



Polar Research Department
Institute of Geophysics
Polish Academy of Sciences

Piotr GŁOWACKI



**„Polish logistic potential at Svalbard
– contribution to SIOS”
(Svalbard Integrated Arctic Earth Observing System)**

Svalbard Integrated Arctic Earth Observing System (SIOS)

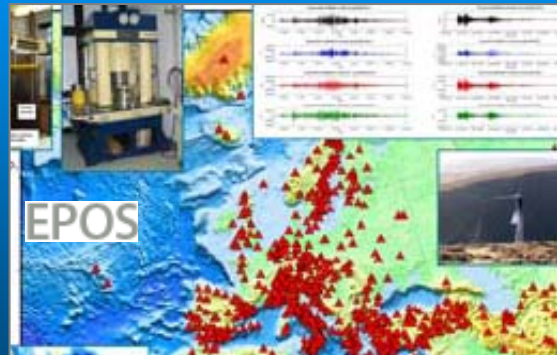
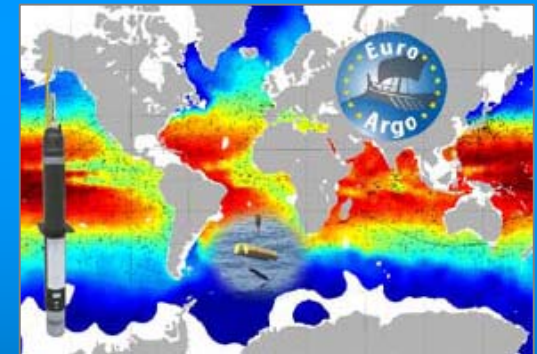
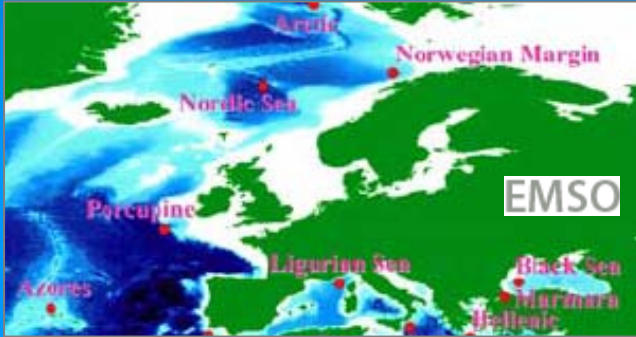
The goal of SIOS

Establish an Arctic Earth Observing System in and around Svalbard that integrates the studies of geophysical, chemical, hydrological and biological processes from all research and monitoring platforms.

SIOS is an opportunity for Europe to establish the central node in the global monitoring of the High Arctic.



AURORA BOREALIS

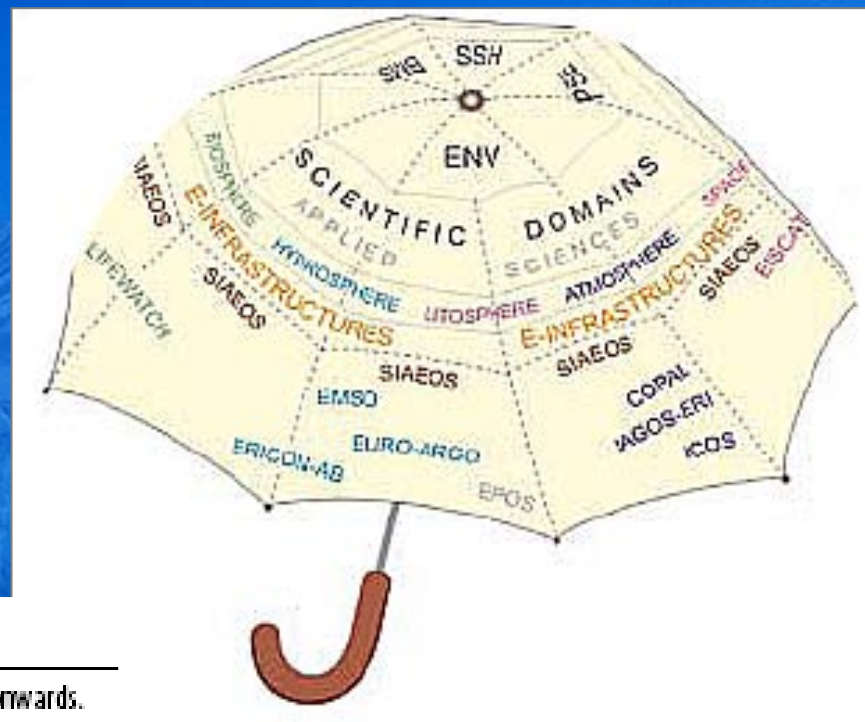


Svalbard Integrated Arctic Earth Observing System (SIOS)



Map of the European Arctic and the area covered by SIOS

Svalbard Integrated Arctic Earth Observing System (SIAEOS → SIOS)



>Timeline.

