



INCREASING ENVIRONMENTAL PRESSURE ON NORTH POLE

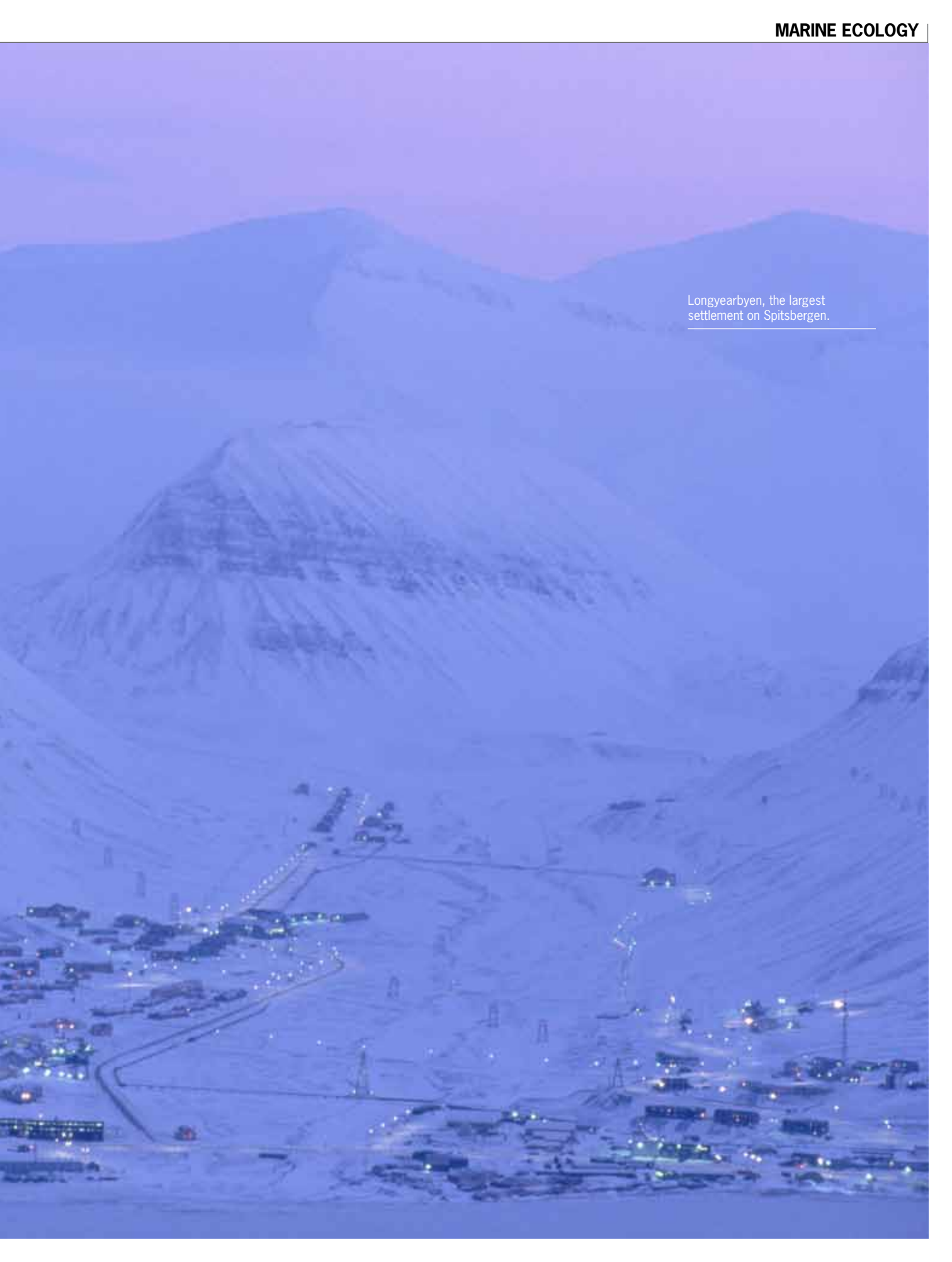
# Of polar bears and oil

The disappearance of the ice in the North Pole region is opening up new prospects for oil and gas extraction. Wageningen UR's Arctic Programme is laying the foundations for an understanding of the effects of new activities on the ecosystem. 'Where is it OK and where is it not? This discussion must be based on independent scientific knowledge.'

