

# Post Chernobyl Experience and Nuclear Emergency preparedness involving Stakeholders in Norway

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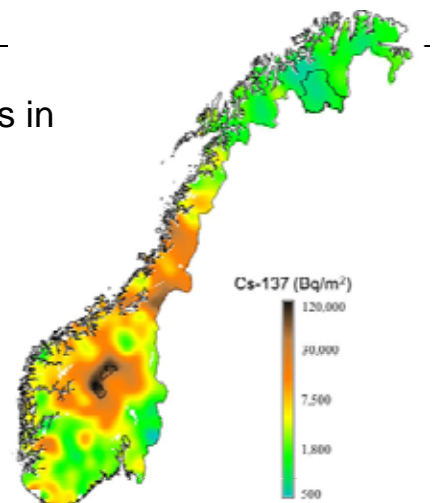
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## Introduction

- Norway was one of the Western European countries most affected, with deposition levels in hot spots reaching 500 kBq/m<sup>2</sup> in non-populated areas
- Rural areas with vulnerable food production systems where animals grazing unimproved forest/mountain pastures
- Some max. concentration (<sup>134</sup>Cs+<sup>137</sup>Cs):

Sheep:	40,000 Bq/kg
Reindeer:	150,000 Bq/kg
Goat milk:	2,900 Bq/l
Humans (reindeer herders):	4,200 Bq/kg



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# Norway's remediation strategy

Two approaches:

1. Measures in agriculture / food production (food safety)
2. Limit intake by exposed groups (dietary advices in leaflet)

NB: 3-4 years to develop techniques and strategies



# Countermeasures in food production: Soil - Plant

Cultivated fields:

- Needed only in few areas; 3-4 years
- Ploughing and extra potassium fertilizer
- Minor change to normal practices

Un cultivated fields/grazingland:

- Mapping the Cs-concentration in the area
- Use the less contaminated pasture before slaughtering the animals
- Contamination lasts for decades in the soil

## Countermeasures in food production - Animal

- Clean feeding: To avoid or reduce contamination (biological half-times: ~3 weeks in sheep; 2-3 weeks in reindeer) – based on live monitoring
- Changed time of slaughter, or alternative grazing area
- Use of Cs-binders to prevent uptake of caesium



Live monitoring of sheep

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## Live monitoring of reindeer, cows and sheep in the field before decisions of countermeasures



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## Caesium binders (Prussian blue) in concentrates, rumen bolus and salt-licks



Supplying rumen bolus to sheep and cow



Rumen bolus



Salt-licks

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## Consequences for reindeer production and the sami culture

**Reindeer production is on a national basis reserved for sami people, because it is a key factor in the sami culture**

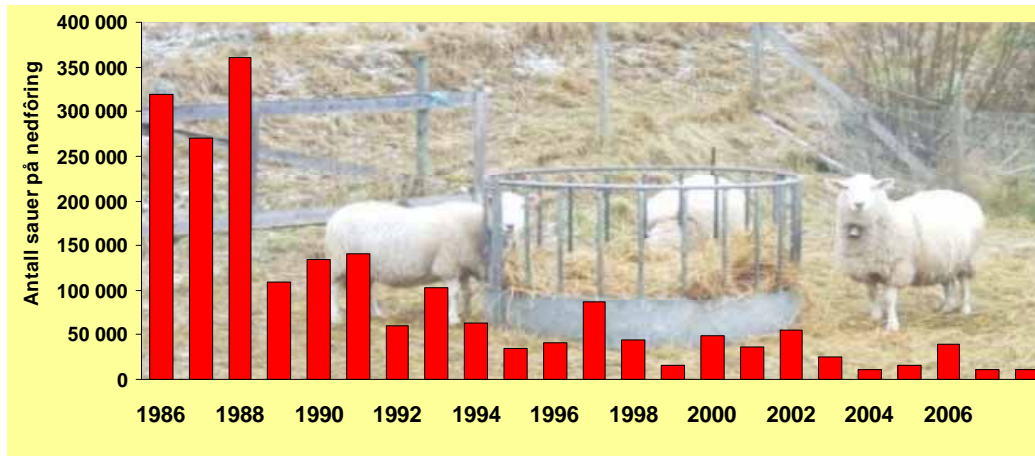
- Reindeer are extremely vulnerable to Cs-fallout:
  - Outdoor through out the year
  - The reindeer demands large areas
  - Lichen is the key source for food
  - Reindeer are not domesticated
- Aspects concerning the sami culture
- Countermeasures often conflicted with the cultural traditions:
  - Change of slaughtering season
  - Feeding clean feed and caesium binders
  - Select low contaminated animals for slaughter



