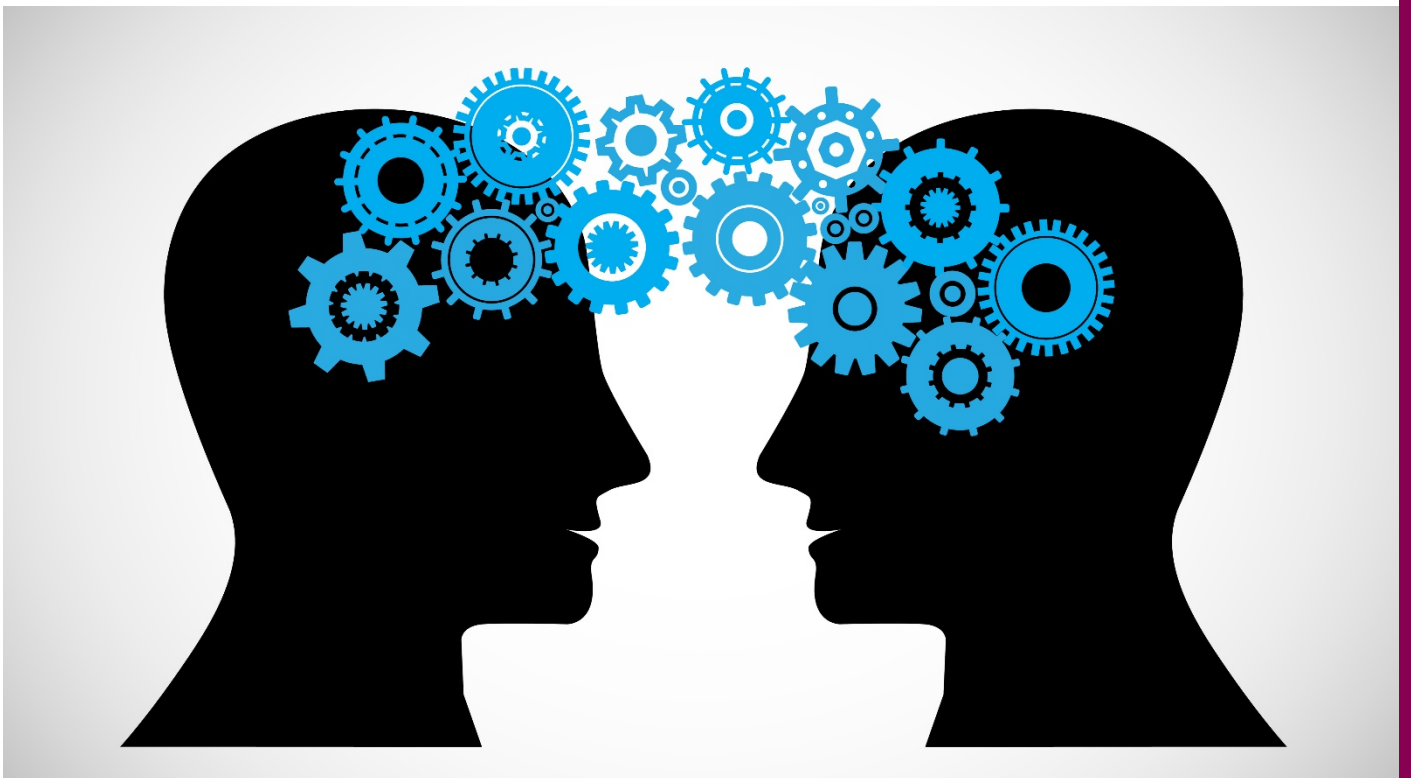


Report 2021:01

# SweNanoSafe

Swedish National Platform for Nanosafety



## Nanosafety and education

Report from workshop series with SweNanoSafe's education network and Roadmap for 2021

# Nanosafety and education

Report from workshop-series with SweNanoSafe's education network and 2021 Roadmap

## Foreword

During the autumn of 2020, SweNanoSafe organised three workshops focused on education within nanosafety, with the goal of starting and consolidating an education network. The first workshop focused on the need for education in nanosafety. The second workshop dealt with available education in nanosafety in Sweden, and the third workshop discussed concrete opportunities of taking various education efforts one step further. The workshops, which were conducted entirely digitally, consisted of short presentations by different actors followed by a joint discussion.

The initiative brought together a total of 29 representatives from several different societal stakeholders, including government agencies, academia, companies, non-profit associations and consultants with a common interest in the field of nanosafety. The joint discussions identified new opportunities for continued networking and created concrete plans for further development. This report summarises the presentations and discussions conducted in the three workshops and presents a work plan for the education network in the form of a Roadmap for 2021.

*Penny Nymark, Klara Midander, Anda Gliga, Coordinator SweNanoSafe, and Annika Hanberg, Chairman SweNanoSafe Steering Group*

This report was originally published in Swedish (available [here](#)) and has been translated to English by Semantix.

SweNanoSafe

Swedish  
National  
Platform for  
Nanosafety

Institute of  
Environmental  
Medicine, Karolinska  
Institutet

Address:

Box 210, SE-171 77  
Stockholm



Karolinska  
Institutet

Cover image:

Adobe Stock

Available to download  
from: [swenanosafe.se](https://swenanosafe.se)

Stockholm, February  
2021

## Contents

About SweNanoSafe.....	3
SweNanoSafe Education Network.....	3
SweNanoSafe workshop series on nanosafety education.....	3
The need for education in nanosafety.....	4
Presentations.....	5
Discussion.....	8
Available education.....	10
Presentations.....	10
Discussion.....	12
Concrete steps forward.....	14
Presentations.....	15
Discussion.....	16
Roadmap for 2021.....	18
Step 1.....	20
Step 2.....	20
Step 3.....	21
Step 4.....	21
References and links.....	22
Annex 1. Programme from Workshop Part 1-3.....	23
Annex 2. Participants in Workshop Part 1-3.....	26

## About SweNanoSafe

The national platform for nanosafety, SweNanoSafe, was established commissioned by the government in 2016 at the SweTox Research Centre. When SweTox ceased to operate at the end of 2018/2019, the platform was moved to the Institute of Environmental Medicine (IMM) at Karolinska Institutet (KI). The platform is now managed by a steering group with members from KI/IMM and the Swedish Chemicals Agency (KemI) (Chair: Annika Hanberg, KI/IMM). An expert panel is attached to the platform whose members have specialist expertise in various disciplines related to nanosafety (Chair: Bengt Fadeel, KI/IMM), a research network, a recently started education network, and a website ([www.swenanosafe.se](http://www.swenanosafe.se)).

Through the appropriation directions to KemI from the Ministry of the Environment (Government Decision dated 17 December 2020), Karolinska Institutet was awarded funds to "*maintain a platform for the safe handling of nanomaterials that can contribute to achieving the environmental quality goal of a non-toxic environment and protecting human health. The platform shall, inter alia, disseminate knowledge and provide specific support to authorities on issues related to the safe handling and use of nanomaterials.*" The overall goal of the mission is to contribute to:

1. Knowledge building, knowledge transfer and communication, as well as, by serving as a common forum, facilitation of collaboration between academia, authorities, industry and organisations in the field of nanosafety.
2. Identification and highlighting of obstacles to the safe handling of nanomaterials and addressing the obstacles by proposing solutions and actively contributing to improvement work.

## SweNanoSafe Education Network

In spring 2020, SweNanoSafe initiated an education network with the aim of improving education in nanosafety. Currently, there are only a few courses on nanosafety in Sweden, and SweNanoSafe aims to ensure that nanosafety is included in more courses and that more professionals and students have the opportunity to educate themselves in the field.

