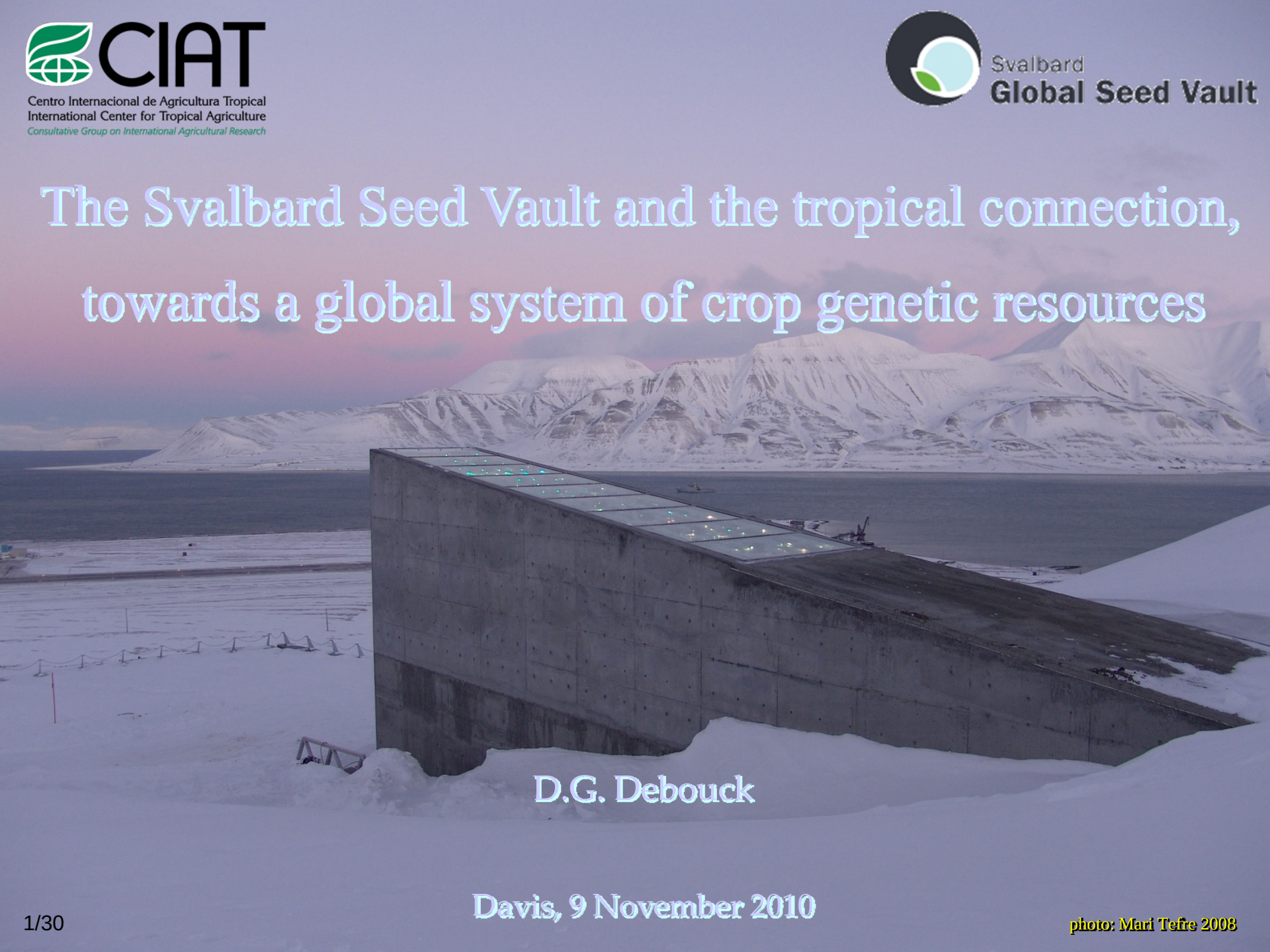
CIAT
Centro Internacional de Agricultura Tropical
International Center for Tropical Agriculture
Consultative Group on International Agricultural Research

Svalbard
Global Seed Vault

# The Svalbard Seed Vault and the tropical connection, towards a global system of crop genetic resources



D.G. Debouck

Davis, 9 November 2010



photo: Mari Tefre 2008

# Outline

Where is Svalbard ?

What is the Svalbard Global Seed Vault ?

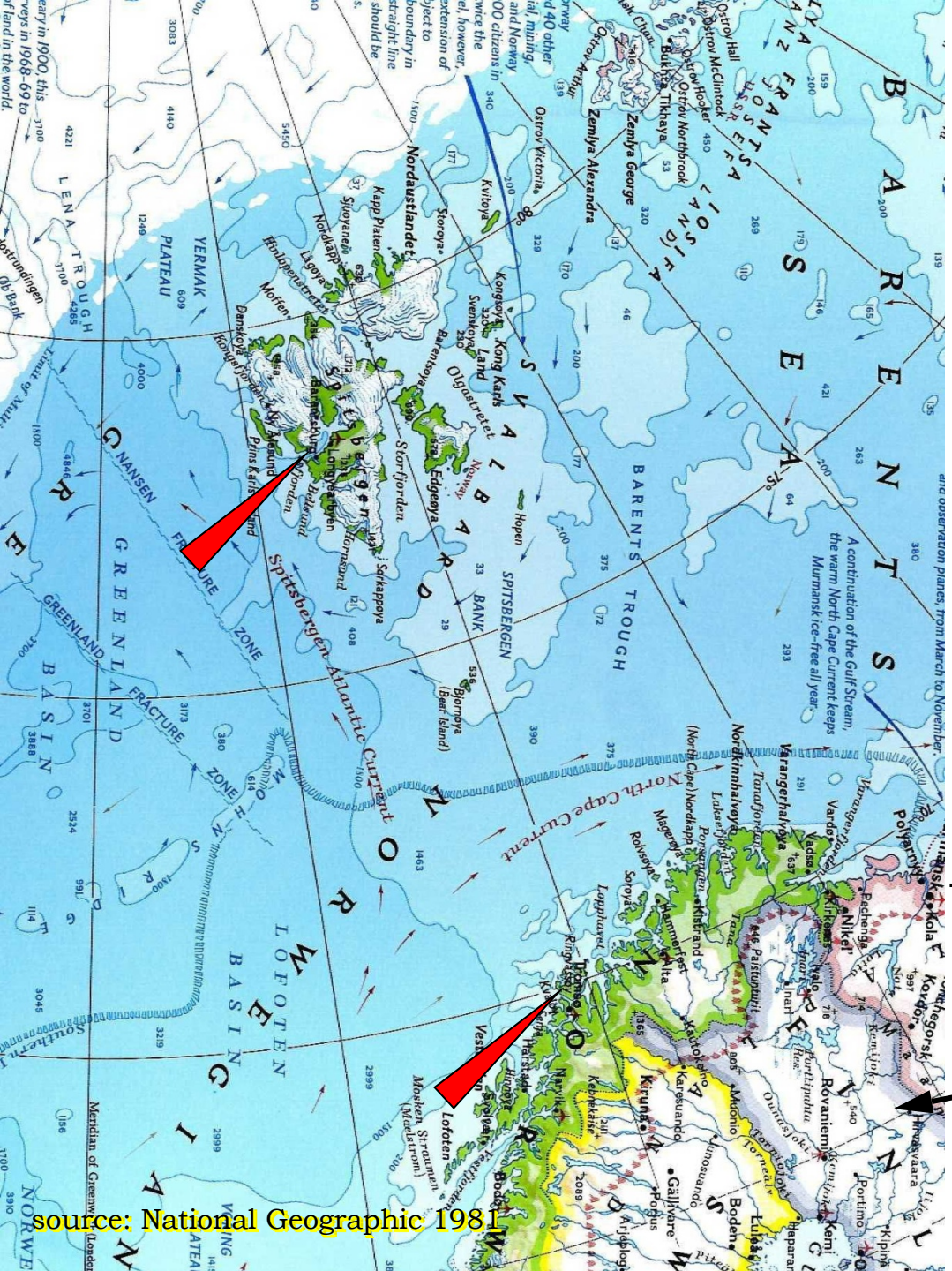
Why Svalbard ?

