

# Under the surface – marine pollution issues

Publication of the POPCORN project



Northern Periphery and  
Arctic Programme  
2014–2020



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# POPCORN introduction

Marine environment is facing numerous challenges in the 2020s. Our hydrocarbon-based lives rely on natural gas and oil as an energy source, a lot of which is transported by ships around the world. Oil transports, and shipping in general, pose a risk to the environment; in case of an accident, the environmental impacts can be catastrophic. As shipping increases, the risks increase, and the risks are getting higher especially in the Arctic as the sea areas become more accessible to human activities there due to global warming.

Oil spills at sea are a well-known risk addressed for decades. The methods and technologies to clean up oil spills have been developed and improved over the years. However, there is still room for further improvement and to increase our preparedness to deal with the spills.

Another environmental risk to the seas, plastic pollution, has received more attention only recently. Unlike major oil spills, it happens all the time

and everywhere. Use of plastics has increased dramatically after WWII and we are only now realizing the consequences of not properly disposing the plastics after their use. Unfortunately, a lot of this waste ends up in oceans.

These two challenges have been in the focus of **POPCORN – Prevention of Oil and Plastics Contamination of Ocean Regions of the North** - which is a clustering project of the **Northern Periphery and Arctic programme (NPA)**. POPCORN brings together three NPA projects and one **Baltic Sea Region** project, which have addressed maritime pollution issues, either oil spills or plastic pollution. The projects have supported authorities, organisations and other actors working with these challenges in the Northern waters and raised awareness of these issues among general population.

The aim of POPCORN is to take the outcomes and best practices of the individual projects and share

them with the new regions and organisations, in the NPA region and beyond.

This short brochure introduces you to these projects, their main outcomes and illustrates in general the hazards that oil spills and plastic pollution pose to the marine environment. The booklet is divided into three sections: oil spill response, marine plastics, and POPCORN outputs.



*POPCORN (2021–2022) is led by University of Oulu (Finland), with project partners University of Turku (Finland), Norwegian Meteorological Institute (Norway) and Environmental Research Institute, UHI North Highland College (Scotland).*

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Publisher: University of Oulu, 2022

Editors: Niko Hänninen, Minna-Liina Ojala,  
Neil James and Lars R. Hole

Layout: Design Inspis Oy





# Oil spill response



# APP4SEA project

## Arctic preparedness platform for oil spills and other environmental accidents

Pollution does not recognize borders, and that is especially true, when it comes to oil spills in the sea. Oil can drift fast and spread to large areas with devastating consequences to marine environment. Arctic ice cover has been a barrier, keeping human activity to minimum in the very north, but global warming is expected to change this situation. Keeping the Arctic safe from the impacts of oil spills requires borders crossing cooperation.

This was the starting point of the NPA funded [APP4SEA project](#), which aimed to improve oil spill response preparedness in the Arctic and northern waters. Increasing the knowledge about the existing methods and technologies, and on the other hand pointing out the gaps in current preparedness level were some of the fields, where APP4SEA aimed

to make a difference. Experts working with these issues were the primary target group of the project, as they need to have the latest knowledge and know-how, how to combat these oil spills, should they happen, and what kind of environmental damage they can cause.

General public was not ignored either in the project, infographics and “Cool facts about the Arctic”, were published to raise their awareness about oil spills and Arctic issues in general. There were other dissemination activities as well, and one of them took the project to Brussels, finals of the **Interreg Project Slam 2019**.

APP4SEA produced many reviews, publications and best practice reports, which targeted various aspects of oil spills in the Arctic region. However, the project created also a concrete tool, after which the whole project was named. A smart map – a preparedness platform – was created in the project, which is presented in this booklet.

Testimonials from stakeholders involved in APP4SEA project can be found from the [NPA programme's map of results page](#). There you can read about **Norwegian Coastal Authority's** and **Greenpeace Nordic's** views about the project and all the outputs of the project are available on the APP4SEA website on the [Resources page](#).



*APP4SEA (2017–2020) was led by University of Oulu (Finland), with project partners University of Iceland (Iceland), Norwegian Meteorological Institute (Norway), Finnish Environment Institute (Finland) and Environmental Research Institute, UHI North Highland College (Scotland).*

# APP4SEA Smart map

## A tool for experts and an information hub for general public about oil spills

One of the main goals of the **APP4SEA** project was to create a smart map that could be used as a tool by experts working with oil spill response. Authorities in many NPA countries have already their own operational tools and maps, which can be used in planning and implementing national response actions in case of oil spills, but a bigger, NPA region covering tool was missing. This map was developed in APP4SEA, with the aim of providing also an information hub for general public, through which they could learn more about oil spills and about the risks that they pose to the marine environment.