The goal of the network is to:

- jointly develop a situation description of education needs in nanosafety
- identify education needs and discuss opportunities to meet these needs

## SweNanoSafe workshop series on nanosafety education

During autumn 2020, SweNanoSafe organised three workshops with the aim of consolidating and engaging the members of the education network in the goal of improving education in nanosafety. The workshops, which consisted of brief presentations, followed by discussions, took place digitally and lasted 2 hours.

### **Part 1: Need for education in nanosafety**

28 September at 9:30 AM - 11:30 AM

Three presentations by different societal stakeholders that highlighted the need for education, as well as joint discussion of concrete needs in different industries and areas.

**Part 2: Available education in Sweden**

20 October at 9:30 AM - 11:30 AM

Three presentations on existing education courses that include nanosafety aspects, as well as joint discussion.

**Part 3: How do we take nanosafety education initiatives one step further?**

15 December at 9:30 AM to 11:30 AM

Brief summary of the results and conclusions of the first and second workshops, as well as short presentations and joint discussion on examples of initiatives to take concrete steps forward.

Below are summaries of the three workshops and a "Roadmap" that describes the thoughts on how the education network can work to develop nanosafety education in Sweden.

## The need for education in nanosafety

"The need for education in nanosafety" was the theme of the first workshop, and the goal was to bring people together to the network from different organisations with a common interest in nanosafety issues and knowledge in the field. The workshop also served to create a basis for further activities within the education network as well as for the platform when it comes to supporting education in nanosafety in Sweden.

Penny Nymark welcomed participants and presented the programme (Annex 1), as well as SweNanoSafe and its goals. The participants were given the opportunity to introduce themselves by name and role, as well as their interest in the workshop. The workshop gathered 23 people from 18 different organisations (Annex 2). The presentation round clarified the basics of the participants' interest, including a need for basic information regarding nanomaterials, insight into laws and regulations, and advice and instructions regarding the handling and use of nanomaterials, knowledge of work environment measurements of nanomaterials, nanosafety information linked to innovation and the use of artificial intelligence in production, knowledge regarding recycling and safety, knowledge in logistics, industrialization, etc. Some also took part in the workshop based on curiosity.

Thereafter, short reports on the need for nanosafety education were presented from three different perspectives; construction industry, government, and a non-profit association with a focus on the work environment. The presentations revolved around four questions that served as the basis for joint discussion in the subsequent workshop, i.e.

1. Why is nanosafety important within your organisation and how is the issue handled today?
2. What kind of education is needed?
3. Who is the target group of the education?

#### 4. What content and form would you recommend?

## Presentations

**Jane Wigren, Head of the Assessment Department, at SundaHus i Linköping AB**, presented "*The need for education on nanosafety in the construction industry*". SundaHus helps customers to archive (digitally) the materials and products that are part of a construction. They support customers with substance control and inform about compliance of a building product with the requirements. SundaHus requests information for its assessments, such as product safety data sheets and information from Byggvarubedömningen (BVD). Sometimes there are gaps in the information

and it is worth noting that the people who fill in the supplier's documentation are not always suitably qualified. In other words, SundaHus supports its customers with "concrete eco-labelling", as well as "digital archiving" of information. In line with the inspirational questions (above), the following is a summary of SundaHus' perspective:

- Nanosafety is important as part of a long-term management perspective. By knowing what type of materials and products are part of a construction, future problems can be prevented. It is necessary to keep track of what is put into a building and to document exceptions.
- In some areas, knowledge of nanomaterials/nanoforms/nanosafety is very limited. Even if a product contains nano, it can be difficult (at the moment) to determine whether or not this is good. If you use a nanoproduct, it is best to document this. Just because a product is based on a nanomaterial, it does not necessarily mean that it continues to exist in nanoform when used. At present, there are no reporting requirements for nanomaterials in construction products, only voluntary initiatives. From the beginning of 2021, nanospecific information must be included in chemical products safety data sheets, but many other products that are not subject to this requirement, including building products, are used in the building industry. It is highly likely that production companies themselves do not always know whether nanoforms are present in their products. Nanomaterials are part of a product because they create beneficial properties. Keywords can be, for example, "dirt repellent, self-cleaning or water repellent". This type of description may indicate that nanomaterials may occur in a product, without being specified/declared.
- The questions that remain for SundaHus are thus: How should voluntarily provided information about nanomaterials from companies be handled? When should requirements be introduced? When should warnings be issued?
- It is important for SundaHus to know when nano is problematic and when it is not. Nano must not simply become an obstacle.

**Gustav Bäck, Administrator at the Swedish Work Environment Authority (Arbetsmiljöverket, AV)**, gave a brief overview of "*Nanosafety and work environment*". AV is an authority that has been commissioned

by the government and parliament to ensure that laws on work environment and working hours are followed by companies and organisations. AV is also partly responsible, for example, for the Environmental Code when it comes to issues relating to pesticides. In line with the inspirational questions, the workshop participants learn that:

- Nanosafety aspects in the field of occupational safety and health are important because the use of nanomaterials affects the work environment and can represent a risk. It is likely that the number and use of nano-containing products will increase in working life. The challenges lie in the fact that it is difficult to assess the risk as the presence of nanomaterials is difficult to measure and cannot always be quantified in a relevant way in the work environment.
- Accordingly, there is a great need for education, including in occupational health care. This also applies to health and safety representatives who need to be aware of whether there are nanomaterials in the work environment.
- AV has therefore started to consider the content of nanosafety education and has identified needs primarily regarding knowledge about the presence of nanomaterials in products, the spread of nanomaterials, and protective equipment. AV is also interested in knowledge about what happens when nanomaterials or nano-products are processed.
- AV has also considered the form of education and was inspired by so-called **NAPO**short films, which are, however, very basic. More detailed information is needed.

**Fredrik Beskow, Project Manager at Prevent**, introduced Prevent (*“Prevent – work environment and collaboration”*) which is a non-profit organisation founded in 1942 in the field of work environment. Prevent is led by three principals; the Confederation of Swedish Enterprise, LO (the Swedish Trade Union Confederation) and PTK (the Swedish Negotiation & Cooperation Council). Prevent also has a sister organisation, Suntarbetsliv, which works towards the SKR sector (Swedish Municipalities and Regions). Together with AFA insurance, a seminar series called “like the job” has been conducted in recent years.

Prevent publishes the magazine *Arbetsliv*, which is published in an edition of 150,000 copies and updated daily on the web. Subscription for the magazine is free. In line with the inspirational questions, the following is a summary of Prevent’s perspective:

- Prevent conducts various projects in collaboration with parties from the business community and a project is currently underway to develop education materials on nanosafety in the work environment. The project group includes the Association of Swedish Engineering Industries (Malin Nilsson) and the Swedish Association of Graduate Engineers (Magnus Skagerfält). The project is financed by AFA insurance.
- Prevent needs information and education material on nanomaterials in the work environment.
- The target groups are mainly SMEs, i.e. not experts in the field.
- Broad support is needed to develop appropriate knowledge and education materials.

In addition to these three presentations by participants at the workshop, Penny Nymark also presented information submitted by stakeholders who could not attend the workshop themselves.

