

Integrating Activities for Advanced Communities



D3.7: Training material and guidelines for four station management relevant courses

Project No.730938– INTERACT

H2020-INFRAIA-2016-2017/H2020-INFRAIA-2016-1

Start date of project: 2016/10/01

Duration: 48 months

Due date of deliverable: 2020/06/30 (Mx)

Actual Submission date: 2020/09/04

Lead partner for deliverable: AU

Author: Elmer Topp-Jørgensen

Dissemination Level		
PU	Public	X
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the Consortium (including the Commission Services)	
CO	Confidential, only for members of the Consortium (including the Commission Services)	

Executive Summary

Meetings in the INTERACT Station Managers' Forum were used as a platform for safety courses arranged by the Arctic Safety Centre, University Centre (UNIS) on Svalbard, Norway. Four safety courses were held on following topics:

1. Arctic safety equipment and Basic Arctic Safety course summer and autumn
2. Safety course for arctic Field Station leaders
3. Arctic safety communication and positioning systems
4. Managing risks – a model for risk assessments

UNIS worked closely with INTERACT station managers to identify relevant themes and develop contents for the safety courses. Three courses were held at INTERACT Station Managers' Forum meetings, while one comprehensive course was held in Svalbard to allow practical field safety exercises as part of the week-long course.

All station participants at the SMF meetings participated in the courses along with key presenters and representatives of other work packages. For the fourth course on Risk management, UNIS teamed up with an external partner, University College Copenhagen. Their experience in working with risk management tools in theory and practice when setting up remote arctic field camps is highly relevant for stations working systematically to reduce risks when working in an arctic environment.

Experiences and material from the courses has also contributed to other tasks and deliverables in the Station Managers' Forum, e.g. INTERACT Fieldwork Planning Handbook and INTERACT Practical Field Guide.

Introduction

This deliverable *D3.7: Training material and guidelines for four station management relevant courses* is a subtask under *Task 3.3 First Class Science Support* in WP3 that will provide expert training for station managers and staff through courses arranged for INTERACT station staff to improve and harmonize management procedures and services offered to the users.

UNIS has been organizing courses in close cooperation with station managers, SMF staff and external collaborators. This led to the development of course materials for four courses that constitute this deliverable. The introduction briefly introduces the courses and their topics followed by course materials for the four courses.

Training course 1

Arctic safety equipment and Basic Arctic Safety course summer and autumn

On 23 October 2017, UNIS gave an overview of its activities, presented 'state of the art' Arctic safety equipment and held a Basic Arctic Safety course for managers of 42 INTERACT stations. UNIS presented a plan for the three courses to be held at Station Managers' Forum meetings and a course held separately at UNIS on Svalbard. The UNIS courses held during INTERACT meetings are thematic theoretical courses, while the course in Svalbard will be comprehensive and include practical safety exercises. Hereafter, UNIS conducted a basic arctic field safety course and showed procedures, facilities and equipment available at UNIS. See course material below.

Training course 2

Safety course for arctic Field Station leaders

From 1–8 October 2018, ten highly qualified and experienced researchers attended the Safety Course for Arctic Field Station leaders. During this week, the participants got introductions and training regarding roles and responsibilities and they trained on cold climate and navigation. Safety in relation to wildlife was a subject and the participants practiced polar bear protection skills. A day on glacier awareness and rescue was also carried out. All this was done while staying in a camp in Ymerbukta in Svalbard. After some days in camp the course continued in Longyearbyen and the subjects there were risk assessment in relation to first aid, cold climate challenges, challenges related to working environment in remote locations, snowmobiles and safety and ended with maritime safety and training. The participants also created training scenarios for field stations related to the role of a station leader. It was an interactive course where the participants contributed with sharing of experiences and competence. The engaged group of participants was key to the learning outcome of the pilot course. See course material below.

Training course 3

Arctic communication and positioning systems

On 5 February 2020, UNIS gave a lecture on available means on communication and positioning systems of relevance to Arctic fieldwork for managers of 42 INTERACT stations and representatives of other INTERACT WPs. The course included pros and cons of different Satellite phones, Emergency Beacons, VHF radios, InReach, Maps and compasses and GPS equipment, supplemented with experiences from station managers. The courses also gave a glimpse into the future by informing about potential new options with Low Earth Orbit satellites, NarrowBandwidth and LowPower WideArea Networks.

See course material below.

Training course 4

Managing risks – a model for risk assessments

On 22 September 2020, Managers of INTERACT Stations will participate in this course at the final Station Managers' Forum meeting of INTERACT II. At the request of station managers, the theme for the course is Risk management. SMF and UNIS has teamed up with the University College Copenhagen, who will present a risk management tool useful for risk assessments at arctic research stations. Due to COVID-19, this course will be held online as part of the online General Assembly of INTERACT II. Managers of 88 station have been invited for the meeting.

See course material below.

Appendices:

UNIS safety course 1 – Safety equipment and Basic Arctic Safety summer and fall

UNIS safety course 2 – Safety Course for Arctic Field Stations (one week)

UNIS safety course 3 – Arctic communication and positioning systems

UNIS safety course 4 – Risk management – a model for risk assessments

Appendix 1

Field safety & emergency equipment



Rifle & signal pistol

- Bolt action rifle -10 rounds hunting ammunition. All UNIS rifles are cal. 30-06.
- A signal pistol is the best way to scare off bears. Always carry a signal pistol in addition to the rifle.
- Take good care of your weapons – check daily, keep clean!



Communication

- **Emergency beacon**
 - Emergency help transmitter
- **Satellite telephone**
 - Works everywhere
 - Daily contact to UNIS etc.
 - Emergency contact
- **VHF Radio**
 - Contact between field groups
 - Contact to boats/ships ch16



- Carry always with you !
- Satphone & VHF **extra batteries + possible charger for longer trips**

Emergency beacon

- Only in real emergency situations when satellite phone is not an option
- Transmits emergency signal & position through satellites when released.
- Can not communicate or give any details about emergency

1



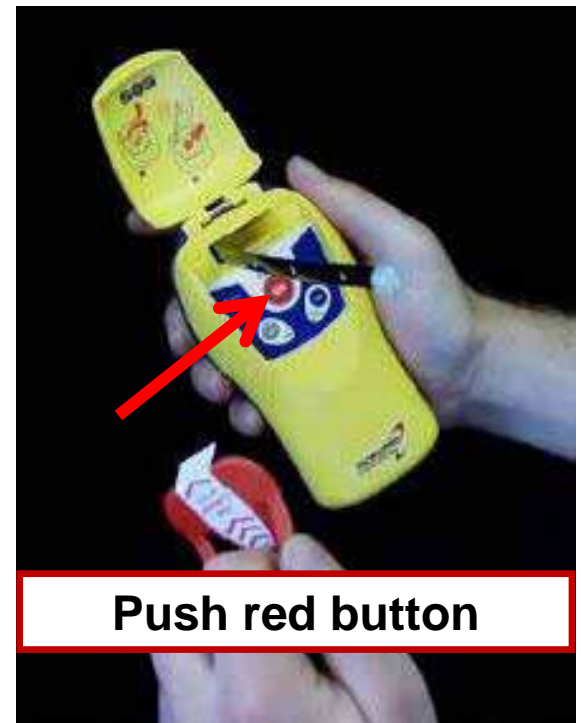
Open

2



Release cover

3



Push red button

Map & compass & GPS

- Always bring map and compass
- Maps 1:100 000 (1cm=1km)
- GPS is only navigation aid!
Bring warm extra batteries.
- Low clouds & fog higher in the terrain & on the sea → no visibility + no landmarks
- Know where you are & where your camp/boat/pick up point is – use waypoints/tracks



Equipment day-long excursions

- Insulated, windproof bivouac bag (Jervenduk)
- Sleeping pad / sitting pad
- First aid kit
- Thermos with warm drink
- Extra food + snacks
- Extra clothing (**hat + gloves!**)
- Rifle & signal pistol
- Communication & contact numbers
- Map & compass & GPS



Safety boat boxes

Engine & boat Box:

- Extra Rope
- Fire extinguisher
- 4-stroke Engine oil
- Extra fuel hose for engine
- Spare propeller
- Fuel filling funnel
- Spare parts for propeller change, extra start plugs, extra wheel bolts
- Extra emergency stop cord
- Repair kit for holes in the pontoons

- 2 emergency flares
- Pump & hose
- Air pressure meter
- Throw rope
- Drifting anchor
- Radar reflector
- Rolling help tube
- Bailing device



Field & Safety Equipment



Content in «Grab / beach bag»

- Tent
- Insulated wind proof bag (Jerven duk)
- 1 sleeping mat
- 12 pk dehydrated food
- 1L fuel
- 1 stove
- 1 kettle
- 1 emergency, insulated blanket
- Tape
- Matches
- Flash light
- Water bottle
- Extra ammunition for flare gun



Emergency camp kit



Before going into the field

- The Buddy System
- Self rescue
- Rescue others





Why do we bring emergency equipment?

The purpose is to have equipment at hand so we can handle unwanted incidents that could happen in the field:

1. Accidents in the group
2. Bad weather situations
3. Assist other field groups asking for help

Emergency equipment

- **When travelling in the field, we will always bring with us some type of emergency equipment.**
- **Depending on the type of activity, this is the set up for a UNIS excursion:**
 - 1. Communication equipment:**
 - Satellite phone
 - Emergency beacon
 - VHF radio
 - Cell phone
 - 2. Navigation equipment:**
 - Map
 - Compass
 - GPS
 - 3. Polar bear protection equipment:**
 - Rifle
 - Deterrent equipment: signal pistol

Emergency equipment

1. **Emergency camp box:**
 - Camp equipment
 - First aid equipment
 - Equipment for giving first aid to a patient suffering from hypothermia
 - Sea ice rescue equipment (survival suit)
 - Equipment for shelter and warming
 - Extra food and drink
2. **Glacier rescue equipment box:**
 - Rescue equipment for crevasse accidents on a glacier
3. **Avalanche rescue equipment:**
 - Avalanche beacon
 - Probe (mounted on the snowmobile)
 - Shovel (mounted on the snowmobile)
4. **Sea ice rescue equipment:**
 - Ice spikes
 - Rescue rope
 - Survival suit (in the emergency camp box)

We will not necessarily bring all this equipment for all types of excursions, but it would be adapted to the type of activity – but if you leave for a scooter excursion, the minimum to bring is the emergency box, polar bear protection- and avalanche rescue equipment

Contents of the emergency box

The box have equipmet for 8 people:

- Tent
- Tent peg for use in snow (10 units)
- Sleeping bag
- Rescue bag, Jerven (1 unit)
- Rescue blanket, Blizzard (3 units)
- Survival suit, passenger typet
- Groundsheet for camping
- Groundsheet for sitting (3 units, double)
- Emergency food (2 units)
- Drinking powder (cocoa, 1 l)
- Primus (MSR XGK EX 2 units)
- Fuelbottle 1 l (4 units)
- Matchbox (2 units)
- Nalgene bottle
- Camping casserole
- Cup (3 units)
- Headlamp (2 units)
- Cap
- Mitten
- Balaclava
- First Aid kit, incl. SAM splint and pain killers
- Shovel
- Avalanche probe (2 units)
- Lightstick (2 units)
- Trip wire kit incl.poles
- Funnel
- Flexible tube



Contents of the emergency box



Contents of the emergency box



Bottom



In the midst of the box

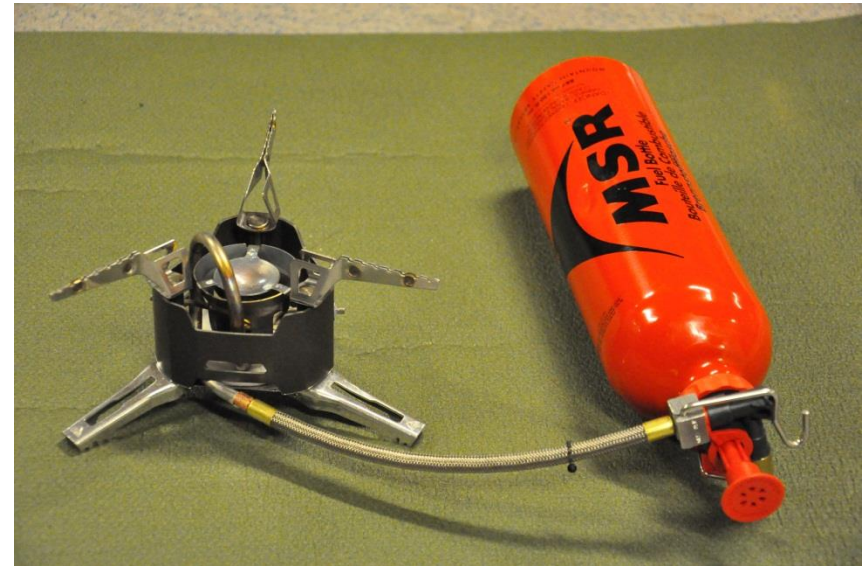


Top

Contents of the emergency box



Stored inside the camping
casserole



Primus, MSR XGK EX with
fuel bottle



WRAP – Hibler's method



vapor barrier – insulation – windproof barrier

Appendix 2

Field Safety Summer & Autumn

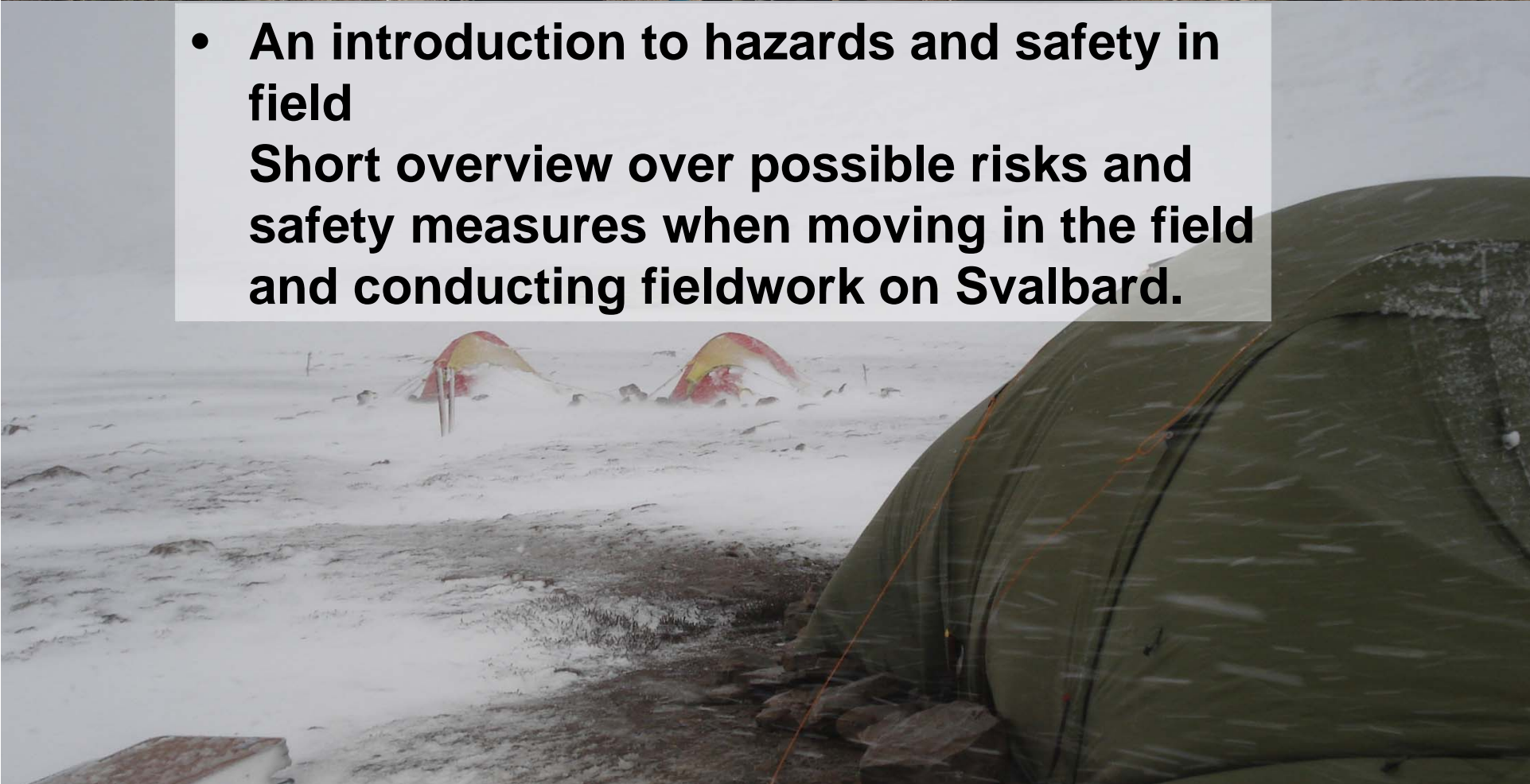
Info Lecture





Objective of this Info Lecture

- **An introduction to hazards and safety in field**
Short overview over possible risks and safety measures when moving in the field and conducting fieldwork on Svalbard.