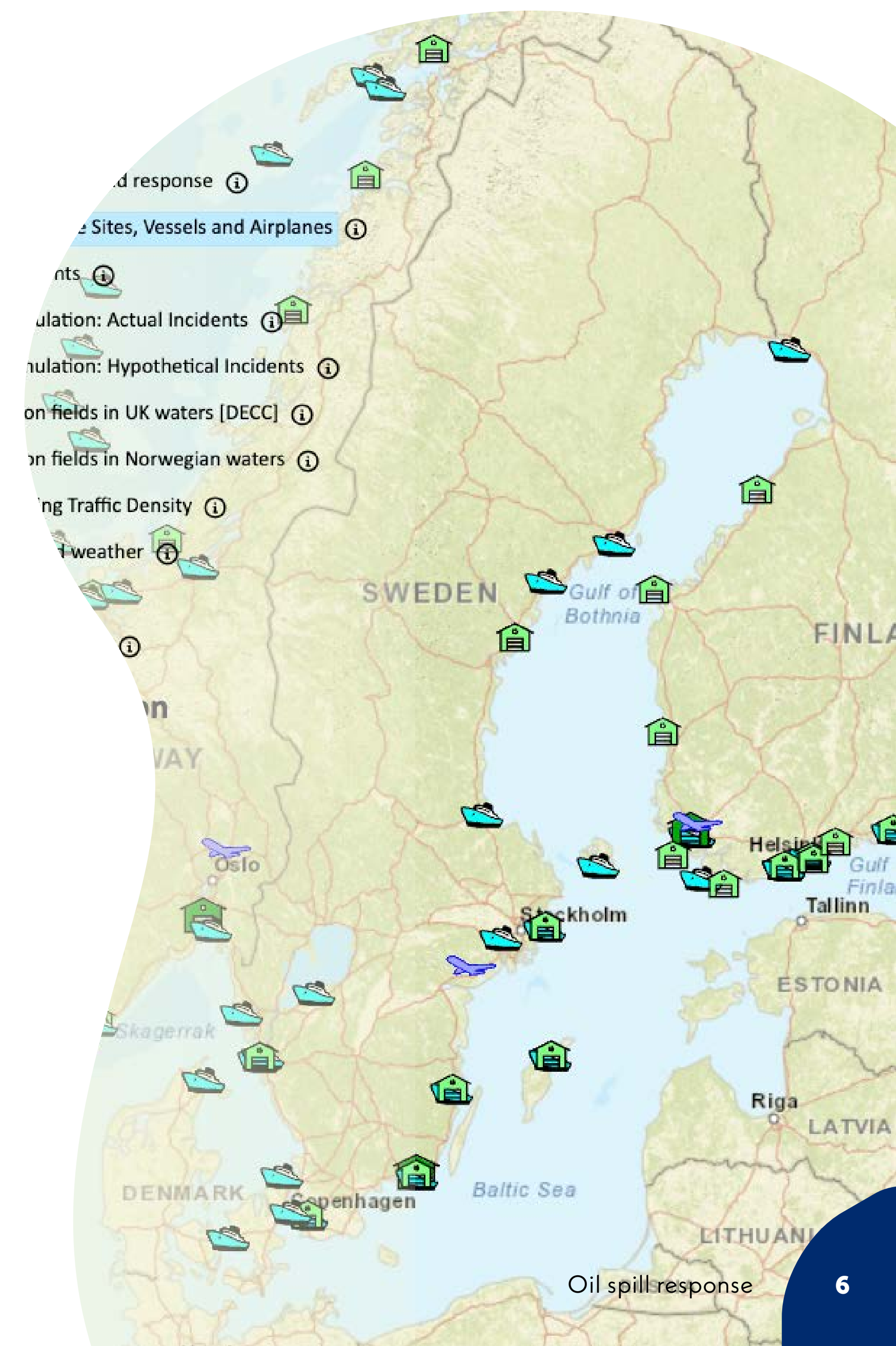
The map, located at [app4sea.com](http://app4sea.com), has information in 4 main map layers, which is essential for oil spill response. These include information about the shipping, oil and gas extraction sites and oil spill response infrastructure in the NPA countries (A *screenhot of this layer illustrates this page on the right*).

Should an accident happen, climate, ocean and weather data are essential information, as these have an impact on the spreading of the oil. There is also information about the ecology of the NPA region, for instance information about the nesting sites of various birds, who would be in danger, should a spill happen.

There is information about past oil spills and simulations of these, as well as simulations of hypothetical oil spills. These illustrate in an informative way the spreading of oil, how far it can reach, and the impacts of oil spills.

In addition to this, there is useful information section with links to other sites of interest dealing with oil spill issues. During POPCORN, the map was updated with a map layer section about marine plastics pollution and links about marine pollution were added to the useful information section.

If you want to know, how to use the map, there is a short [tutorial video](#) about the map. Check out also this [Twitter tutorial](#) from APP4SEA's Twitter conference.





# OpenDrift

## A tool for modeling trajectories of oil spills and other substances in seas

If an oil spill happens at sea, it is important to get response operations underway as fast as possible. The spill might happen close to a shore, so there is a risk of oil drifting to the shore, where it can cause serious environmental damage and from where it is

very hard to remove. Clean up operations are easier to conduct at the sea, but responders have to know where the oil spill is and where it will be, when they get to the sea. Currents, wind and other weather and oceanographic factors can spread oil quite fast and far away. In order to get things right, responders rely on different kind of tools for modeling trajectories, so that they will get to there, where the oil is.

**OpenDrift** is one of this kind of tools, which can be used to track and forecast trajectories of oil spills in the ocean. The tool can be also used to track other substances in sea and has been employed in search and rescue operations. OpenDrift has been developed by **Norwegian Meteorological Institute (MET)** and is in use by authorities and oil spill experts in many countries.