**Julia Taylor, administrator and microplastics coordinator, Swedish Environmental Protection Agency** (Naturvårdsverket, NV). NV is a driving and coordinating authority in environmental work, responsible for issues related to climate and air, soil, biodiversity, polluted areas, cycles and waste, environmental monitoring, hunting and wildlife and environmental research. NV works to ensure that the generational goals for environmental work and the environmental quality goals set by the parliament are met, and will, if necessary, propose measures for the development of environmental management. NV also has a focus



on developing and disseminating knowledge about microplastics within Sweden's national plastic coordination. In line with the inspirational questions, NV therefore has the following key needs:

- In the work with microplastics, especially when effects, fragmentation and occurrence are discussed, nanoparticles are often mentioned. Close cooperation between SweNanoSafe and NV on this issue is therefore seen as very important.
- The target group for education includes authorities that NV works with in relation to national plastic coordination, the Government Offices, municipalities, industry and organisations.
- Information is needed on the health and environmental effects of nanoplastics – what do we know and what do we not know? What are the main bottlenecks that must be solved to move forward on environmental impact issues?
- The form of the education can be seminars, reasonably concise and easy-to-read summaries/reports (i.e. a language that is easy to understand for those who do not conduct research in the field).

**Anna Vikström, Head, Department of Environmental Assessments, Byggvarubedömningen.**

Byggvarubedömningen is a non-profit economic association whose task is to actively contribute to the development and construction of sustainable solutions of the future by inspiring industry actors to achieve a non-toxic environment and sustainable supply chain. The operations are two-fold: assessments of building materials and a logbook tool. Together, they form the basis of active material selection at the construction stage and comprehensive product information, which enables future tracking at the management stage. From the perspective of Byggvarubedömningen, the following needs/opportunities are important:

- There is a lack of knowledge about how suppliers or other stakeholders in the construction industry determine whether something is a nanomaterial and where to find information about it. Examples: Building materials are often described in a so-called building materials declaration (BVD). Sometimes the list of substances in a BVD contains a nanomaterial while at the same time it has been ticked that the material does not contain a nanomaterial.
- In general, there seems to be a need for education/information regarding nanomaterials linked to construction products.
- Byggvarubedömningen could contribute by disseminating/linking information through our communication channels.

**Christer Idström, indoor environment expert at the Swedish National Board of Housing Building and Planning (Boverket, BV).**

BV is an authority that works with issues related to urban planning, construction and housing. BV promotes knowledge dissemination in the sector area and must comply with the environmental goal *Good built environment*, as well as be active in international work in the sector area. In line with the inspirational questions, the need for general knowledge regarding nanomaterials and nanosafety is as follows:

- What are nano-substances? Typical examples of nano-substances.
- Where do nano-substances occur? Examples of building materials or manufacturing processes of building materials containing or giving rise to nanomaterials/particles.



- In what contexts are nanomaterials added to building materials to achieve certain properties such as dirt rejection or “self-cleaning” surfaces?
- What are the health effects of nanomaterials/particles? Mainly with a focus on building materials or products/technologies used in the construction industry.
- What terms are used in content declarations, product sheets etc. for different nanomaterials? Tips for identifying nanomaterials/products that are not referred to as “nanoproduct”.
- Future scenarios for nanomaterials. How has the use of these materials developed, with a focus on the construction industry.
- Are there any questions about this that could be addressed to the Swedish National Board of Housing Building and Planning, for example regarding building regulations or guidance on these materials/products?
- Safety in relation to nano-issues is important, both from a “general health point of view” for those living in the buildings who are possibly exposed, but also from a health and safety point of view for those who build and install professionally.

## Discussion

Following the presentations, a joint discussion followed, focusing on gaining insight into concrete area-specific needs for nanosafety education as a basis for further development of solutions. In line with the inspirational questions before the presentations, the discussion revolved around the following two questions:

- Who is/are the target group/groups for education in your field?
- What content and form of education do you think is needed?

An overall comment (Fredrik Beskow, Prevent) which sparked the discussion was that there is a poor connection between research and communication of knowledge to professionals and employers. Without up-to-date and accessible knowledge, it is difficult for them to know when they can/should act and when to get help. Below, the discussion on the two issues has been summarised based on target groups and form/content.

### Target groups for the education

The possibility of identifying target groups was discussed and an example of how to proceed that was highlighted in this context was Prevent’s work with different persona descriptions representing different target groups within its education project. As a result, there was clearly a need to reach out to SMEs and important to target beginners.

In addition, there were proposals that potential target groups may be identified with the help of, for example, SweNanoSafe’s innovation project and course leaders for nanotechnology education at the Royal Institute of Technology (KTH). SweNanoSafe’s education network, which could serve as a basis for concretely mapping competence within the network to enable catering to needs, was also seen as having an important role.

### Form/content of the education

Regarding the format of education, various possibilities were discussed, including web-based modules that can be broken down based on level of and need for knowledge, short concise courses such as fact pages and checklists, but also the possibility of longer education. The need for basic information with reference and links to other parties/education to obtain in-depth information was also raised.

In terms of content, several areas of interest were mentioned, including life cycle perspectives for nanomaterials, information in Safety Data Sheets (SDS) and existing restrictions on nanomaterials in specific products (e.g. wood products, food, cosmetics). In relation to these areas of interest, SweNanoSafe's ongoing project on nanomaterials in the environment (including life cycle perspectives), food and cosmetics was mentioned. This type of specific knowledge is needed especially in authorities, such as the National Food Agency, which is supposed to be a controlling authority, because representatives from municipalities that are also likely to carry out supervision will need education. In this context, it was mentioned that the Swedish Food Agency works with issues regarding nano-food additives, and may therefore have additional perspectives on the content needed in education.

It was recognised that it is a large-scale task to summarise all the needs and proposals regarding working on common cases and sharing experiences and opportunities. For example, a number of different cases could be developed where everyone can give feedback based on their perspectives and competences. This could be used as a basis for education materials and an understanding of how to provide education at different levels. It was suggested that this would be a good point to work around in the final workshop on concrete steps forward (see the list of workshops above). Proposals regarding building a case around e.g. nano-size [titanium dioxide \(TiO<sub>2</sub>\) as a food additive](#) were raised.

The discussion also touched on the topic of the next workshop, namely accessible education on nanosafety within Sweden and examples such as the education in occupational hygiene (offered by Gothenburg University/Occupational and Environmental Medicine on behalf of the Swedish Agency for Work Environment Expertise in spring 2021). The course focuses on measurements and the course leader is Håkan Tinnerberg. In addition, it is possible to extend the education for occupational health and safety engineers (chemical work environment risks, lecturer Klara Midander) to include a section on nanosafety. It was also proposed that available education materials should be collected to serve as a basis for further development of new adapted materials to avoid reinventing the wheel. There were also suggestions to look at possible international materials (e.g. from [the Nanosafety Cluster](#)), and to take a closer look at the [PFAS network](#) for inspiration.

**The discussion resulted in three concrete proposals regarding moving forward:**

- To map interest in and competence to meet needs, e.g. through persona descriptions of target groups and overview of knowledge within SweNanoSafe's education network.
- To identify a number of relevant cases with the aim of sharing experiences, such as the form and content of education. These cases can focus on, for example, a specific type of target group or a specific area.
- To inventory and collect education materials that serve as a basis for further development.

## Available education

“Available education in nanosafety” was the theme of the second workshop and the aim was to bring people together to the network from different organisations, with insight into available education

and a common interest in developing education in nanosafety. Like the first workshop, this also served as a basis for creating further activities within the education network and for the platform on the issue of expanding education in nanosafety in Sweden.

Penny Nymark welcomed the participants, presented the programme (Annex 1) and gave a brief overview of the conclusions of the first workshop. The participants were given an opportunity to introduce themselves by name and role, as well as their interest in the workshop series.