1. Identify the hazards

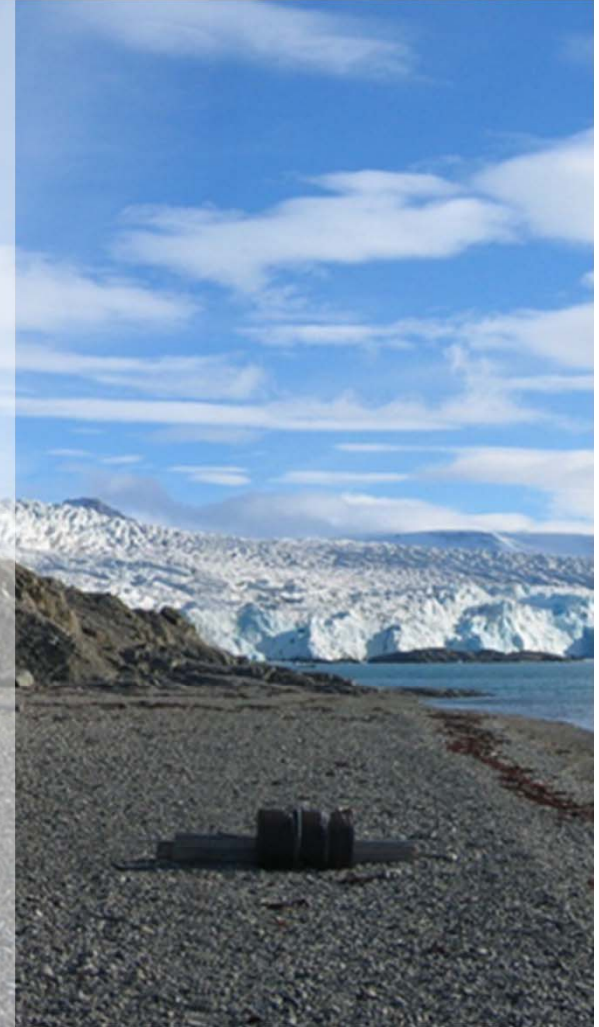
2. Minimize the risk

3. Rescue



Risks and safety measures in the field

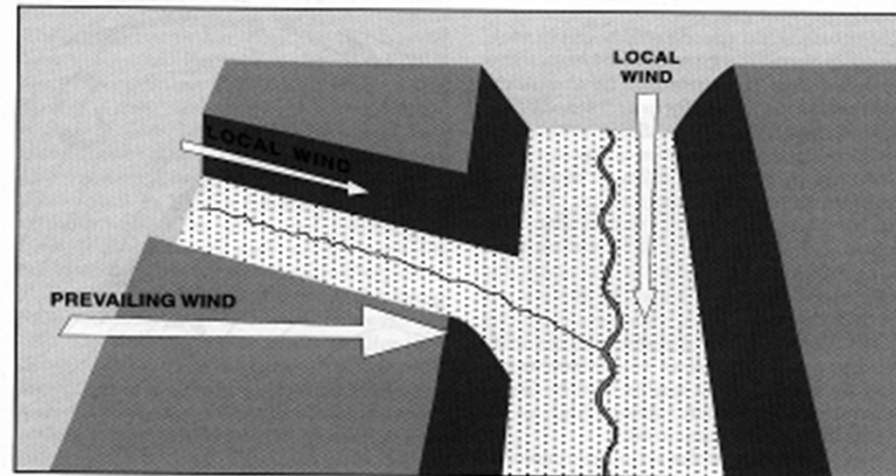
- Weather
- Clothing
- Travelling at sea
- Movement on sea ice
- Glaciers
- Steep mountain terrain
- Hiking on tundra
- Wildlife
- Tent camp
- Field safety equipment
- Transport with plane and helicopter
- Safety routines connected to fieldwork
- Some special environmental rules on Svalbard



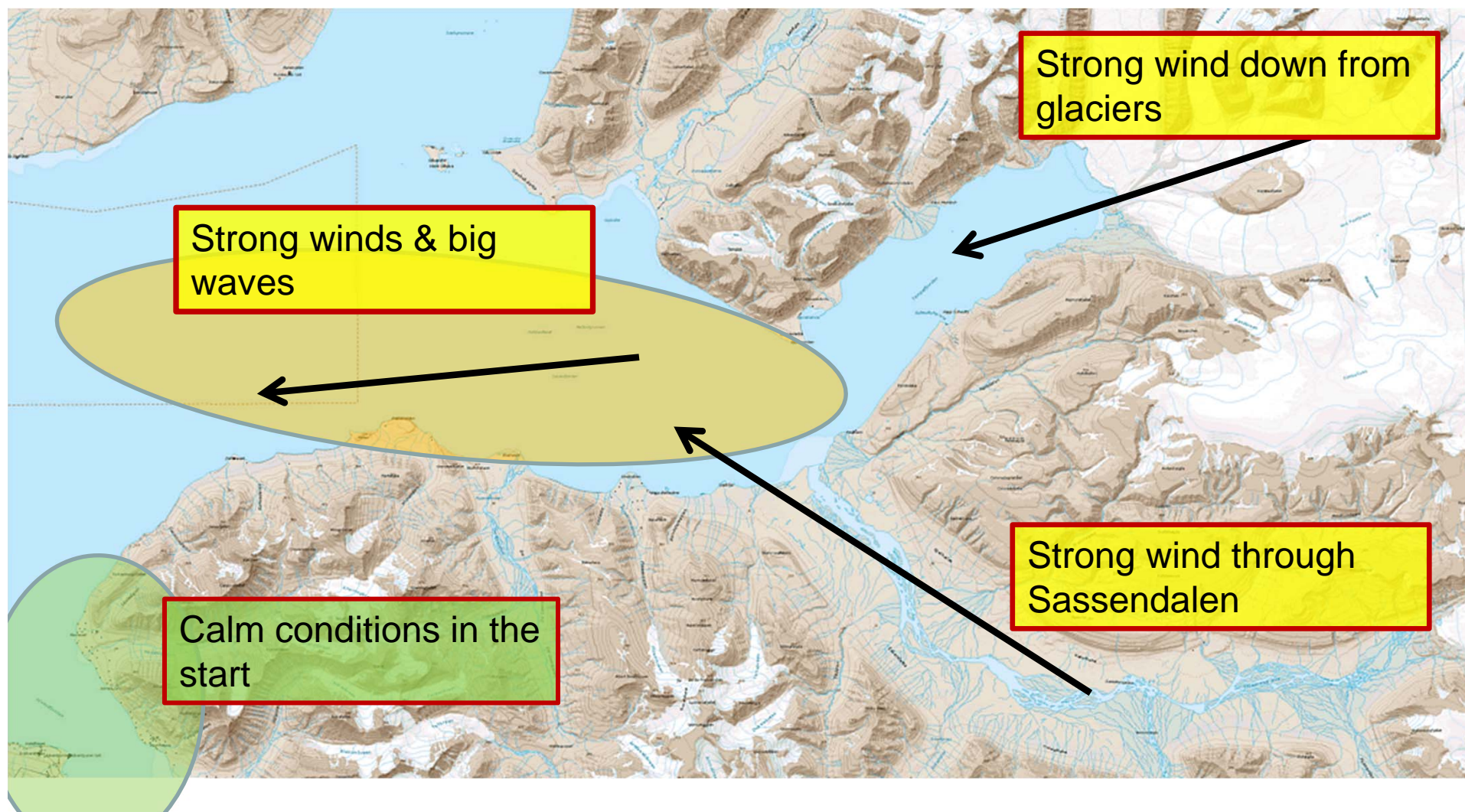
The weather on Svalbard

- Hard to predict the weather
- Big local variations.
- The weather may change very rapidly.
- Average temp. summertime: **2°C - 6°C**
- Arctic fog & low clouds common → low visibility
- Often windy → wind chill, boat travel, wind channelled through valleys and glaciers

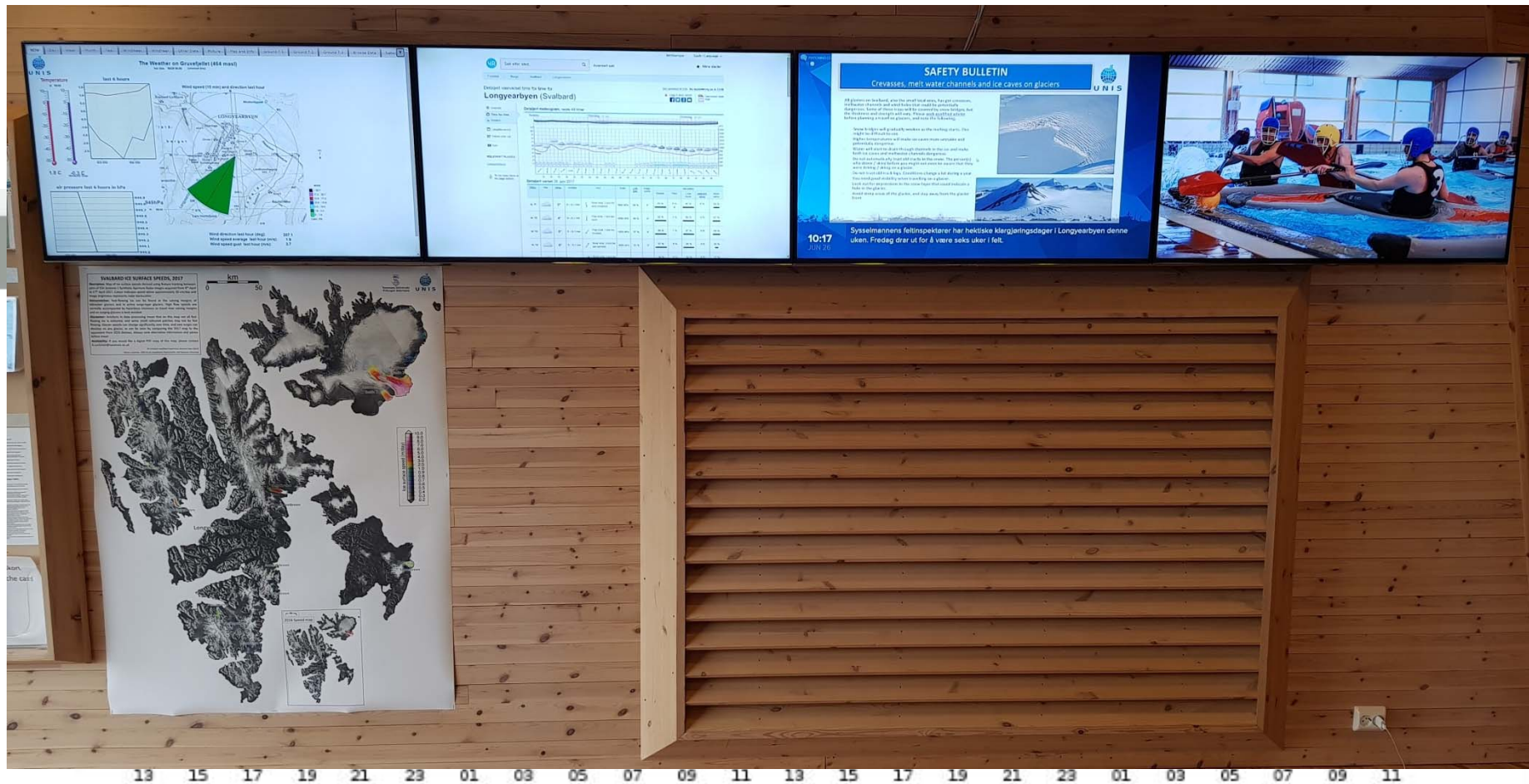
Chilly & windy & exposed



Local east-northeast wind conditions



Meteogram Weather forecast



Also: www.yr.no

Clothing suited for fieldwork

- Clothing must be adapted to the activity → several layers
- In general same clothing as in the mountains of Scandinavia or Alps during Autumn.
- Strong, stable hiking boots – sometimes rubber boots
- **Headwear, gloves and socks. Have extras!**
- **Always carry extra layers & spare clothing!**
- **Windproof !**



Hiking on Tundra

- Many small and larger rivers
- Sediments in the water → difficult to cross rivers
- Permafrost; only the upper layer will melt – soft, wet terrain

Terrain cover mostly either:

- Wet soft terrain – especially early season
- Uneven hard rocky, moraine terrain with sharp rocks



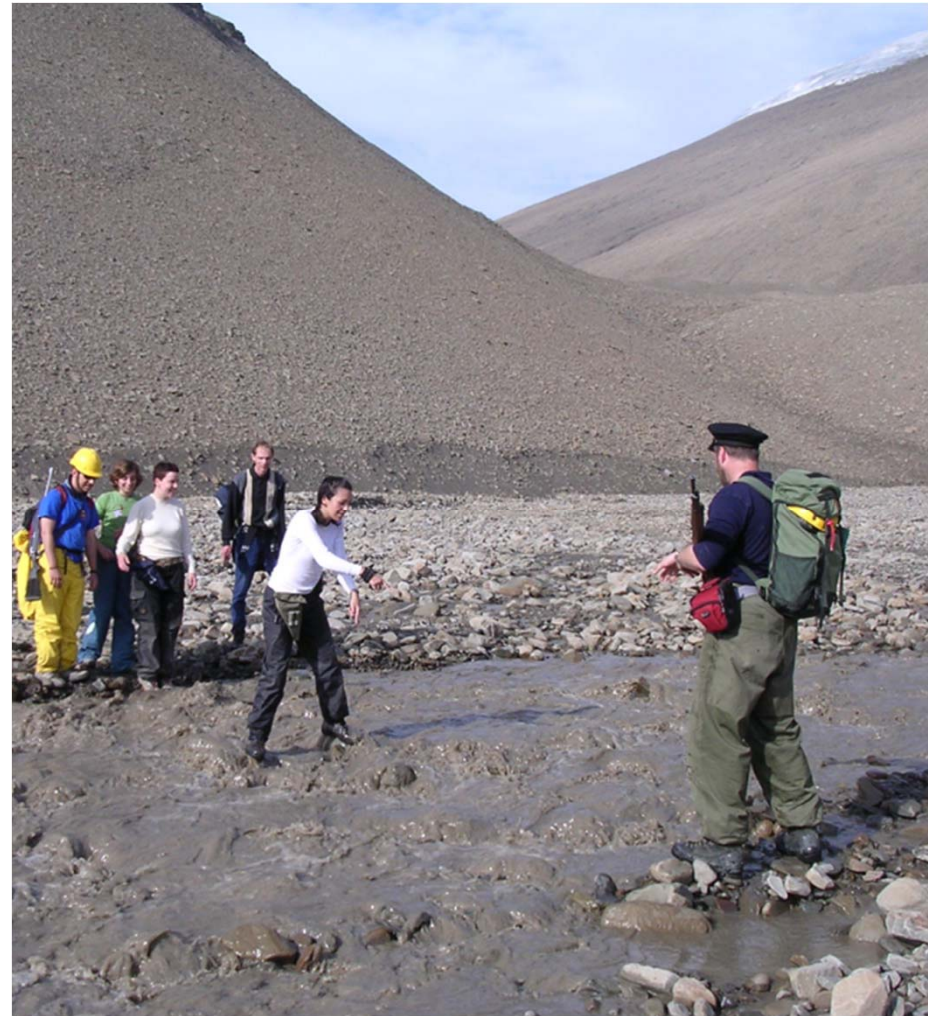
Safe & enjoyable hiking on tundra

River crossing

- Avoid jumping over where larger rocks → unstable, injuries
- Rather get wet boots than wet clothes & broken bones