OpenDrift is an open source tool, so you don't have to be an oil spill expert to get your hands on it. It can be accessed and downloaded from the [website of the of the programme](#), which contains a lot of information about how to use the tool, technical data about it, for what purposes it can be used, etc. For instance, the simulations of historical and hypothetical oil spills, which can be found on the [APP4SEA smart map](#), were created by MET with this tool. In POPCORN, MET created with OpenDrift drifting patterns of plastic litter, which were the basis of POPCORN's "Plastics in the Sea" social media campaign. These simulations have been added also to the APP4SEA smart map and you can read more about these cases from [POPCORN's website](#).



# OIL SPILL project

## Enhanced oil spill response capability in the Baltic Sea Region

Shallow waters and coastal areas are especially challenging environments for oil spill response (OSR). In addition, the administrative procedures can be unclear in these transitional zones and the great potential of volunteers is often not recognized.

The **OIL SPILL Project** gathered several key actors at the ministerial level and among authorities, non-governmental organizations, the petrochemical industry, and experienced knowledge partners across the Baltic Sea Region (BSR) to work on these challenges.

By sharing knowledge and organizing joint exercises, the Project Partners were able to improve their competence and networks and strengthen both local and regional oil spill response capability in the BSR.

In addition to the reports and lessons learned, the new networks and increased international and cross-sectoral interaction are definitely among the most significant and lasting outcomes of the Project. Read more about OIL SPILL [here](#).

- OIL SPILL [presentations and webinars](#)
- OIL SPILL [events](#) and [newsletters](#)
- OIL SPILL [reports and other publications](#)



*“OIL SPILL has certainly provided us with an additional dimension of knowledge and viewpoints. It is clear that challenges and questions are more effectively solved when contemplated and discussed together.”*

– [Per Nisser & Samuel Andersson, Östra Götaland Fire and Rescue Service](#)

*“Now, we have been able to provide theoretical elements in the format of international lessons learned and guidelines into the general national system of emergency OSR in Latvia.”*

– [Aleksandrs Pavlovics, Latvian Maritime Academy](#)

*“This project enhanced not only our understanding of and preparedness to oil spill disasters but also our national visibility of Lithuanian Red Cross as a potential partner in the disaster response.”*

– [Emilija Unė Sakalauskaitė, Lithuanian Red Cross](#)



# WWF Finland volunteers

## When oil hits the shore, the volunteers are ready for action

In case of a large-scale oil spill at sea, the oil almost always reaches the shore. Since the authorities do not usually have the workforce for time-consuming manual cleaning, a reserve of capable volunteers becomes a lifesaver.

[WWF Finland](#) established its own oil spill response troops in 2003. Currently, close to 10 000 people are enlisted, and around 350 volunteers are trained annually.

Because large oil disasters are rather rare, it can take several years before the volunteers are needed in a real spill. However, if a spill happens, the consequences for society as a whole and for the environment are substantial, and the response must be rapid and competent.

*“In oil spill response work, readiness is always an asset. Volunteers cannot be just numbers in a register; the troops must be trained and motivated regularly,”* says Conservation Officer Teemu Niinimäki.

The training package consists of courses in shoreline cleanup and oiled wildlife response. With additional leadership training, the volunteer has an opportunity to become a group leader. The idea is that the voluntary forces can work as an independent unit under the official authorities.

WWF Finland collaborates with the authorities and other NGOs to uphold and develop the preparedness of voluntary response in Finland and abroad. WWF Finland operates under the [Finnish Voluntary Rescue Service](#) and is a member of the [European Oiled Wildlife Assistance network](#), for instance.

*“When resources are limited, cooperation is a key,”* notes Marine Conservation Officer Vanessa Ryan. *“The cooperation between different stakeholders and the decision-making processes need to be planned and trained regularly to ensure everything runs smoothly when needed.”*

POPCORN webinar: [Volunteers in OSR](#)  
POPCORN [Under the Surface Podcast](#)  
WWF [FI guide for cleaning oiled shores](#)



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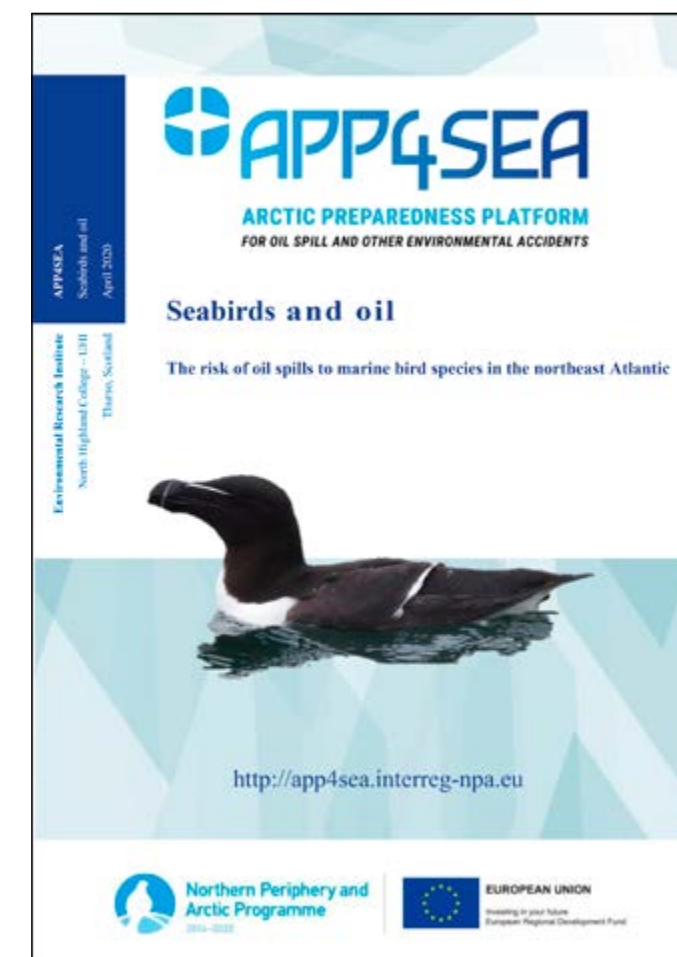
# Seabirds and oil