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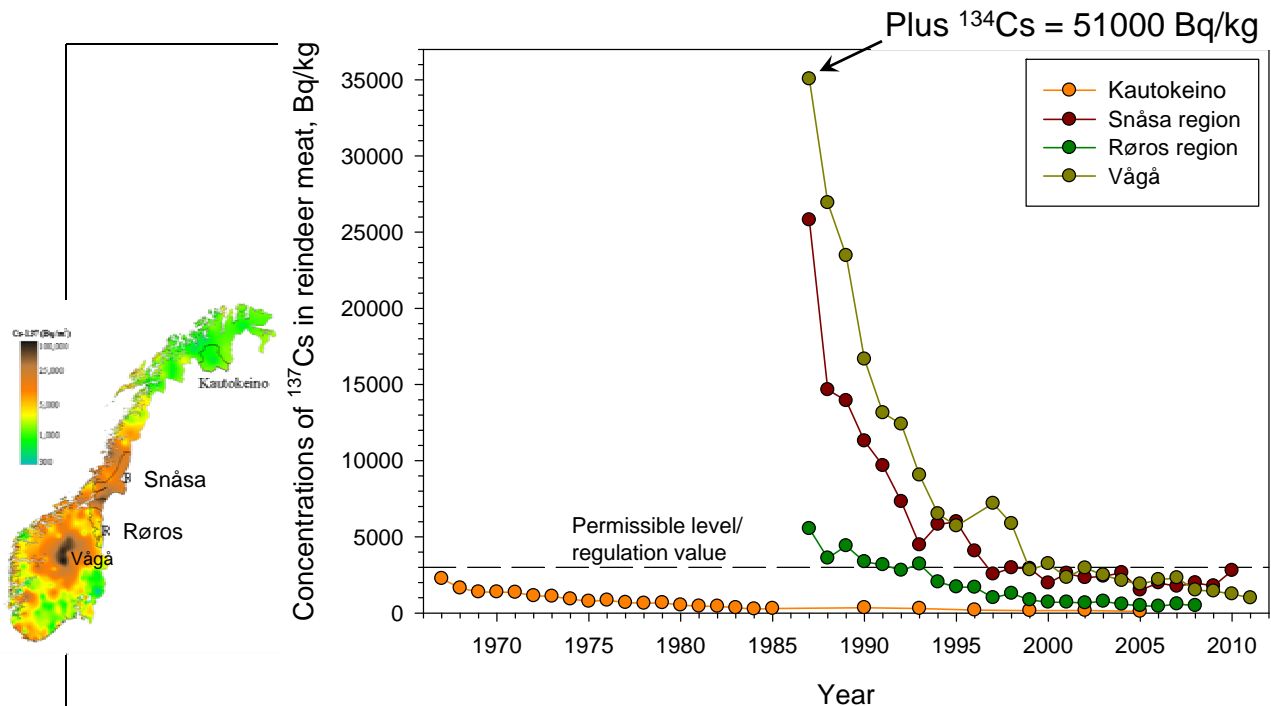
# Countermeasures in sheep production