The process leading to Svalbard

The tropical connection, and the global system



photo: Debouck 2008


BARENTS SEA
SVALBARD
Spitsbergen
Nordaustlandet
Kvitøya
Storøya
Zemlya Alexandra
Zemlya George
Ostrov Victoria
Ostrov Hooker
Ostrov Northbrook
Ostrov Arthur
Ostrov Hall
Ostrov McClintock
Bukhta Tikhaya
FRANZ JOSEF LAND
Kapp Platen
Nordkapp
Sjuøyane
Lågøya
Hinlopenstretet
Mofen
Danskøya
Kongsøya
Kong Karls Land
Svenskøya
Barentsøya
Olgastretet
Storfjorden
Edgeøya
Hopen
SPITSBERGEN BANK
BARENTS TROUGH
Bjørnøya (Bear Island)
Nordkinnhalvøya
Varangerhalvøya
Vadsø
Vardø
Tanafjorden
Lakse fjorden
Porsangerfjorden
Magerøya
Honningsvåg
Repvåg
Sørøya
Hammerfest
Kvalsund
Alta
Loppa
Tromsø
Ringvassøya
Vesterålen
Harstad
Narvik
Kiruna
Karesuando
Muonio
Gällivare
Pajala
Haparanda
Kemi
Tornio
Rovaniemi
Kemijoki
Ounasjoki
Torne älv
Luleå
Boden
Piteå
Arjeplog
Jokkmokk
Kautokeino
Alta
Hammerfest
Kvalsund
Repvåg
Honningsvåg
Nikel'
Pechenga
Kirkenes
Kola
Murmansk
Polyarnyy
Severomorsk
Kovdor
Apatity
Kandalaksha
Olenegorsk
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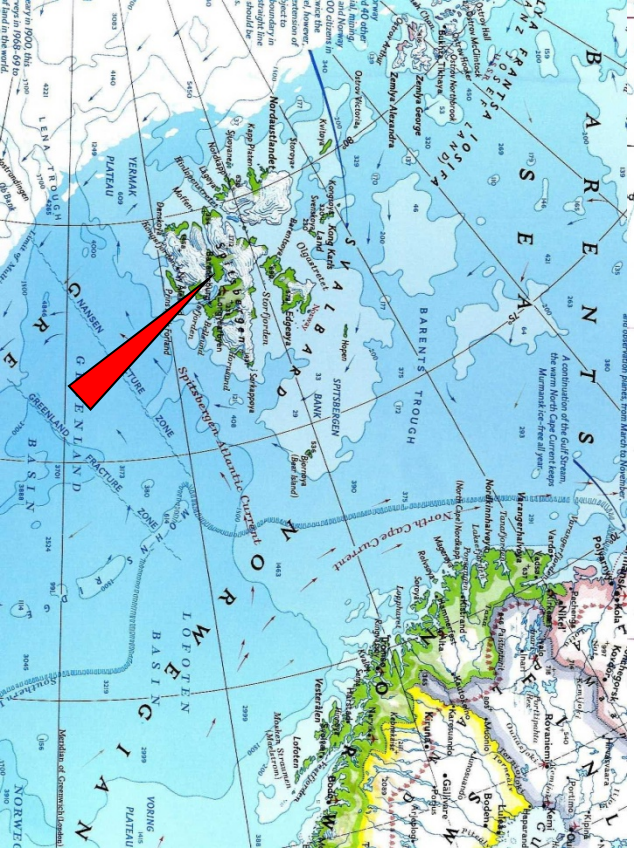