## The risk of oil spills to marine bird species in the northeast Atlantic

Due to their ecology, some seabird species are more likely to be affected by oil than others. By taking into account their behavior and life history characteristics, it is possible to estimate each species' vulnerability to oil. This method was used in **APP4SEA** to create an index for the sensitivity of seabirds to oil – **Oil Vulnerability Index (OVI)**.

To estimate where seabirds are most vulnerable to oil pollution in the event of an oil incident, the species-specific OVI values were combined with each species distribution map. Eventually, the combined data were input to the [interactive smart map](#), also developed in the APP4SEA. You may explore the Seabird Oil Vulnerability Maps under the Ecological zones Map Layer.

Download [the report](#) and access the smart map [here](#).





# EUROWA – Network of oiled wildlife experts

**European Oiled Wildlife Assistance (EUROWA)** is a dynamic network of European oiled wildlife response experts working together to provide international expert resources for dealing with affected animals in marine wildlife emergencies. [Sea Alarm](#) has played an essential role in facilitating this cooperation and provides the function of the EUROWA network Secretariat.

EUROWA supports and empowers European authorities, NGOs, and potential polluters in dealing with the challenges connected to the assistance of affected marine wildlife using agreed international standards and procedures. The aim is to have at least one network member in each coastal country in Europe.

The purpose of EUROWA activities is to:

- Educate and involve key individuals in national authorities, NGOs, and industry, to understand marine wildlife emergencies better.

- Via training and exercises, maximize the potential of those parties to make a constructive contribution as part of a wildlife emergency response to mitigate the effects of oil.
- Collectively, members aim to work, train and exercise together to ensure that at all times, a EUROWA team and their equipment can be put together to assist a requesting country.

Visit the [EUROWA website](#) for more information.





# Marine plastics





# Circular Ocean project

## Developing enterprise opportunities from marine plastic waste

In pursuit of innovative and sustainable solutions for marine plastic waste, the **Circular Ocean** project inspired enterprises and entrepreneurs to realise the hidden opportunities of discarded fishing nets and ropes in the Northern Periphery & Arctic (NPA) region.

Through transnational collaboration and eco-innovation, Circular Ocean developed, shared and tested new sustainable solutions to incentivise the collection and reprocessing of discarded fishing nets and assisted the movement towards a more circular economy.

Circular Ocean used stakeholder engagement and research to inform scientists, politicians, entrepreneurs and local communities on how to develop sustainable solutions to the problem of derelict fishing gear. The project developed a suite of resources focussed on assessing the impact of

waste fishing gear and the opportunities for reuse, recycling, and upcycling.

Circular Ocean guided communities on how best to harness the hidden opportunities of discarded fishing nets through each stage in the recovery, recycling and reuse process. The project generated a suite of resources including:

- Information for communities on fishing net reuse and recycling options.
- Guidance on the enterprise potential of discarded nets
- An open-source Eco-innovation Hub to promote the exchange of ideas and techniques.
- An Eco-innovation toolkit to support partners and end-users on Circular Economy Innovation.
- Case studies of existing projects from the NPA region and beyond.
- Assessment of the threat of marine plastics to seabirds in Greenland, Ireland, Scotland, and Norway.
- Examples of pilot work undertaken using discarded fishing nets within remote regions.



The project was the winner of the **European Commission's RegioStars 2016 Public Choice Award**,

in addition to being a finalist in the category of Sustainable Growth: Circular Economy. It was also awarded the **2018 Pakman Award for achievements in Environmental Education & Awareness**.

Read more about the Circular Ocean project [here](#) and watch the [project video](#).



*Circular Ocean (2015-2018) was led by the Environmental Research Institute, UHI North Highland (Scotland), and funded under the European Regional Development Fund (ERDF) [Interreg VB Northern Periphery and Arctic](#) (NPA) Programme. It had partners in Ireland ([Macroom](#)), England ([The Centre for Sustainable Design](#)), Greenland ([Arctic Technology Centre](#)), and Norway ([Norwegian University of Science and Technology](#)).*



# Blue Circular Economy project

## End-of-life fishing nets, sustainable businesses, and innovation clusters

Blue Circular Economy (BCE) was a three and a half year (2018-2021) transnational project co-funded by the EU Interreg Northern enterprises Periphery and Arctic Programme (NPA). Its aim was to support the development of the fishing net waste industry in regions across Europe's Northern Edge. This project built on the previous project, Circular Ocean.