Good places

- River gets wider → shallower, more even bottom & depth
- Many smaller streams
- Stable, proper hiking boots
- Early season sometimes rubber boots better depending on activity



Steep mountain terrain risks

- Sedimentary mountains → loose stones
- Block fall and tumble stones, persons above you kicking down rocks
- Avoid steep gullies and ravines → falling rocks, snowdrifts and ice left high up in the mountainsides fall down
- Possible to fall and injure yourself → loose rocks & gravel, slippery in rain



Steep mountain terrain

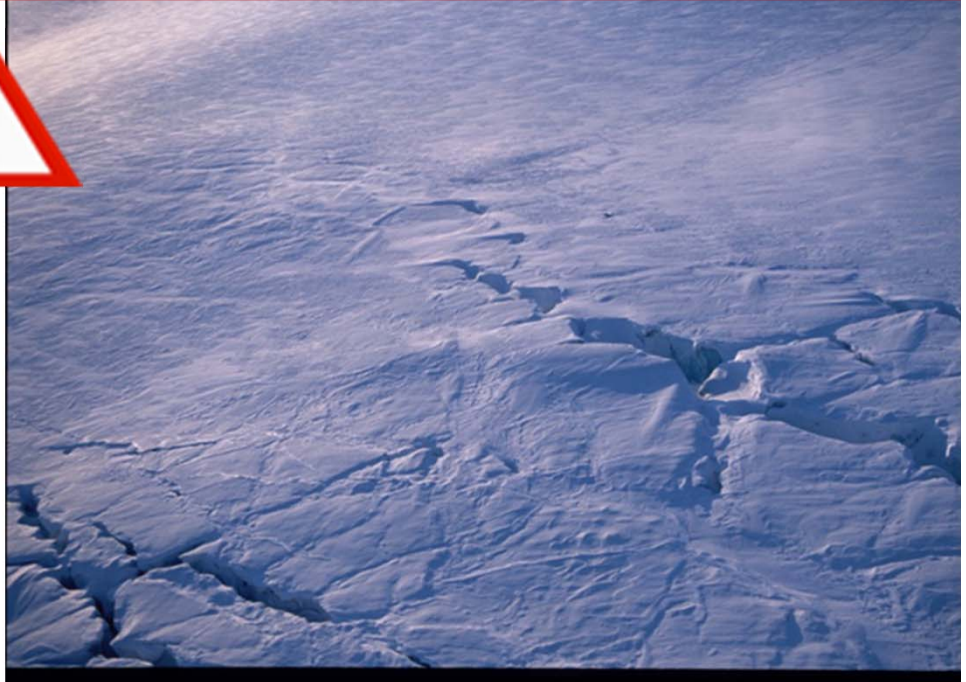
Safety

- Helmets and gloves
- Stable, proper hiking boots
- Careful, slowly walking with short steps both up and down
- Keep group together & organized → if rocks kicked down easier to stop them and shorter fall distance
- Alarm others if rocks fall → shout ROCKFALL
- Responsibility for your own safety AND safety of others



Moving on Glaciers

- 60 % of Svalbard is covered by glaciers
- All glaciers are potentially dangerous
 - Crevasses
 - Melt water channels
 - Moraine areas
 - Local weather conditions
- **Snow covered areas HIGH RISK → everything hidden under snow**
- Blue ice areas LOWER RISK → ice surface visible - but can be very slippery

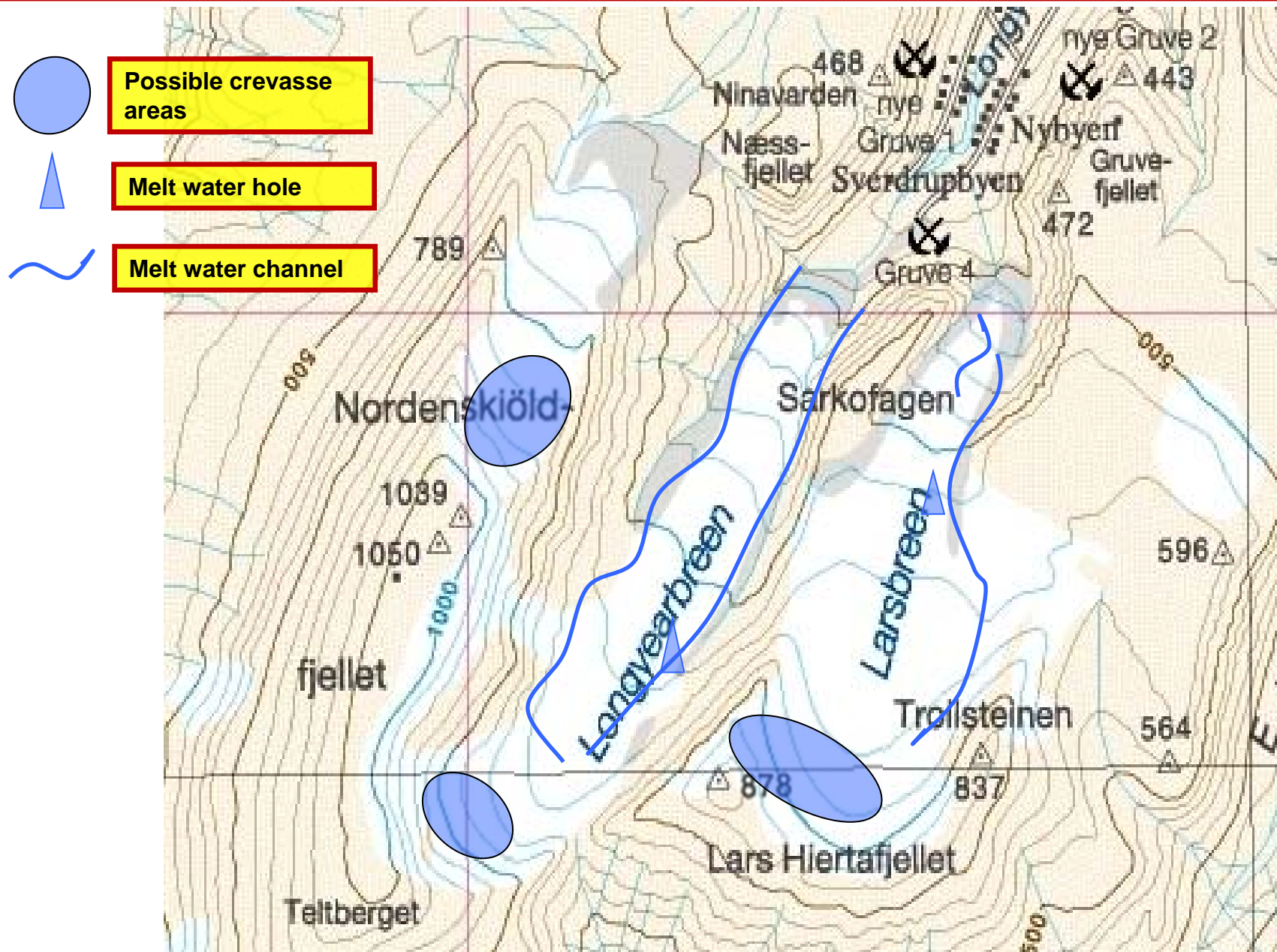


Glacier high risk areas

- Snow covered areas
- Close to fronts → lot of crevasses
- Steeper areas, curves, convex surface, close to cliffs → crevasses
- On the sides, close to moraines → melt water channels
- Early summer → many areas covered by snow



Potentially dangerous glacier areas south of Longyearbyen



Glacier melt water channels in Longyearbreen



Channels along sides of Longyearbreen

Crevasses and melt water holes on Larsbreen



Safety on glaciers



Travelling at sea – large vessels

Risks & Safety

- Heavy & dangerous equipment on deck → think what you do & **use helmets**
- Going over to small boats or on to the ice → extra careful
- Behaviour on deck, in bad weather or if sea sick:
 - Never alone on deck!
- **Safety brief on-board!**
- Alcohol is not allowed



Movement on sea ice

Risks

- Early summer season ice in the inner parts of fjords and on lakes.
- East and north coasts
- Sea ice during summer and autumn is very unsafe! – bad quality - cracks



Safety

- Check ice thickness and quality often
- Use ice spikes around your neck
- Use floatation suits (Regatta) or survival suits completely zipped up & hood on
- Have rescue throw line available or use rope
- Do not go out alone!



PolarCircle Boats



UNIS POLARIS

UNIS FLYER





Travelling at sea – Zodiac rubber boats

Safety measures

- Zodiac driving course
- What if ?
- Check weather
- Map studies, ask logistics – shallow spots, landings ?
- Careful driving & look ahead
- Check tide table
- Keep minimum 200 m distance to glacier fronts

When driving

- **Communication, emergency and navigation tools** on-board & ready
- **Emergency beacon on body & attached**
- **Driver use emergency stop cord**
- **Survival suit hoods on & completely zipped up**
- Extra fuel
- Boat safety boxes on-board



Travelling at sea – Zodiac rubber boats

Risks

- Inexperienced drivers
- Difficult landing spots when windy
- Shallow water + sediments many places → damage engine on bottom
- Timber and ice floating on surface
- Fast shifting weather & wind
- Engine or boat problems
- Glacier front collapses/calving
- Tide water 1-2 metres difference
- Partly closed survival suits – fill with water if fall into sea
- No GPS-map plotter



Wildlife – Arctic fox

- Harmless & curious
- Can steal food

Be aware:

- Rabies
- “Mouse parasite” (*Echinococcus multilocularis*) – specially Grumant, Fuglefjella

- Store food & waste properly – do not feed foxes
- No drinking water from streams in high risk areas for *Echinococcus*-parasite (boiling kills it)
- Keep away & report aggressive foxes (Rabies) (report also immobile reindeers)



Wildlife – Walrus

- Growing population
- Also more common in Isfjorden
- Can be curious or even aggressive → can puncture or destroy small boats, risk also on ice edge

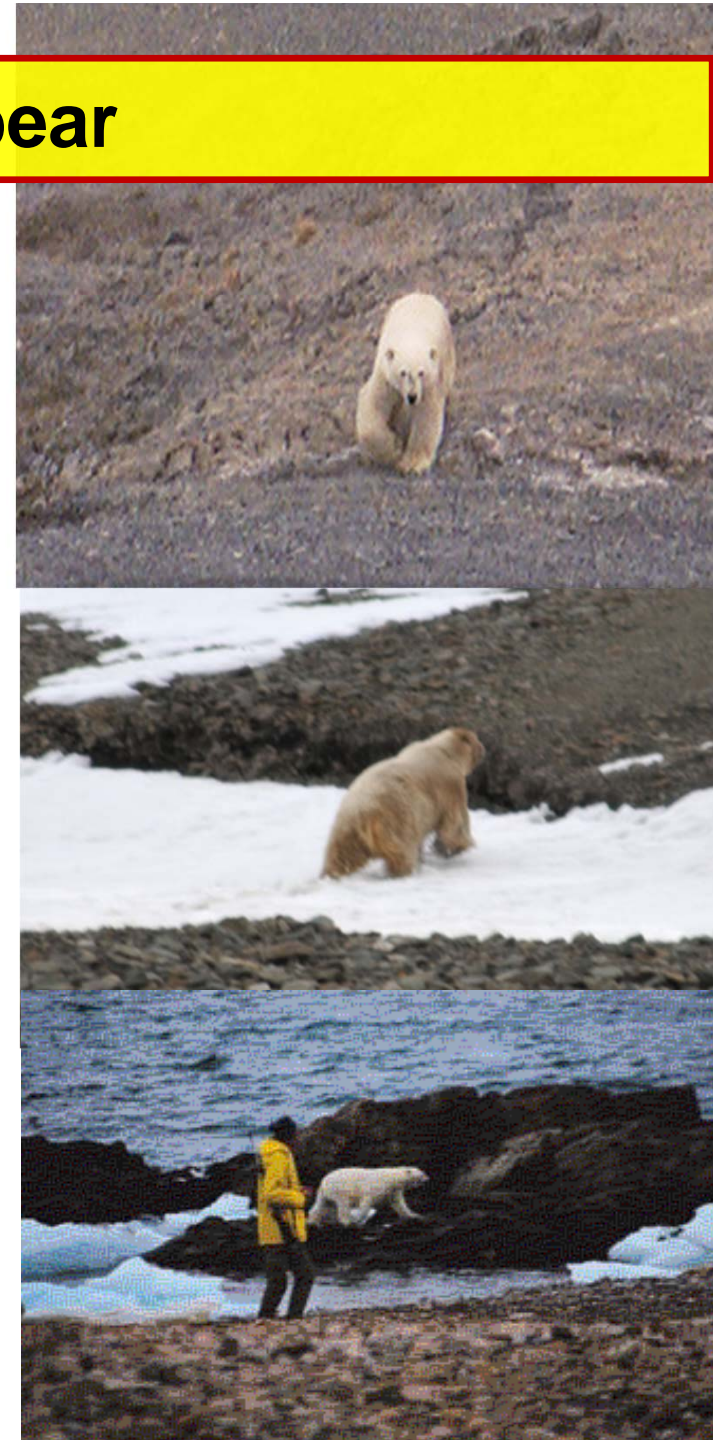


- Keep some distance & move away from close coming walrus
- Keep distance to walrus groups on land or on ice



Wildlife – Polar bear

- You can meet polar bear all over Svalbard and surrounding ice covered waters
- All kinds of terrain and places, also water
- Especially sea ice, sea shore, glacier fronts, carcasses on shore
- Curious hunter
- Moves surprisingly fast in all kinds of terrain
- Very good sense of smell
- Not always shiny white



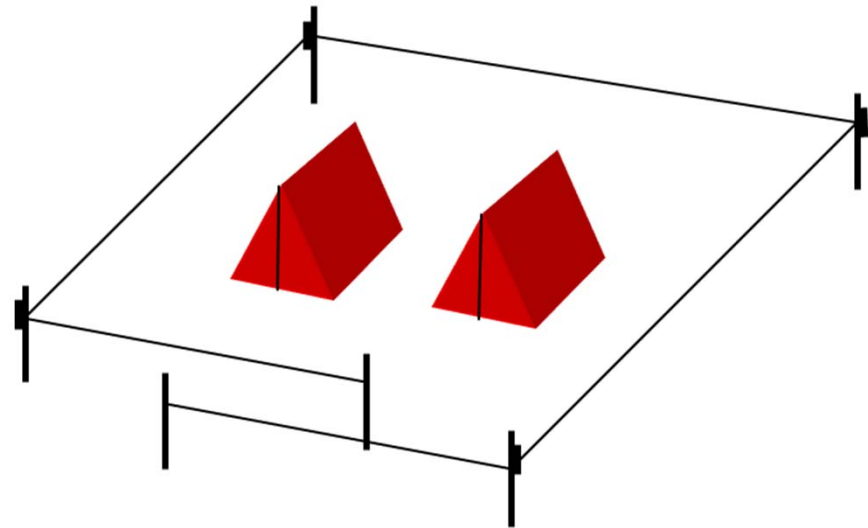
Wildlife – Encountering Polar bear

- Avoid all closer encounters & situations
- Stay alert – think how you use terrain - can you see around?
- Carry rifle & flare gun with you all times
- If you meet polar bear:
 - Gather the group
 - Try to walk away
 - Try to scare the Bear off in time
 - Bears can be shot only in self defence



Tent camp safety

- **Anchor always storm proof**
- Placement in terrain – wind, polar bears, cultural heritage min 100m
- Organize the camp & gear
- Polar bear safety – visibility, trip wire, bear watch, separate kitchen tent
- Choose tough, barren groundcover
- Spare parts, extra fuel + extra food
- Drinking water ?