Preparatory phase 2008-2010; construction phase; 2010-2012; operations 2012 onwards.

>Estimated costs.

Preparation costs:	2-5 M€.
Total construction costs:	50 M€.
Operation costs:	9.5 M€/year.
Decommissioning costs:	not applicable.

>Website: www.unis.no/SIAEOS

Svalbard Integrated Arctic Earth Observing System (SIOS)

Main Goals of SIOS

- To build up a comprehensive observation platform capable of monitoring the Arctic Earth System in the Svalbard region, thus matching Earth System models.
- To establish a major European environmental research infrastructure in the frame of EGFR and catalyse the development of the European-Atlantic segment of SAON.
- To secure the legacy of the International Polar Year-

Why Svalbard?

- Svalbard is located in a region where key Arctic processes take place and large natural gradients exist – an ideal location to study variability and change
- A wide set of scientific infrastructure and strong international cooperation already exists
- Svalbard is easily accessible year-round and has excellent logistical and communication infrastructure
- Existing satellite communication infrastructure will provide excellent access to remote sensing data – in a region with very high satellite monitoring coverage

Institutions contributing to SIOS

[illegible]

Core element:
**The SIOS Knowledge
Centre**

- Data centre
- Logistics coordination
- Education and Outreach
- Communication centre
- Scientific catalyser

What will be included in SIOS?

- **Observations of upper atmosphere and solar-terrestrial coupling:**
EISCAT - visible auroral observations - geomagnetic observations - active sounding
- **Active and passive atmospheric monitoring:** stratosphere and ozone layer tropospheric components, radiation, trace gases, climate drivers (CH₄, aerosols, clouds)
- **Cryosphere monitoring:** glaciers and ice sheet mass balance, permafrost characteristics and changes, sea ice properties and changes
- **Ocean monitoring:** heat transport, deep ocean water formation, ocean acidification, coastal dynamics, pollution transport using mooring stations, seafloor observatories, research vessels
- **Ecosystem studies:** variability, productivity and long-term changes of marine ecosystems, inventory of terrestrial ecosystems and climate-induced changes, marine-terrestrial ecosystem interaction
- **Solid Earth:** stability of seafloor (methane hydrates), effects of deglaciation, regional sedimentary mobilisation of paleo-carbon reservoirs, land uplift
- **Geodynamics and feedback loops between all these components**



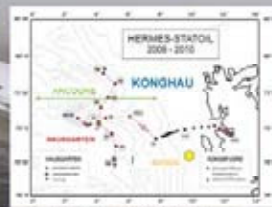
SIOS Time Plan

Spring 2010: Contract negotiations SIOS Preparatory Phase project (SIOS-PP)
Autumn 2010: SIOS-PP kick-off

2011-2013: Investment phase, build-up of SIOS Knowledge Centre

Summer 2013: Formal Establishment of SIOS Infrastructure

From autumn 2013:
Occupational Phase



The Research Council
of Norway

Contact:
Karin Røffnes karin.roffnes@helse-bergen.no
Georg Hansen georg.hansen@helse-bergen.no
The Research Council of Norway
Slottsborggaten 29
NO 0131 Oslo, NORWAY
info@helsenorge.no helsenorge.no



Svalbard Integrated Arctic Earth Observing System (SIOS)

Access to Project (preparatory phase)

45 partners from 15 countrys :