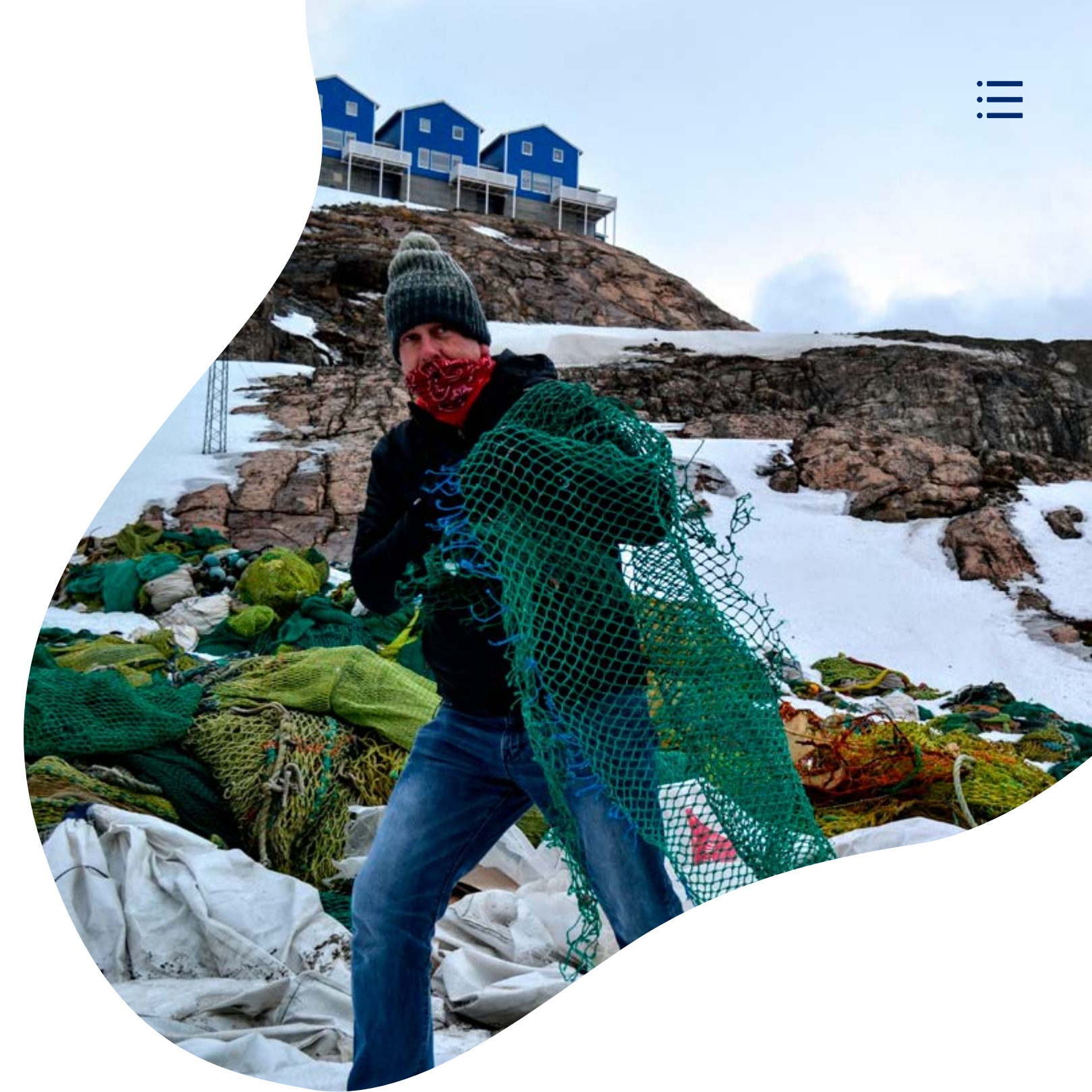
Remote regions of the NPA area face important decisions on how they deal with materials which may not have been produced or used locally, but have washed up onto their shores and seas. BCE worked with local communities to address this.

BCE aimed to help small and medium-sized enterprises (SMEs) offering products and services within fishing gear recycling solutions in the NPA region to attain a greater market reach. BCE set up a multi-level cluster to connect and catalyze SMEs in the region. The cluster formation acts as a network enabler where knowledge and experience are developed and shared.

BCE contributed to sustainable development in the NPA region at the economic, environmental and social levels. The project vision was to create the ecosystem, knowledge and industry necessary to reduce the presence of marine plastic waste by fostering a vibrant industry for the recycling and reuse of used fishing nets.

Understanding the complex eco system and sharing valuable business opportunity information was key for the BCE project. The big question for communities and enterprises is "How can used and/or waste FNRCs be reused, repaired and recycled into new products and services?". BCE has worked to identify and provide new market opportunities for eco-innovative SMEs and entrepreneurs in the NPA region.