Number of sheep fed uncontaminated feed before slaughter 1986-2008



We expect to have to perform countermeasures for at least another decade

# Concentrations of caesium-137 in reindeer meat, 1967 - 2011



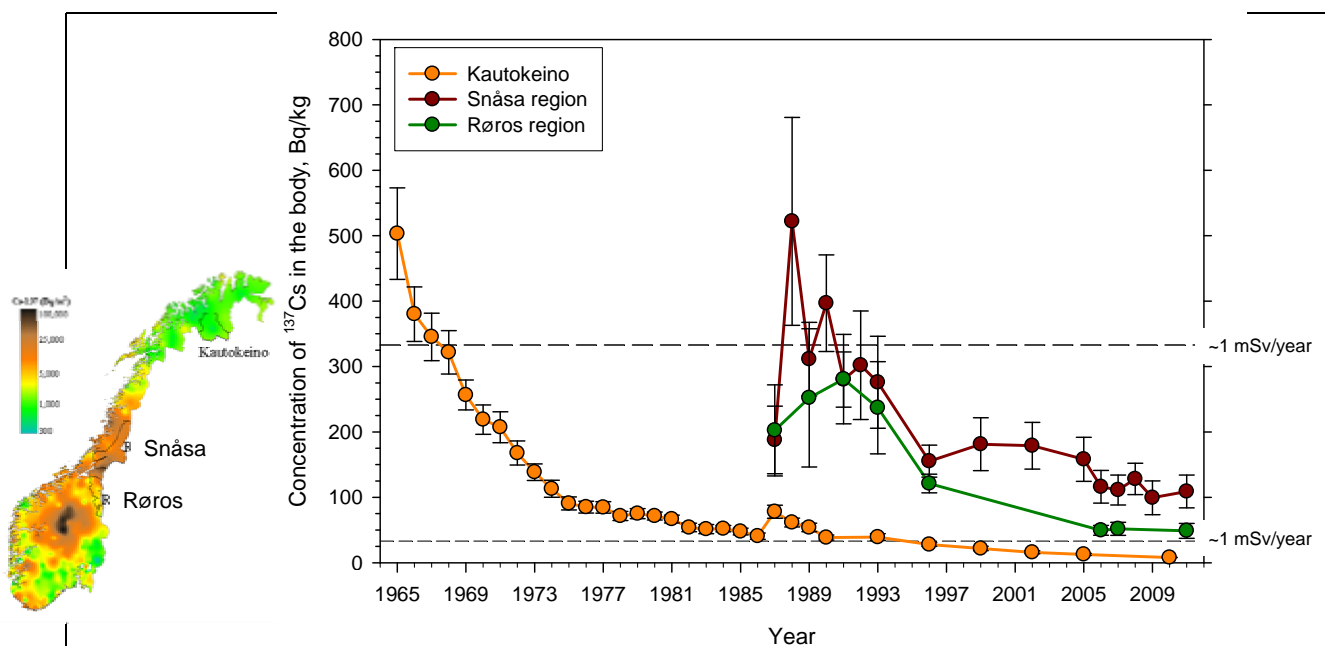
# Limiting intake: Dietary advices (1)

- Focussed on limiting annual intake (< 1 mSv/year) – not intervention level
- Limit: 80.000 Bq/year (~ 75.000 Bq/year here). Children and pregnant women: 40.000 Bq
- Example:



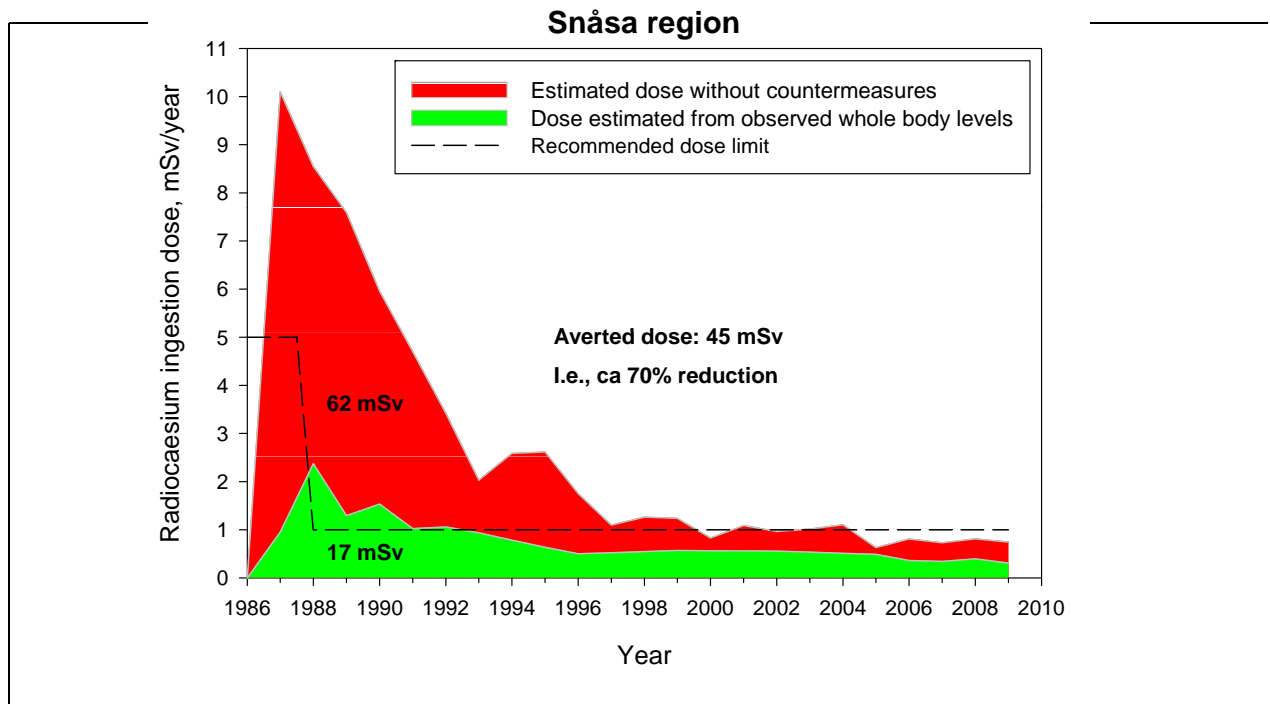
Cs level	Consumption of meat/fish	
600 Bq/kg	100 kg/year	10 meals/week
1.000 Bq/kg	60 kg/year	6 meals/week
6.000 Bq/kg	10 kg/year	1 meals/week
20.000 Bq/kg	3 kg/year	1 meal per month

## Concentrations of caesium-137 in Sámi reindeer herders, 1965 - 2011



Max. concentration in individual reindeer herder: 4,200 Bq/kg (~10 mSv)

# Averted ingestion doses after Chernobyl



## Stakeholder involvment

- Reindeer herders engaged in sampling/mapping
- Authorities, farmer's and reindeer herder's unions, food industries etc. involved in working and coordination groups on countermeasure R&D, practical implementation etc.
- Negotiations with the unions on economic compensation
- Field testing of measures developed in labs (live monitoring, clean feeding, administration of Cs binders)
- Evaluation of countermeasure regimes in reindeer herding (1992, 2006)