Transport with plane and helicopter

- **Transport with helicopter:**
 - Special safety briefing
 - Some limitations regarding dangerous goods (fuel, ammunition)
 - Garbage from field parties must be stored in containers
- **Transport with fixed wing (plane):**
 - Same safety regulations as for commercial airliners!
 - No flammable goods, ammunition or batteries.
 - Limitations of what kind of petrol driven machinery it is allowed to bring on board.



Field safety & emergency equipment



Rifle & signal pistol

- Bolt action rifle -10 rounds hunting ammunition. All UNIS rifles are cal. 30-06.
- A signal pistol is the best way to scare off bears. Always carry a signal pistol in addition to the rifle.
- Take good care of your weapons – check daily, keep clean!



Communication

- **Emergency beacon**
 - Emergency help transmitter
- **Satellite telephone**
 - Works everywhere
 - Daily contact to UNIS etc.
 - Emergency contact
- **VHF Radio**
 - Contact between field groups
 - Contact to boats/ships ch16



- Carry always with you !
- Satphone & VHF **extra batteries + possible charger for longer trips**

Emergency beacon

- Only in real emergency situations when satellite phone is not an option
- Transmits emergency signal & position through satellites when released.
- Can not communicate or give any details about emergency

1



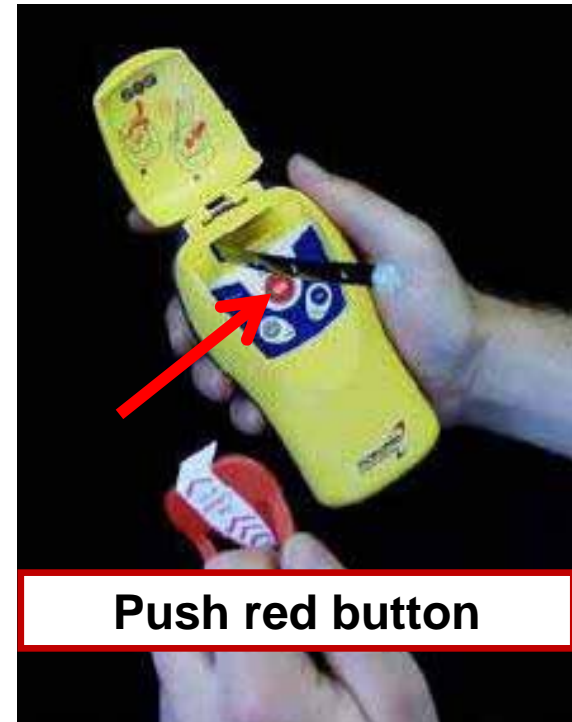
Open

2



Release cover

3



Push red button

Map & compass & GPS

- Always bring map and compass
- Maps 1:100 000 (1cm=1km)
- GPS is only navigation aid! Bring warm extra batteries.
- Low clouds & fog higher in the terrain & on the sea → no visibility + no landmarks
- Know where you are & where your camp/boat/pick up point is – use waypoints/tracks



Equipment day-long excursions

- Insulated, windproof bivouac bag (Jervenduk)
- Sleeping pad / sitting pad
- First aid kit
- Thermos with warm drink
- Extra food + snacks
- Extra clothing (**hat + gloves!**)
- Rifle & signal pistol
- Communication & contact numbers
- Map & compass & GPS



Environmental legislation and caution

- Research activities, physical installations & sampling regulated & need to be agreed on with local authorities
- Label all physical field installations (contacts, dates)
- Leave No Trace on nature on campsites
- Be aware of cultural heritage. Camping minimum 100m away.
- All traces of human activity dating from 1945 or earlier are protected elements



Governor of Svalbard

www.syssemmannen.no

Researchers

Whoever plans to carry out research activities in Svalbard needs to familiarize him or herself with current rules and regulations. As a rule, most field activities demand a permit from the Governor in Svalbard.



Safety routines with field work

- All field work and work at the lab's need to be agreed on with the logistic department.
- HSE (health, safety and environmental) briefing before all fieldwork.
- Document with contact info, group members, plan, gear etc. before going out
- Contact with person on duty at UNIS if working after 1530 and if need for assistance.

"HSE" (Health, Safety and Environment) documentation

Page 1 of 4

"HSE" documentation for field work operations at UNIS

Fieldwork/ excursion supervisor		
Topic / project name / Code		
Location:		
Time period:		
Object of work:		
Means of transportation:		
Means of communication, call signals and numbers:		
Satellite phone	Telephone number:	
VHF Radio	Call signal:	Channel:
Cell – phone (s)	Telephone number(s):	
Emergency beacon	LC number:	

Time of daily contact with UNIS, if out over several days.	
On weekdays:	On Saturday, Sunday or holidays:
Action to be taken from UNIS and the field-party if communication fails:	

Latest time of arrival / return (date and time):
--

Contact person at UNIS in this period:
--

Routines when returning from fieldwork:	1) Call "Contact person at UNIS" at 95 28 35 11.
	2) Put this form in the "returned" shelter.

Means of communications at UNIS	Radio VHF, UNIS	55540
	Radio, VHS, Contact person UNIS	55542
	Cell-phone, Contact person UNIS	95 28 35 11

Daily excursion plan (time, place and alternative routes). Use more paper, or attach a map image, if necessary:

Emergency & Health & Problem contacts

Emergency Phone 112

Telephone to police 24 hours:
+47 79021222

UNIS CAMPUS

Daytime from 08.30 to 16.00: **Study administration.**

Phone: Tel: +47 79 02 33 00

E-mail addresses: Studadm@unis.no

Evening/nights from 16.00 to 08.30: **Duty officer.**

Phone: Tel: +47 95 28 35 11

Off campus alternatives:

Longyearbyen hospital

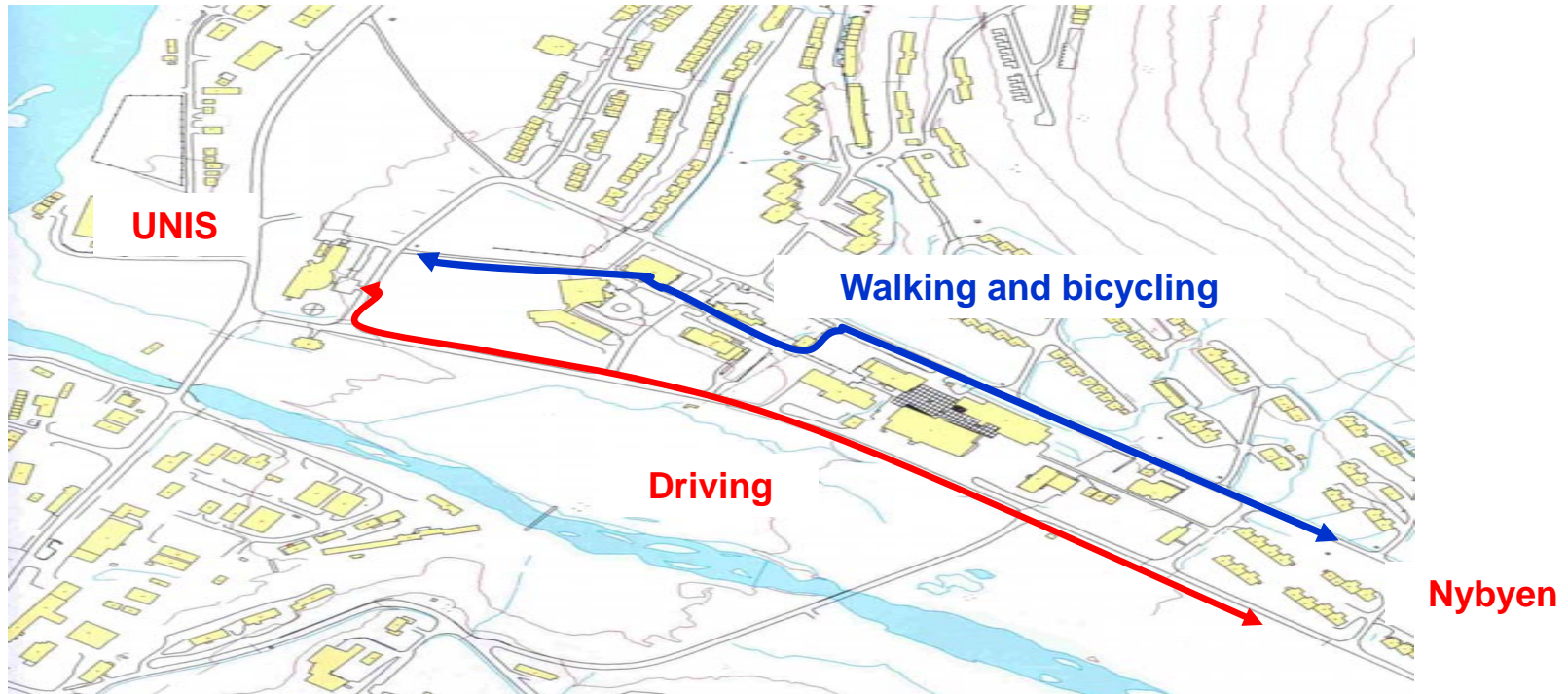
Emergency phone 113

Phone nr. + 47 79 02 42 00

Svalbard Church

Phone nr. + 47 79 02 55 60

Choose the safest route to and from UNIS



...and use reflectors on your clothing and lights on your bike when dark!

Next of kin & Personal statement of health

- Have you filled out the forms?
- If not, do it on:

[Health issues - UNIS - The University Centre in Svalbard](#)

When going out on private excursions..

- Make sure someone knows where you are & your contact details & when you are supposed to be back!
- Take right equipment & right attitude
- Have fun & play safe!



The most important tool to keep yourself safe is your head – take your time to use it early enough! **Most accidents happen because we do mistakes or bad decisions.**

Thank you!



The University Centre in Svalbard

Have a nice and safe stay on Svalbard!

UNIS Logistics Department

Appendix 3

Means of Communication and Positioning Systems in the Field

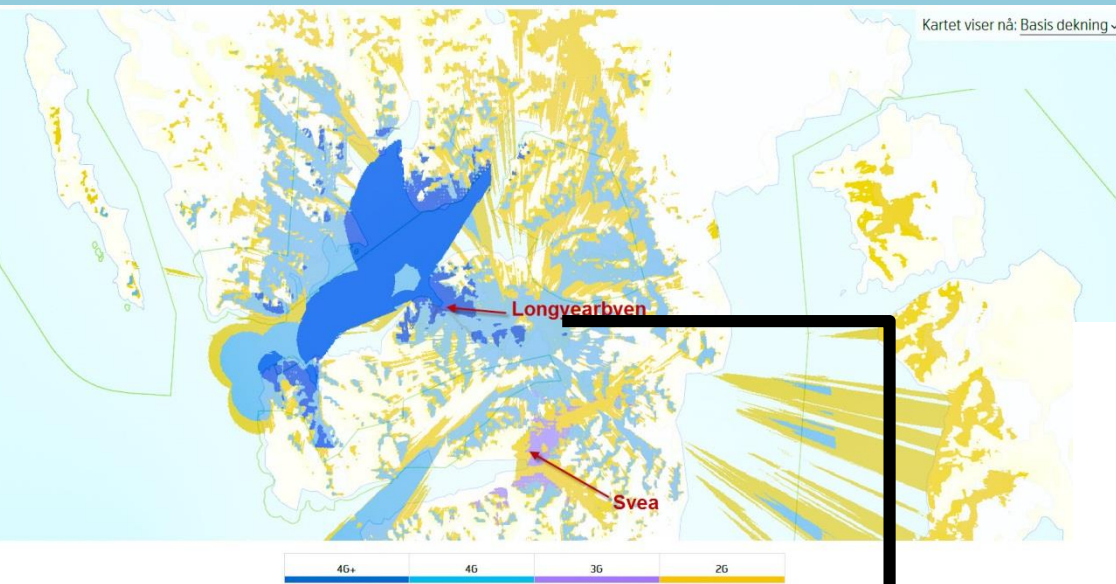


Sara Cohen
Head Engineer
University Centre in Svalbard
Arctic Safety Centre
sarac@unis.no

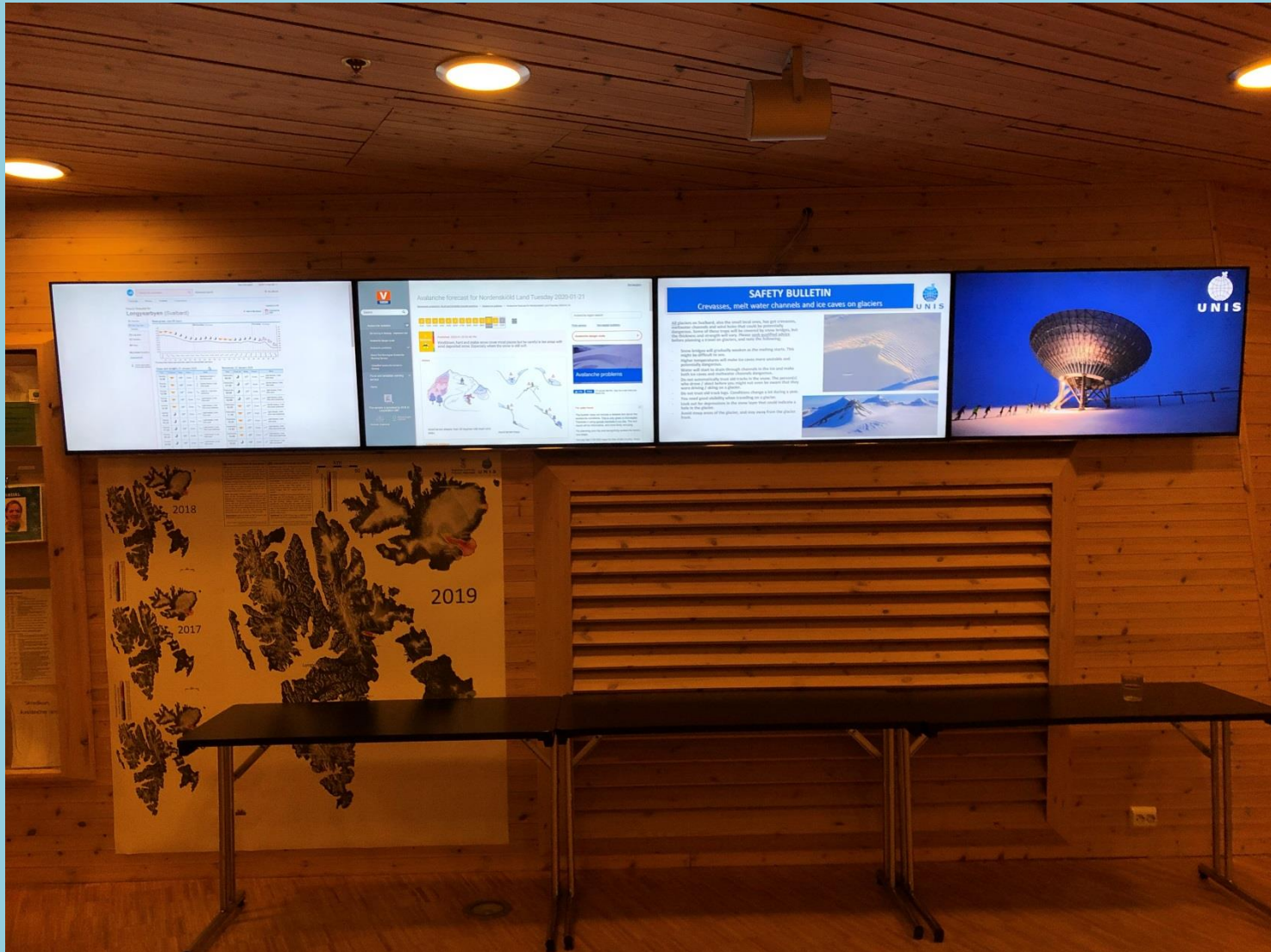


- Born and raised in Juneau, Alaska
- BSc in Physical Geography, University of Oregon 2011
- MSc in Geosciences, University of Oslo 2013
- Physical Sciences Technician at Klondike Goldrush National Historical Park, Skagway Alaska, 2011
- Scientific Technician at Summit Station, Greenland, 2014
- Head Engineer in the departments of Arctic Geology and Operations & Field Safety, University Centre in Svalbard, 2015-Present

Why do we care?