The Blue Circular Economy developed a [library of webinars and video content](#), to better facilitate the information transfer and to also better equip SMEs and Entrepreneurs to tackle the challenges of fishing net and plastic wastes in our oceans. To inform them of the opportunity and provide them with the tools necessary to commercialise it.



**BLUE CIRCULAR**  
ECONOMY

*BCE was led by Norwegian University of Science and Technology (Norway), with project partners Western Development Commission (Ireland), Technical University of Denmark (Denmark), The Centre for Sustainable Design (England), Environmental Research Institute, UHI North Highland (Scotland).*



# Birds & Debris

## Using citizen science to reveal the impact of plastics on wildlife

As part of **BCE**, researchers at the **Environmental Research Institute, UHI North Highland** developed the ground-breaking website [Birds & Debris](http://www.birdsanddebris.com) to gather information about the interaction between birds and debris such as plastics. Members of the public are encouraged to upload details and photos of birds which have become entangled in debris or which have incorporated it into their nests to [www.birdsanddebris.com](http://www.birdsanddebris.com).



Anthropogenic debris is a global environmental issue, which can impact a wide range of species, especially birds. Marine debris (mostly plastic) has affected at least 36% of all seabird species through entanglement – at sea or at the nest where debris is used as nesting material.

While there is a lot of anecdotal evidence about the impact debris such as plastics have on birds, there have been very few studies on entanglement and nest incorporation. By enlisting the help of the public through citizen science the Birds & Debris project is revealing the scale and geographical spread of this issue.

To date approximately 500 incidences of entanglement or nest incorporation involving over 150 species have been made to Birds & Debris, covering 49 countries and every continent. The most recent [research paper](#) using these data investigated the impact of COVID-19 pandemic related PPE on wildlife.





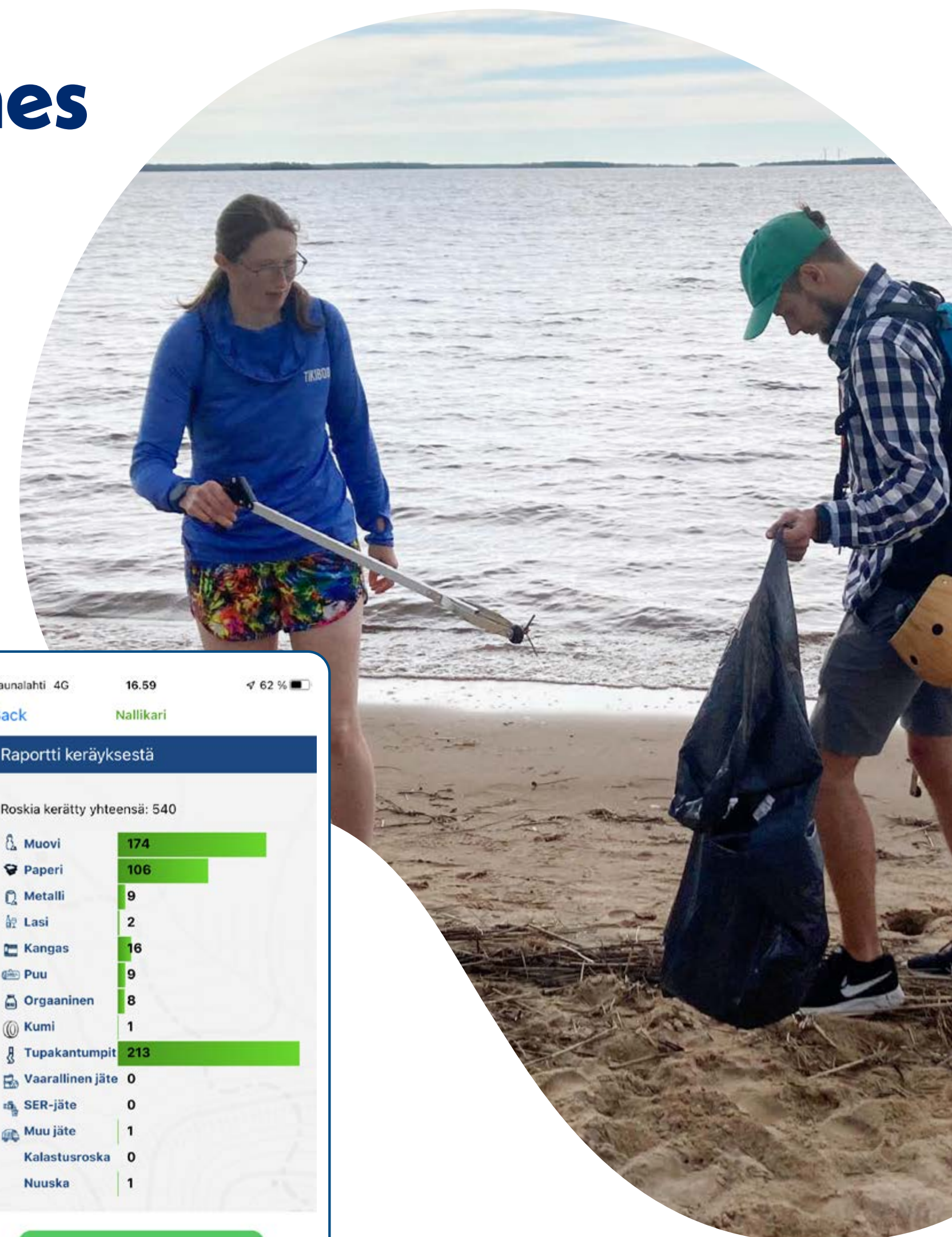
# Beach clean-ups – together for cleaner beaches

Disposing plastics items properly after their use is something that each one of us can do to keep the nature free of plastic litter. However, there are still persons, who do not live according to this basic principle, or there might be gaps in the waste management system when it comes to handling of plastic waste. When plastic items end up in waterways, either to rivers, lakes or seas, they can travel long distances and end up hundreds, if not thousands of kilometers away from their place of origin. When they are out in the sea, they are out of sight and out of mind, but once they hit the land, they remind us of their existence.

