IMPACT ASSESSMENT ON A LONG-TERM INVESTMENT ON ARCTIC OBSERVATIONS (IMOBAR)

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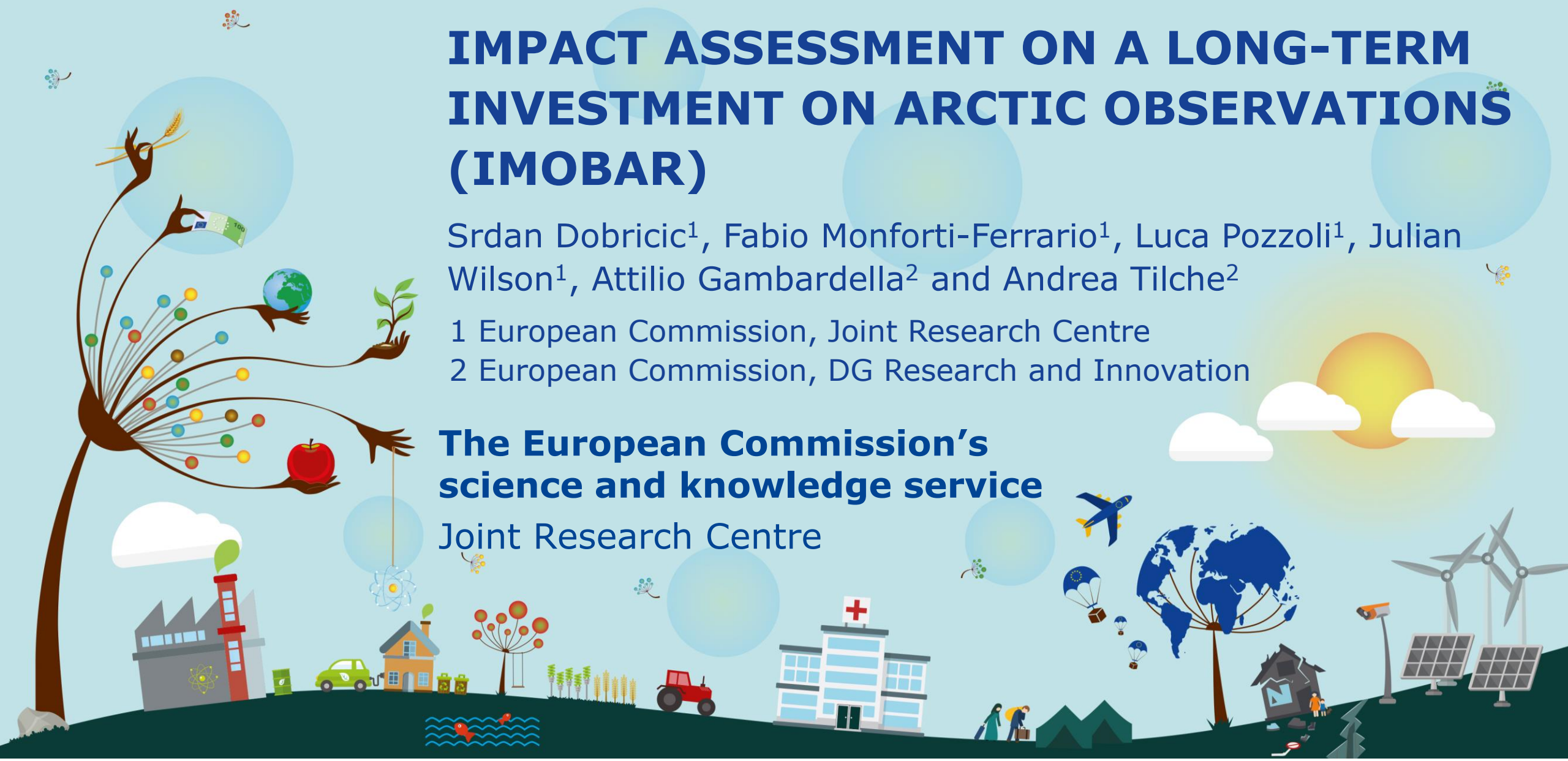