TEXT ARNO VAN 'T HOOG ILLUSTRATION MARTIJN BOUDESTIJN PHOTOGRAPHY CORBIS AND HOLLANDSE HOOGTE

Longyearbyen, the largest  
settlement on Spitsbergen.

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**T**he summer of 2013 was wet in Ny-Ålesund, in the northwest of Spitsbergen. Researcher Martine van den Heuvel-Greve and programme manager Bas Bolman, both from IMARES Wageningen UR, regularly got soaking wet. So much is clear from the documentary Knowledge for a sustainable North Pole, by cameraman Ruben Kocx.

Rain is a sign that something is changing on this bleak archipelago, which lies about 1200 kilometres from the North Pole. More rain is part of climate change, as are the receding glaciers around Ny-Ålesund, which are now more than 500 metres shorter than they were 40 years ago.

Gradually rising temperatures are also the reason why the amount of sea ice around the North Pole in the summer is rapidly shrinking. This is leading to new shipping routes being opened up, and northern countries laying claims to the sea bed way beyond their territorial waters. They want their share of the treasures that may lie hidden there.



**MARTINE VAN DEN HEUVEL-GREVE,**  
Researcher IMARES  
Wageningen UR

**'To acquire really relevant knowledge you do need to work in the region itself'**

The urge to explore the northern regions is nothing new in itself, says Bas Bolman. 'People have been coming here for hundreds of years. Willen Barentsz discovered Spitsbergen during his search for a northern passage; the Dutch set up whale oil refineries in the 17th century.' An old steam train in Ny-Ålesund is a reminder of the coal mines that were in operation there between 1916 and 1962.

But the interests that are at stake today are considerably bigger. 'At a guess, 13 percent of the world's oil stocks and 30 percent of its gas are at the bottom of the Arctic Ocean,' says Bolman. 'Less ice means better access, while rising gas and oil prices make it increasingly profitable to invest in extraction in the region. These trends are bringing extreme areas more and more into the picture.'

This carries risks that are not present in more temperate regions. Bolman: 'An iceberg can scrape the seabed and damage a pipeline if it is not buried deep enough. The oil that is released gets locked up in the ice in the winter. The ice moves and can melt somewhere else in the summer, bringing the oil to the surface elsewhere. We don't really know yet how to deal with that.' The environment in cold regions is often fragile, too, says Bolman. 'The North Pole has many different ecosystems which are all coming under pressure from climate change. Human activities come on top of that. There is a debate going on about which activities are permissible here. Where is an activity OK and where is it not? And if it is OK, under what conditions and at what time of year? That discussion must be based on independent scientific knowledge. And that is precisely our role.'

#### **CHEMICALS IN SEABEDS**

Most research begins with collecting data about the current state of a region. Martine van den Heuvel-Greve has completed an initial study of the pollution of Spitsbergen

harbours with chemicals from ships' hulls. These toxic substances – organotin compounds – were added to marine paint for decades in order to deter algae and shellfish from growing on the hull. However, the toxins leak from the paint, thus polluting the beds of harbours and along busy shipping routes, disturbing the reproduction of slugs living there. An international treaty banning these substances has been in place since 2008, but it has not been ratified by all shipping countries.

Studies of sludge from harbours along the east coast of Spitsbergen have indeed revealed traces of organotin. 'But the levels are low compared to large European ports,' says Van den Heuvel. 'We haven't seen any effects on the slugs we examined on the spot. We took these measurements primarily to have them as a reference point for the future.' All the indications are that shipping traffic in the North Pole region will increase when new shipping routes thaw out. 'If monitoring shows that the organotin level goes up, that provides a basis for intervening. With a ban on the use of this kind of paint on ships plying northern routes, for instance.'