## Lessons learned (1)

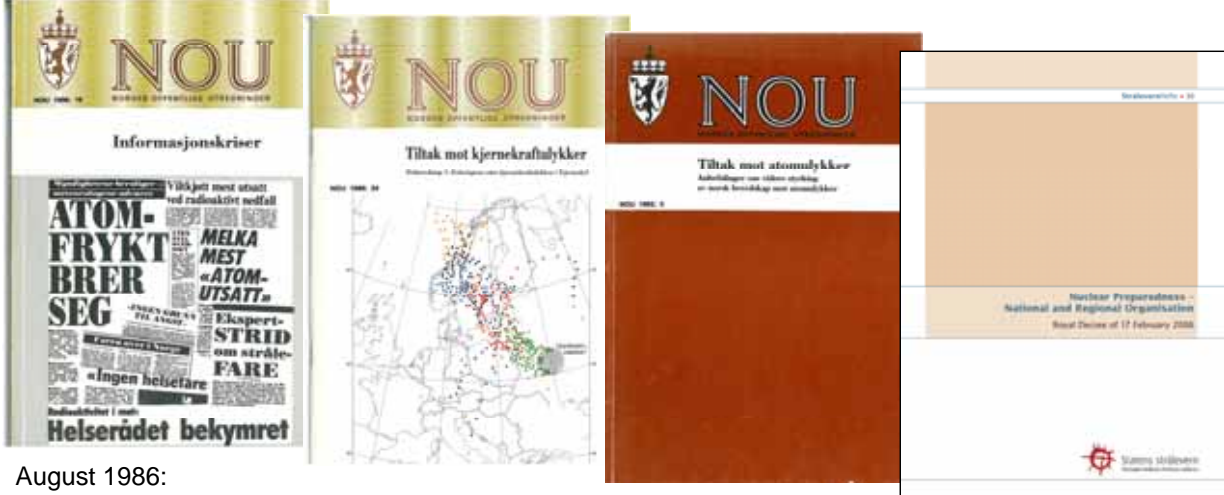
1. Involve all stakeholders before implementing any countermeasures, e.g. from animal owners to slaughterhouse or dairy, local authority responsible for the implementation, and authority who will inspect that implementation were successful
2. Develop set of measures, i.e options. Gives some feeling of influence/control/independence. No freedom cause frustration
3. Live monitoring acceptable and appreciated measure to avoid condemnation
4. Local monitoring stations enable building of local knowledge on contamination, giving the local population specific rather than general answers, e.g. free monitoring of their own private products

## Lessons learned (2)

5. Need to maintain and develop national competence. Need definite answers. Experimenting and testing creates “guinea pigs”
6. Take into account possible scepticism towards national authorities and experts:
  - Inherent scepticism among rural populations towards practical values of regulation/advice from national authorities and experts
  - “Any scientist in radiation protection/radioecology is a pro-nuclear activist” – direct contact crucial for confidence
7. Stakeholder involvement is not a consensus exercise:
  - Individuals from the same stakeholder group have various views
  - Stakeholders may represent more than one group (e.g. political interests as well as personal costs)
  - Stakeholder views may change with time (20 years....)



# Public reports on nuclear emergency preparedness after Chernobyl




August 1986:  
«Information crisis»

November 1986:  
«Countermeasures in nuclear power accidents – Part I: experiences after the nuclear accident in Chernobyl»

February 1992:  
«Countermeasures in nuclear accidents – Recommendations on further strengthening of Norwegian emergency preparedness towards nuclear accidents»

June 1998, updated February 2006: «Nuclear Preparedness – National and Regional Organisation» (royal decree)

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## Norwegian organisation of nuclear and radiological emergency preparedness

- Norwegian preparedness for nuclear and radiological emergencies differs from most other national emergency preparedness systems, both in Norway and in other countries. In order to ensure an efficient, rapid and competent crisis management of the early phase of a nuclear event, a national Crisis Committee for Nuclear Preparedness has been appointed.
- The Committee is authorised to make decisions and order implementation of specific countermeasures in the early phase and ensures good coordination on a sub-strategic level (directorate level).
- The Crisis Committee may on its own initiative implement countermeasures in the early phase and acts as advisor for the government and ministries in later phases
- The Crisis Committee has advisors from several national authorities and organisations. These advisors can also be viewed as stakeholders.