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The IMOBAR study

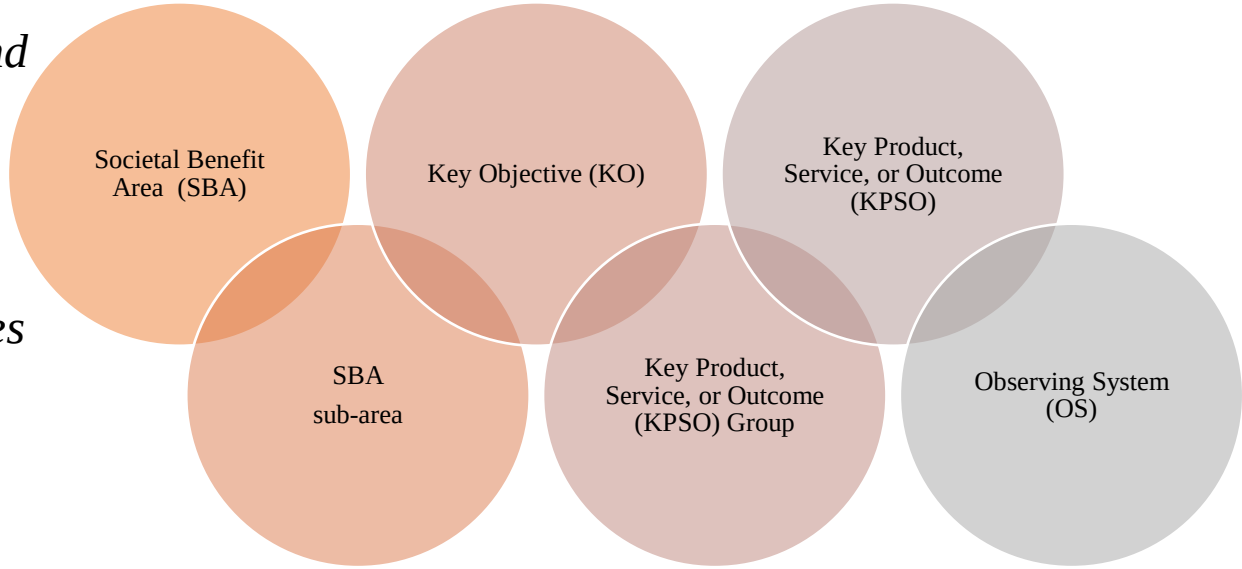
The goal is to estimate and compare costs and benefits of Arctic observation systems as a contribution towards making the "business case" for sustaining Arctic observations in the long-term and to support the decision-making process.

This is achieved by:

- A structured and reproducible approach
- Expert evaluation of 10 case studies
- Evaluation of observing system costs and, when possible, economic benefits

Pan-Arctic Assessment Value Tree SBAs (STPI SAON 2017)

1. **Disaster Preparedness** *(Disaster Resilience)*
2. **Environmental Quality**
3. **Food Security** *(Food Security and Sustainable Agriculture)*
4. **Fundamental Understanding of Arctic Systems**
5. **Human Health** *(Public Health Surveillance)*
6. **Infrastructure and Operations** *(Infrastructure and Transport Management)*
7. **Marine and Coastal Ecosystems and Processes** *(Biodiversity and Ecosystem Sustainability)*
8. **Natural Resources** *(Energy and Mineral Resources Management)*
9. **Resilient Communities**
10. **Sociocultural Services**
11. **Terrestrial and Freshwater Ecosystems and Processes** *(Biodiversity and Ecosystem Sustainability)*
12. **Weather and Climate**



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Selection of case studies

Domain	Case studies
Sea ice	• Ship routing/ navigation • Search and rescue of vessels • Offshore installations • Oil spill
Human dimension	• SmartICE application
Sea level rise	• Port management • Property insurance
Permafrost	• Infrastructure in areas of thawing permafrost • Forest management
Biodiversity	• Evolution of fisheries in the Arctic

Costs of observing systems

Type of observing system	Annualised costs (global in MEUR)	Assumed share of the observations that refer to the Arctic		Annualised costs (Arctic, for all systems identified) (in MEUR)	
		Min.	Max.	Min.	Max.
Global satellite (e.g. Envisat, Sentinel 1)	770	3%	7%	23	54
Polar satellite (CryoSat)	19	50%	70%	9	13
Airborne (aircraft and helicopters)	13	20%	70%	3	9
Marine (coastal radars)	2	25%	45%	1	1
Atmospheric observation systems (non-satellite) / atmospheric composition (e.g. SYNOP-SHIP-METAR, EMEP)	3.5-10	100%		3.5	10
Icebreakers (research vessels)	88	25%	45%	22	39
Underwater (coastal buoys, drifting buoys, wave gliders, Argo, instruments installed on vessels)	9	100%		9	9
Estimated overall Arctic costs per year				**70**	**135**

Contribution of case studies to the SBAs

Case studies	Disaster preparedness	Environmental Quality	Food security	Fundamental Understanding	Human Health	Infrastructure & Operations	Marine Ecosystems	Natural Resource	Resilient Communities	Sociocultural Services	Terrestrial/freshwater Ecosystems	Weather and Climate	Quantified SBAs	Total SBAs linked
Infrastructures	●	●	●	●	●	●			●				1	7
Forest Management		●	●	●		●		●	●	●	●	●	2	9
Fisheries Management		●	●	●	●		●		●		●		-	7
Port Management	●		●	●		●			●			●	2	6
Property Insurance	●					●			●				2	3
Shipping	●	●	●		●	●	●	●					3	7
Offshore	●	●				●							2	3
Search and Rescue	●				●								1	2
Oil spills	●	●	●		●		●						1	5
SmartICE	●		●		●				●	●			-	5