Norway – 24

EU – 13

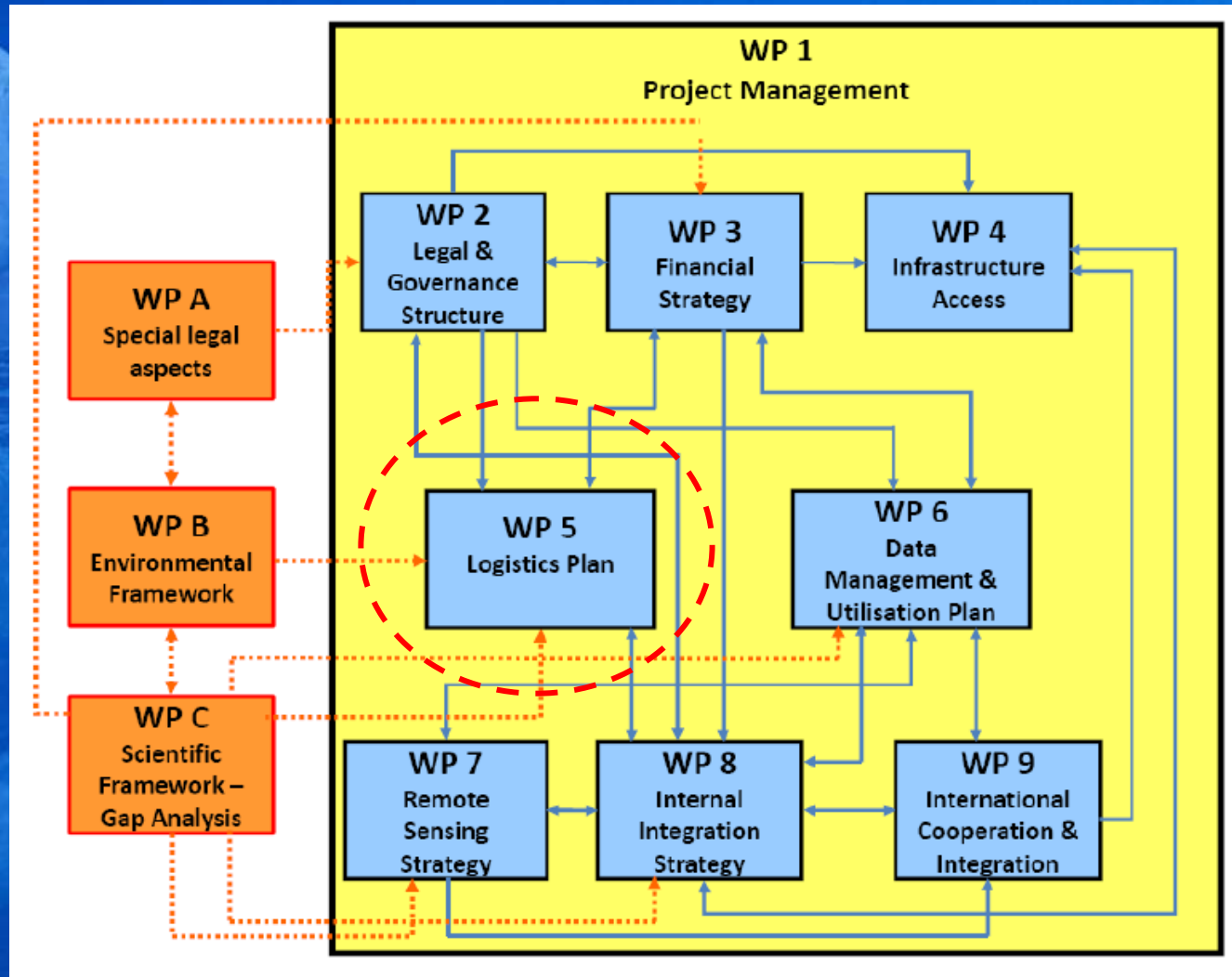
(Great Britain - 3, Poland - 2, Finland - 2, Danish, France, Netherlands, Germany, Sweden and Italy)

non EU – 7

(Russia - 4, China, Korea, Japan)