## Challenges in long-term recovery 25 years after Chernobyl

- Still need for countermeasures in reindeer husbandry and agriculture in some but few municipalities, but no real need for comprehensive countermeasure plan regarding the Chernobyl fallout
- Lack of experience in this field – vulnerable for loss of competence in several fields, such as radioecology, measurement strategies and planning, countermeasure effectiveness etc.
- As a result: There is still need for nuclear and radiological emergency planning, but the need is not very visible in day-to-day Life

## Background for the on going work

- NRPA has extensive experience in post-Chernobyl management, and is also strongly involved in the continuous improvement of the national nuclear emergency preparedness and response system .
- Through dedicated seminars and exercises, NRPA has a good contact with various actors and levels within the emergency and response organisations.
- The EU NERIS-TP is a follow-up of the EU EURANOS project "Involvement of people affected by the contamination" and establishment of local-national forums is a national part of the NERIS-TP WP3
- The project involve stakeholders, such as operators, professional organisations, research institutes, universities, NGOs, all levels of the food production (farmers, processing industries and sale). It is important to engage stakeholders on both national and local level

## Project: Nuclear and radiological emergency preparedness seminars

- A series of seminars in nuclear and radiological emergency preparedness for the 19 county governors in Norway
- One day-seminar arranged by the NRPA for the county emergency board and the administration
- Content of the seminars
  - Threat/hazard assessment and the nuclear and radiological emergency preparedness organisation
  - Methods and tools for decision making
  - Information strategies
  - Countermeasure strategies
- Table top exercise

# EURANOS project – Involvement of people affected by the contamination of an area

How do we best prepare for the long-term effects of nuclear accidents?

– Participants from the local communities, local- regional- and national authorities responsible for health, agriculture and environment, and NGO's



– Participants with and without Chernobyl experience

– Two workshops of 2 days each



– IDPA-method was used

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## How do we proceed forward from the EURANOS project?

- Practice: Change the authorities mind set from "making plans FOR" to "making plans WITH". This means that local- regional and national administrations and people representing other interests should cooperate when improving the emergency preparedness.
- This requires that we:
  - Increase the general knowledge about risk and possible countermeasures
  - Create arenas for cooperation for potential partners
  - Start cooperative planning processes before a contamination situation occurs

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# NERIS-TP Local-national forums in Norway

A series of seminars are set up where authorities and stakeholders at all levels and sectors are involved. These seminars will address the following challenges:

- **I. Threat assessment** - what are possible scenarios that could cause radioactive contamination of our municipality/local territory??
- **II. Sensitivity analysis** - what part of the community would be most affected?
- **III. Evaluating mitigating actions** - what are the choices? Can they be implemented in our community?
- **IV. Engaging local actors** - who need/should be involved in the local cooperation to solve the challenges, at various phases of the emergency? What are the responsibilities and roles? How will the engagement be done in practice?
- **V. National assistance** – (i.e. assistance between different national levels) what are the expectations and what is possible? How will the chain national → regional → municipality/local cooperation work in practice? Roles and responsibilities of each level.

## Local-national forum for emergency and recovery strategies in Østfold, Norway

- The local-national forum is build strongly on already existing national and local initiatives for nuclear and radiological emergency preparedness and recovery
- The initiative and planning of the forum was done by the County Governor, The Farmers Association, the Norwegian Food Safety Authority and the NRPA and the participants in addition from Regional and local food authorities, the Ministry of Health and Social Services, the Farmer's association, the food industry, members of the regional forum for coordination of nuclear emergency preparedness, representatives from local municipalities, the local health authorities, NGOs, and others
- There will be a series of seminars:
  - Introductory sessions
  - Scenariobased discussions on countermeasures
  - Table-top exercise

# Conclusions and following up

- Through the discussions, the participants realised their roles and responsibilities and the need to be better prepared for this kind of emergencies
- There are many practical challenges which need to be solved locally, and there need to be prepared emergency plans. It is important that these plans are made with stakeholders on all levels.
- There are need for different kinds of decision support tools and educational tools for the local and regional authorities. These tools need to be well-known in advance of an emergency
- Procedures and systems for communication between local, regional and national levels in the emergency response organisation need to be developed in order to have a successful implementation of countermeasures during an emergency and late phase recovery

