-based modelling for e… modelling for ship movement; li…
MITIGATON MEASURES	Onshore power supply; optimiz… of alternative fuels and retrofitti…
TECH. FOR MITIGATION	Battery-electric systems; hydro… based energy optimization syste…
BENEFICIARIES	Port authorities; shipping companies; local communities; global environmental organizations
DIRECT OUTPUT	Reduced port and shipping emissions; enhanced operational efficiency; adoption of cleaner technologies
PROJECT IMPACT	Lowered GHG emissions; improved air quality; economic savings; strengthened environmental governance

DESCRIPTION	TOWARDS SUSTAINABLE …QUACULTURE IN THE BALTIC SEA
	…s; feed amounts; amount of nutrients in marine …ovariables impacting aquaculture species &
	…ıter drones; satellite (Copernicus) data
	…ize sea areas for different types of aquaculture; …omaly detection to control feeding; IMTA … mechanisms (low trophic aquaculture to fish
	…; linking 3D hydrophysical & DEB aquaculture
	…ls for adjacent habitat restoration
	…es in marine environment; solutions for low …tion
	…ture protection organizations; wind park …ners
	…arming; strategic modelling for sustainable … in the Baltic Sea region
PROJECT IMPACT	healthy local food security; expanded sustainable bioeconomy; diversified co-uses in marine environment; improved health of marine ecosystems



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WHAT WE NEED TO KNOW?

DATA

- farming technology
- amount of nutrients
- environmental covariables
- emission data
- port operations,
- fuel types,
- renewable energy use
- lifecycle emissions
- ship traffic
- environmental data
- ice conditions
- bathymeter data
- underwater noise
- UW bathymetry
- UW imaginary
- …

DATA EXTRACTION

- AIS
- VTS
- ASV
- AUV
- UAV
- Smart buoys
- satellite
- camera
- radar
- sonar
- PAM
- AI & ML
- IoT sensors
- energy audits
- real-time fuel monitoring
- underwater sensor networks
- ….

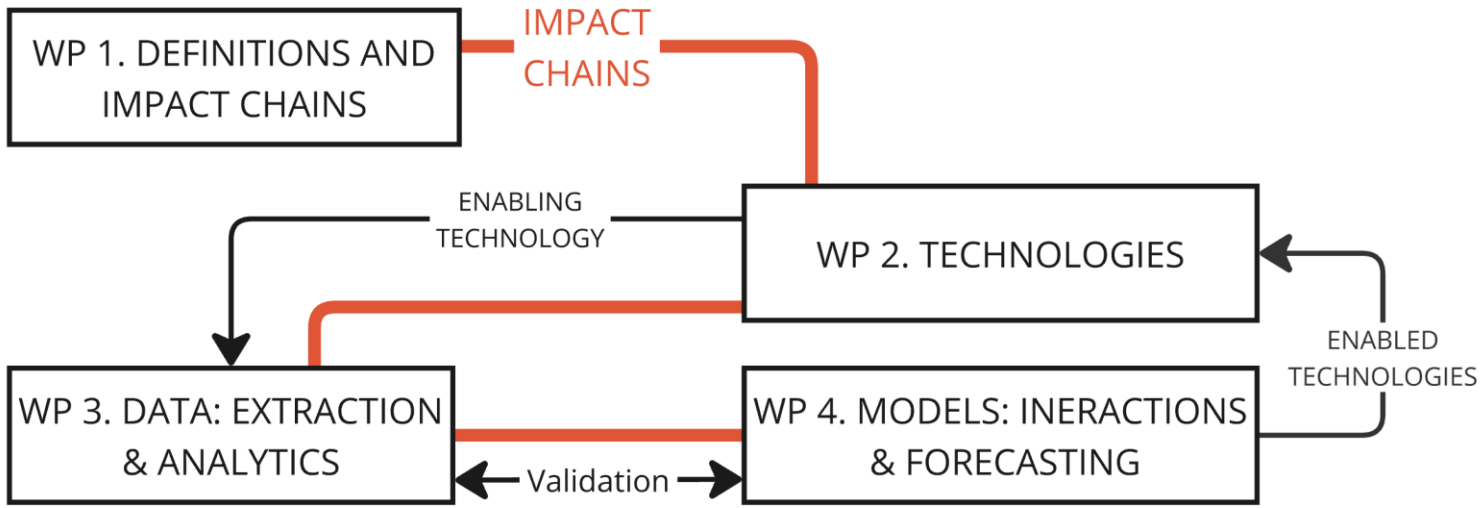
MODELS

- 3D hydrophysical modelling;
- linking 3D hydrophysical & DEB aquaculture models;
- IMTA models
- Scenario-based modelling for energy-efficient operations;
- lifecycle GHG modelling
- AI & ML
- Big Data analytics
- Surrogate models
- predictive modelling for ship movement;
- forecasting of vessel behaviour and interactions,
- collision avoidance
- …

(MITIGATION) TECHNOLOGY

- IMTA-based solutions;
- models for adjacent habitat restoration
- cultivating low trophic species in marine environment;
- solutions for low trophic aquaculture valorization
- battery-electric systems;
- hydrogen fuel cells;
- shore power technologies;
- AI-based energy optimization systems
- Near miss algorithms,
- collision avoidance,
- automatic camera images
- underwater acoustic network
- response fleet
- autonomous drones
- …

PROJECT SCOPE & R&D PARTNERS



DIRECT OUTPUT

- **Data** extraction and analysis methods
- Interaction and prediction **models**
- Enabling and enabled **technologies**
- Improved & efficient management of maritime domain, in line with **SDG**

COMPETENCIES

TALTECH

- Marine technology competence centre
- Laboratory of Wave Engineering
- Centre of Biorobotics
- Fluid and structure interaction research group
- Department of Electrical Power Engineering and Mechatronics
- Marine Systems Institute
- Estonian Marine Academy
- …

UNIVERSITY OF TARTU

- Estonian Marine Institute

UNIVERSITY OF SOUTHAMPTON
ALFRED WEGENER INSTITUTE
ABB, DNV

POTENTIAL FUNDING

HORIZON-WHORIZON-WIDERA-2025-ACCESS-01-01-two-stage: Teaming for Excellence

- To create or modernise a centre of excellence, relevant at national level, in a chosen scientific domain
- Increased scientific capabilities of the beneficiary institution and the host country enabling them to successfully apply for competitive funding in the EU and globally;
- Development of new research strands in relevant domains;
- Developed and enhanced research and innovation capacities and the uptake of advanced technologies;
- Enhanced innovation and integration of planned processes, services and products of the centre

Call Opening: 3 Dec 2024

Call Closure stage 1: 10 Apr 2025

Call Closure stage 2: 20 Jan 2026

Type of Action: CSA

Budget: € 270 Mio.

Indicative number of projects: 18

Key takeaways

- multi-domain use of data, information and forecasting models
- faster development and uptake of technologies
- safer, economically & environmentally sustainable maritime domain

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