Base Information Center



Base Information Center



"HSE" documentation for fieldwork at UNIS.

Fieldwork/ excursion supervisor		
Topic / project name / Code		
Location:		
Time period:		
Object of work:		
Means of transportation:		
Communication, call signals and numbers:		
Satellite phone	Telephone number:	
VHF Radio	Call signal:	Channel:
Cell – phone (s)	Telephone number(s):	
Emergency beacon	LC number:	
In reach	UNIS number:	

Agreements on time of daily contact with UNIS, if out over several days. (+47 95 28 35 11)

On weekdays:	On Saturday, Sunday or holidays:
--------------	----------------------------------

Action to be taken from UNIS and the field-party if communication fails:

Latest time of arrival / return (date and time):

"Person on duty" at UNIS in this period:

Routines when returning from fieldwork:	1)	Call "Contact person at UNIS" at: +47 95 28 35 11.
	2)	Put this form in the "returned" shelter.
Governors Police department. (Emergency, search and rescue)	Telephone (weekdays 08:30 AM to 03:30 PM)	+47 79 02 43 00
	Police officer on duty (after working hours)	+ 47 79 02 12 22
	Telephone emergency line	112

Daily excursion plan (time, place and alternative routes). Use more paper, or attach a map image, if necessary:

The following "HSE issues" has been discussed and agreed on with the field party:

✓	Health issues	✓	Environmental issues
	Self declaration on health condition filled out by everyone		Disturbance of wildlife special to the area and time period.
	Appropriate clothing and personal equipment		Waste disposal
	Nutrition, food and drinks		Protected areas
	List of "next of kin"		Cultural heritage
	Alcohol / drugs / medication		Location of camp sites
	Rabies		Flora
	Parasite; " <u>Echinococcus multilocularis</u> "		Need for special applications?
	Sanitation, hygiene and risk of contagion.		
	Insurance		
	Life assurance, is everyone covered?		
	Insurance of field equipment and personal equipment		
			Field camp
			Tents
	Safety issues in general		Small cabins
	The field parties route		Fire protection
	Weather forecast for the period		CO poisoning
	How to handle bad weather situations		Polar bear protection
	Travelling over / movement on sea ice		Location of the field camp, safety issues.
	Travelling over / movement on glaciers		Communications from the field camp
	Travelling / movement in mountain sides		Garbage / waste, routines and handling
	Travelling / moving in areas exposed to avalanches		
	The Polar bear		Organisation, planning and responsibilities
	Routines regarding fire arms and pyrotechnics		Leadership and responsibilities
	Travelling / movement on melted Tundra		When to report back to UNIS.
	Crossing over rivers		Report when driving to and from destination
	Means of communication		Emergency equipment where?
	Communication routines		Preparing equipment before fieldwork
	Distribution of safety equipment in the field party		Termination of field work.
	Working on large vessels.		Has everyone paid cost money (cruises only)?
	Use of drones (UAV, UUV / AUS)		
	Permits in place?		Mandatory check in / de-brief / evaluation
	Competence and certificates for pilots		Register incidents, accidents or deviations
	Risk analyses		Restore / cleaning equipment after fieldwork
			Need of debrief / evaluation
			Register polar bear sightings / incidents
	Transportation		
	Snow scooters NB; Drivers licence needed.		
	Snow scooter; organization and driving procedures.		Special operations
	Small boats. SJA & mandatory safety briefing		Diving (see "diving instructions at UNIS")
	Large vessels		Handling heavy equipment
	Helicopter NB; Mandatory safety briefing.		Handling heavy or dangerous machinery
	Band wagon NB; Mandatory safety briefing.		Use of winch or similar.
	Car		Handling chemicals
	On foot / ski		Use of toxic material
	By local plane		Need for special safety analyses / HSE analyses?
	Information / announcing of field activities		
	Activities that might create public concern, or be of danger to the public, must be announced.		

Emergency equipment following the field party:

√	Equipment	Number	Remarks
	Rifle, cal. 30-06		Front and back of the group
	Ammunition cal. 30-06		
	Signal pistol		Front and back of the group
	Red signal ammunition		
	Brown signal ammunition (Blitz / knall)		
	Fire crackers (knallskudd)		
	Satellite telephone		Front or back of group
	Emergency beacon		Front or back of group
	VHF radio		Front and back of the group
	Spare battery pack for radio		
	Battery charger for VHF radio		
	Avalanche search beacon		Everyone
	Glacier rescue kit		Front and back of the group
	Emergency box 7 pax (winter)		Front and back of the group
	Emergency backpack 2 pax. (Summer)		
	Scooter rep set		At the back of the group
	Ice rescue spike		Everyone
	Ice rescue "throwrope bag"		Second scooter and last scooter in the column.
	Survival suite		Everyone
	Map		
	Compass		
	GPS		
	First aid kit		
	Windproof bag (Jerven duk), shovel, search probe, sitting pad and candle.		In every snow scooter

Responsible individuals and registration number on rifles following the field party

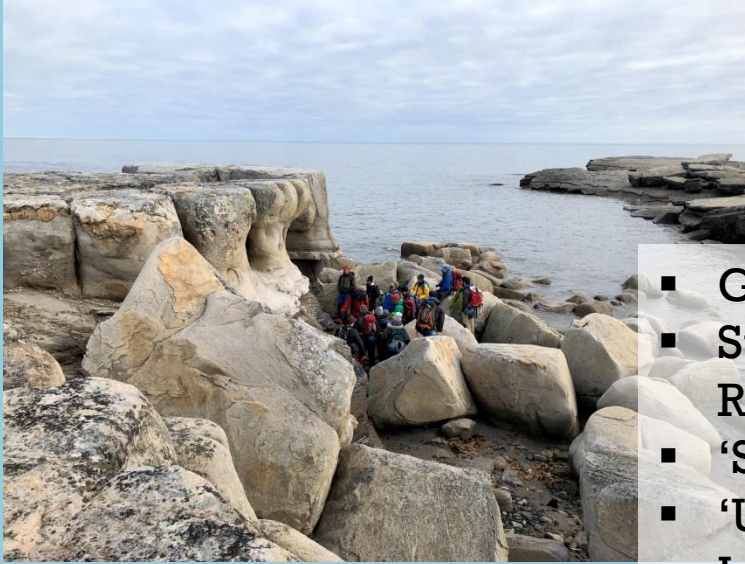
Responsible student / staff	Rifle registration number

.....
(Date and signature) Excursion supervisor.....
(Date and signature) Section for field safety**Mandatory immediate check in / de-brief / evaluation**

Topic	Y	N	Comment
Polar bear sightings / incidents?			
Accidents / incidents / close accidents?			
Equipment failure or damage?			
Cleaning and restoring of equipment done?			
Need for more thorough evaluation?			

.....
(Date and signature) Excursion supervisor.....
(Date and signature) Section for field safety

Who is our target user group?



- Group Size
- Students & Researchers
- 'Supervised'
- 'Unsupervised'
- Isolation & Field Period



Who is our target user group?

- **Large Groups →**
 - Multiple devices
 - Spread out within the group
 - Group-to-group, group-to-base
 - Responsibilities within the group
- **Small Groups →**
 - Limited space
 - Group-to-group, group-to-base
 - Backups
- **Students & Researchers →**
 - Clear instruction on expectations for communication
 - Instructions for use and procedure available 'in-the-field'
- **'Supervised' vs 'Unsupervised'**
 - Is there a technician or staff from the field station joining?
- **Isolation & Field Period**
 - Can the group access cellular network?
 - How far away is help if something happens
 - How long will the group be in the field
 - Battery Capacity

What means of communication are appropriate for our situation?



- Winter
- Summer
- Snowmobile
- Boat
- Hiking
- Camping
- Group Size



Satellite Phones

- When do we use them?
 - We take them anytime we travel or work outside of network coverage, we use them for regular or emergency communication
- User Group?
 - Appropriate for any usergroup
- Different Networks
 - In polar regions we use Iridium satellite phones due to satellite coverage. It's important to assess the area you are working in when deciding what satellite phone you should use. You can decide between satellite phones which use geostationary satellites and low earth orbit satellites.
- How they work
 - Connect to a satellite 'constellation' or geostationary satellite
 - Need sky view
 - Make sure you know how to call other phones. When on the iridium network you dial: 00, country code, phone number
 - Make sure you have an active subscription service or voucher to make calls
- Pros
 - Works 99% of the time with working antenna and charged battery → sometimes patience is necessary for a connection!
 - Intuitive for anyone who has used a cell phone
 - Fairly durable, especially with pelican case
 - Battery will last for several calls
- Cons
 - Satellite phones are costly! The satellite phone can cost over \$1000 USD alone, and calls can cost 15 cents to 15 dollars per minute depending on the plan you have
 - Poor connection with satellites can lead to repeat or dropped calls, you may need several attempts to make a call
 - Need to be outside, unless you are on a ship or building which has put a fixed installation outside

Waterproof Pelican Case

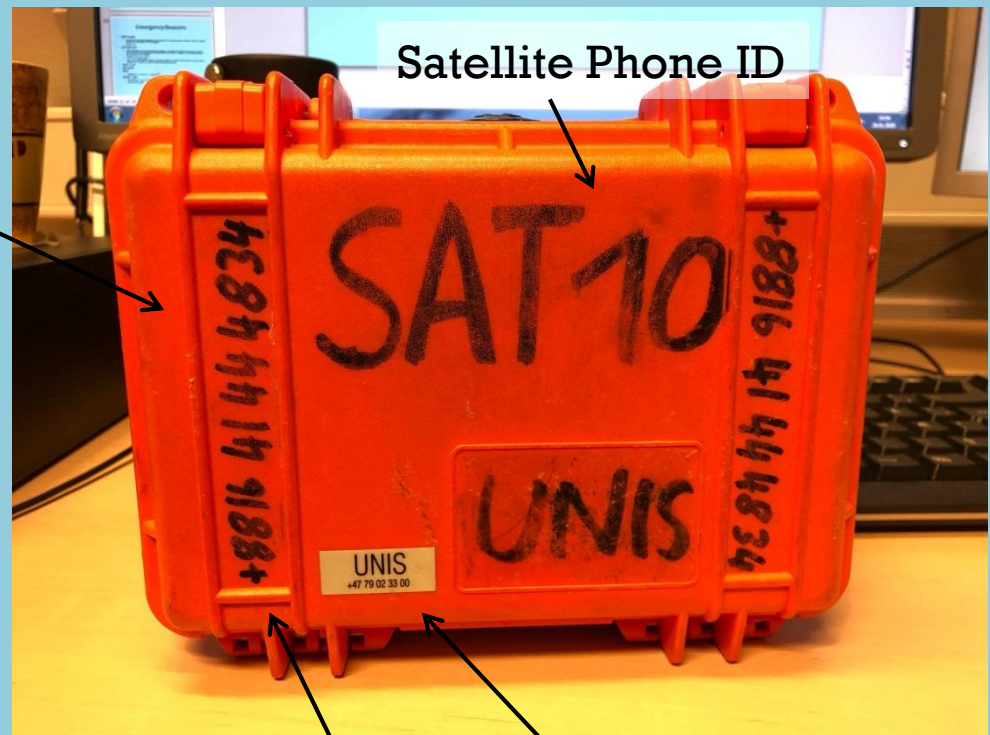
Relevant Emergency Numbers



Emergency Procedures

Insulating Foam

Extra Battery



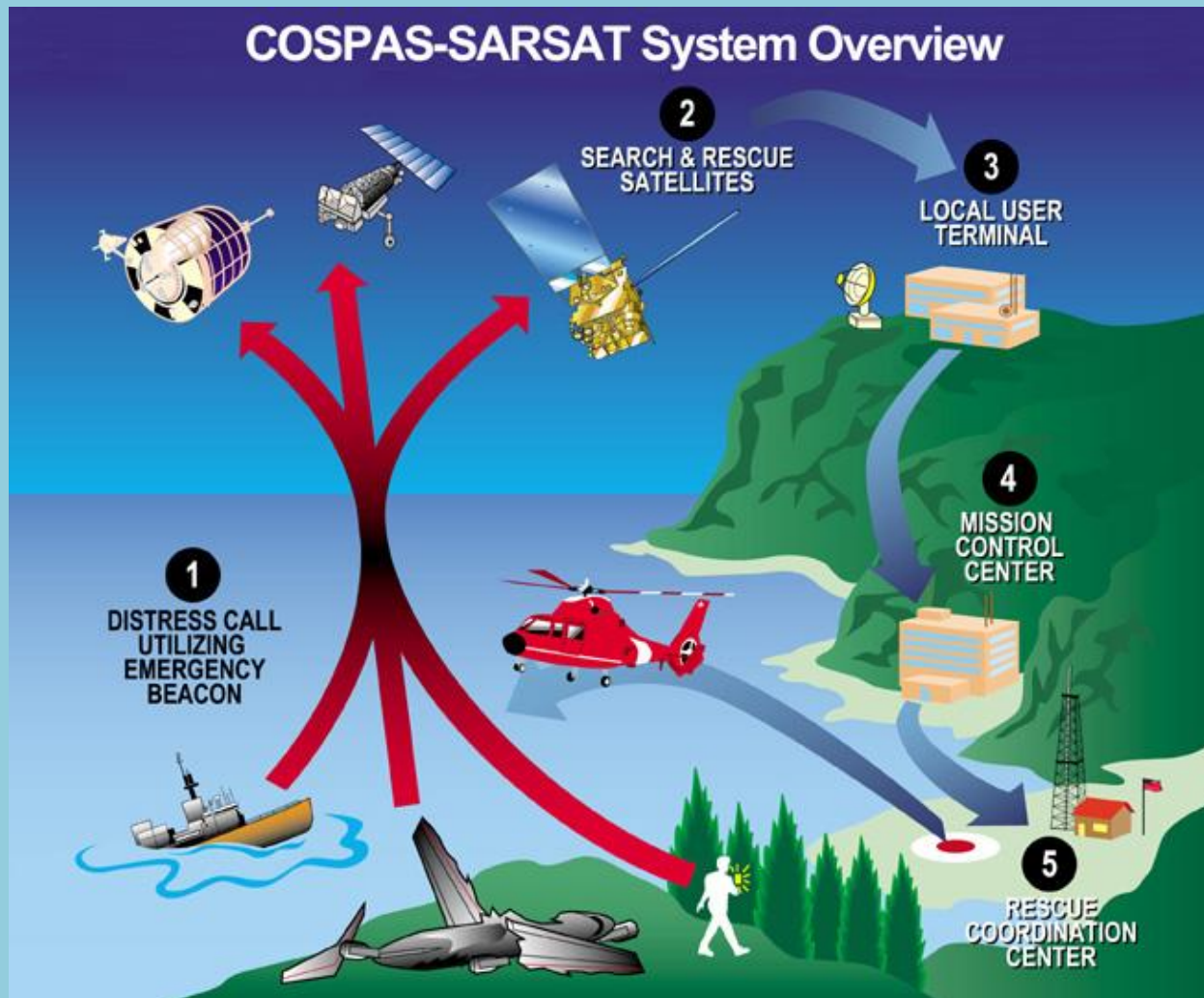
Satellite Phone ID

Organization

Phone Number of Satellite Phone

Always know how your device works and test it before using in the field!!

Emergency Beacons



Personal Locator Beacon (PLB)

- When do we use them?
 - We take them anytime we travel in the field, used only in an emergency
- User Group?
 - Appropriate for any user group
- How they work
 - Personal safety device designed to alert search and rescue services and allow them to quickly locate you in the event of an emergency
 - When activated it transmits a coded message on the 406 MHz distress frequency which is monitored by the Cospas-Sarsat satellite system. The alert is relayed to the nearest Rescue Coordination Centre (RCC)
 - Uses internal GPS/GNSS receiver to pinpoint location to within 62m. Once in the area, rescue services can pinpoint using 121.5Mhz homing transmitter
- Setup
 - Registered to a person or organization
- Brands / Costs
 - McMurdo Fast Find 220 USD, typically between 200-300 USD
 - Different brands cater to land/water, so pick out one appropriate for your use
- Pros
 - Cheaper than a satellite phone
 - Works anywhere on earth
 - No cost of ownership after purchase
 - Battery life is up to five years
 - Relatively small and lightweight
 - Durable
- Cons
 - Can only transmit an SOS message
 - Some models can be manually deactivated, some cannot

Floating Cover with ID & Organization



Strap to attach

Serial Number &
Call Sign



Battery Life



Diagram for 'how to activate'

Always know how your
device works and test it
before using in the
field!!