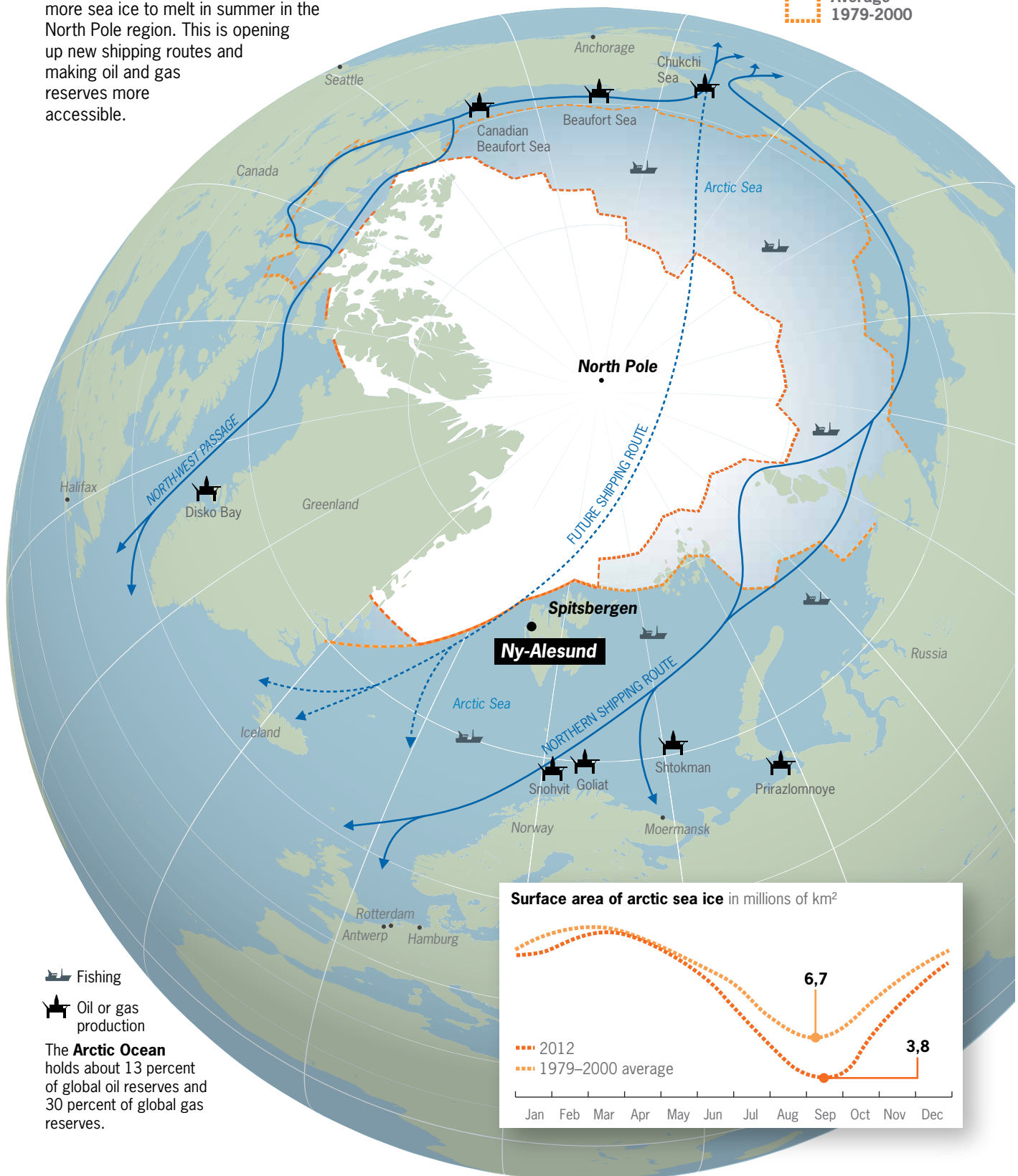
PhD student Ariadna Szczybelski at Wageningen University, part of Wageningen UR, worked on another project to develop so-called bio-indicators for the effects of oil and gas extraction. To do this, over the past year, Szczybelski sank a mud sampler to the seabed at several locations around Spitsbergen, collecting sea soil and animals such as various species of marine worms and shellfish.