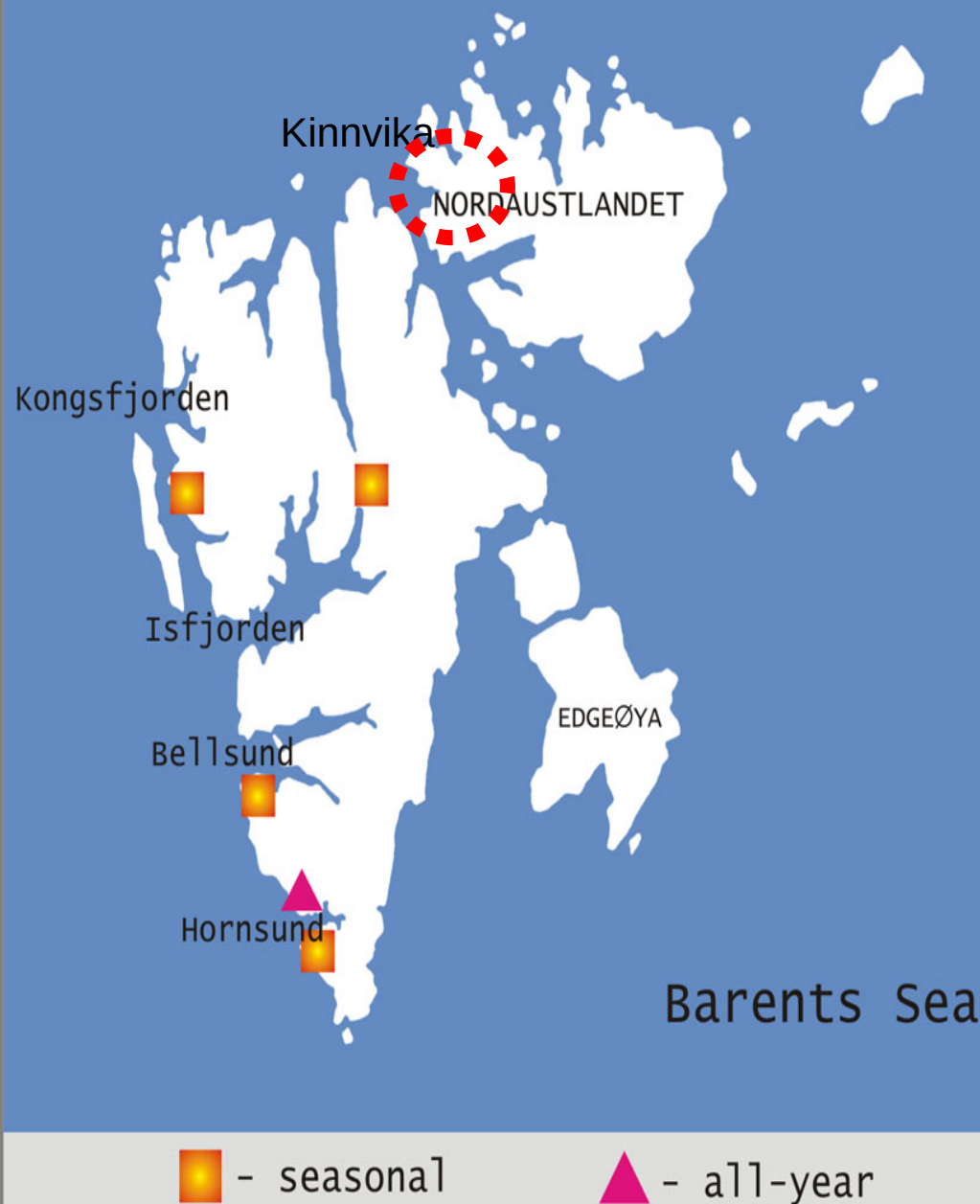


Svalbard Integrated Arctic Earth Observing System





SPITSBERGEN



Honsund area



Polish Polar Station



Polish vessel *HORYZONT II*

2002 9 27

Polish Polar Station in Hornsund area







Scientific - training vessel *Horyzont II*



Scientific vessel
OCEANIA





**Baranowski Field Station of the Wrocław University
near Werenskiöld Glacier (Spitsbergen - Wedel Jarlsberg Land)**





Polar Field Station of the Toruń University at Kaffiøyra (Spitsbergen - Oscar II Land)





Investigation field area of the Lublin University near Recherche Fjorden (Wedel Jarlsberg Land)





Investigation field area of the Poznań University at Petunia Bay (Spitsbergen - Dickson Land)





Polish Polar Station at Hornsund (Svalbard)

Facilities:

- Single bedrooms – 13
- Larger bedrooms – 7
(30 places for seasonal groups)
- Science laboratories – 10
- Kitchen
- Dining room
- Common room
- 3 Bathrooms
- 4 Toilets
- Garage and workshop
- 12 Snow mobiles
- 2 Open boats
- 2 Zodiacs
- 2 Caterpillars
- Environmental pavilion
- 3 Geophysical containers







Three satellite systems are used for communication (INMARSAT and IRIDIUM and Internet) but for the safety short - wave transmitter is also used

Crew at the Station in winter time :

Meteorologist (2)

Mechanic

Electronic engineer

Geophysicist (2)

Electrician

Environmental observer

Polish Polar Station at Hornsund

Scientific programme

CONTINUOUS OBSERVATIONS OF GEOPHYSICAL FIELDS AT HIGH GEOMAGNETIC AND GEOGRAPHICAL LATITUDES

This location is very suitable for geophysical investigations.