Emergency Position-Indicating Radio Beacon (EPIRB)

- When do we use them?
 - We have them on a vessel, we use them only in an emergency
- User Group?
 - Anyone working on a vessel at sea
- How they work
 - EPIRBs are registered to a specific vessel
 - Automatically deploy underwater or manually deployed
 - Utilizes the COSPAS-SARSAT system
 - Transmits for 24-48 hours
- Setup
 - Mounted on the vessel the EPIRB is registered to
- Pros
 - Battery life lasts for six years
 - Reliable for incidents at sea
 - Can be turned off if accidentally deployed
- Cons
 - Only for delivering SOS message, can be accidentally deployed

Manual Deployment

Antenna

Vessel Information

Vessel Name

Battery Life



Always know how your device works and test it before using in the field!!

Marine Very High Frequency (VHF) Radios

- When do we use them?
 - We use them on vessels and on land. Ship-to-ship, ship-to-shore, shore-to-shore. We take them when we will split into smaller groups in the field
 - We can also use them as primary communication means for a station where cellular network is not available.
- User Group?
 - Appropriate for most user groups. It is important that persons responsible for using a VHF radio are trained on proper use. If you use a VHF radio on a vessel, you should have a course
- How They Work
 - Worldwide system of two way radio transceivers on vessels
 - Line-of-sight, does not require satellite, uses antenna towers
 - All frequencies from 30-300MHz, marine is 156-174
- Setup
 - Fixed or portable, depending on use
 - Marine or other, depending on use
 - Possible to setup a mobile relay station with base station and repeaters, to use in an area with no cellular coverage
- Pros
 - Easy to use
 - Works without cellular network
 - Can use for both normal communications and emergency communications
- Cons
 - Limited Range
 - Need to 'follow the rules'
 - Can interfere with scientific equipment



Always know how your device works and test it before using in the field!!

InReach

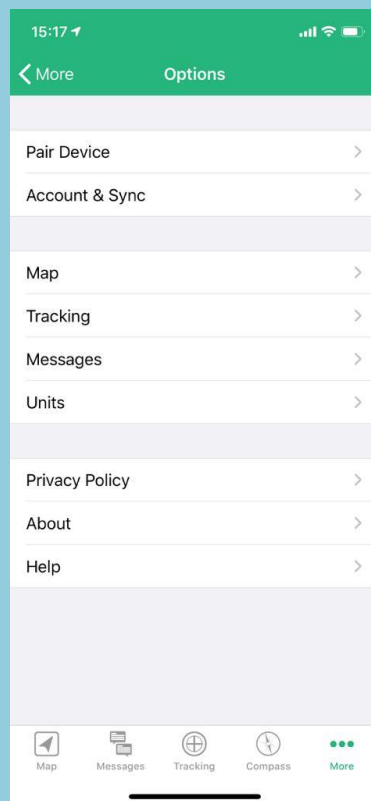
- When do we use them?
 - We use them whenever we go into the field and are out of cellular coverage
- User Group?
 - Appropriate for any usergroup
- How they work
 - InReach uses the Iridium satellite network. They are mainly used as a tracking device and for communication
 - InReach can also be used to alert an emergency situation
 - Emergency or SOS button triggers a private company (GEOS) which will then notify the appropriate rescue service
- Setup
 - The owner purchases a subscription service which allows the user to send tracking information, text messages and emergency notifications
 - Setup preferences before leaving on your trip and use the APP and bluetooth connection to use interface on cellular device
- Pros
 - Cheaper option than satellite phone. 300-400 USD, subscription 20USD/month +
 - Access to weather data
 - Track from 'base station'
 - Ability to 'communicate' in an emergency
 - Battery can last up to 5 days, even when turned on constantly
- Cons
 - Can interfere with other equipment



inReach MINI

SOS Button

Controls



Always know how your device works and test it before using in the field!!



inReach SE
(also inReach Explorer +)

App for using
Bluetooth Connection
to Cellphone



▼ Kartfiltre (På)

[Velg et bokmerke] ▼



Meldingstyper ▼

Dato og tidsrom:

Tilpasset datoområde ▼

Fra: 1. jan 2010 kl. 16.06

Til: 19. okt 2019 kl. 16.06

Rediger

Tøm filtre

Filtrer brukere

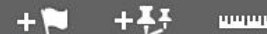
○ ★ 🗨 📍 ⊕
Spør Lokaliser Melding Send Sentrer

👁 ID Navn ⌕ 🔍

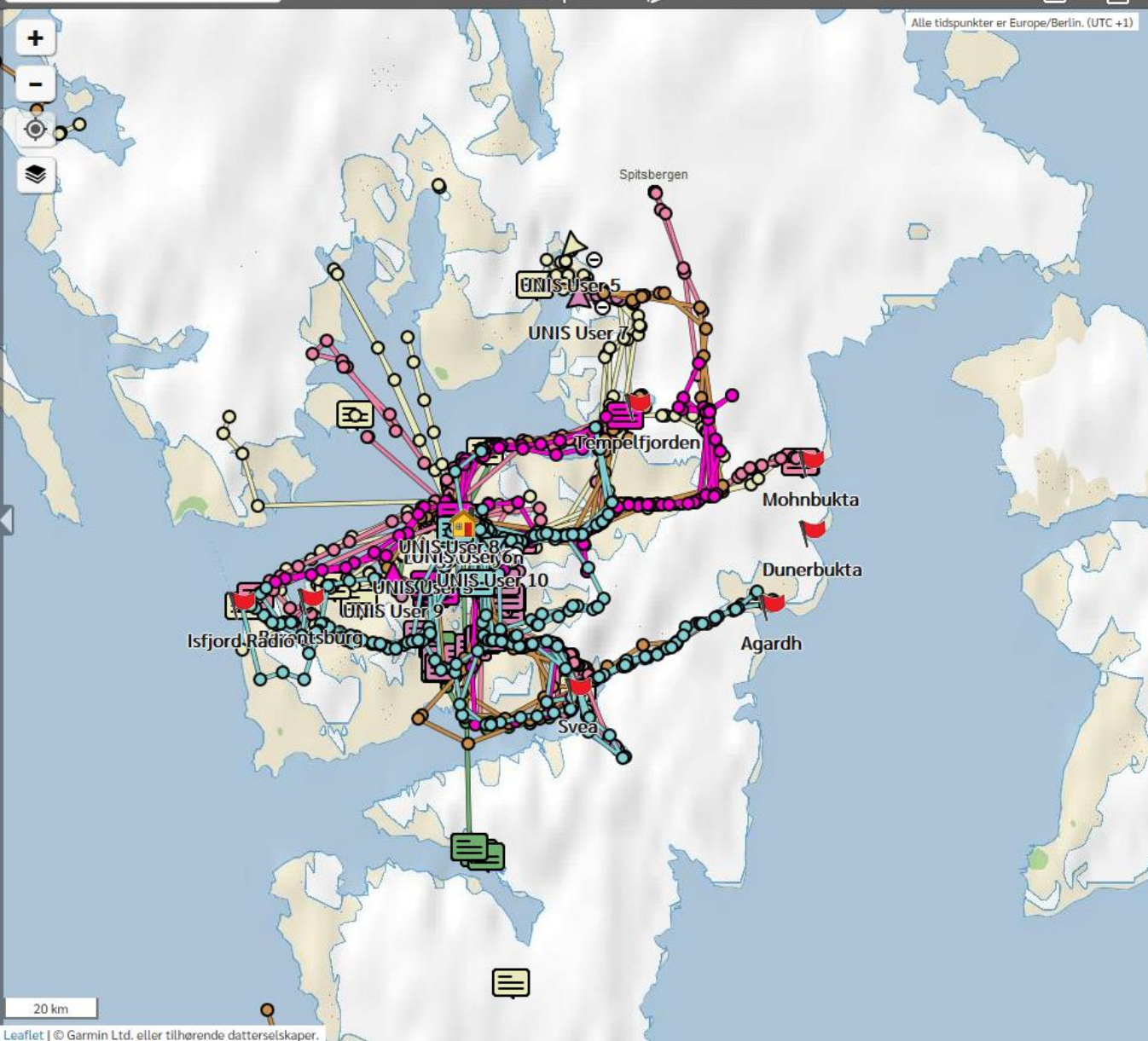
- | | | |
|---|-------------------------------|-----|
| 👁 | UNIS User 3 | ➔ |
| ⊕ | Siste: 24. sep 2019 kl. 17.16 | |
| 👁 | UNIS User 4 | ➔ |
| ⊕ | Siste: 23. sep 2019 kl. 16.16 | |
| 👁 | UNIS User 2 | ➔ |
| ⊕ | Siste: 23. sep 2019 kl. 16.14 | |
| 👁 | UNIS User 5 | ➔ |
| ⊖ | Siste: 23. sep 2019 kl. 16.12 | |
| 👁 | UNIS User 1 | ✓ ➔ |
| ⊖ | Siste: 23. sep 2019 kl. 16.12 | |
| 👁 | UNIS User 8 | ➔ |
| ⊖ | Siste: 4. sep 2019 kl. 19.33 | |
| 👁 | UNIS User 7 | ➔ |
| ⊖ | Siste: 22. aug 2019 kl. 23.36 | |
| 👁 | UNIS User 9 | ➔ |
| ⊖ | Siste: 31. jul 2019 kl. 15.20 | |
| 👁 | UNIS User 10 | ➔ |

<https://inreach.garmin.com/Admin>

🔍 Søk



Alle tidspunkter er Europe/Berlin. (UTC +1)

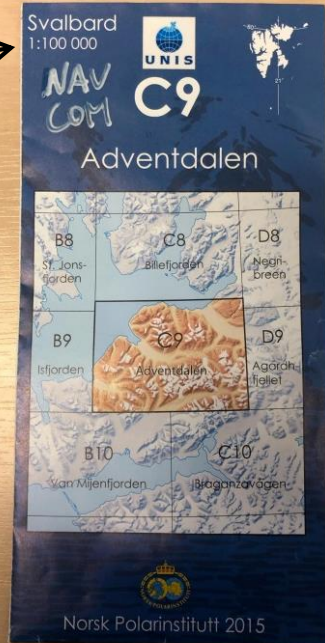


Map & Compass

- Paper Maps & Compass
 - Scale is important! For navigation, use 1:100.000 or smaller
 - Durability: most maps are not waterproof, bring plastic shield or laminate to protect
 - If not primary navigational source, at least bring as a backup
 - Always study beforehand to look at landmarks, obstacles, etc. In Svalbard we often use toposvalbard as a supplement, can also download app on the phone which works offline
 - If you use a compass, make sure to compensate for the magnetic declination!
- Reference Systems
 - Am I working in Latitude and Longitude or UTM? Lat Long is always used at sea, and for rescue purposes. UTM is used on land, and for mapping purposes (ArcGIS)
 - Lat Long can be written in three different formats:
 - Degrees Minutes Seconds 00°00'00"
 - Decimal Degrees 00.0000°
 - Degrees Decimal Minutes 00°00.00'
 - UTM is written in the following format: Zone, Easting, Northing

Map Scale!

Correct for magnetic declination

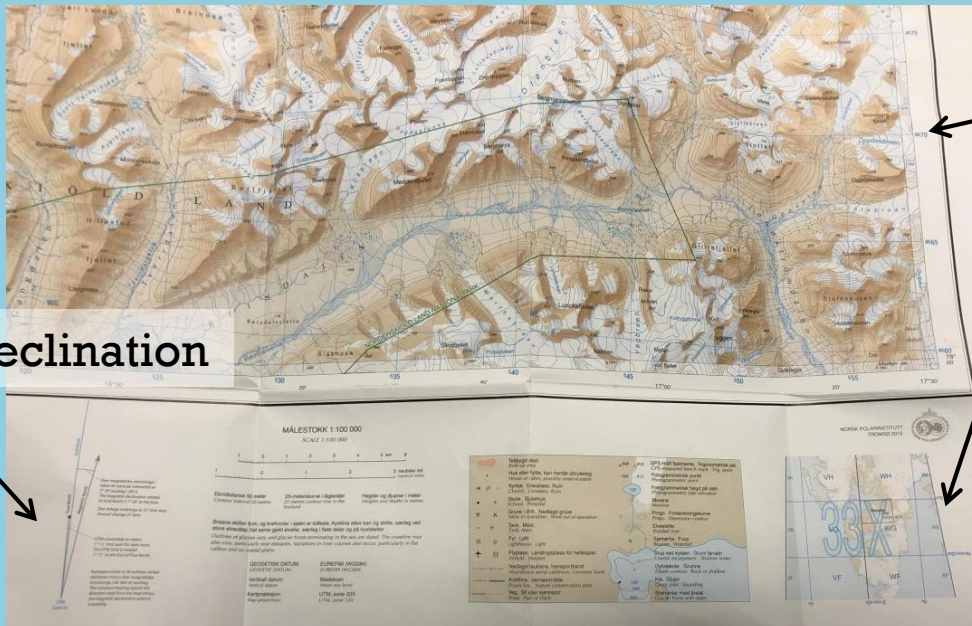


Map Grid

UTM Zone

Magnetic Declination

Always know how your device works and test it before using in the field!!



GPS

- When do we use them?
 - We take a GPS anytime we go into the field
- User Group?
 - All usergroups
- How they work
 - GPS is based on the time and known position of GPS satellites. Each satellite transmits a radio signal with the time and position, 31 satellites in total
- Setup
 - Setup the GPS unit before you go into the field with the correct units and positioning system for your use
 - Use a program (Ozi Explorer, Garmin Basecamp, MapSource, ArcGIS, etc) to download and upload tracks, routes, waypoints
 - For use with snowmobiles, install charging mount which charges the gps off of the battery
- Pros
 - Very reliable source of navigation in the field
 - Plenty of models, suited to every need
 - User friendly
- Cons
 - Dependent on battery life
 - Can be difficult to operate in the cold
 - It's Technology, so it can break down!
- Different brands
 - We use Garmin at UNIS
 - Cost 100-600 USD

Garmin E-trex
Good for waypoints



Garmin Montana
Good for driving snowmobile, hiking



Garmin 64 series
Good for hiking

Always know how your
device works and test it
before using in the
field!!