These data are now being analysed. The aim is to develop a monitoring instrument, with marine fauna serving as living measuring instruments. If the condition of species deteriorates or their numbers drop, this could be a sign of pollution or stress. Van den Heuvel: 'First of all we collect the seabed samples in order to find out which substances are found in the seabed. >

## THE NORTH POLE BECKONS

Warmer temperatures are causing more and more sea ice to melt in summer in the North Pole region. This is opening up new shipping routes and making oil and gas reserves more accessible.

Limit summer ice   26 August 2012  
New all-time low  
  Average  
1979-2000



Fishing

Oil or gas production

The **Arctic Ocean** holds about 13 percent of global oil reserves and 30 percent of global gas reserves.



Then we do targeted experiments in the lab to study what the effects are on the common species there. They could be combinations of stress factors such as pollution and warming.'

### ARMED WITH A GUN

The Dutch research station in Ny-Ålesund, managed by Maarten Loonen of the Arctic Centre at the University of Groningen, plays a key role, as the IMARES researcher is at pains to emphasize. 'You can do a lot in the Netherlands, but in order to acquire really relevant knowledge, you do need to work in the region itself. There is a big international community there, all working on the science, and that collaboration is very stimulating. People exchange information and you go out for meals together to discuss your research; it is a sort of continuous scientific conference.'

Ny-Ålesund is one of the few research areas where a gun is a compulsory part of a researcher's fieldwork equipment. You never know when a hungry polar bear is going to show up. For the same reason, researchers always go out in pairs at least, and one of those present must have passed the polar bear and shooting course.

Most of the research focuses on the life in the seabed around Spitsbergen. At first glance, the fauna on the bottom of the Arctic Ocean is not very different to that in the North Sea, but the food web works very differently due to the extreme conditions. Food chains are often shorter, Van den Heuvel explains. 'There are shellfish living in the seabed, for instance, which eat algae and waste particles. Those shellfish are on the menu of walrus. So there is only one step between the alga and the walrus. If the shellfish disappear from an area, the walrus has to look for other food. In other words, the dependencies in feeding relationships are bigger than they are in the North Sea. Another factor is the extremely short growing season. There is no autumn or spring, only a long



‘If the shellfish disappear  
the walrus has to look for  
other food’

Walrus, a whale and a polar bear in the North Pole region. Their habitat is under pressure from climate change and receding ice.

dark winter and a short summer with a lot of light and a brief period when temperatures rise. One way of adapting to that is that species grow slowly and can get very old.'

### TREATING BALLAST WATER

Freezing temperatures also mean that tried and tested strategies in the maritime sector work differently. One example is the chemical treatment of ballast water. Big ships fill tanks with seawater in order to stabilize the hull. In the process, small fish, algae and crab larvae can be sucked into the tanks. When they are emptied when the ship loads cargo in a port on another continent, undesirable exotics can get a foothold. On order to prevent that, the ballast water is often treated with chemical biocides to kill off any life present. 'It is questionable whether a chemical treatment of this kind works as well in severely cold conditions,' says Van den Heuvel. 'We don't know whether the sea life here is just as sensitive to biocides and whether the biocide is broken down as quickly after it has done its work. It is important that it is deactivated before it is dumped in the sea, otherwise it will damage the local marine fauna. Our initial experiments suggest that the biocides are just as effective at low temperatures. But there are indications that they break down more slowly, so you should wait a bit longer before dumping the ballast water.'

There is a lot of uncertainty surrounding the consequences of gas and oil extraction, too. Environmental organizations are concerned about what would happen if there was an oil disaster. Cold and ice make oil and chemicals much thicker, so it is not certain that standard methods of dealing with such disasters would work. The use of dispersants on oil seems to be less effective in cold tem-

peratures; and the question remains of precisely what happens when oil particles and dispersant reach the bottom of the Arctic Ocean.