The glaciers placed nearby the Station are an excellent research polygon for determining the interglacial physical processes.

The location of Spitsbergen is optimal for studying physical processes in the region of aurora and polar cusp. Measurements of geomagnetic field components together with those of atmospheric electricity elements, ionospheric absorption, and observations of aurora.

Many programs performed at the Station concern the physical parameters investigated in the framework of the International Program *Global Change*.

Research fields and programmes

➤ Geomagnetism

- Study of magnetic field changes at high geomagnetic latitudes.

➤ Seismology

- Seismicity of the Arctic Sea Basin.
- Glacial seismic events.

➤ Space physics

- Study of the transfer of energy, mass and momentum from the solar wind to the magnetosphere.

➤ Electricity and optics of the atmosphere

- Determination of electric field in the „polar cusp”.
- Determination of factors affecting the UV radiation influx to the Earth's surface.

➤ Glaciology

- Dynamics and mass balance of glaciers in the region of Hornsund as an indicator of global climatic change.

Research fields and programmes

➤ **Meteorology**

- Meteorological observations and transmission of meteorological data to World Data Centers.

➤ **Biology**

- Biodiversity of the Arctic ecosystems. The Fjord Hornsund as one of flagship sites for biodiversity of European ecosystems.

➤ **Natural environment**

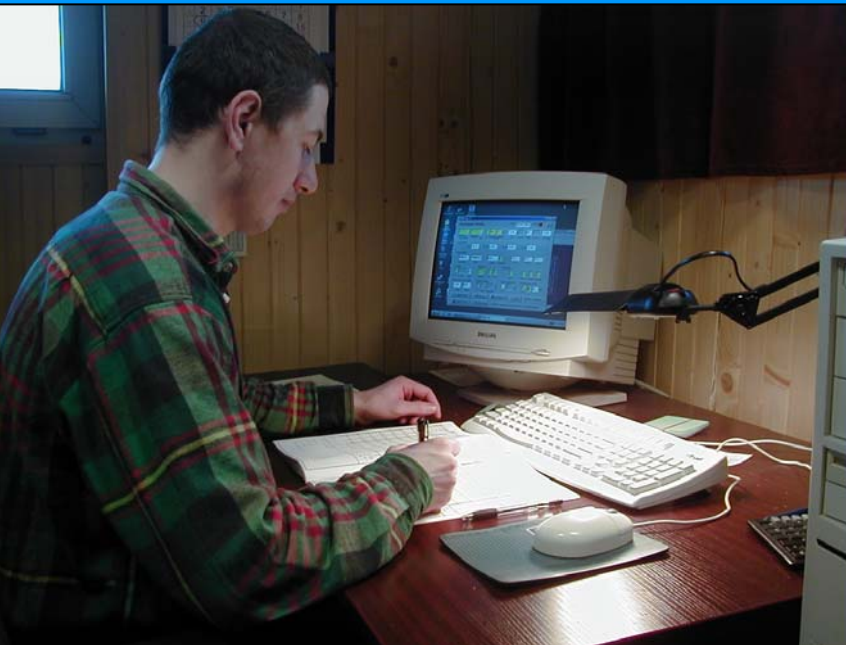
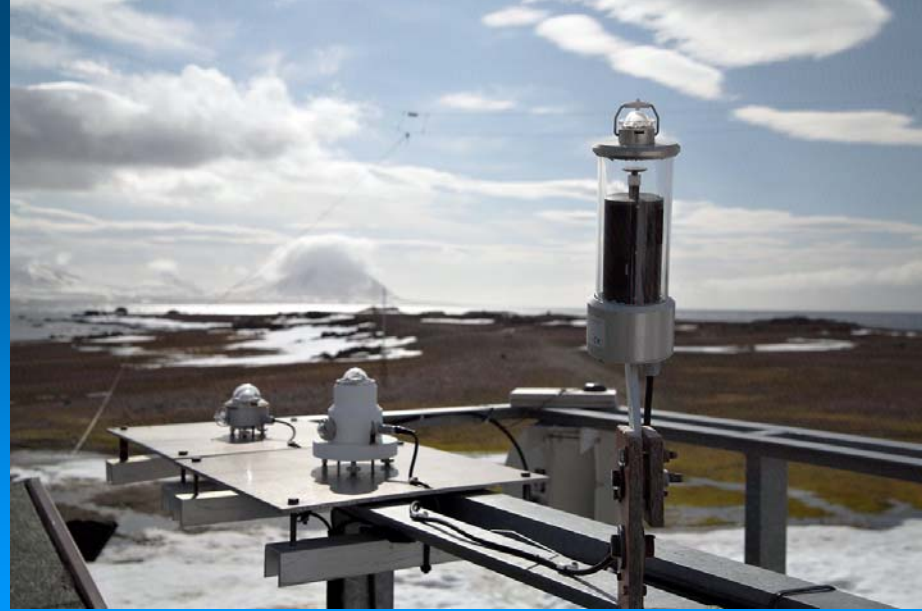
- Long range transportation of air pollutants to the Arctic.
- Water circulation in the polar environment during climate warming
- Evolution of the polar environment as a result of climate changes and anthropogenic impact.