only 1,000 km from North Pole

Geographic coordinates

78° 13′ N

15° 30′ E

130 masl

Island of Spitzbergen

**source: Norsk Polarinstitutt 1983**

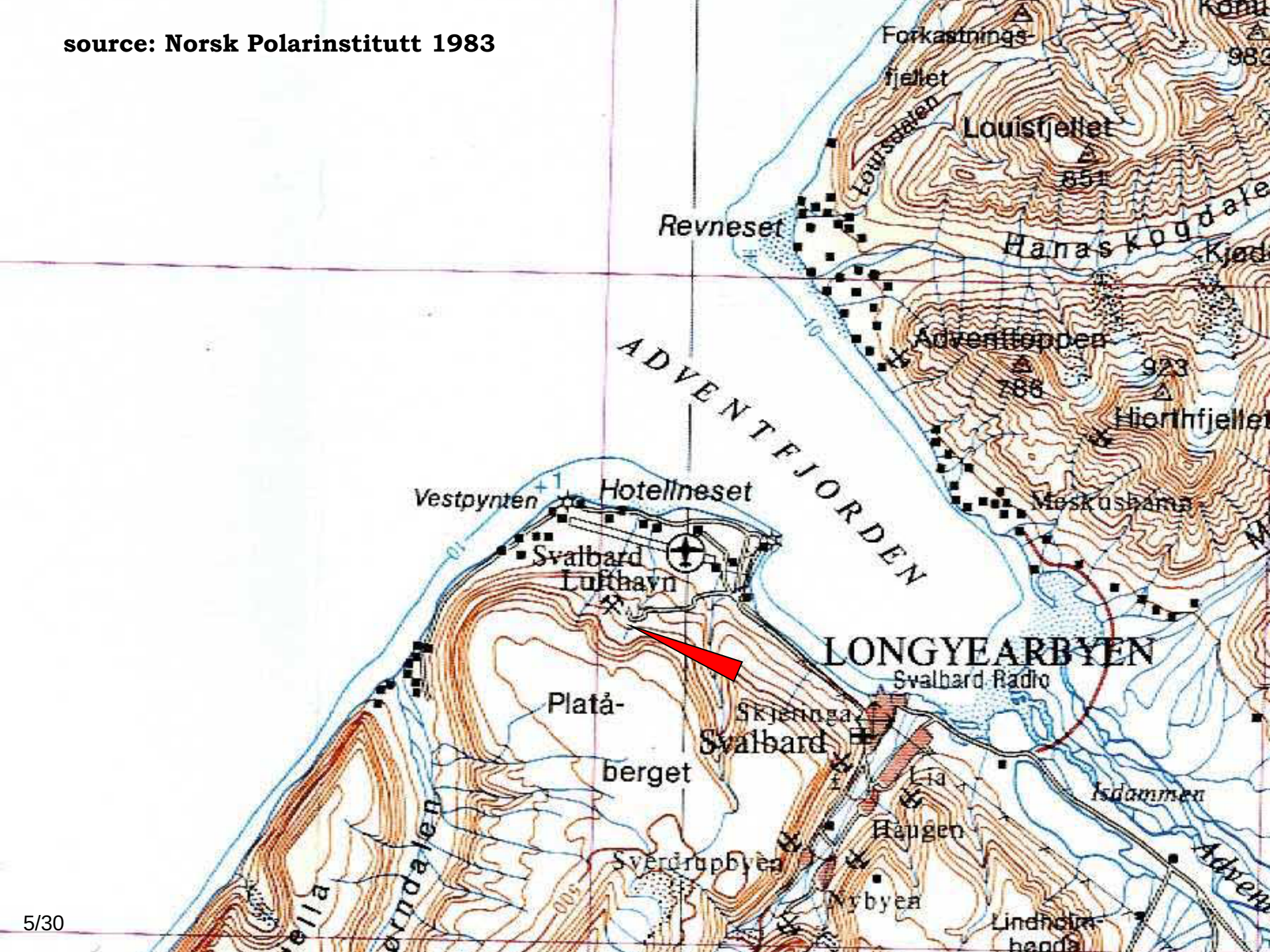


photo: Debouck 2008

Adventfjorden
Longyearbyen
photo: Debouck 2008

Longyearbyen: capital of the Svalbard archipelago, about 1,200 people all year-round named after John Longyear who started the first coal mine in 1906

photo: Debouck 2008

# Chronology to the Svalbard Global Seed Vault

1977-1983: discussions in FAO about a long-term deposit for PGRFA

2004, spring: Norway received a request from the CGIAR about long-term deposit

2004, June 29th : the International Treaty on PGRFA came into force

2004, October: FAO Commission recommended the Norwegian initiative

2005, autumn: Statsbygg was commissioned, drafting plans, selecting site

2006, May: Norwegian government decided the building of the Vault

2006, autumn: building companies were awarded the contracts

2007, April 11th : beginning of excavation on slope of Platåfjell

2007, May 18th and July 9th : first and last blast for the tunnelling

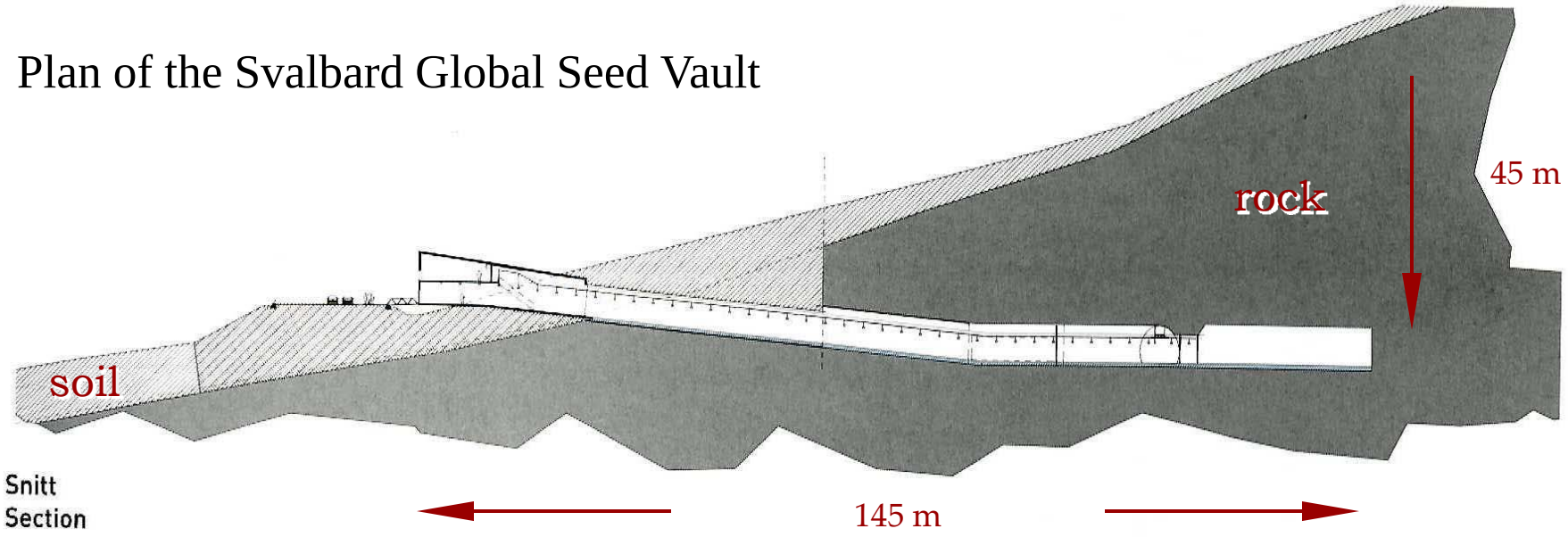
2007, summer: technical installation, namely freezing plant and ventilation