This time the workshop gathered 15 people from 11 different organisations (Annex 2). Like the first workshop, the participants represented a wide range of stakeholders, this time with an emphasis on academia, including trainers with expertise in nanosafety. The expertise of the participants included: measurements and emissions of nanoparticles in the work environment and in chambers, education of companies in occupational safety and health (including projects on developing nanosafety education), exposure and risk assessment (including regulatory) as well as teaching for health and safety engineers and occupational hygienists, exposure and health effects in the respiratory tract (nanotoxicology), airborne particles and nanomaterials, and their effects, environmental information on building products, material scientists and graphene expertise, and the use of nanomaterials in the construction industry.

The presentations were followed by brief presentations on nanosafety education available in Sweden. The presentations revolved around four issues that later in the workshop served as the basis for a joint discussion:

1. What type of stakeholder do you represent?
2. Why is nanosafety important in your field?
3. What type of education are you responsible for?
4.
  - a. Who is the target group of the education?
  - b. What is the content and form of the education?

## Presentations

### **Doctoral course in nanosafety, NanoLund, Lund University (LU)**

Christina Isaxon, Senior Lecturer at Lund University of Technology and principal coordinator for nanosafety at NanoLund, presented the course “Nanosafety” which has been given twice to date. NanoLund is a centre consisting of about 400 researchers and doctoral students at LU who act for continuous and close cooperation with the industry. Nanosafety is one of NanoLund’s flagships. The course is described as follows:

- Doctoral course with 5-7.5 credits, open also to masters students doing relevant degree projects, doctoral students from other universities, and as assignment education for external participants (authorities, companies), is included in NanoLund "*distinction for PhD students*"

and is one of two compulsory courses required to obtain NanoLund distinction.

- Consists of 4 + 4 full days during two separate weeks and includes lectures on characterisation, exposure, emissions and life cycle aspects of nanomaterials, as well as risk assessment and management, ethical aspects, toxicology, environmental effects and epidemiology, as well as assignments to be performed before and after the course (individually) and between the course weeks (in groups).
- The course is given annually and has been conducted twice to date (2019 and 2020 [digitally]) with mainly NanoLund doctoral students. This is a broad, interdisciplinary course, which has been highly appreciated based on course evaluations. The course is given in English and is free for doctoral students but costs SEK 21,000 for representatives from industry and authorities.
- The course currently needs to improve its advertising targeting the industry.

### **Masters degree in toxicology at the Institute of Environmental Medicine (IMM), Karolinska Institutet (KI)**

Annika Hanberg, Professor at IMM, talked briefly about KI's global Masters Programme in Toxicology, which focuses on health and risk assessment of chemicals, but also of (nano)particles. Over the past 10 years, it has been an international programme with a broad scope in terms of methods, research and risk assessment. The programme includes toxicology, health effects from exposure to chemicals, and also deals with different groups (consumers, professionals, children/adults, etc.). The education is research preparation but also preparatory for those who want to work with chemical safety in authorities or companies.

The programme's various course elements also include specific introductions to nanosafety, including in the modules Toxicological Principles, Organ toxicology, Laboratory course in toxicological methods, Molecular and cellular toxicology, and thesis opportunities on nanomaterials.

### **Teaching on nanosafety as part of various courses and programmes in Sweden**

Hanna Karlsson, Researcher at IMM, continued and told us specifically about different nanosafety and nanotoxicology elements in various courses available in Sweden. She lectures in KI's Masters programme in Toxicology (see above). In addition, she teaches in several different courses given at Stockholm University (SU) and the Royal Institute of Technology (KTH). The workshop participants saw examples of presentation materials used in introductory lectures. These often focus on lung effects, e.g. the deposit of small particles in the lung, reactive particles that either dissolve or do not dissolve, i.e. regarding the special properties of nanomaterials and specifically in biological contexts.

The Masters Programme in Toxicology (KI) in particular has several different elements regarding nanotoxicology, e.g. nanoparticles and cancer. The programme also includes laboratory work with nanoparticles over a period of 5 weeks. The students report their results in the form of a fictitious scientific article. Within the framework of this task, several relevant issues related to nanosafety are addressed:

- Comparisons of effects and measurements of nanoparticles between animal experiments and alternative cell-based methods

- Comparisons between different ways of representing nanoparticle doses in relation to experiments and reality
- Measurement and modelling of cell doses (e.g. by models showing where in the lung the particles will deposit)

Finally, Penny Nymark gave a brief overview of information sent before the workshop by a stakeholder who could not participate:

### **International Doctoral Course in Nanotoxicology at IMM, KI**

Bengt Fadeel, Professor at IMM shared information about a PhD course in nanotoxicology given at IMM, "*Nanotoxicology: Potential Risk Of Engineered Nanomaterials To Human Health And The Environment*". The course is described as follows:

- 1 week long, organised every 2-3 years, given in English and representing 1.5 credits.
- In previous courses it been organised in collaboration with international researchers (including Prof. Valerian Kagan, Univ of Pittsburgh; Prof. Anna Shvedova, West Virginia Univ & AMP; Prof. Antonio Pietroiusti, Univ of Rome Tor Vergata).
- Includes lectures, journal clubs, group work, and an oral examination including discussion. The course literature consists of the book [Adverse Effects of Engineered Nanomaterials: Exposure, Toxicology, and Impact on Human Health](#). Eds. B. Fadeel, A. Pietroiusti, A. Shvedova. 2nd Edition. (2017), as well as various overview articles.
- Has gathered an average of around 20 doctoral students, half of whom are usually from KI, while the rest come from other universities both in Sweden and internationally.

## **Discussion**

Like the first workshop, the presentations were followed by a discussion where the focus was on gaining insight into how to build concrete area-specific education elements on nanosafety as a basis for further development of solutions. The inspirational questions were:

- How can academic education be adapted to specific target groups?
- How can the education be structured in the best way, technically and pedagogically?

### **Academic education tailored to specific target groups**

In line with the first inspirational question, the need to redesign existing education to reach out to companies, etc. was discussed. It was recognised that more detailed information on what the target groups need is required and that it is important to make academic research studies intelligible to make them accessible to companies. At Present, for example, experts are also being sought for the project to develop education in nanosafety for companies. The discussion provided the following insight into the adaptation of academic education to specific target groups:

- The development of so-called cases (see discussion after the first workshop) is a pragmatic starting point for the development of education materials adapted to specific target groups. Cases could focus on, for example, a common form of a nanomaterial, a common use of a nanomaterial (nano in concrete was mentioned as an example) or a clear target group.
- Surveys (also mentioned at the first workshop) can provide a basis for gaining insight into

which nanomaterials are considered most important, or which target groups are most central.

- The doctoral course at NanoLund was proposed to serve as a good basis and starting point for increased work on education in the field. The course is broad and has opportunities to provide both overview insight into the area and more area-specific knowledge. NanoLund has an interest in educating health and safety managers and industry both through the current course and in other ways with newly developed material.
- Small businesses were mentioned as an important target group that needs insight into thinking about safety at the innovation level, such as knowledge of the so-called [Safe by Design concept](#). Larger companies were also mentioned but often assumed to have broader knowledge. Examples of innovation projects (e.g. development of 3D printers) were mentioned where education materials were developed to spread specific knowledge about, for example, how to handle powder, how dust arises, the need for ventilation, the possibilities of building in. Often, in this type of innovation, the focus is on reducing the possibility of exposure, i.e. following [so-called precautionary principles](#), but there is also a need for insight into what happens after the development phase, especially in the event of a scale-up of the processes, and life cycle perspectives are still needed. The project involving 3D printers will publish final reports and materials that can serve as insights into the mindset in innovation (contact person Hanna Karlsson). In terms of innovation and life cycle perspectives, it may also be relevant to have more in-depth education on toxicity, such as the type of models and studies to be used to gain insight into risks worth considering in various industrially relevant assessments.
- Since January 2021, when a [reporting requirement in relation to nanomaterials](#) in chemical products was introduced, knowledge of the definition of nanomaterials has become increasingly important. Knowledge of, for example, the international cooperation agency OECD's unofficial definition is needed (i.e. 50% of a material must be within the size range of 1-100nm in at least one dimension). In addition, different authorities have made their own interpretations, such as EFSA, which has its own extended interpretation. An [update of the OECD's interpretation](#) is underway.