**Keep the Archipelago Tidy Association** ([Pidä Saaristo Siistinä Ry](#)) has been working for cleaner coastlines for over 50 years in Finland. One of their activities is **Clean Beach programme**. It has a three-fold aim: to engage people in environmental activity, clean the beaches, and collect information about the volumes and types of litter on the Finnish coastlines. For these purposes, the association has developed easy instructions and an app for reporting the collected litter (see the screenshot of the app on the right).

During POPCORN, University of Oulu and University of Turku organised Siisti Biitsi clean-ups, which were also part of European Maritime Day in My country events. These clean-ups gathered about 20 “litter hunters” in Turku and 40 in Oulu and resulted in removal of 1100 and 1800 individual litter pieces respectively.

Organising a beach clean-up is a simple way to do something concrete for the well-being of your environment. Many cities and municipalities support this kind of activities by loaning clean-up tools and by taking away the collected litter. There might also be environmental organisations that organise clean-up events or provide guidance for doing so. You may also check [Clean Beach programme's homepage](#) for tips on organising your own event.





# POPCORN\* outputs

*\* Popcorn is best enjoyed on movie nights, but it can also be used to simulate oil in oil spill response exercises. However, when seagulls spot it on the surface of the sea, this can drive them crazy as in “The Birds”!*





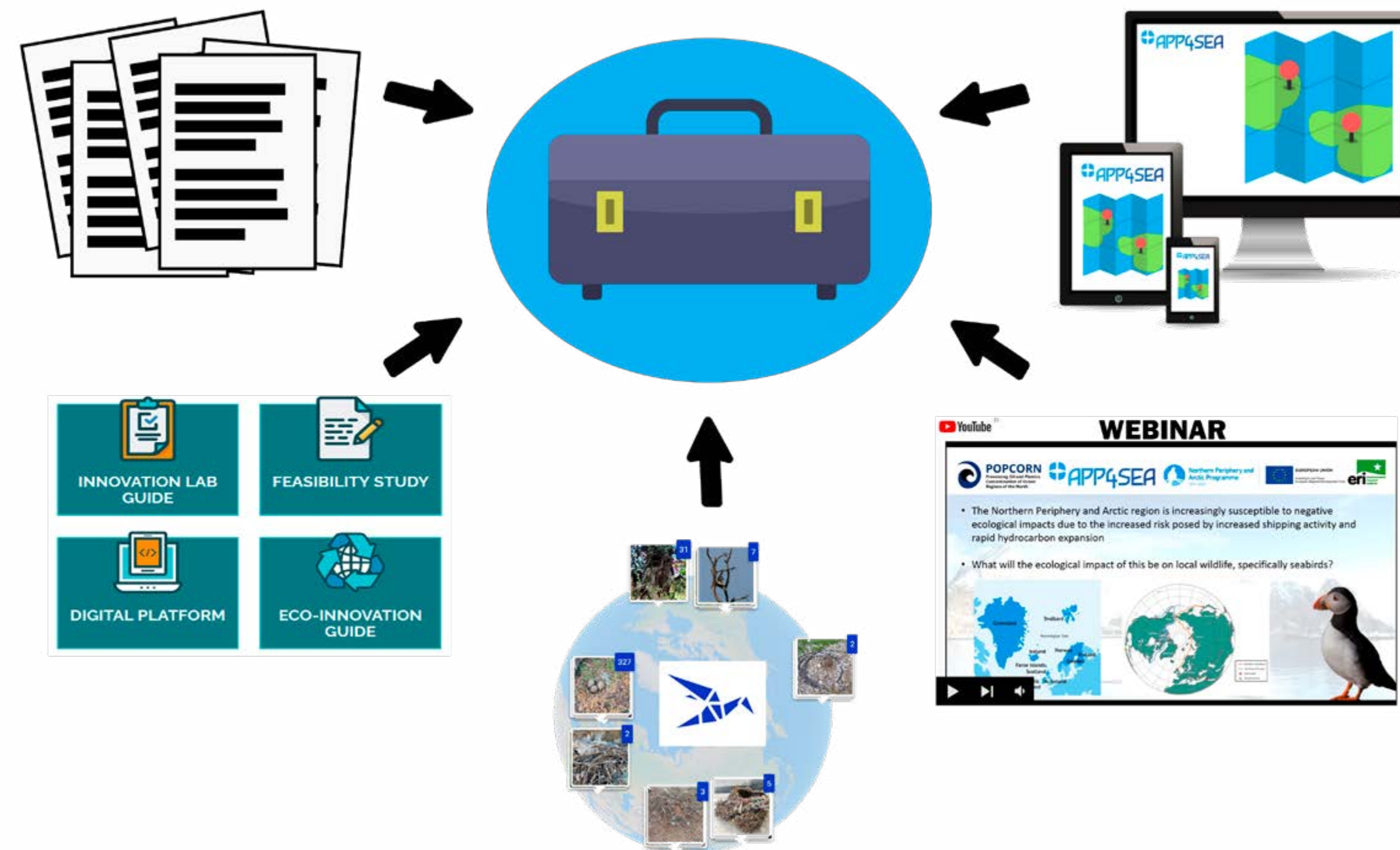
# The POPCORN toolkit about oil spills and plastic pollution