2007, December: cooling of the caverns, installation of shelving system

2008, February 26th : Opening Ceremony of the Vault

**SGRP, Addis**
**20-29 Jan 2007**
**200,000**

Plan of the Svalbard Global Seed Vault




from the idea of an abandoned coal mine to a facility built on purpose

building the Vault: Nov 2006 – Dec 2007

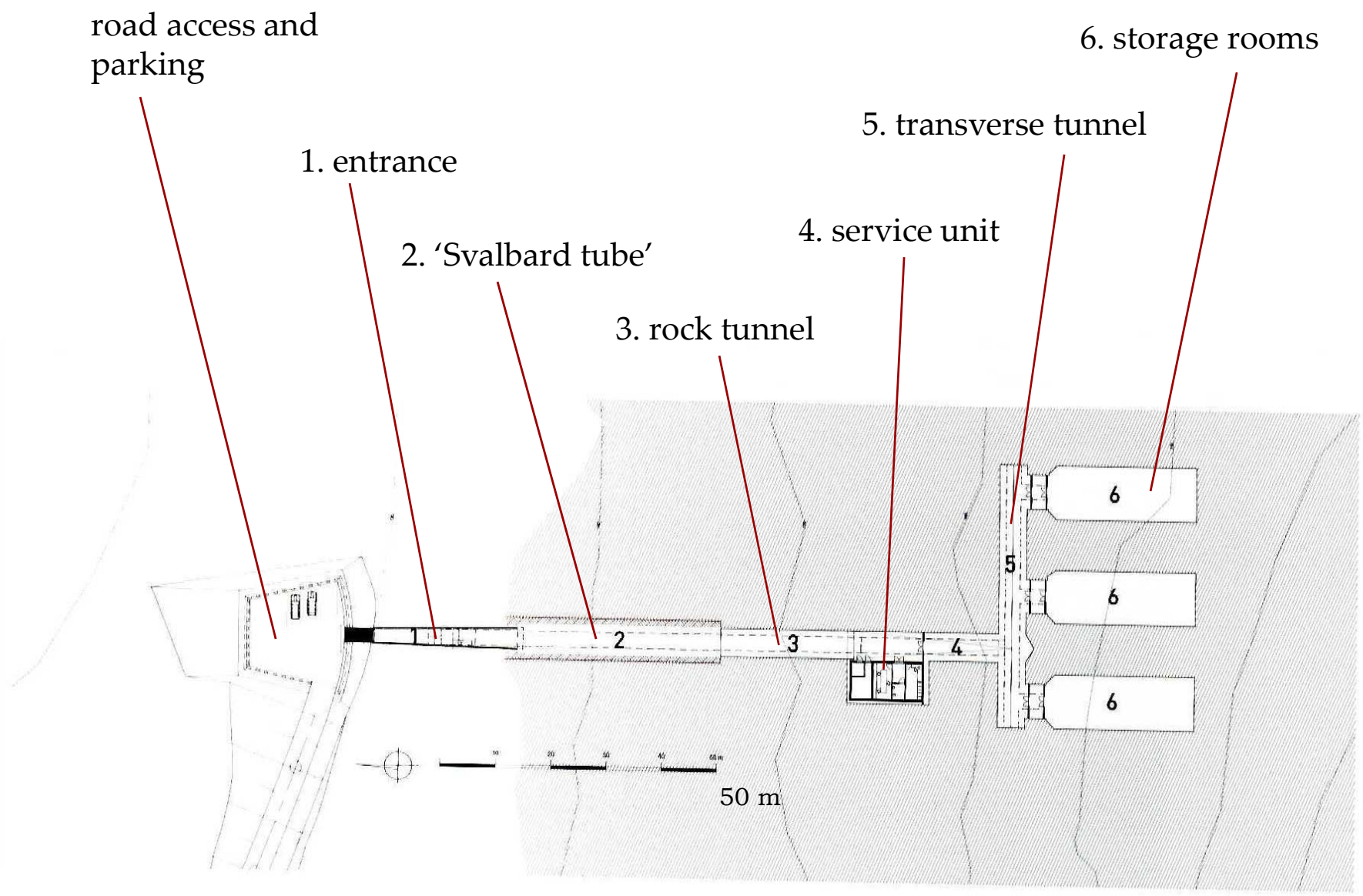
soil: scree, moraines; summer thawing 1-1.5 m, below: 'permafrost' (-4°C)