That is one of the research questions Wageningen professor of Toxicology Tinka Murk is involved in addressing, on the strength of her research on the effects of the cleanup operations after the oil spill in the Gulf of Mexico. She is one of many Wageningen experts contributing to the Arctic Programme, on which about 2 million euros will be spent between 2012 and 2016. Bolman: 'IMARES may be leading the programme but there are many other institutes taking part. For example, agricultural economics institute LEI Wageningen and environmental institute Alterra Wageningen UR are studying the impact of developments on people in the polar region. This includes an overview of the rules and regulations and of the interests of indigenous and foreign residents. Actually you study the impact of developments in the area in the same way as the research on nature does, only in this case it focuses on people and society.'

### LEAST DAMAGING TECHNIQUE

The aim of one of the projects is to create a Handbook for Arctic Operations. This Joint Industry Project, as it is called, is drawing up guidelines for offshore and marine engineering activities in northern regions. 'This partly revolves around the question of how to get the measure of environmental pressure. This means a company can work through a checklist of relevant points for attention in evaluating activities in a region. In the end, that should help companies and those issuing licenses to select the least damaging techniques,' says Bolman. One of the participants is Boskalis, a maritime contractor and dredging company which is not yet active in the polar region. According to Peter Hendrickx, engineer and Arctic expert with Boskalis's consultancy bureau, finding and then extracting oil and gas in the polar



**BAS BOLMAN,**  
Programme manager IMARES  
Wageningen UR

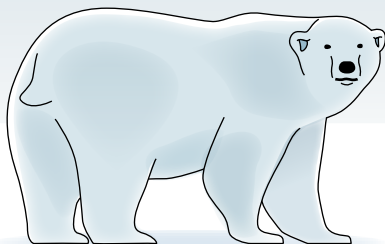
**'An iceberg can scrape the seabed and damage a pipeline if it is not buried deep enough'**

region is a long-term project. 'It will take many years yet before it really happens.' Until then there are various questions to be answered, thinks Hendrickx. 'There are international norms for the design of offshore installations in the polar region, but there are no guidelines for how they are installed. That is all about the implementation: how you do the dredging, how you look out for the environment. In the Handbook for Arctic Operations we want to line up the available knowledge and experience, partly also to get a sense of what is still missing.' According to Hendrickx, there is still a fundamental lack of ecological knowledge. 'Before we can set to work somewhere, we want to have an impression of what is going on there. For many areas, that is still not known, which is part of the problem. A second issue is ice and extreme weather: there can be heavy storms in the polar region in the summer. You are far from civilization and in winter there is very little daylight. These conditions call for all sorts of new >

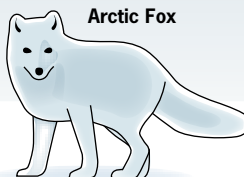
## INVESTIGATING EFFECTS OF NORTH POLE EXPLOITATION

The North Pole has several ecosystems, characterized by short food chains, which make them extra vulnerable. Climate change is putting them under pressure. Human activities come on top of this.

Polar bear

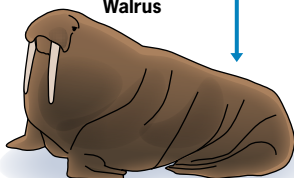


Arctic Fox



Research should show what effects pollutants have on the animals.

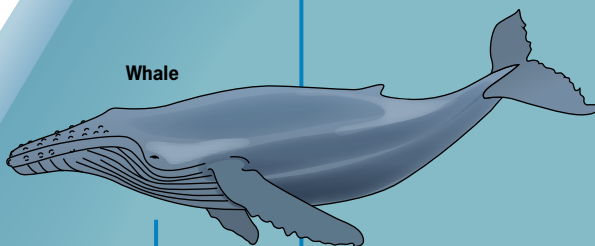
Walrus



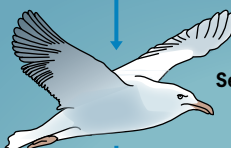
Seal



Whale



Sea birds

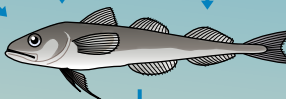


Shellfish



Research is being done on which animal species could serve as indicator species for the state of the ecosystem.