### **Towards pedagogical and technically accessible education**

In relation to how to structure education in the best way, technically and pedagogically, the possibility of gaining insight into international initiatives was discussed. In this context, the following courses and activities were mentioned:

- [NIVA's](#) (Nordic Institute for Advanced Training in Occupational Health) course "Safety and Risks of Engineered Nanomaterials"
- Nanosafety Cluster [Working Group A – Communications, Training & Education](#)
- The German nanosafety platform [DaNa 4.0](#) ([Krug et al. 2018](#))
- [Nanosafety "training school"](#) organised every year, in the last 10 years, in Venice
- [Nanosafety Forum for Young Scientists](#), organised every two years in different locations in Europe
- [SIO Grafen](#), a research project that connects industry/companies with academia working with graphene. The project, which is actually more like a network, manages about 100 academic projects that deal with graphene. The network has no direct focus on education, but can serve as a relevant network for capturing information, e.g. in connection with surveys. A small strategy project is underway on graphene in the work environment,



and it is suggested that this could form the basis for cooperation between SweNanoSafe and SIO Grafen (contact persons Sofia Öiseth and Erik Nilebäck).

In addition, a potential survey was discussed further (also mentioned during the first workshop) and proposed questions concern e.g. how risks are managed today. Suggested target groups for a survey include health and safety managers among the public and patients, such as construction workers, concrete crushers, cleaners, employers who are required to answer these kinds of questions, firefighters who worry about what they don't know when they go out to fires in industries, etc. It was proposed that the questions be put primarily to health and safety engineers and environmental coordinators. The ability of surveys to reach many people was also discussed, but with a risk of a low response interest. Motivations may be needed to attract people's interest. It may be difficult to cover enough areas and get enough answers for the survey to be valuable. It was pointed out that the dialogue is also very valuable!

It was also proposed that nanosafety elements should be included in ongoing courses for work environment engineers (contact persons Håkan Tinnerberg, Mattias Sjöström). In general, mainly hands-on knowledge, often strongly linked to classical occupational hygiene, is needed.

The Swedish Food Agency (Livsmedelsverket, SLV) contributes with a lecture on Food Toxicology (contact person Marie-Louise Nilsson) within the course Food Safety at SU. The course includes information about nanomaterials in food and in materials in contact with food, as well as its purpose. It also mentions some examples of approved nanomaterials and materials under evaluation, as well as how an evaluation is carried out at the European Food Safety Authorities (EFSA).

In particular, the specific need for knowledge regarding permits for the use of nanomaterials in food packaging such as plastics is addressed. Companies applying for permits need a great deal of knowledge and, as mentioned earlier, it is often small companies that have the greatest knowledge needs.

**In conclusion, the workshop** concludes that all valuable insights from the discussions during the two workshops will be summarised in order to proceed with a plan for the education network in 2021. Concrete plans include:

- Continued dialogue (including possible development of a survey) to gather information from target groups regarding educational needs and formats
- Development of a Roadmap for concrete steps forward regarding education in nanosafety for 2021

## Concrete steps forward

"How we take initiatives in nanosafety education one step further" was the theme of the third and final workshop. The goal was to gather people from different organisations and with an interest in contributing to the planning of the continued development work to improve education in nanosafety.

Penny Nymark welcomed everyone and presented today's programme (Annex 1), after which the participants had the opportunity to introduce themselves. The workshop was attended by 10 people from 8 different organisations (Annex 2). This time, stakeholders from academia, authorities,



companies and a non-profit association were present. Participants were also provided with a brief overview of the discussions and conclusions of the two previous workshops.

A brief discussion followed this overview and the value of this common ground, which is now being built, was recognised. Together, we have the opportunity to emphasise the importance of and facilitate better education in the field and this report can serve as a basis for harmonising both terminology and approaches to the development of education materials in the various sub-areas. A total of 29 people took part in the three workshops, a collection of key actors with an interest and ability to be involved in concrete steps forward for the development of education within the area of nanosafety (see Annex 2).

## **Presentations**

### **Proposed Roadmap for 2021**

Penny Nymark presented a proposed Roadmap developed based on the discussions and insights from workshops 1 and 2. The proposal covers 4 steps as follows:

#### *Step 1:*

- Identify and describe relevant target groups for nanosafety education
- Develop cases (focuses on target groups or a specific sample area such as graphene)
- Produce cases
- Collect teaching materials, e.g. via personal communication and email

#### *Step 2:*

- Sort collected teaching materials for the specific target groups, possibly with priority for a specific area or working group initially (e.g. with focus on health, environment, work environment, or risk assessment)
- The focus of this step is on developing education materials for specific cases with varying depths depending on the need, i.e. building modules with education materials

#### *Step 3:*

- production of education materials

#### *Step 4:*

- communication and dissemination of education materials
- dissemination of the operation itself, i.e. the development of education materials in the field

### **Factual materials and checklists in nanosafety**

Fredrik Beskow presented Prevent's work in producing factual material and checklists in nanosafety. Prevent currently lacks information and tools on nanomaterials in its educational offering, which has been in strong demand among their partners. As mentioned earlier, Prevent therefore spent autumn 2020 forming an overview, and completion of factual material began in December 2020. The material

is aimed at SMEs, as well as lay people (not experts). PDF documents with basic facts, as well as reference to in-depth information, will be published on [Prevent's website](#). Checklists will also link to the factual material to support systematic work environment management ("SAM for Nano"). The key questions that this effort intends to answer are:

- **What** is nano?
- **Where** are nanoparticles found?
  - Why are they used?
  - What do they add?
- **Why** should we work with this in the work environment management?
  - What are the risks?
  - Why is prevention important?
- **What** must we do?
  - How is this connected to SAM and chemical work environment risks?

An example of how Atlas Copco has used a work environment (laboratory environment) as a case to gain insight into how checklists could help in managing risks with nanomaterials in the work environment was also presented. The current issues in connection with this work have mainly concerned appropriate sources of facts, where the research is, how "deep" one should delve into the factual material and how detailed the checklists should be. What does the legislation provide, for example, the Regulations of the Swedish Work Environment Authority (AFS) and European REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals). Finally, an overview was given of the timetable and work that will be done iteratively in the spring and is expected to be completed by the summer.

## Discussion

The presentations were followed by a discussion focused on agreeing on a final Roadmap for 2021. Inspirational questions for the discussion were:

- Are there suggestions for cases?
- Are there proposals for working groups (themes)?
- Are there interested convening persons?
- What is the motivation for the members of the education network to get involved?

In relation to cases, experience from the aforementioned SIO Graphene initiative was discussed where a preliminary study (contact persons Mikael Syväjärvi and Curt Lindmark) was conducted and identified a number of cases in connection with companies interested in using graphene in their products and bringing it to the market. In these cases, it was clear that it was important to have someone to turn to in case of questions, as a sounding board regarding nanosafety. It was mentioned that education materials could also include more dialogue-based webinars. In addition to formal information, more informal forms of support are also needed. It was

mentioned that SIO Graphene has insight into many of these issues and will work specifically to produce information on health and safety risks, legislation, etc. The question was raised as to whether it would be worth building a case around graphene? Generally, one could start with work environment,

then life cycle perspective, i.e. how to find information about risks that may arise by including graphene in products. SIO Grafen comprises about 100 innovation projects that will work with so-called corporate cases in the spring, both from the perspective of manufacturers and users of graphene, and they will take a closer look at management and work environment issues.