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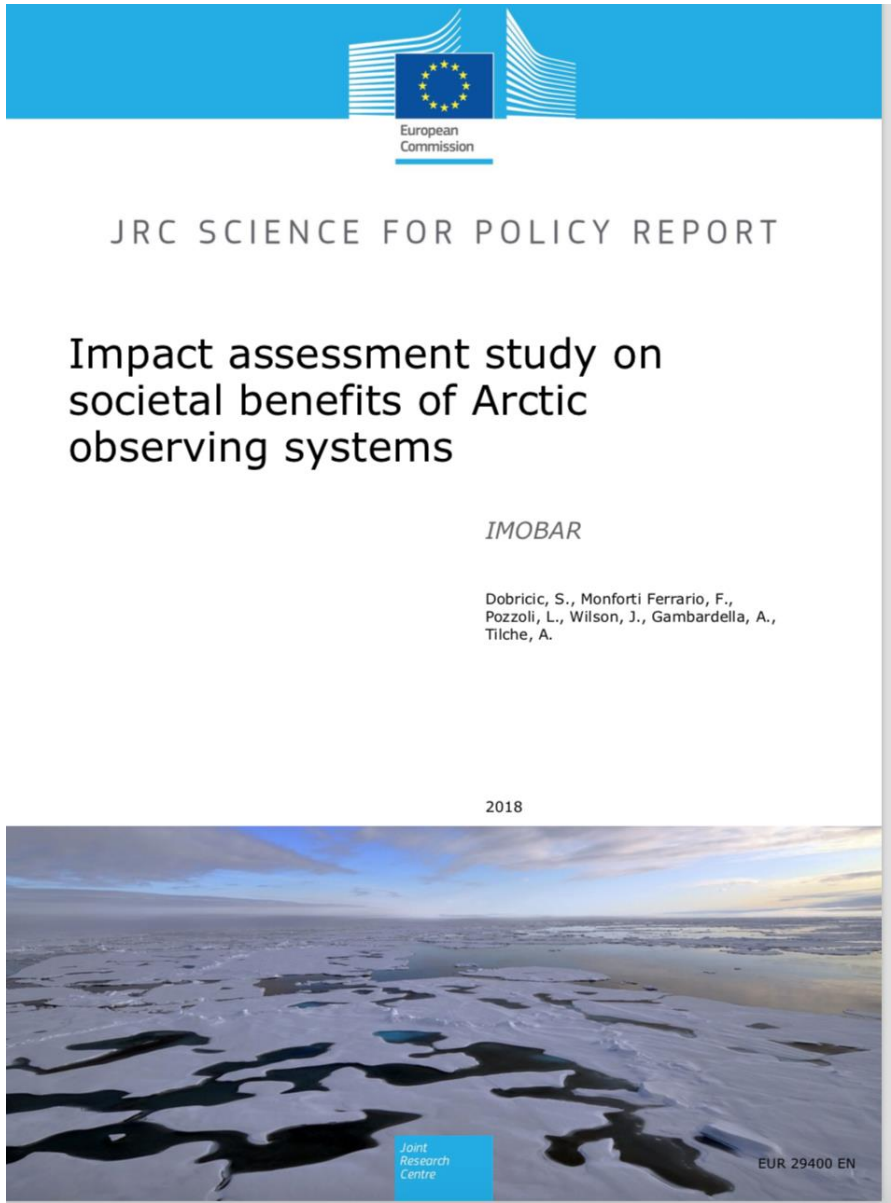
Economic benefits

Case	Unit of analysis	Overall monetary effects in MEUR		Estimated share of effects relating to observing systems		Annual monetary benefits from observing systems in MEUR	
		Min.	Max.	Min.	Max.	Min.	Max.
Sea ice							
Ship routing	Expected cost savings relating to shipping in the Arctic	919	1,168	15%	20%	138	234
Search and rescue	Benefits of observing systems relate to a potential reduction of the costs for S&R activities	2	5	20%	25%	0.5	1
Oil spills	Savings relating to the clean-up for a fictive oil spill similar to that of the Exxon Valdez every 10 years	100	330	10-15%		1	4
Sea level rise							
Property insurance	Estimated benefit of data from the Copernicus program for intermediate users in the insurance industry	0.5	1	100%		0.5	1
Permafrost							
Infrastructure	Costs savings due to timely infrastructure adaptation measures	39	76	60%	80%	23	61
Forest management	Estimated revenue generated based on data generated by observing systems in relation to forest management in 2020	20	40	100%		20	40
Estimated overall savings relating to the data points identified						**183**	**341**

Conclusions

- The results of the IMOBAR study show a **positive return on investment** for the considered case studies and for selected Arctic challenges: **Economic benefits exceed by at least 50% investments** in Arctic observing systems.
- Observing systems in the Arctic strongly support the preservation of ecosystems, protection of human health and lives, and directly reduce losses in economic activities.
- Additional economic returns may be expected from other societal benefits at the regional and global scales.

http://publications.jrc.ec.europa.eu/repository/bitstream/JRC113327/kjna29400enn.pdf



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