Garmin 276Cx
Good for snowmobiles, boats

Storage Space



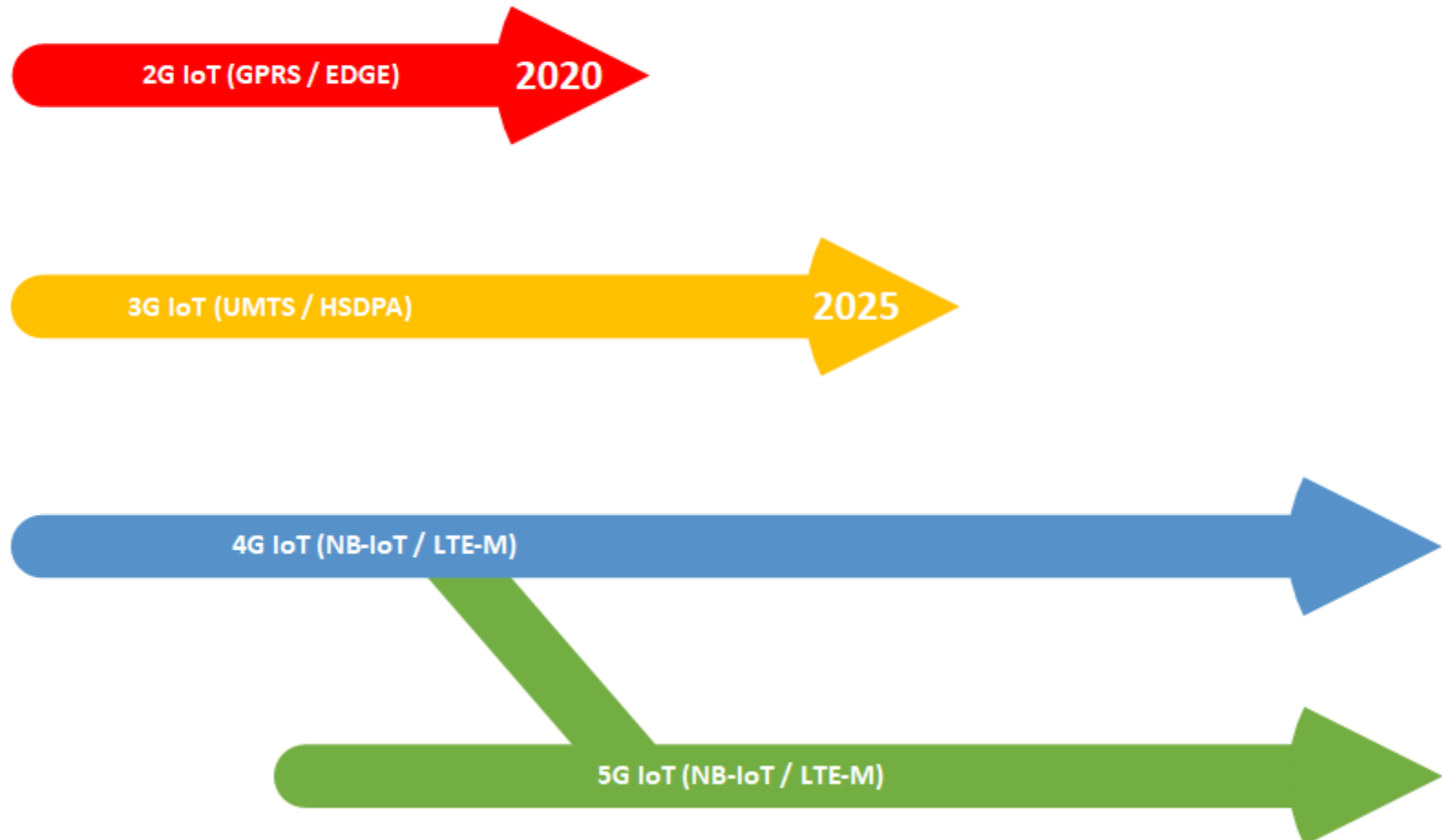
Most Important!

- 'Double Up' Principle
- Always bring two forms of communication
 - Those two forms should be different
- Always prepare for dead batteries
 - Extra batteries
 - Battery Bank
 - Solar Panel Charger
 - Generator
 - Connection to snow mobile

What Can We Expect?

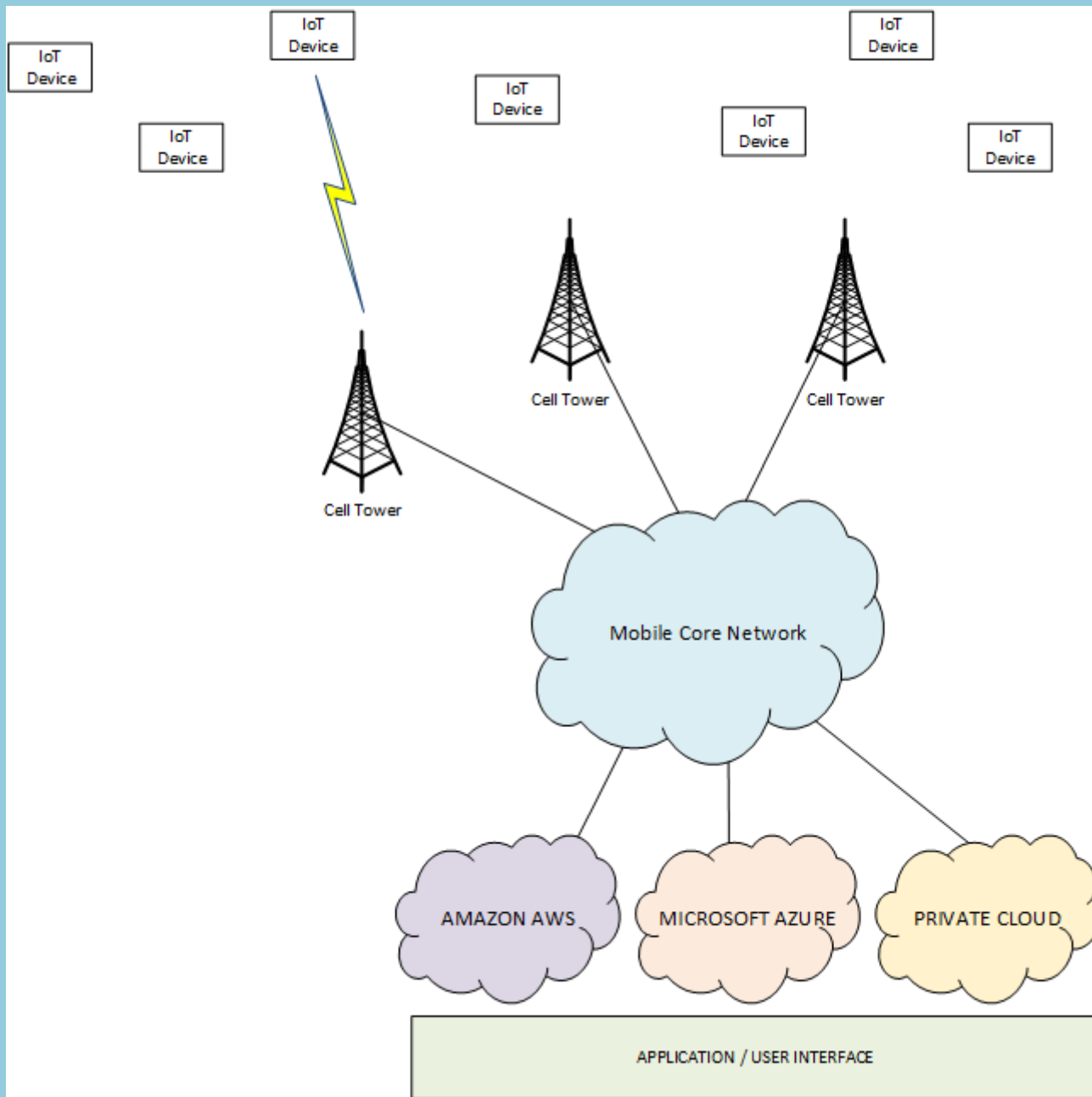
- OneWeb/Starlink
 - Will offer worldwide satellite based broadband coverage
 - Services will team up with local service providers who you can purchase the product through
 - Purchase a terminal to distribute broadband and then set up network either with WIFI or 4G/5G
 - After terminal is setup, any kind of device is usable over the network
 - Orbits run on different inclinations so choose what is viable for your location
 - OneWeb is launching 34 satellites today!
 - Service can be available in the next 5 years

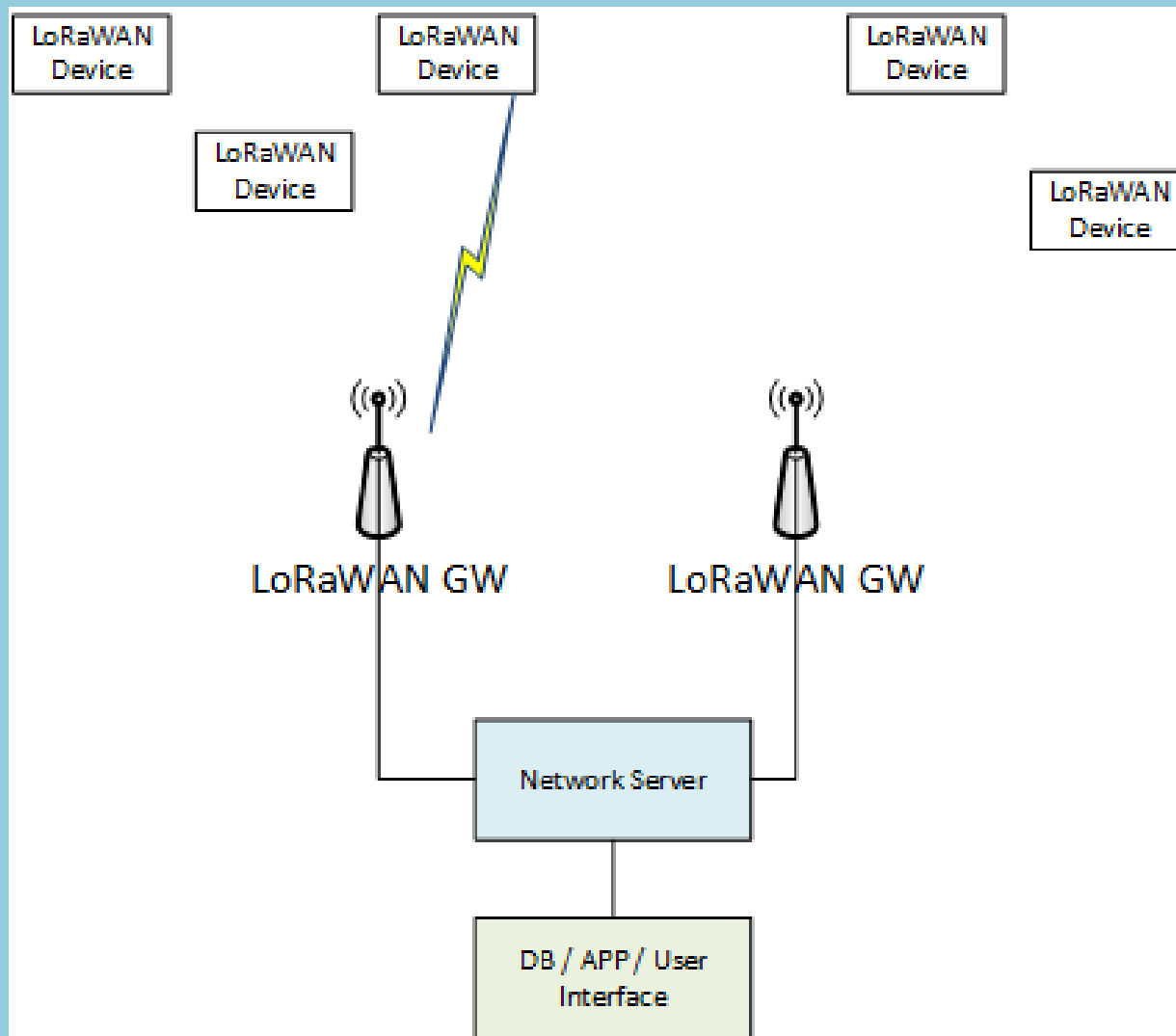
Expected mobile network availability in Norway



IoT, Narrowband, LPWAN – What is it?

- Narrow Bandwidth, Low Power Wide Area Networks
- Technologies available
 - LoRa / LoRaWAN / Sigfox
 - Non global standardization
 - Open spectrum
 - Can be set up as stand alone networks
 - NB-IoT / LTE-M (Mobile Networks)
 - Global standardization (3GPP / GSMA)
 - Licensed spectrum
 - Can only be used inside the coverage of a network provider (up to 100km)
 - SIM card based authentication for strong security
- Narrow bandwidths allows for long range communications with a minimum use of transmission power. LoRaWAN has the record of 766km using just 25mW of transmission power.
- With the use of low power sensors, it allows for devices to be operated on small batteries for a very long time.
- Example: The DRIVA snow sensor uses a first generation NB-IoT chipset which allows for up to 7 years of operation. It uses $<20\mu\text{A}$ when it sleeps – and only $622\mu\text{Wh}$ every time it sends the sensor data over the cellular network (every 10 minutes). Next generation NB-IoT chipsets will half the power consumption.
- All these technologies are based on simple chipset designs which allows for low cost devices compared to legacy 2G/3G-modems widely used today.





Thank You!

Questions



Appendix 4

Managing risks – A model for risk assessment

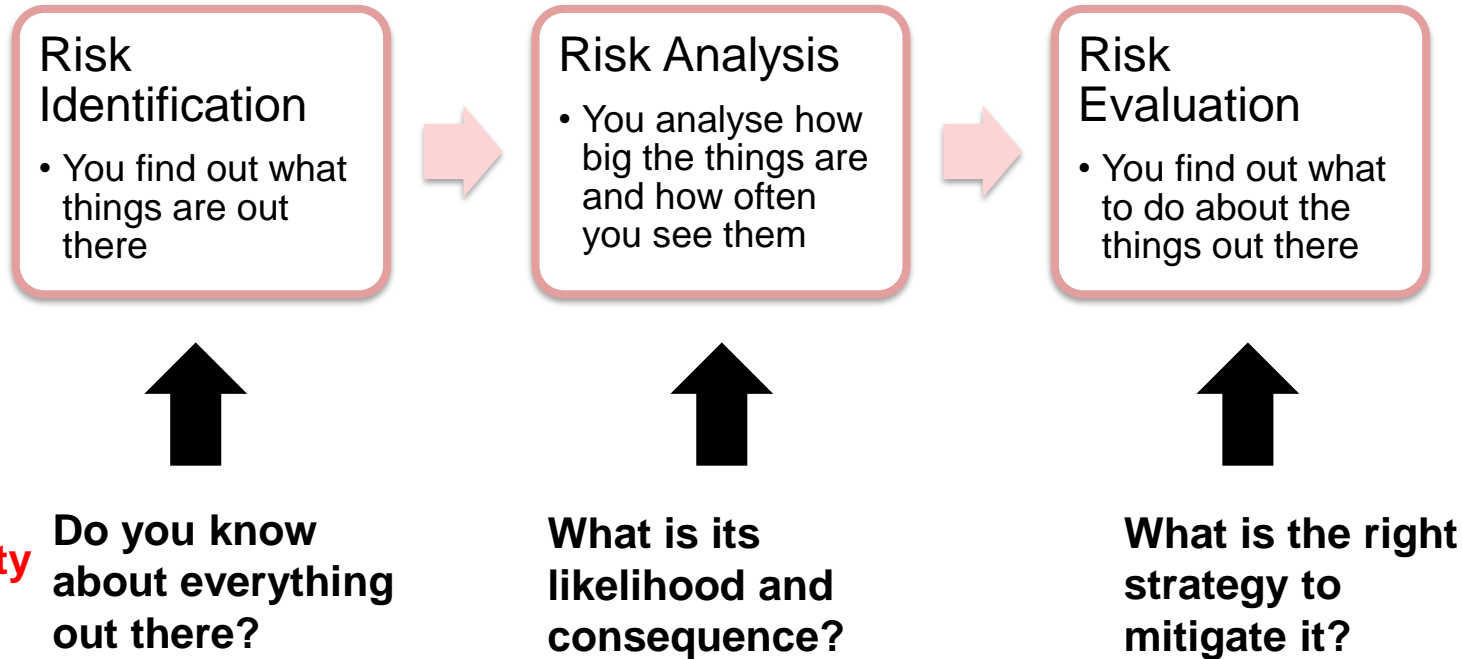
- Welcome to a short introduction on how to work with a resilience-based risk assessment.