Workshop participants wondered if the innovation process itself is dealt with? Could, for example, the Safe by Design concept/process serve as a basis for addressing safety in industrial contexts? Might education in Safe by Design be needed? It was noted that it is likely that this type of information should be produced and may be useful.

Prevent's work was discussed in relation to the need for education materials, and several participants appreciated this initiative. Participants were told that Prevent maintains and revises all the information on their pages at least once a year. The balance between general and in-depth information was discussed, and generally the view was that links to in-depth materials are good, but that it is important to keep this up to date and relevant, and to ensure that it is easily accessible. Prevent sometimes also takes in external material and processes it to better fit the purposes. On the other hand, there is also a need for a more established user network, i.e. identifying those who actually need the information and education. In this case, for example, SIO Grafen was seen as an example of a potentially valuable user network.

Regarding education materials and useful networks, the need to look out into international contexts was discussed, which was also raised in the context of the second workshop (see discussion above). Denmark was mentioned, for example, as a country with early nano-research and exposure measurements, with a long experience in health and safety issues and that has probably developed education materials by now. NIVA (see above) was mentioned as an actor in this field. British materials were also mentioned.

Regarding motivation for educators and education developers, it is a challenge that there is commitment, but frequently lack of time, opportunity and funding. With sufficient grounds, support and insight into the needs of knowledge in the field, SweNanoSafe may also be able to establish new projects and apply for funding specifically for this purpose.

At the end of the discussion, gratitude for this initiative was expressed, and the participants expressed an interest in continued involvement. In addition, three working groups will be formed, and will continue to work in line with the discussions in the three workshops during the spring:

#### Working groups for spring 2021

The discussion about graphene, innovation and Safe by Design led to insight into possible synergies between SIO Grafen, Prevent's work on facts and SweNanoSafe's education initiative. The possibilities of starting to build working groups that take a closer look at target groups and education materials became clearer, and three working groups were proposed:

1. Working group to build a case around target groups and their needs with a focus on the area of "graphene". The results of this work may tentatively be a list of target groups, as well as a list of their needs in relation to educational materials.

2. Working group to gather education materials in line with Prevent's target group descriptions (see details above in connection with workshop Part 2). The results of this work may include, for example, a list of available material, as well as a list of missing material.
3. Working group to collect information on international initiatives on education, as well as available material.

## Roadmap for 2021

The three workshops that SweNanoSafe organised in the autumn of 2020 generated interest from a wide range of actors in nanosafety and led to discussions on solutions and concrete steps forward in the field of improving education. The discussions laid the foundations for the establishment of a Roadmap for the Education Network in 2021. The roadmap covers 4 steps, of which the first two will play a major role in spring 2021. **Figure 1** shows an overview of the Roadmap, while concrete details and examples of activities within the four steps can be found below.

# Roadmap for the Education Network 2021

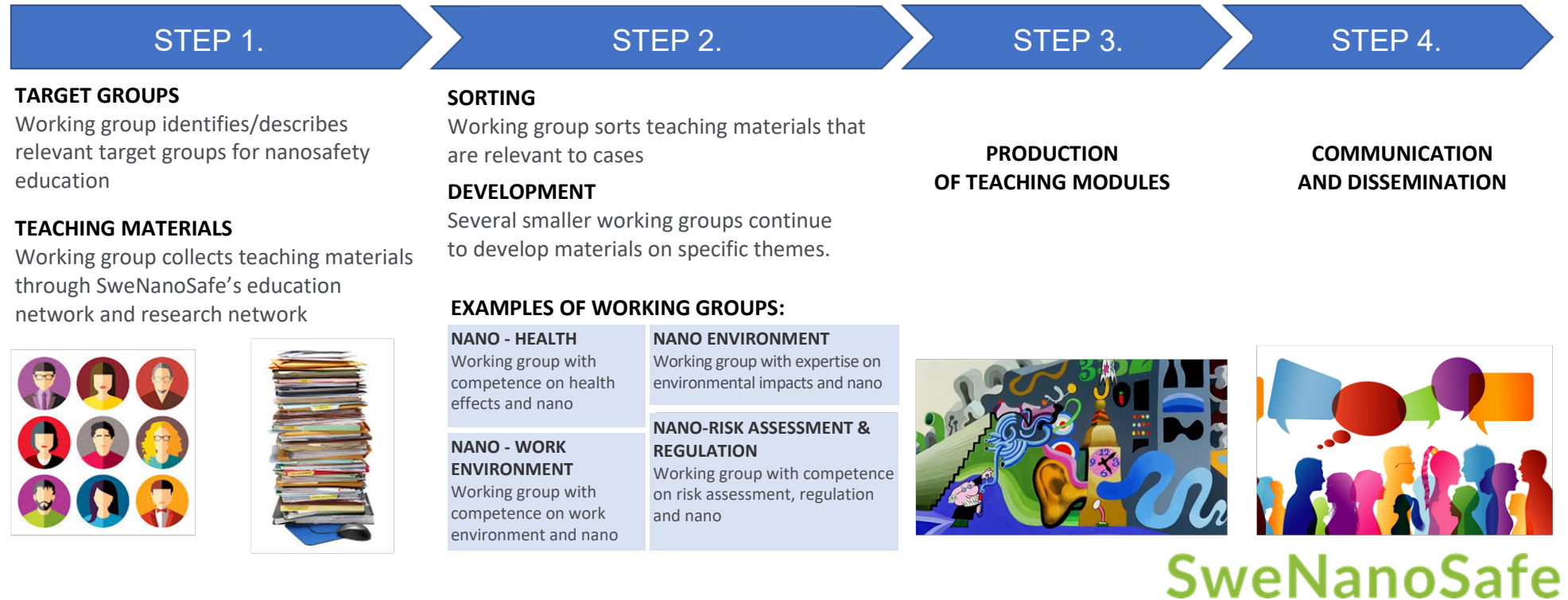


Figure 1. Roadmap for SweNanoSafe's education network for 2021

## Step 1

### Target groups

One (or more) working group(s) works to identify and describe relevant target groups for nanosafety education. The approach may include, for example, so-called persona descriptions as well as cases, where different target groups and their needs for education are described in relation to a specific field. In addition, questionnaires may be sent with the purpose of collecting information about target groups, or the needs of the target groups after they have been identified. The work is planned to generate between 2 and 4 descriptions of target groups, as well as an indication of the level of education needs.

The working group(s) preferably consist(s) of a number of different actors, including trainers in work environment, academic trainers/academics, government officials, clinical persons, trade unionists. There is, of course, a risk that the working group may not cover the area with a sufficient number and variety of cases and that relevant areas may be missing, but the idea is that the work will provide a basis for continued iterative initiatives that eventually generate several cases/target groups with increasing breadth.

Working Group 1 (see above) is working on this objective.

### Teaching materials

One (or more) working group(s) work to gather teaching materials, e.g. through SweNanoSafe's education network (and research network). The procedure may include e.g. e-mail and personal communication. The work can be expected to result in a variety of "unsorted" material in the form of ppt slides, recorded lectures, documents and compendiums.

In cases where trainers are not prepared to share all their material, the working group may collect information about the trainer, as well as details of the education and its target group.

Working groups 2 and 3 (see above) are working on this objective.

## Step 2

### Sorting

One (or more) working group(s) sort the collected material according to the relevant cases. The work may include, for example, a pilot exercise where a couple of relevant cases are selected to focus the sorting.