➤ **Geology**

- Study of Quaternary sedimentary basins of Spitsbergen.
- Research into the origin of Spitsbergen fjords based on investigation of tectonic structures.

Meteorological observatory and Geophysical laboratory

- VISALA automatic weather station (QLC 50)
- Multiwavelength Elastic & Raman Scattering LIDAR
- UV-S-AE-T Biometer Kipp&Zonen
UV-A & Erythemal Radiation,
- Sunphotometer CE-318-2.



Ionospheric investigation laboratory



Digital Ionosonde

3 Spaced GPS Scintillation/TEC Receivers

30 MHz riometer Digital Ionosonde

Magnetic investigation





Seismological investigation and monitoring



Broadband station
(high quality recordings of
teleseismic events):
seismometers: STS-2;
Data acquisition
system: GURALP
CMG-DM24: sampling:
20 Hz

Chemical and Biological Laboratory



System of two ion chromatographs
761 IC Compact (Metrohm, Switzerland)

Conductivity and pH meters
(CX 401, CX 722, Cp-311 Elmetron, Poland)

Glass filtering sets
(Millipore, USA)

Analytical balance,
laboratory oven, water purification system

Environmental field laboratory

Radionuclide's
air monitoring

4 7 2002



Glaciological Research

1. Stereographic digital lapse cameras.
2. Automatic glaciological stations
 - snow depth sounder,
 - vertical wire strain sensor,
 - geophone,
 - subglacial water pressure,
 - bed stylus
3. Leica precise GPS differential system,
 - reference station GRX 1200 pro
 - glacier permanent station GRX 1200
 - RTK real time kinematic GX 1230
4. Electronic distance meter (Leica TCR 1105)
5. Digital electronic level (Leica - DNA 10)