Associate prof., PhD
Jacob Taarup-Esbensen
jata@kp.dk

“Risk is uncertainty about and severity of the consequences of an activity with respect to something that humans value” SRA, 2020



Traditional risk assessment models



**Uncertainty
as to...**

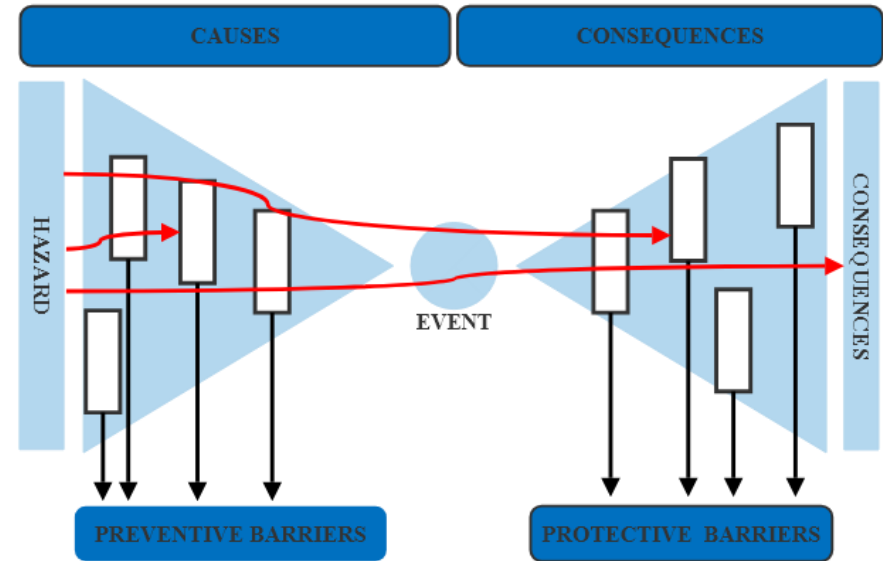
Using a Organisational resilience approach to Risk assessment

- Focusing on processes rather than events (reducing your guesses)
- Working with what brings value to the organisation and its members (sense of direction)
- Emphasis on the contribution of managers in resolving events (Capabilities, monitoring, Competence, Evaluation)
- Recognising that organisation needs to resolve problems themselves (to a certain degree and at least in the initial phases of an event)
- Recognising that and event do, if resolved correctly, not inevitably result in a crisis (planning is everything but plans are nothing)
- Acknowledgement that the impact, potential or realised, affect a wide range of stakeholders (you are properly not alone)

The Bow-tie model

The analysis includes the complete event scenario, compounded by a fault tree (the left side), which identifies causes to the event, and an event tree (right side) dealing with consequences once the event is realised.

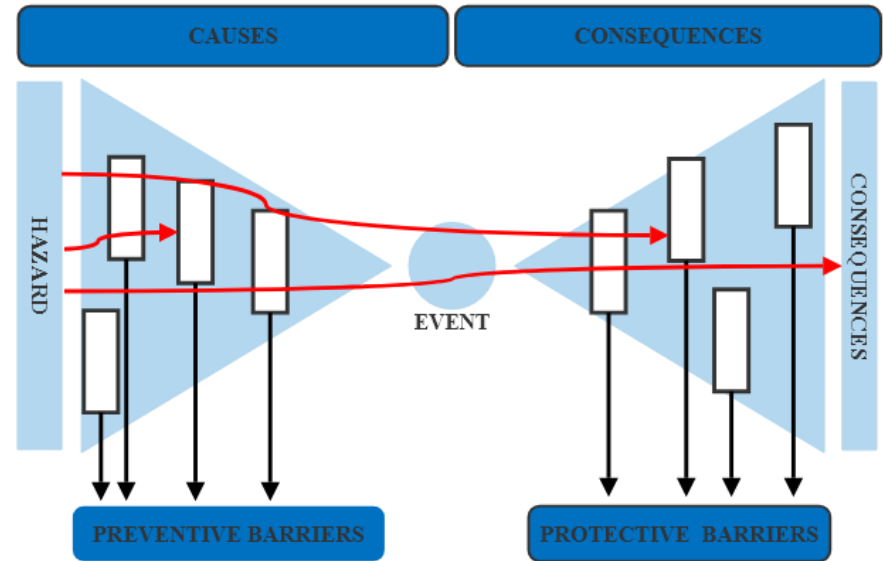
The Bow-tie, identifies all connections between the hazard, the event and final the outcome, in the form of consequence.



The Bow-tie model

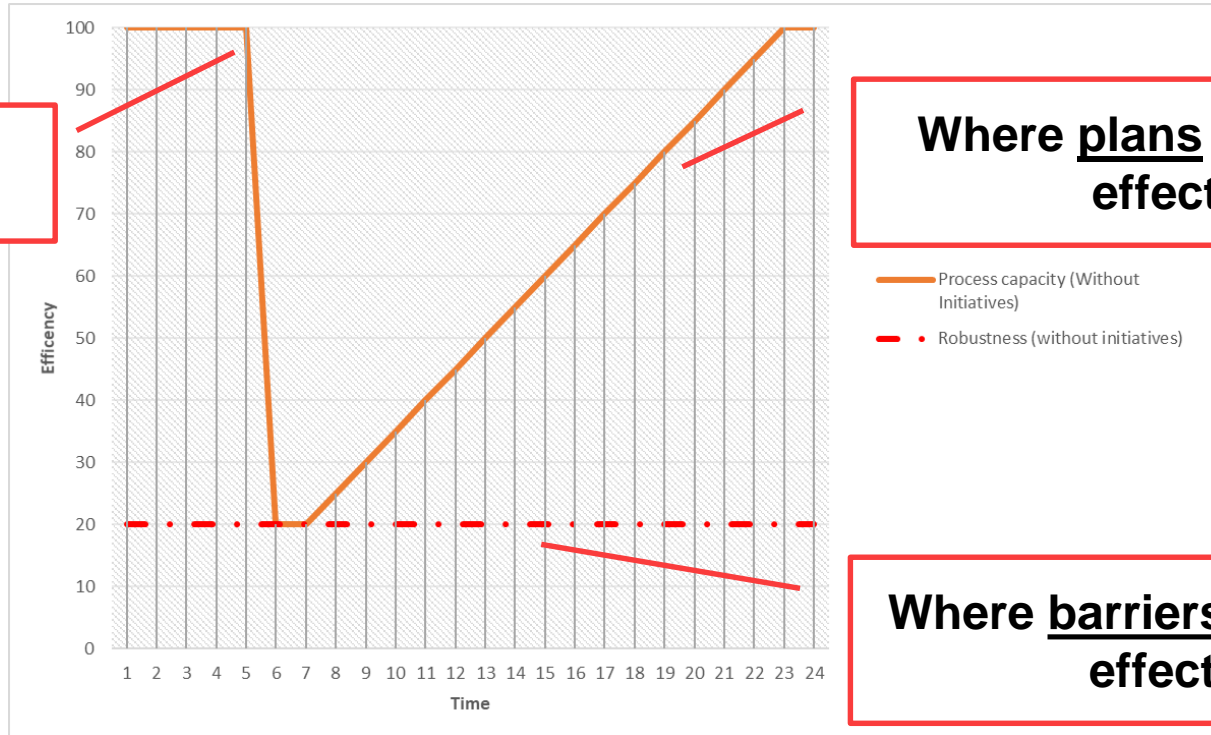
A series of barriers exist that will either prevent the event from materialising and protect the organisation if it does.

These barriers are physical or organisational structures that, in different ways, hinder a hazard in becoming an event and further materialise into tangible consequences that result in a loss (of something that humans value).



Effect of organisational resilience

Event



Where plans have an effect

Where barriers have an effect

Focus on Value

To create the risk assessment it is important to know what is important to the organisation or *something that humans value*.

Value can be monetary but can also include things that are deemed valuable, such as cultural, environmental or social structures.



Focus on Value

For companies values comes from bringing their product to market.

For example, the value creating process for mining companies is produce ore, which is refined and later sold to vendors. But can also be their reputation as a social responsible business.

For research stations this could be being considered a preferred station for researchers and tourists or being a preferred grant recipient.



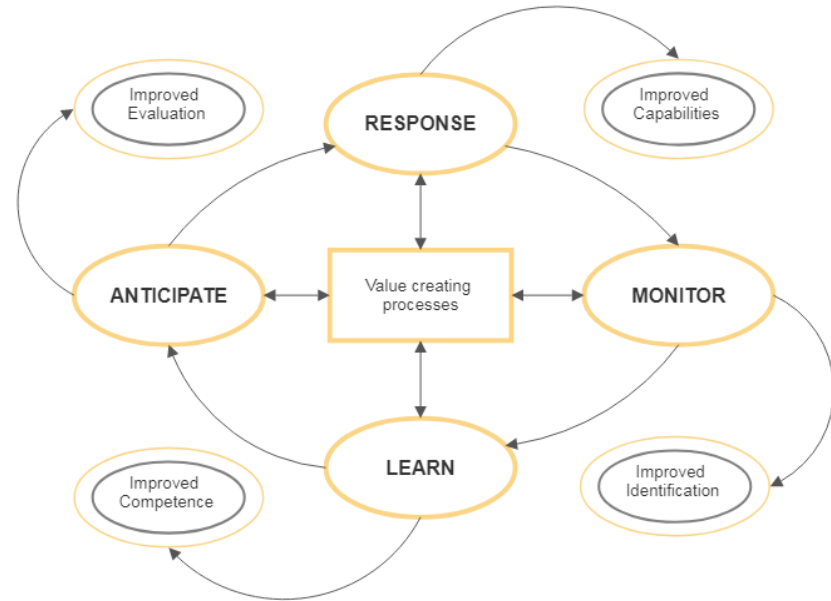
Assessing risks and creating barriers

A systemic *response* to known and unknown events by creating capabilities that will stop, mitigate or delay consequences.

To *Monitor* how processes are supposed to be carried out, how an event might influence them and when they requires an organisational response.

To *Learn* means knowing what has happened by analysing impacts of events in the past and the organisations' ability behave appropriately.

To *Anticipate* future developments, threats and opportunities that arise both internally and external that have the potential to disrupt or alter processes.



Respons

An organisation's ability to *respond* in a systematic manner to a deviation in how the value-adding processes are supposed to perform.

Organisations create capabilities or systems that will enable it to perform tasks in a way that ensure risks are addressed in a timely and effective manner.

For example, through the adoption of standard operating procedures (SOPs) or recovery plans.



Monitoring

Monitoring is related to risk identification insofar as the organisation can systematically collect information about its environment.

Knowing what has happened in the past can inform the organisation of what to prepare for in the future.

For example, sharing experiences using a log to record events and using these to create awareness of possible uncertainties in a specific context improves monitoring.

An alternative can be a notice board where operational information is conveyed such as weather, production figures, staff at and off site, incidents of relevance. The aim is to provide decision makers with information that enable risk identification.



Learn

The accurate assessment of risks in the internal and external context is connected to the organisation ability to *learn* from experience.

While the system enables a response through capabilities these are of little use if the individual does not possess the right competencies to utilise these.

For example, employing specialised engineers to a mining site will improve yield or having people trained in emergency response will reduce the chance that fire hazards become events or minimises their consequences if realised.



Anticipate

Being able to anticipate changes to context and organisational processes enables improvements to the evaluation of risks and hence qualifies decisions to prevent, mitigate or accept a possible event.

For example, changes in the weather will influence logistics or companies storing hazardous materials must plan for possible spills.



Creating barriers

Organisational resilience management is about creating preventive and plans for protective barriers.

It is about what to protect - namely something that humans value

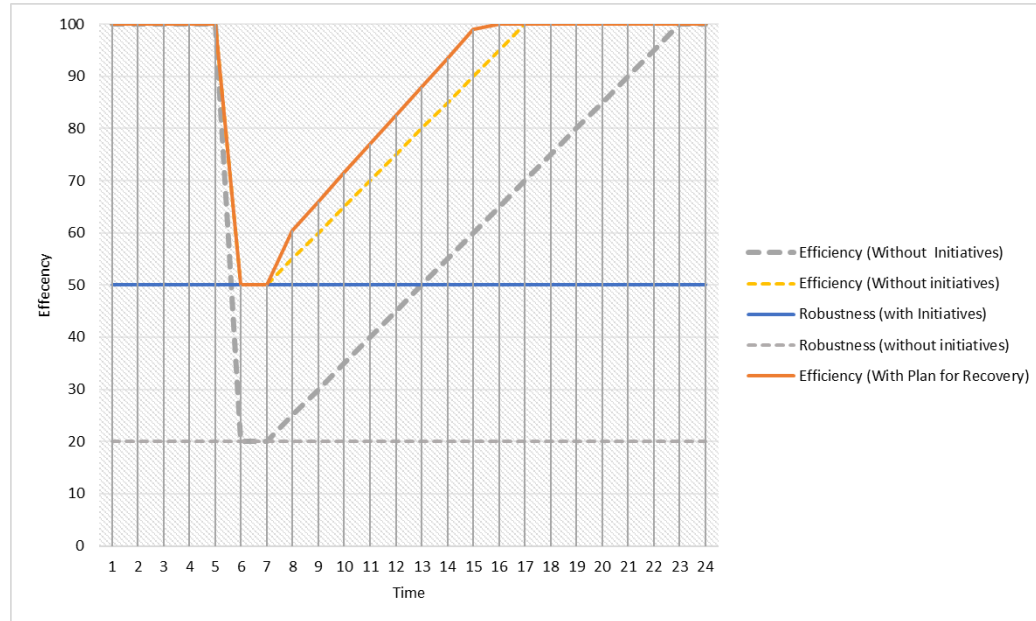


Barriers and recovery

An organisation can become more resilient by increasing its robustness, by building barriers, and by making plans for recovery.

Two elements

- 1) Increasing robustness (Risk Reduction Plan) – Blue line
- 2) Contingency plans (Business Recovery Plans) – Orange line



Exercise – Barriers (55 minutes total)

Round 1 (everyone):

Use 10 minutes to look at the hazards and risks bricks at your table

1. What is the most pressing hazard or combination hereof threatening 'something of value' at your station?

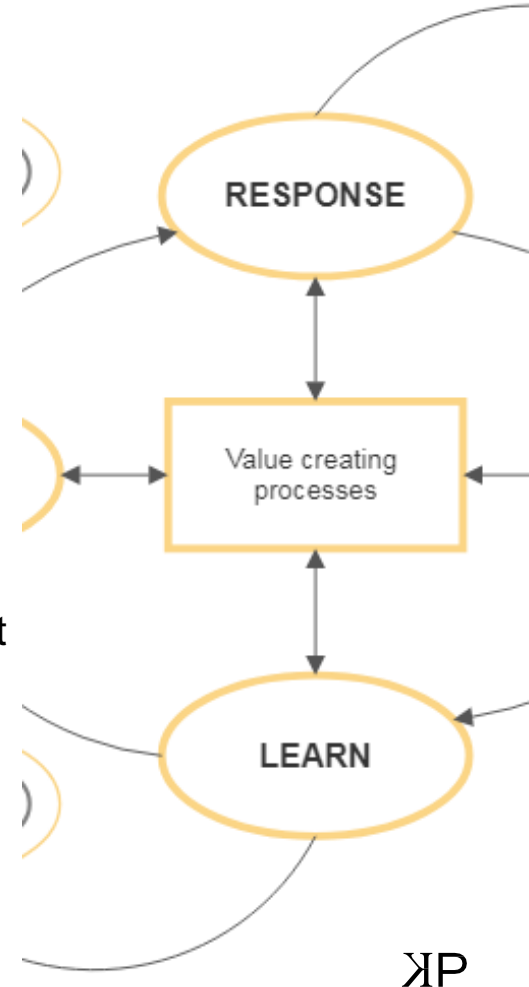
Take three examples (do not have to be prioritized and can be different from the bricks, just create another)

Round 2 (in groups 45 minutes):

Using the top three hazards shared by the group choose one:

- Use the Response, Monitor, Learn, Anticipate-framework to create a barrier.
- Based on your experience under what circumstances will your station have an effective response? When will it not?

Present your solution to the group



Group presentations

Follow-up

Risk Cards

- These risk cards represent the diverse set of risks and uncertainties that people can encounter in the Arctic. They do not represent a complete list but can be seen as work in progress.
- The list is compiled from the extant literature on risk and safety events under arctic conditions.
- The cards are structured as follows:

Theme: Indicates the general category of the risk. In this instance Technical risks that are hazards that can influence equipment, buildings, vehicles etc.

Description: The concrete risk that can threaten something that humans value. The treat can be general like for example low temperatures or specific like a temperature range of low temperatures.

**Technical
Risks**
Low temperatures -
General

Notes

Notes: Place for writing more details or specifying a specific event

Risk Cards - Themes

- **Technical Risks**
 - **Effects vehicles, equipment and buildings**
- **Weather communication and operational decisions**
 - **Effects quality of decision making**
- **Safety risk**
 - **Effects Occupational Safety Health**
- **Environment**
 - **Effects on the external environment**
- **Reputational risks**
 - **Effects the legitimacy of the organisation**
- **Climate sensitive infections**
 - **Effects that decrease can have on humans and animals**