rock: sandstone, 'Caroline' formation, below the coal-bearing layer



source: Statsbygg 2008

# Plan of the Svalbard Global Seed Vault (cont.)

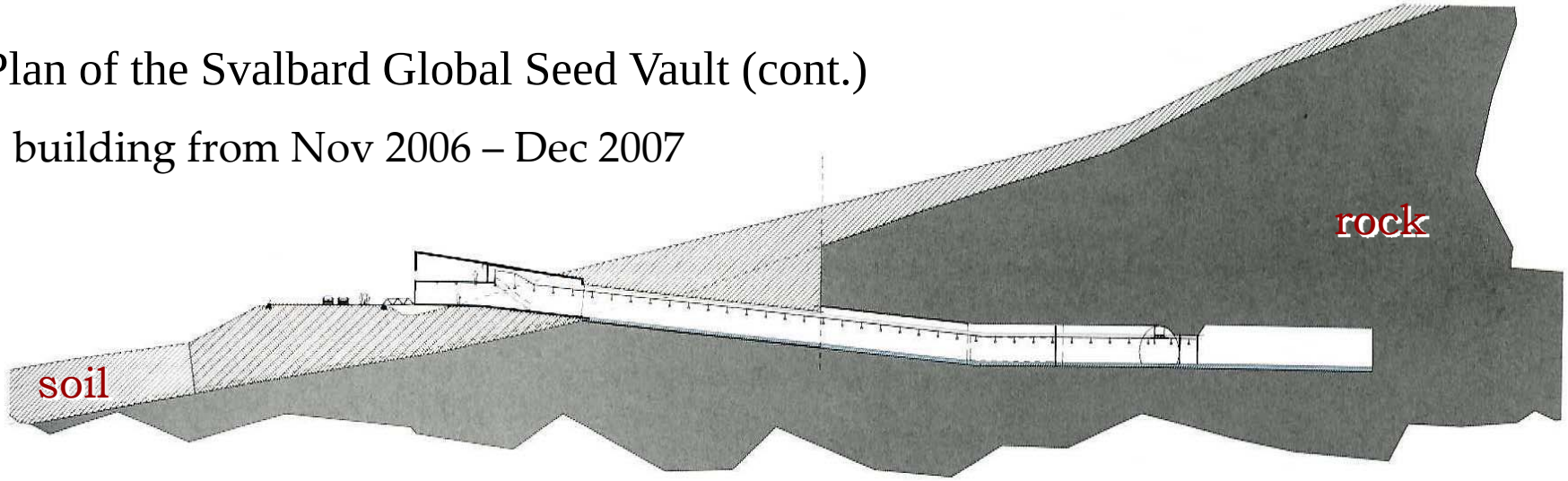




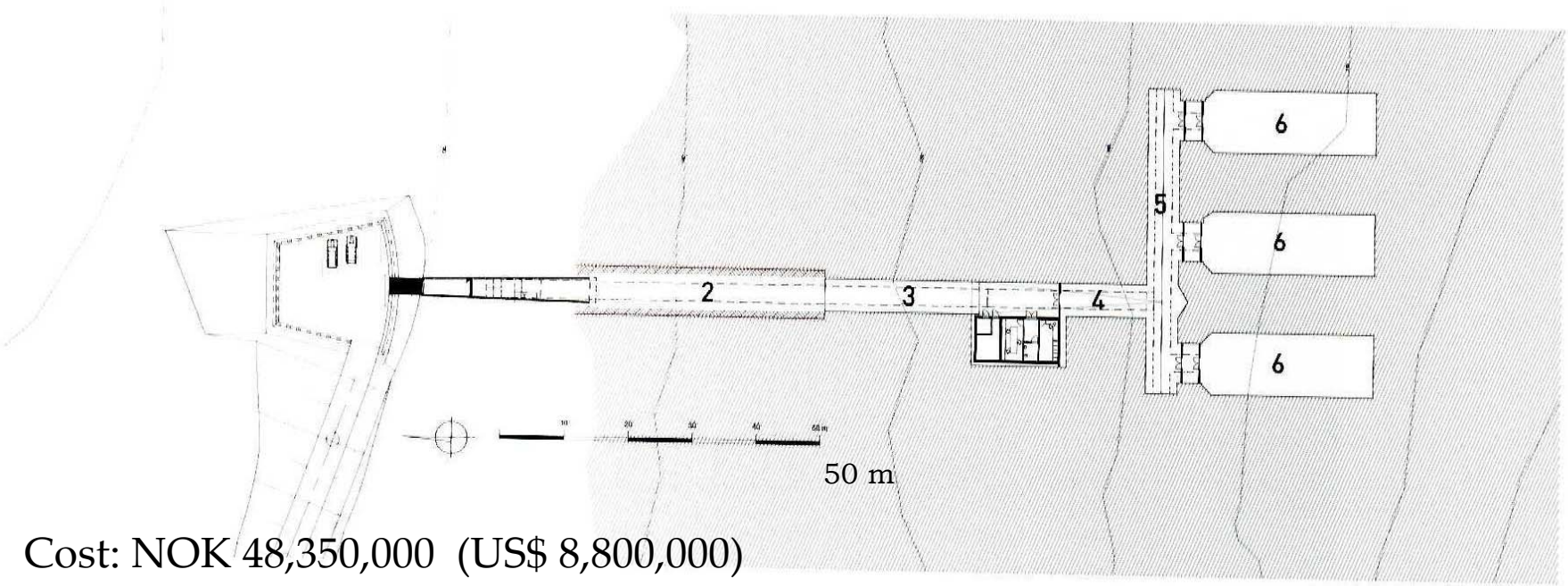

source: Statsbygg 2008

# Plan of the Svalbard Global Seed Vault (cont.)

building from Nov 2006 – Dec 2007




Building, tunnelling: Risϕyhamn; refrigeration, electricity: Longyearbyen




Cost: NOK 48,350,000 (US$ 8,800,000)



source: Statsbygg 2008

# Entrance

Special characteristics: aerodynamism, cantilevered, ventilation exit, security door

photo: Debouck 2008

Norwegian artist  Dyveke Sanne

"Perpetual repercussion"