Svalbard – Hornsund area



European Marine Biodiversity Flagship Site

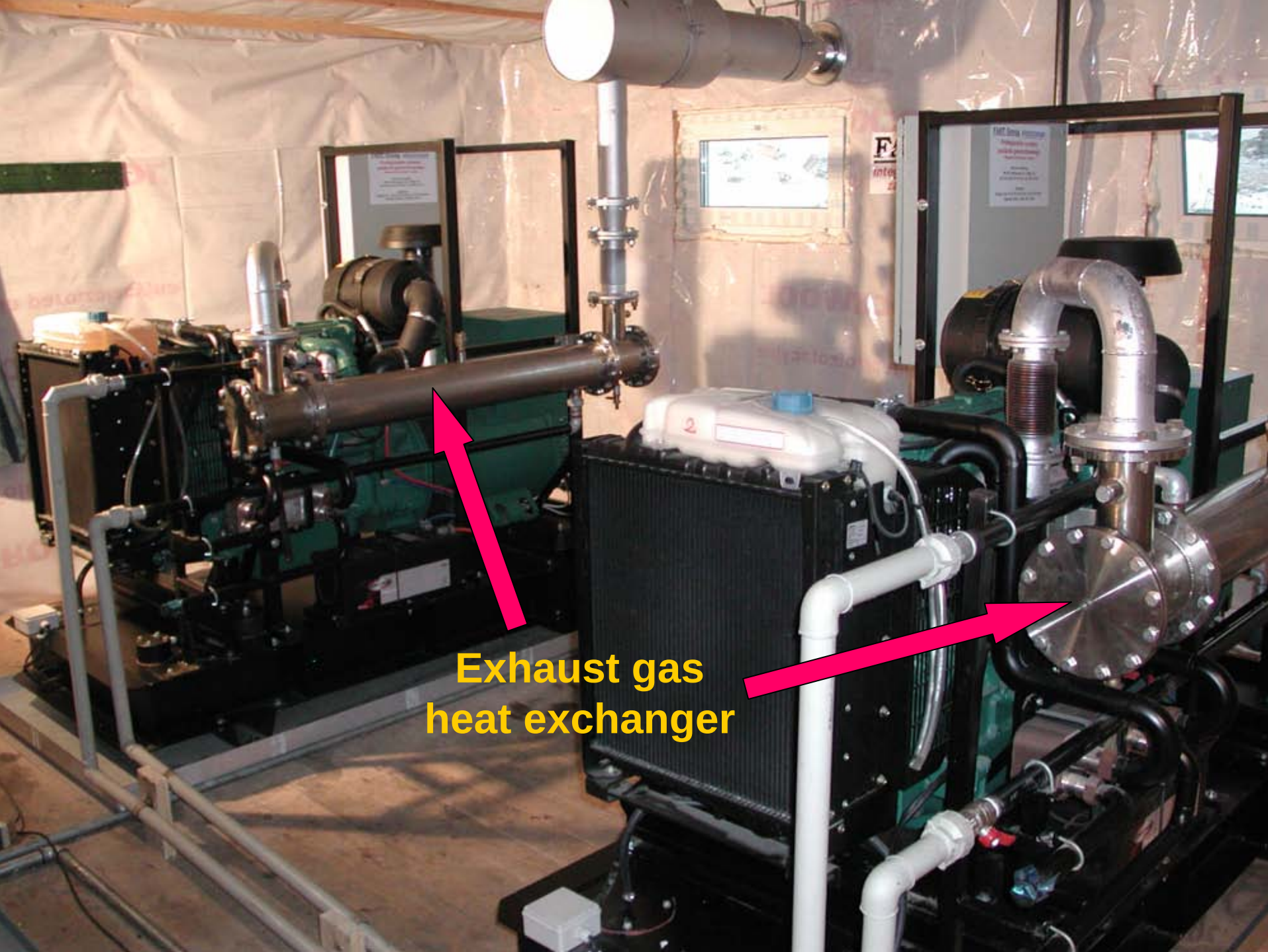




The special
sewage
treatment plant

Fuel base for the power plant and snow mobiles





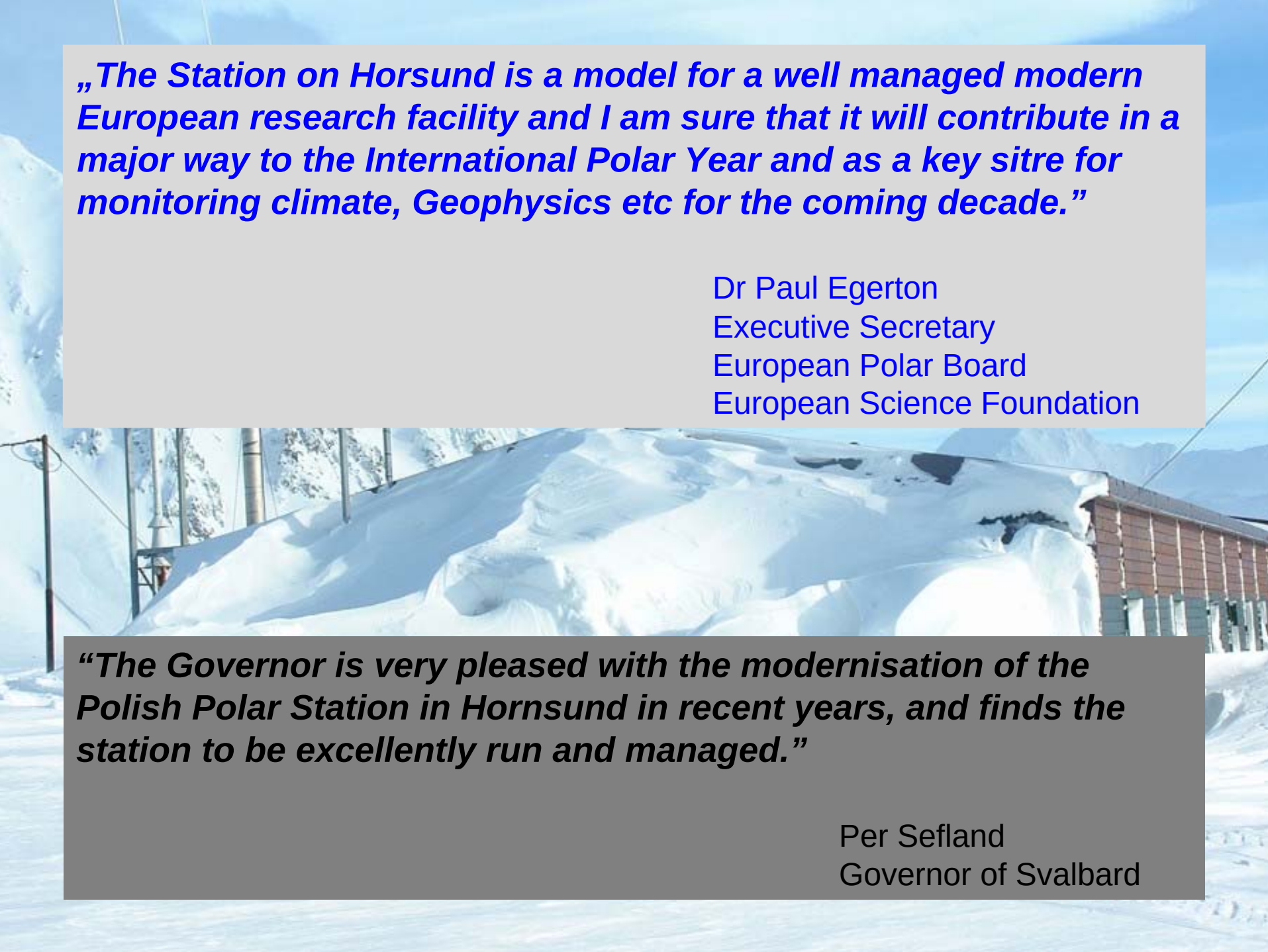
**Exhaust gas
heat exchanger**



Polish Polar Station at Hornsund (Svalbard)

Combustion
of waste material
in ecological incinerator





„The Station on Horsund is a model for a well managed modern European research facility and I am sure that it will contribute in a major way to the International Polar Year and as a key site for monitoring climate, Geophysics etc for the coming decade.”

Dr Paul Egerton
Executive Secretary
European Polar Board
European Science Foundation

“The Governor is very pleased with the modernisation of the Polish Polar Station in Hornsund in recent years, and finds the station to be excellently run and managed.”

Per Sefland
Governor of Svalbard

Center of Earth and Planet Studies



Division VII PAS:

Institute of Geophysics

*Institute of Geological
Sciences*

Institute of Oceanology

Division III PAS

*Centre for Space
Research*

Polish potential activity in future:

- **Oceanic and atmospheric investigations**
(establishing new instruments for aerosols observation)
- **Terrestrials monitoring**
(rapid monitoring of coastline processes)
- **Deep ice coring to sub-glacial lake**
(Amundsenisen accumulation area in deepest ice at Svalbard)