### Development

Several smaller working groups continue to work on the sorted material in relation to some specific and relevant cases e.g. in health, environment, work environment or risk assessment. The approach involves meeting the need for education either at in-depth or a more superficial level and using the sorted teaching materials identified in relation to the working group's area. The work can be expected to lead to drafts of education materials adapted for specific cases, such as a number of ppt-slides + guidance at a deeper/shallower level. The work may also include, for example, identification of missing material, script ideas for short films, or plans for the construction of complete teaching modules.

The working groups consist of a convener with experience in each field, as well as educators, academic competence, stakeholders in the relevant case, and possibly an educational developer.

### **Step 3**

One (or more) working groups develop and produce teaching modules aimed at specific target groups. The work can consist of an iterative process in which a convening person (either the same as in the previous steps or a new one) has a production responsibility. The working group(s) may (if funds are available) include a dedicated person/professional for the development of educational material.

### **Step 4**

One (or more) working groups work (in consultation and collaboration with SweNanoSafe) to communicate and disseminate information about the education material within relevant contexts. The work may include, for example, the publication of education materials on SweNanoSafe's website, press releases aimed at specialist journals, newsletters in relevant spheres, etc.

The work can also include a webinar with the aim of spreading knowledge about educational opportunities, a pedagogically oriented scientific publication describing the process, as well as dissemination via other national and international platforms (e.g. [DaNa](#), [Nanosafety Cluster](#), etc.).

These four steps form the basis of structured work aimed at improving education in nanosafety in Sweden. The goal is to initiate Steps 1 and 2 and form working groups that continue to work on as described above. In 2021, the vision is to reach a point where it is possible to test the newly developed education material in the near future on a relevant target group.



## References and links

Adverse Effects of Engineered Nanomaterials: Exposure, Toxicology, and Impact on Human Health. Eds. B. Fadeel, A. Pietroiusti, A. Shvedova. 2nd Edition. (2017). ISBN 978-0-12-809199-9.

[www.sciencedirect.com/book/9780128091999/adverse-effects-of-engineered-nanomaterials](http://www.sciencedirect.com/book/9780128091999/adverse-effects-of-engineered-nanomaterials)

Basinas I, Sánchez Jiménez A, Galea KS, van Tongeren M, Hurley F. *A Systematic Review of the Routes and Forms of Exposure to Engineered Nanomaterials*. *Annals of Work Exposures and Health*, Volume 62, Issue 6, July 2018, Pages 639-662, [doi.org/10.1093/annweh/wxy048](https://doi.org/10.1093/annweh/wxy048)

DaNa – national platform for nanosafety in Germany, [www.nanosafetycluster.eu/nsc-overview/nsc-structure/steering-group/dana-2-0/](http://www.nanosafetycluster.eu/nsc-overview/nsc-structure/steering-group/dana-2-0/)

Krug HF, Bohmer N, Kühnel D, Marquardt C, Nau K, Steinbach C. *The DaNa2.0 Knowledge Base Nanomaterials – An Important Measure Accompanying Nanomaterials Development*. *Nanomaterials* 2018, 8, 204. [doi.org/10.3390/nano8040204](https://doi.org/10.3390/nano8040204)

NanoSafety Cluster – European Platform for Nanosafety, [www.nanosafetycluster.eu/](http://www.nanosafetycluster.eu/)

NanoSafety Cluster Working Group A – Working group focused on communication, training and education in nanosafety, [www.nanosafetycluster.eu/nsc-overview/nsc-structure/working-groups/wga/](http://www.nanosafetycluster.eu/nsc-overview/nsc-structure/working-groups/wga/)

Nanosafety Forum for Young Scientists - [www.nanosafetycluster.eu/2nd-nanosafety-forum-for-young-scientists/](http://www.nanosafetycluster.eu/2nd-nanosafety-forum-for-young-scientists/)

Nanosafety Training School -

[www.h2020gracious.eu/event/nanosafety\\_training\\_school\\_from\\_basic\\_science\\_to\\_risk\\_governance](http://www.h2020gracious.eu/event/nanosafety_training_school_from_basic_science_to_risk_governance)

NAPO films – animated films focusing on important work environment issues

[www.napofilm.net/sv/napos-films/films](http://www.napofilm.net/sv/napos-films/films)

NIVA – Teaching in occupational health and the environment, [niva.org/](http://niva.org/)

OECD definition of nanomaterials - [nanotechia.org/news/eu-plans-review-definition-nanomaterial](http://nanotechia.org/news/eu-plans-review-definition-nanomaterial)

PFAS Network – Networks focusing on communication regarding perfluorinated substances in the environment, [www.kemi.se/om-kemikalieinspektionen/vart-uppdrag/regeringsuppdrag/handlingsplan-for-en-giftfri-vardag/pfas-natverk](http://www.kemi.se/om-kemikalieinspektionen/vart-uppdrag/regeringsuppdrag/handlingsplan-for-en-giftfri-vardag/pfas-natverk)

Prevent Website - [www.prevent.se/](http://www.prevent.se/)

Safe by Design – concept focuses on safety in innovation [www.nanoreg2.eu/safe-design](http://www.nanoreg2.eu/safe-design)

SIO Grafen - national innovation programme with the ambition to strengthen cross-border collaboration in the field of graphene, [siografen.se/](http://siografen.se/)

SweNanoSafe website - [www.swenanosafe.se](http://www.swenanosafe.se)

TiO<sub>2</sub> in food - [www.livsmedelsforetagen.se/aktuellt-inom-livsmedelslagstiftning-pa-eu-niva-2/](http://www.livsmedelsforetagen.se/aktuellt-inom-livsmedelslagstiftning-pa-eu-niva-2/)

# Annex 1. Programme from Workshop Part 1-3

## The training network's workshop series Part 1: Need for training in nanosafety

### AN INITIATIVE OF THE NATIONAL PLATFORM FOR NANOSAFETY, SWENANOSAFE

**Date:** 28 September 2020

**Venue:** Online, Teams

**Time:** 9.30 AM – 11.30 AM

**Participants:** academia, trade unions, authorities, regional government, companies, non-profit associations, consultants

**Background:** The goal of SweNanoSafe's training network is to create conditions for collaboration on educational needs as well as training efforts in nanosafety, aimed at different target groups within Sweden. A significant need to expand and improve education in nanosafety has been identified in Sweden. In order to meet this need, we plan three workshops during the autumn, of which this is the first part. Welcome!

#### Programme:

9:30 AM SweNanoSafe welcomes and introduces the programme for the day

Tour de table – short participant presentations (~1 min.) focusing on “Why are you here?”

Brief presentations by different stakeholders highlighting the need for training

- Jane Wigren, Head of assessment department at SundaHus i Linköping AB
- Gustav Bäck, Administrator at the Swedish Work Environment Authority
- Fredrik Beskow, Project Manager at Prevent
- Brief summary of information submitted by stakeholders who were unable to attend (Penny Nymark, SweNanoSafe)

Group discussions – training needs in each area (exercise of public authority, research/higher education, work environment, and further education)

Presentation of results from group discussions

Final words and invitation to the next workshop

11.30 AM End

# The training network's workshop series

## Part 2: Available training in nanosafety

### AN INITIATIVE OF THE NATIONAL PLATFORM FOR NANOSAFETY, SWENANOSAFE

**Date:** 20 October 2020

**Venue:** Online, Zoom

**Time:** 9.30 AM – 11.30 AM

**Participants:** academia, authorities, companies, non-profit associations, consultants

**Background:** The goal of SweNanoSafe's training network is to create conditions for collaboration on educational needs as well as training efforts in nanosafety, aimed at different target groups within Sweden. A significant need to expand and improve education in nanosafety has been identified in Sweden. In order to meet this need, we plan three workshops during the autumn, of which this is the second part focusing on available training. Welcome!