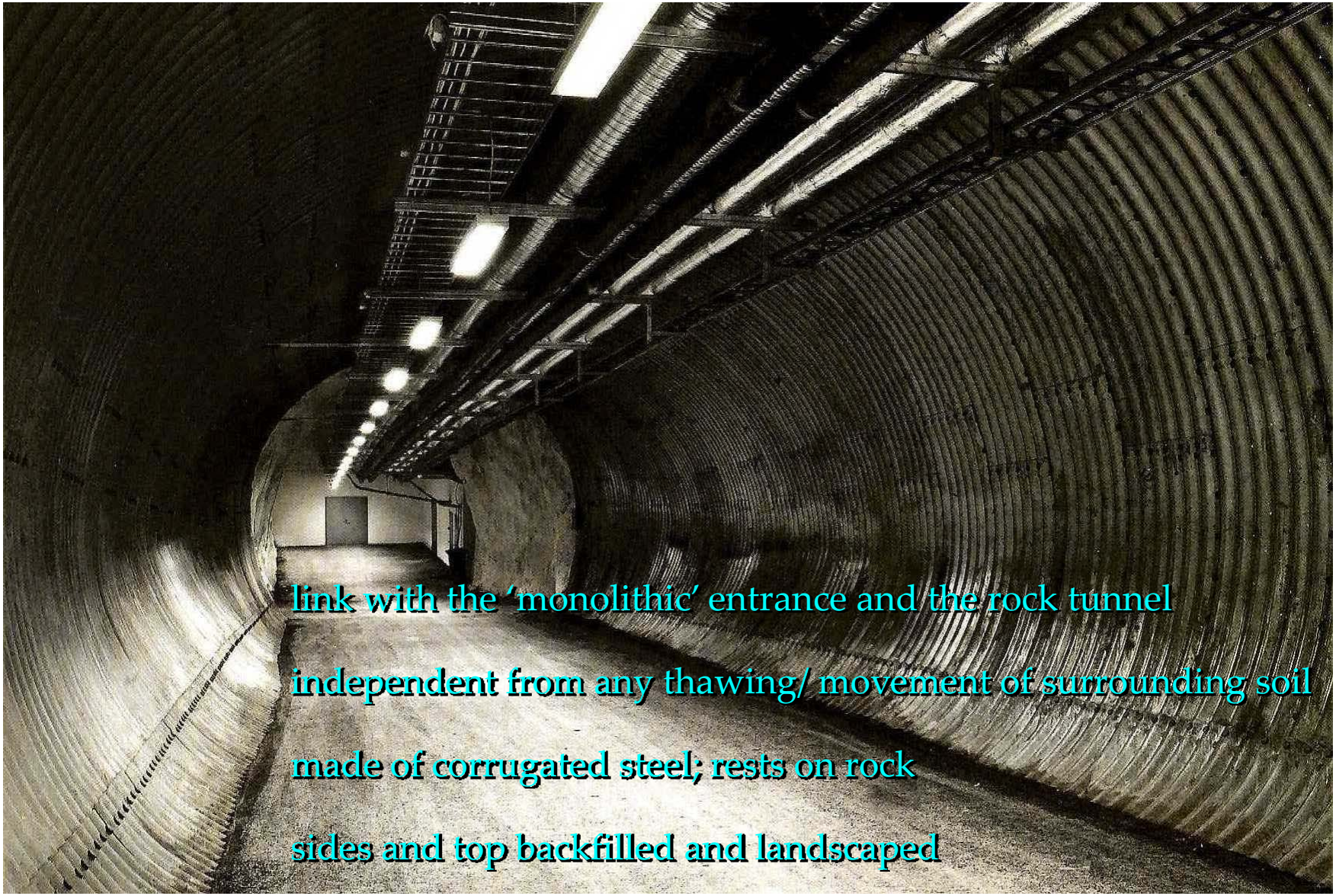
2007

Request for the art work: to signal the building at all times, at low cost

two planes 10 cm deep each; glass, steel plates, mirrors, fibre optic lights

photo: Statsbygg 2008

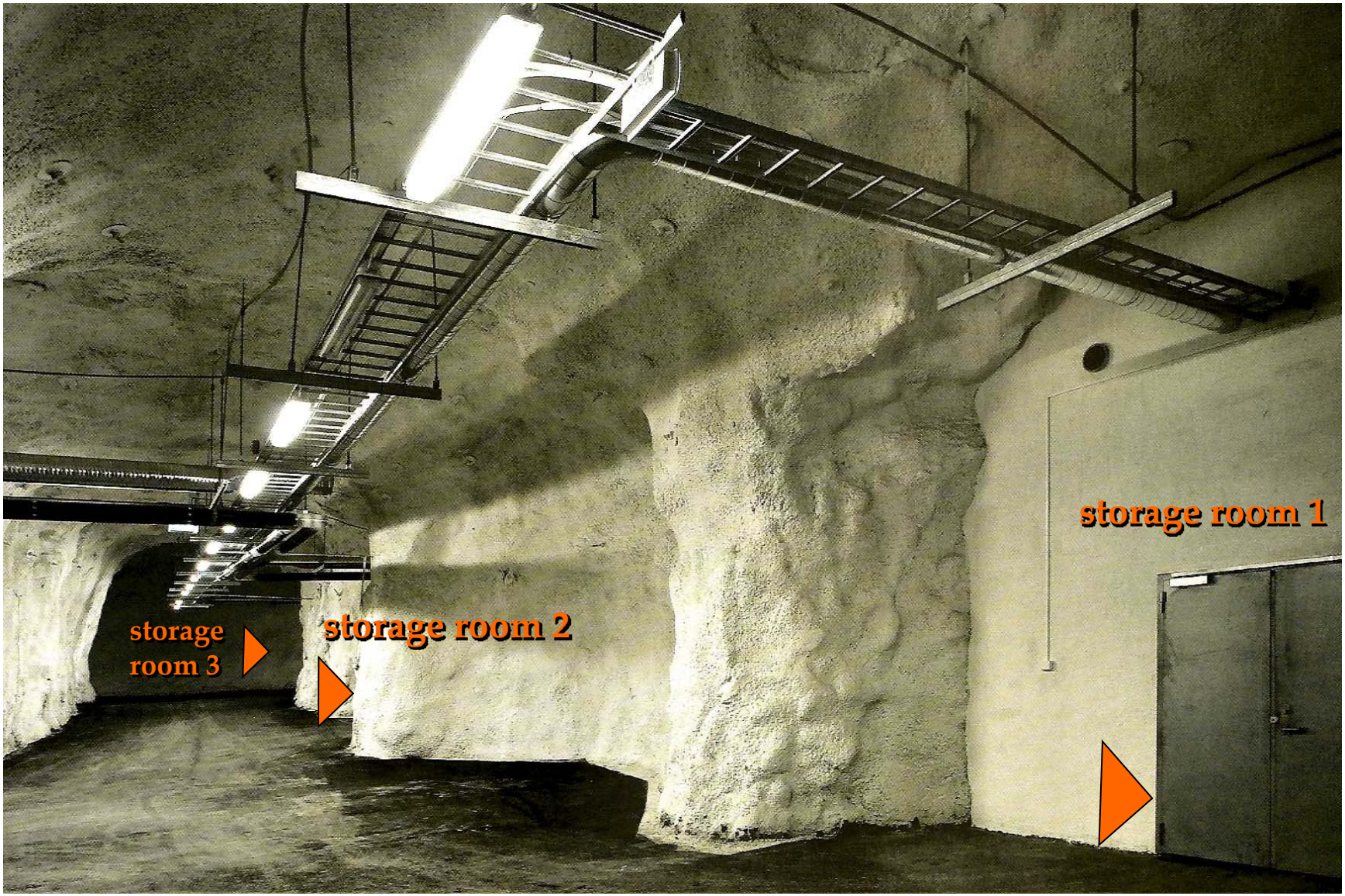
# Svalbard ‘tube’






source: Statsbygg 2008

# Transverse tunnel




source: Statsbygg 2008

# Storage rooms

positive surprise = 3rd deposit !

