Radiation protection research: is Nordic cooperation a way forward to ensure sustainable competence and high-quality research?

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Sustain competence

An investigation on the sustainability of the national competence in radiation safety (SSM, 2018) concluded:

1. Major grant suppliers explicitly lack interest in radiation protection

2. The need for RP expertise is most obvious in emergencies and non-normal conditions but is often ignored under normal circumstances

3. Uncertain future for NP industry leads to less margins for RP research as large part of funding is generated by NPP production “quota”
External grant providers (SE)

- The Swedish Radiation Safety Authority
- The Swedish Civil Contingency
- The Swedish Cancer Society
- EURATOM/EU-frameworks
- Nordic Nuclear Safety, NKS
- The Swedish Research Council, FORMAS, SFS, etc
- Crafoord, Wallenberg, etc
What is RP research?

- Distinctly applied scientific field
- Tackling “well-known unknowns”
- Tradition of post-war RP related projects in Europe as a TSO function
- Well defined goals and with a distinct end-user perspective
What is RP research?

In Sweden SSM has outlined the following fields:

• Radiation Biology
• Radioecology
• Low dose epidemiology
• Dosimetry (incl. internal dosimetry & biokinetics)
• Dispersion calculations
• RP radiometry and measurement techniques
• Radiochemistry
Multidisciplinary and cross-boundary scientific field

- Low dose epidemiology
- Radioecology
- Radiation Biology
- RP radiometry and measurement techniques
- Radiochemistry
- Dispersion calculations
- Dosimetry (incl. internal dosimetry & biokinetics)

Related fields:
- Environmental Science
- Molecular Biology
- Nuclear Physics
- Metrology
- Marine/Terrestrial Ecology
- Geology
- Social Science
- Ecotoxicology
- Ecology
- Radiation Oncology
- Meteorology
- Neutron Radiation and Detectors
- Pharmacology
Sustain competence: Teaching

Education and teaching =>

regenerates future competence
safeguards position within faculty
# Teaching – specifically directed towards RP

<table>
<thead>
<tr>
<th>Country</th>
<th>Advanced level courses in applied radiation protection (30 HP)</th>
<th>GU+LU</th>
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<tbody>
<tr>
<td>Sweden</td>
<td>Basic level courses in Radiation Protection (5-7.5 HP)</td>
<td>Gu</td>
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<tr>
<td></td>
<td>MSc programs in Medical Physics</td>
<td>SAINT</td>
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<td></td>
<td>Strålskydd och medicinska effekter av strålning,</td>
<td>LU, GU, Sthlm and Umeå</td>
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<td></td>
<td></td>
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<tr>
<td>Finland</td>
<td>Radiochemistry BSc-level:</td>
<td>University of Helsinki (25 HP)</td>
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<tr>
<td></td>
<td>University of Jyväskylä, physics: jaana.k.kumpulainen(at)ju.fi</td>
<td>?</td>
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<tr>
<td></td>
<td>Medical Imaging, Physics and Technology: <a href="https://www.oulu.fi/medicine/mipt">https://www.oulu.fi/medicine/mipt</a></td>
<td>University of Uleåborg</td>
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<tr>
<td></td>
<td>MSc in Medical Physics program</td>
<td>University of Helsinki + University of Eastern Finland</td>
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<tr>
<td>Norway</td>
<td><a href="https://www.nmbu.no/en/services/centers/cerad/education">https://www.nmbu.no/en/services/centers/cerad/education</a> (MsC and PhD-levels)</td>
<td>University of Oslo</td>
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<tr>
<td></td>
<td>Biological and Medical Physics</td>
<td>University of Oslo</td>
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<td><a href="https://www.uio.no/studier/emner/matnat/kjemi/KJM5903/index.html">https://www.uio.no/studier/emner/matnat/kjemi/KJM5903/index.html</a></td>
<td>Strålevern (5 HP)</td>
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<tr>
<td></td>
<td>Radiokjemi og radioaktivitet:</td>
<td>University of Bergen (10 HP)</td>
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<td><a href="https://www.uib.no/emne/KJEM260">https://www.uib.no/emne/KJEM260</a></td>
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<tr>
<td></td>
<td>Strålebiologi, stråleterapi og strålevern:</td>
<td>University in Tromsø</td>
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<td><a href="https://uit.no/utdanning/emner/emne/597665/hel-3134">https://uit.no/utdanning/emner/emne/597665/hel-3134</a></td>
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<tr>
<td>Denmark</td>
<td>No definitive MSc-programs according to <a href="https://dsmf.org/dsmf/english">https://dsmf.org/dsmf/english</a></td>
<td>E.g. DTU-Nutech</td>
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<td>Short/compact professional development courses are sold in a number of Danish research establishments – no apparent university level admission</td>
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<td>Iceland</td>
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Join forces?

European platforms and network related to RP: MELODY, ALLIANCE, NERIS, EURADOS, ..., 

In Sweden similar platforms exist such as SFREK (Svensk förening för radioekologi), Svensk förening för radiobiologi, SAINT (Swedish Academic Initiative in Nuclear and radiation Technology research and education), etc. Less so in other Nordic countries.

Can NKS and NSFS and other platforms be a basis for Nordic cooperation for subcritical research areas?
Questions to be addressed in evaluation of long-term benefit of existing Nordic cooperation

<table>
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<th>Criteria – RQ20</th>
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<tr>
<td>Research grants (faculty + external)</td>
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<td>Excellence</td>
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<tr>
<td>Relationship between faculty teaching means/faculty research grants/external grants</td>
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<td>Competence growth at the university</td>
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<td>Academic staffing (tenure tracked)</td>
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<td>No of professors, associate professors, postdocs and PhDs</td>
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</table>
No evident intra-Nordic cooperation among highly cited researchers in RP-related research field.

Some RP research fields are evidently stronger and more prolific than in other countries. Ex: Radiochemistry in FI, NO and DK but not in SE.
Questions to be addressed in the near future for how to support sustainability in the RP research

• Who should distribute and prioritize research grants in RP research?

• Cooperation vs autonomy?

• What criteria are to be used when prioritizing and rewarding?
Concluding remarks and suggestions

- Internal competition may be a large obstacle for a national resource consolidation

- Exploit existing platforms dedicated for RP research between the Nordic countries

- Define radiation protection research with a Nordic and European outlook (A bird’s eye view on research and education)

- Contemplate altogether new RP research constellations
Concluding remarks and suggestions

CERAD in Norway and Cores in Finland may set examples for other Nordic countries