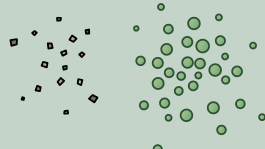
Fish



Krill



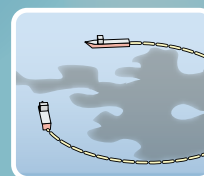
Algae and waste particles



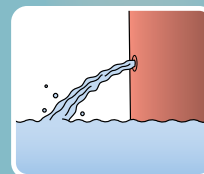
### Threats



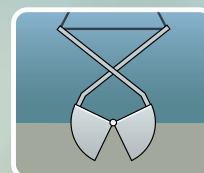
Shipping and oil and gas extraction carry risks for the ecosystem.



Research is being done on whether standard oil-clearing techniques work under cold and icy conditions.



The behaviour in cold conditions of substances that clean ballast water is being studied, as is their effect on marine life.



Research should clarify which chemicals occur in seabeds and seabed life.

facilities and safety measures for our staff, such as medical facilities.'

### CAMPAIGNERS ARRESTED

The search for oil and gas around the North Pole is attracting plenty of interest from the public, especially since Greenpeace campaigners climbed onto a northern drilling rig in September in protest, and were arrested. 'Of course you can dispute whether erecting infrastructure isn't fundamentally in conflict with sustainability,' says Diana van Minnen - de Kroon, senior communication advisor at Boskalis. 'The issue of principle as to whether or not to extract oil and gas in the Arctic region is a social and political one.' If you want infrastructure, we are the people to ask. We can do it in a way that at least minimizes the environmental impact of the implementation, and which lim-

its the long-term effects of it as well.'

Scientific research and smart assessment instruments do not in themselves deliver licenses, certification or a stamp of approval for activities. Research cannot tell us what is the most desirable line of action in developing the polar region – insofar as there is any consensus about that. 'We deliver the knowledge, and the client can take decisions on the basis of that knowledge,' says researcher Van den Heuvel. Bolman adds: 'It is of course in the interests of companies and governments to demonstrate that they are dealing with the environment responsibly, for example by showing that they leave certain areas in peace because they are too easily disturbed.'

In heated public debates, research is often the target of criticism, such as accusations that research results are influenced by the

client. According to Bolman and Van den Heuvel, the Arctic Programme will be able to forestall that criticism by laying a firm foundation with a self-funded research programme.

Bolman: 'Where possible in contract research you involve parties which have the opposite interests, like companies and nature conservation organizations. Like that you can weigh up different points of view and opinions. But even then, all we can do is measure the potential effects on the ecosystem. Whether they are permissible is not for the scientists to decide. We try to understand the system and where possible to make predictions. After that it is up to the international community to put our findings to use.' ■

[www.wageningenur.nl/arctic](http://www.wageningenur.nl/arctic)

**'Whether the effects on the ecosystem are permissible is not for scientists to decide'**

Film 'Kennis voor een duurzame Noordpool', in Dutch:



### ARCTIC PROGRAMME

Wageningen UR's Arctic Programme focuses on identifying and limiting the potential pressure on societies and environments in the North Pole region resulting from oil and gas extraction, shipping, tourism and fisheries.

The subject matter of the projects varies from governance and the use of natural resources, to climate predictions and bio-indicators. They include both applied research projects involving companies, environmental organizations, governments and knowledge institutions, and more fundamental research by PhD students on subjects such as the management and use of natu-

ral resources and innovative ways of measuring the quality of the Arctic marine environment. There are also educational projects, such as courses for Russian and Dutch companies, or a guest lecture on the Minor in Oil & Gas at NHL University of Applied Sciences in Den Helder.

The Arctic Programme is funded to the tune of about 2 million euros between 2012 and 2016 by the Dutch research organization NWO's Polar Programme, the Maritime Campus Netherlands, the European Fund for Regional Development, the Dutch ministry of Economic Affairs, TripleP@Sea and the business world.