- **Ionosphere investigation**
(establishing new scanner for aurora borealis)
- **Plate Observing Systems**
(establishing seismic array and permanent GPS network)

Polish Polar Station at Hornsund

International cooperation

AERONET

– Aerosol Robotic Network

ATBI

– All Taxa Biodiversity Inventory

BIODAFF II

– Biodiversity and Fluxes in Arctic Glaciated Fjords

BIOMARE

– Long Term Marine Biodiversity Research Sites

COST

– European Cooperation in the Field of Scientific and Technological Research

EPC

– European Polar Consortium

FARO

– Forum of Arctic Research Operators

FDSN

– Federation of Digital Seismograph Networks,

IAGA

– International Association of Geomagnetism and Aeronomy

IMAGE

– International Monitoring for Auroral Geomagnetic Effects

INTERMAGNET

– International Real-time Magnetic Observatory Network

MAGICS

– Mass Balance of Arctic Ice Sheets and Glaciers in Relation to the Climate and Sea Level Changes (IASC)

NORSAR

– Independent foundation dealing with sismology, applied geophysics and identification of earthquakes and underground nuclear explosions

VEBSN

– Virtual European Broadband Seismograph Network,

WDC-1

– World Data Center for Geomagnetism

WGMS

– World Glacier Monitoring Service (UNEP, IHP)

WMO

– World Meteorological Observation Network

SSF

– Svalbard Science Forum

Thank you for your attention!



Hmmm...

What am I still
doing here !