As was mentioned in the introduction, **POPCORN** project was set up as a clustering project to promote the outcomes of previously implemented projects and to introduce them to potential users, who are not aware of them yet. **APP4SEA, OIL SPILL, Circular Economy** and **Blue Circular Economy** projects have created, collected, and laid out different kinds of reports, methods, presentations and other tools, which can help experts upgrade their skillsets to deal with marine pollution. Having these documents in just one location, makes them more accessible for experts and others, who are looking for this information.

These materials, which range from oil spill response infrastructure in the NPA region report to Birds and debris website have been collected to [POPCORN website](#), where they can be viewed or downloaded. This toolkit is arranged thematically into an accordion and can be found under [Resources](#).

If you are tired of reading reports, no worries! We also added the webinars that were organised in the four participating projects to help you learn more about how to combat oil spills and solve the issues

with marine plastic pollution. In addition to this, a couple of webinars were organised also during POPCORN and these webinar presentations can be found also from the [POPCORN toolkit](#).





# Under the Surface podcasts



As part of the **POPCORN project**, a new podcast series was launched to take closer look at research and innovation surrounding oil and plastics pollution in the north. **Under the Surface: The Pollution Experience** aims to enlighten those wishing to find out more about the challenges and opportunities that marine pollution brings, and the latest novel approaches in tackling oil and plastics in our seas.

In each episodes, host **Dr Neil James**, from the **Environmental Research Institute, UHI North Highland**, talks to an expert guest about their work, to explore and the get to know the people behind efforts helping to measure and reduce the impact of marine oil and plastics pollution.

Under the Surface: The Pollution Experience, has featured episodes on a range of topics and fields including the ingestion, entanglement and nest incorporation of plastics by birds, microplastics and citizen science, marine plastics and the circular economy, APP4SEA, oil spills and the role volunteers, remote sensing of marine plastics, and the lifecycle management of fishing gear.

The podcast is available online at [anchor.fm/underthesurface](https://anchor.fm/underthesurface), and also through all major podcast providers including Amazon Music, Apple Podcasts, Google Podcasts, and Spotify.

APP4SEA – Seabirds & Nest Incorporation of Plastics – Remote Sensing of Marine Plastics – Fishing Gear Management in Norway – Microplastics and Citizen Science  
 Niko Hänninen  
 Dr Nina O'Hanlon  
 Dr Lonneke Goddijn-Murphy  
 Dr Paritosh Deshpande  
 Dr Alex Bond  
 Prof Martin Charter  
 Dr Lola Paradinas  
 and more!



# POPCORN final conference – tweeting around the world

Covid challenged international collaboration during the pandemic, as traveling was restricted and lockdowns were put in place. But where there is a problem, there is also a solution! In April 2020, we took the final conference of the **APP4SEA** project to Twitter. It was a great success, which prompted us to repeat this feat in **POPCORN** two years later.

This conference did not focus only on POPCORN outputs. Oil spill response and marine litter issues were presented in greater detail by experts from Europe and farther away. The presentations included various topics, of which many – but not all – have found their way on the pages of this brochure as well. The full conference programme can be found [here](#).

Having the final conference in Twitter had several benefits when compared to traditional, physical final conferences. Going online made it possible, for example, that **Joel Baziuk** from **Global Ghost Gear Initiative** could deliver a keynote presentation about plastics litter without travelling from California to Europe. In a similar way, the final conference could be attended regardless of location by following it live in Twitter as the events unfolded.

The presentations can still be found from Twitter with the hashtag **#POPCORN2022**. Since the tweets are there forever and ever, the final conference does not actually have an end date. The tweets can still be commented and liked, and even questions can be asked from the presenters by replying to these individual tweets.



## POPCORN 2022 Twitter Conference

The tweets by chair and presenters of the POPCORN final conference, held on 21st of June 2022 –search #POPCORN to find the whole thread in Twitter

The proceedings of the conference, so to said, have also been published. Thanks to the marvels of modern IT-technology, the collection of the tweets can be found from the [Under the Surface wakelet](#).





## Under the surface – marine pollution issues

POPCORN – Preventing Oil and Plastics Contamination of Ocean Regions of the North – is a Northern Periphery and Arctic 2014-2020 programme clustering project. The project brought together four projects – APP4SEA, OIL SPILL, Circular Ocean and Blue Circular Economy – which were working with marine pollution issues.

**[popcorn.interreg-npa.eu](http://popcorn.interreg-npa.eu)**