#### Programme:

9:30 AM SweNanoSafe welcomes and introduces the programme for the day

Tour de table – short participant presentations (~1 min.) focusing on “Why are you here?”

Brief presentations by different stakeholders responsible for nanosafety training

- Christina Isaxon, Associate Senior Lecturer at NanoLund
- Annika Hanberg, Professor at the Institute of Environmental Medicine, Karolinska Institutet
- Hanna Karlsson, Researcher at the Institute of Environmental Medicine, Karolinska Institutet
- Brief summary of information submitted by stakeholders who were unable to attend (Penny Nymark, SweNanoSafe)

Joint discussion

Final words and planning for the next workshop

11.30 AM End

# The training network's workshop series

## Part 3: How do we take nanosafety training initiatives one step further?

### AN INITIATIVE OF THE NATIONAL PLATFORM FOR NANOSAFETY, SWENANOSAFE

**Date:** 15 December 2020

**Venue:** Online, Teams

**Time:** 9.30 AM – 11.30 AM

**Participants:** academia, authorities, companies, non-profit associations, consultants

**Background:** The goal of SweNanoSafe's training network is to create conditions for collaboration on educational needs as well as training efforts in nanosafety, aimed at different target groups within Sweden. A significant need to expand and improve education in nanosafety has been identified in Sweden. In order to meet this need, we plan three workshops during the autumn, of which this is the third part focusing on concrete steps further to develop training in nanosafety. Welcome!

#### Programme:

9:30 AM SweNanoSafe welcomes and introduces the programme for the day

Summary of Workshops 1 and 2 (Penny Nymark, SweNanoSafe)

Overview of the Education Network Roadmap 2021 (Penny Nymark, SweNanoSafe)  
Nano – facts and check lists (Fredrik Beskow, Prevent)

Joint discussion on Roadmap 2021 and working groups

Final words

11.30 AM End

## Annex 2. Participants in Workshop Part 1-3

<b>Participants Workshop 1</b>		
<b>Name</b>	<b>Position</b>	<b>Organisation</b>
Anda Gliga	Researcher	SweNanoSafe / Institute of Environmental Medicine (IMM), Karolinska Institutet (KI)
Penny Nymark	Researcher	SweNanoSafe / IMM, KI
Klara Midander	Researcher	SweNanoSafe / IMM, KI
Annika Hanberg	Professor	SweNanoSafe / IMM, KI
Markus Ifverberg	Chemist/investigator	Swedish Chemicals Agency
Gustaf Bäck	Administrator	Swedish Work Environment Authority
Britt-Marie Larsson	Administrator	Swedish Work Environment Authority
Marie-Louise Nilsson	Risk assessor	Swedish National Food Agency
Christer Idström	Expert, indoor environment	National Board of Housing Building and Planning
Ann-Charlotte (Lotta) Almstrand	Section Manager, Chemist	Sahlgrenska University Hospital / Västra Götaland Region, Occupational and Environmental Medicine
Mattias Sjöström	Occupational hygienist/Researcher	Centre for Occupational and Environmental Medicine (CAMM) / KI
Nanna Fyhrquist	Research group leader	IMM, KI
Eva Emanuelsson	Researcher	RISE
Anna Bredberg	Researcher/chemist	RISE
Carmen Vogt	Researcher	Royal Institute of Technology (KTH)
Mikael Syväjärvi	Research and innovation capacity	Linköping University / Alminica AB
Lena Killander	Implementation Manager	Applied Nano Surfaces
Jane Wigren	Head of Assessment Department	SundaHus i Linköping AB
Fredrik Beskow	Project manager	Prevent
Magnus Skagerfält	Expert	Swedish Association of Graduate Engineers / PTK / Prevent
Malin Nilsson	Occupational safety and health specialist/advisor	Association of Swedish Engineering Industries
Anna Vikström	Manager, environmental assessments	Byggvarubedömningen
Danielle Freilich	Environmental Consultant	Freilich Konsulter AB
<b>Persons who had expressed an interest in attending but were unable to attend</b>		
Eva Blomberg	University Lecturer	KTH, CBH (Chemistry, Surface and Corrosion Science)
Kristina Neimert Carne	Expert chemical issues	IKEM
Gregory Moore	Investigator	Swedish Chemicals Agency / SweNanoSafe
Heike Siegmund	Chemical safety coordinator	KI
Lena Palmberg	Professor	IMM, KI

## Participants Workshop Part 2

Name	Position	Organisation
Annika Hanberg	Professor, Chairman	SweNanoSafe / IMM, KI
Klara Midander	Researcher, coordinator	SweNanoSafe / IMM, KI
Penny Nymark	Researcher, coordinator	SweNanoSafe / IMM, KI
Anda Gliga	Researcher, coordinator	SweNanoSafe / IMM, KI
Marietta Athanasiou	Coordinator	SweNanoSafe / IMM, KI
Hanna Karlsson	Researcher	IMM, KI
Anna Bredberg	Researcher/chemist	RISE
Fredrik Beskow	Project manager	Prevent
Mattias Sjöström	Occupational hygienists/Researcher	CAMM/KI
Håkan Tinnerberg	Occupational hygienist	Sahlgrenska University Hospital / Västra Götaland Region, Occupational and Environmental Medicine
Ann Charlotte Almstrand	Chemist, Section Manager	Sahlgrenska University Hospital / Västra Götaland Region, Occupational and Environmental Medicine
Christina Isaxon	Senior Lecturer	Lund University
Jane Wigren	Kemis	SundaHus i Linköping AB
Sofia Öiseth	Project manager	Chalmers Industrial Technology
Danielle Freilich	Environmental Consultant	Freilich Konsulter
Marie-Louise Nilsson	Risk assessor	National Food Agency
<b>Persons who had expressed an interest in attending but were unable to attend</b>		
Gustaf Bäck	Administrator	Swedish Work Environment Authority
Charlotte Jackson	Coordinator	SweNanoSafe / IMM, KI
Vadim Kessler	Professor	Swedish University of Agricultural Sciences
Christer Idström	Expert, indoor environment	National Board of Housing Building and Planning
Markus Ifverberg	Chemist, investigator	Swedish Chemicals Agency

### Participants Workshop Part 3

Name	Position	Organisation
Penny Nymark	Researcher, coordinator	SweNanoSafe / IMM, KI
Klara Midander	Researcher, coordinator	SweNanoSafe / IMM, KI
Annika Hanberg	Professor, Chairman of SweNanoSafe Steering Group	SweNanoSafe / IMM, KI
Håkan Tinnerberg	Occupational hygienist	Sahlgrenska University Hospital / Västra Götaland Region, Occupational and Environmental Medicine
Christina Isaxon	Lecturer	Lund University
Gustaf Bäck	Administrator	Swedish Work Environment Authority
Fredrik Beskow	Project manager	Prevent
Erik Nilebäck	Project manager	Chalmers Industrial Technology
Mikael Syväjärvi	Researcher, entrepreneur	Alminica AB / Linköping University
Christer Idström	Indoor environment expert	National Board of Housing Building and Planning
<b>Persons who had expressed an interest in attending but were unable to attend</b>		
Joachim Sturve	Professor	University of Gothenburg
Lena Killander	Implementation Manager	Applied Nano Surfaces
Danielle Freilich	Chemist	Freilich Konsulter
Anna Vikström	Manager, environmental assessments	Byggvarubedömningen