(+/- within budget and schedule)

'permafrost', stable at – 4°C

27 m x 9 m x 5 m, or 1,215 $m^3$

temperature maintained at -18°C

two electric refrigeration plants

smoke/ methane/ CO detectors

four shelving levels

capacity: 1.5 million seed samples each

source: Statsbygg 2008

# Why Svalbard ?

✓safety black-box for the seeds of crop genetic resources

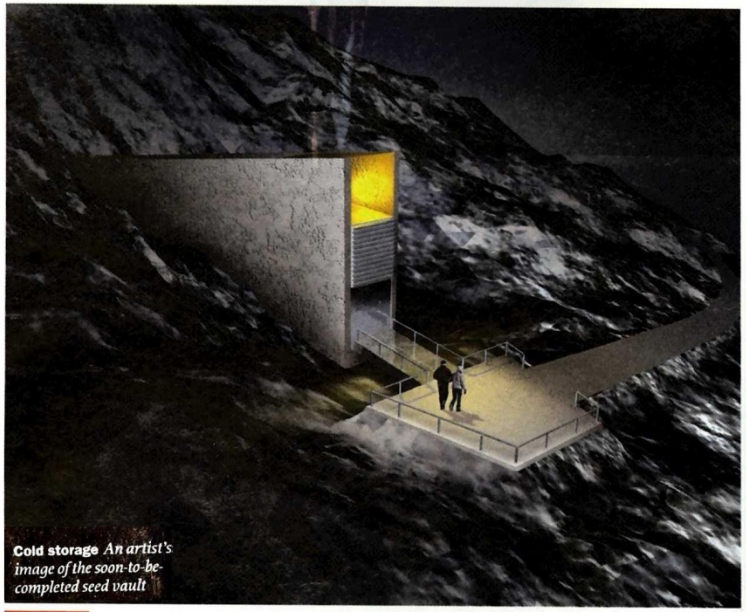
✓public awareness towards the risks affecting crop genetic resources

✓example of North-South cooperation using a special context

✓to bring attention of the public onto the fragility of polar regions



photo: Debouck 2008



**Cold storage** *An artist's image of the soon-to-be-completed seed vault*

SCIENCE

# The Farmers' Bank

## If the world loses its seeds, our food supply could follow. A new vault on a remote Arctic island may represent our last line of agricultural defense

BY BRYAN WALSH

IT'S A MAXIM THAT'S AS true for farming as it is for your home PC: always back up your data. In agriculture, data take the form of seeds, and farmers have been saving seed varieties for millenniums. If disaster struck and an entire crop were lost, a cache of seeds could mean the difference between survival and starvation.

We still save seeds today, mostly in national seed banks that often specialize in native crops: pistachios in Iran, rice in the Philippines. When a disaster like the Irish potato blight of the 1840s hits, scientists can search the seed bank for an old variety that might prove resistant. Since pests and pathogens are constantly evolving, a well-stocked seed bank "is our best line of defense," says Geoff Hawtin, director-general of the International Center for Tropical Agriculture in Colombia.

But that defense is in peril. Often, the seed banks with the richest collections are located in unstable countries that don't take care of them. When Afghanistan's seed bank was looted during the Taliban's rule, rare varieties of walnuts, cherries and apricots were lost. Cary Fowler, executive director of the Global Crop Diversity Trust, an agricultural NGO, estimates that as many as half the seed banks in the developing world may be at risk.

To ensure that an agricultural doomsday never comes, Fowler and his colleagues have organized the Svalbard Global Seed Vault, an international seed bank built into a mountain on a Norwegian island in the Arctic. A Fort Knox for seeds, the vault will be a backup for the backups and will eventually be expanded to include genetic samples of every crop on the planet. The first shipments, from more than 36 African nations, arrived at the end of January, and there will be room for as many as 4.5 million samples once it opens Feb. 26. The specimens will be kept very dry at around 0°F. Properly stored, some seeds can last thousands of years; even if the facility lost power, the seeds are likely to remain viable in the Arctic climate. The cost of construction—mostly borne by the Norwegian government—is less than $9 million. "If you think of it as an insurance policy for the world, you can't beat the value," says Fowler.

The need for the vault to narrow the genetic diversity of plants, focusing on select, high-producing crop varieties. Global warming will also create demand for a stockpile of seeds that may not be suited to today's growing conditions but could be just right for tomorrow's. "We'll need crop varieties for hotter, dryer, wetter and colder climates," says Fowler. Sometime in the future, the vault of last resort could end up more like an ATM. ■

TOP LEFT: GLOBAL CROP DIVERSITY; OPPOSITE, BOTTOM RIGHT: AJ PHOTO—PHOTO RESEARCHERS; ILLUSTRATION BY MARK MATCHO

# Agreement between the Government of Norway and the Depositor

(signed by CIAT on December 19, 2007)

✓No transfer of legal ownership, no IP rights conveyed to Norway

✓Obligation to have deposited in another genebank (art.3) and available (art.7)

✓Deposited in conformity with national/ international law

✓No germination tests, no distribution, but long-term conservation

✓Withdrawal at any time, at depositor's expenses

*Seed collections*

•Packed and sealed under specified conditions

•Minimum data on depositing

•Viability for at least ten years

•No genetic copies (each material deposited is unique) !

# Figures of seed depositors (20) on the Opening

| | | | |
|---|---|---|---|
| 1 | IRRI | rice | 70,180 |
| 2 | CIMMYT | wheat and maize | 57,721 |
| 3 | CIAT | beans and tropical forages | 30,911 |
| 4 | ICARDA | barley, chickpea, vetches | 30,567 |
| 5 | CGNetherlands | beet, lettuce, vegetables | 18,212 |
| 6 | NordGen | barley, rye, forages | 12,699 |
| 7 | USDA | wheat, soybean, sunflower | 10,865 |
| 8 | AVRDC | chili peppers, eggplant | 7,350 |
| 9 | IITA | maize, cowpea | 6,513 |
| 10 | PGRCanada | barley, oat | 5,942 |
| 11 | CIP | potato | 5,847 |
| 12 | ILRI | tropical forages (mid altitudes) | 4,007 |
| 13 | IPK | wheat | 2,589 |
| 14 | WARDA | rice | 2,158 |
| 15 | VIRussia | oat | 945 |

source: NordGen, 2008

# Germplasm registered into the Multilateral System of the Treaty

| Commodity | Rank | No. of taxa | No. of accessions |
|---|---|---|---|
| Beans (*Phaseolus*) | 1 | 44 | 36,197 |
| Cassava (*Manihot*) | 1 | 33 | 6,592 |
| Tropical forages | 1 | 668 | 23,140 |

**Germplasm accessions as International Public Goods :** 65,929

**Seed collections : 141 countries** ***in vitro*** **collections : 28 countries**

source: CIAT – GRP, 2010

# CIAT plans for the safety back-ups

per 22/10/2010

| | CIMMYT | Svalbard | CIP |
|---|---|---|---|
| Beans | 20,271 | 25,658 (70.8%) | |
| Forages | 10,061 | 12,137 (52.4%) | |
| total | 30,332 (51.1%) | 37,795 (63.7%) * | |
| Cassava | | | 4,596 (72%) ** |

* 124 countries out of 141 ; ** 28 countries out of 28

**% on the basis of 36,197, 23,140, and 6,592 accessions, respectively**

source: CIAT – GRP, 2010

Seed production

Seed purity

Seed viability

Seed health

Seed drying

Seed packing

CIAT 002
Filling the boxes

Shiping
CIAT
5/5

# The tropical connection, and the global system

# A couple of observations about a ‘Global System’

- Svalbard is at the end of a conservation chain but is not a genebank !

- it is a deposit for seeds, and the IARCs have sent a copy, as did the USA, Canada, Russia, Netherlands, the Nordic countries, Kenya and others

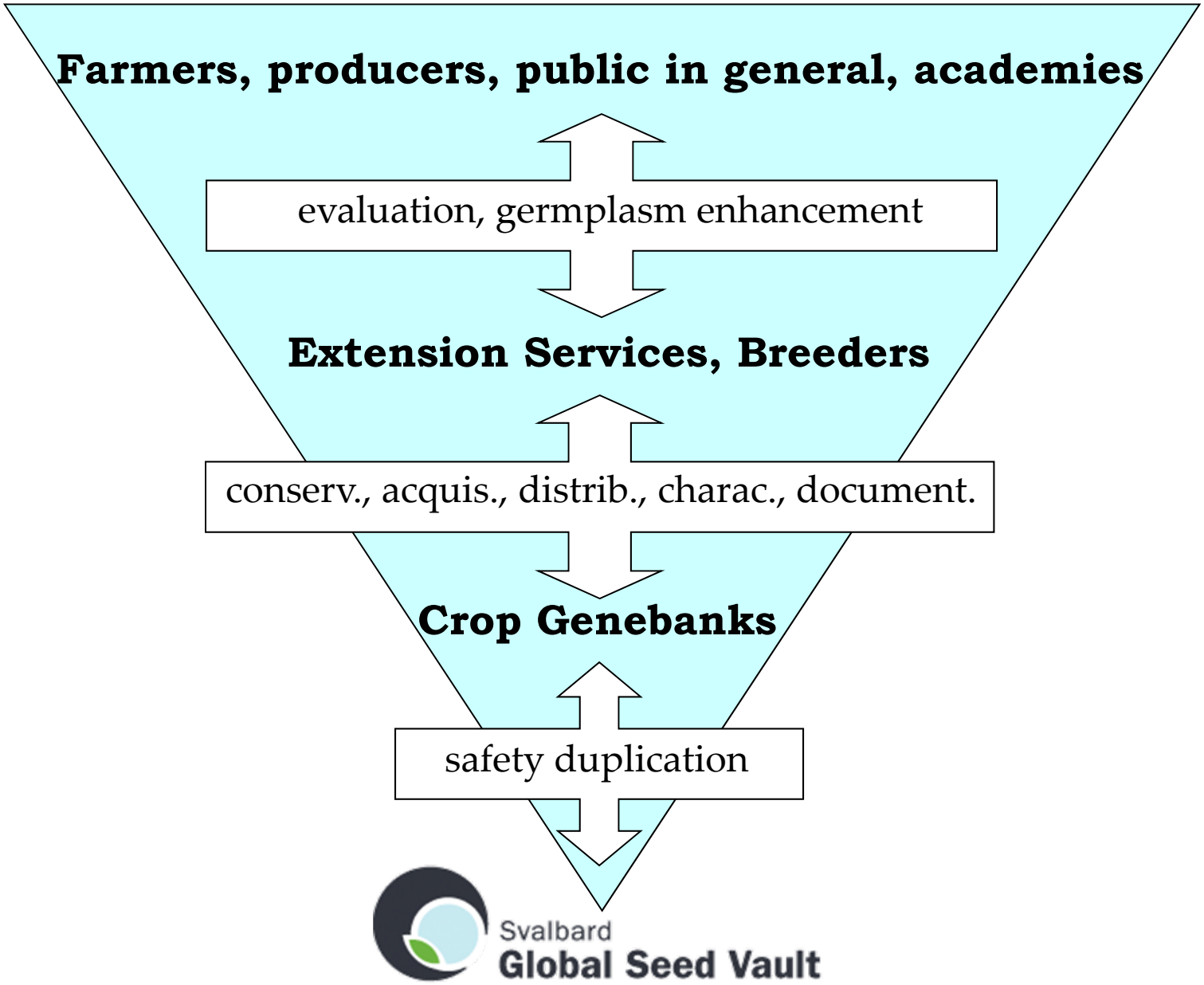
- “I do not know how Svalbard can help me” Tatay Gipo of the Philippines at the University of Svalbard, on Feb 25th 2008

- link : farmers – genebank – Svalbard Global Seed Vault needs articulation

  re-think rural extension ?

  re-think the role of national/ regional genebanks ?

# ‘Global System’: reliable, sustainable, efficient, relevant



- if there are today more than 1,400 genebanks around the world,
  if it is proposed to have 2 (3) genebanks for each crop,
  this would lead to the possibility to conserve 500-700 crops
  instead of the 30-40 crops that they conserve (or try to) right now

- 2 (3) genebanks for each ‘major’ crop, one for each ‘minor’ crop
  this could work for crops listed in Annex 1 of the Treaty
  under international standards and under international supervision
  concern for food security may justify the keeping of a (inactive) copy

- genebanks must cut down costs, through research, to expand
  genebanks must turn into the libraries of the total variability of crops
  genebanks must open up, namely the databases, to the public at large

# Final reflections

- Svalbard has been a ‘hit’ of success, technically but also socially (use of the technical expertise in mining, adoption by local people)
- coal mining will one day finish at Svalbard, but biodiversity will stay
- climate change, food security at risk, but at cornerstone to development

  “our agricultural heritage is our future food supply” Terje Riis-Johansen
- support of Norway to the International Treaty benefit-sharing fund
- Svalbard is a strong invitation to re-think environmental issues globally

Thank you !