



# NANOTRUST 53 en

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# Environment, Health and Safety Research Projects in Horizon 2020

# Summary

Numerous research projects within the 8th Framework Programme for Research and Innovation of the European Commission - Horizon 2020 - are dedicated to environment, health and safety aspects of nanotechnologies, in continuation of the preceding 7th Framework Programme<sup>1</sup>. Many of the Horizon 2020 projects are devoted to the following subjects: risk assessment, regulation, standardization of measurement and analytical methods. Furthermore, some projects are focusing their research on production techniques and quality standards. Further research topics include life cycle analyses, safeby-design approaches and processes regarding sustainable production. Projects surrounding the subject of toxicity of nanomaterials are increasingly focusing on long-term studies and the (further) development of test methods. A number of Horizon 2020 projects are also dedicated to the consolidation and harmonization of data and databases. An increasing number of projects investigate computer models for the analysis of health risks and exposure scenarios, which are made available in the form of online platforms or tools for regulators, developers and researchers. Compared to the 7<sup>th</sup> Framework Programme, Horizon 2020 includes more projects dedicated to physicochemical characterization and the development of measurement and analysis methods of nanomaterials, as well as an increased number of nanoinformatic projects, which are intended to pool existing data on a European level.

# Introduction

The European Commission identifies nanotechnology as a Key Enabling Technology (KET) to address the challenges of the future. Nanomaterials and nanotechnologies play an important part in Horizon 2020, the European Commission's 8th Framework Programme for research funding for the period 2014 to 2020. Within this programme, the Commission is focusing above all on sustainable cooperation between research, development and industry, in order to facilitate the establishment of new products on the market and make Europe competitive in this sector (Leadership in Enabling and Industrial Technologies, LEIT).2 In the interest of simultaneously ensuring the safe development of nanomaterials and similar innovations, a number of projects are dedicated to the potential risks to health and the environment caused by specific applications of nanotechnology. These projects are to provide tools for science-based risk assessment and platforms for governance and risk communication.3 Moreover, Horizon 2020 places a focus on physicochemical material characterization and the development of computer models to provide an alternative to in vivo and in vitro toxicity testing.4 With the "Responsible Research and Innovation" approach attempts are made to also address ethical and social issues. In a similar vein, some projects investigate the implementation of the "safeby-design" concept in production processes of concrete nanomaterial-based products.<sup>5</sup> Projects with a focus on ecological aspects investigate distribution, accumulation and modification in the living and non-living environment, including life

cycle analyses of nanomaterials and the handling of waste disposal. In addition, the ongoing European NanoSafety Cluster continues to serve as a platform for cooperation, discussion and coordination of research activities, having already coordinated projects in the 6<sup>th</sup> and 7<sup>th</sup> Framework Programme.<sup>6</sup> Some of the European Technology Platforms (ETPs) also participate in projects in the field of nano-safety.

The work programme for "Nanotechnologies, Advanced Materials, Biotechnology and Advanced Manufacturing and Processing" provided a budget of € 230.7 million for 2014 and € 252 million for 2015 for projects under the "Nanotechnologies, Advanced Materials and Production" call.2 For the years 2016 and 2017, € 231.15 million and € 259.86 million respectively were allocated to projects on "Science-based Risk Assessment and Management of Nanotechnologies, Advanced materials and Innovative and Responsible Governance of New and Converging Enabling Technologies".3 The call for "Foundations for Tomorrow's Industries" from the work programme for the years 2018 to 2020 provided € 105.8 million for material characterization and computer modelling and € 80.8 million for governance, sciencebased risk assessment and regulatory aspects.4

This dossier provides an overview of current projects in safety research related to nanotechnology. Further information on the individual projects can be found in the CORDIS database of the European Commission.<sup>7</sup>

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# **Projects**

## **ACEnano**

Title	Analytical and Characterisation Excellence in nanomaterial risk assessment: A tiered approach
Duration	1.1.2017 - 31.12.2020
Coordinator	University of Birmingham, UK
Austrian partner	University of Vienna
Budget	€ 10,761,803.75 of which € 7,000,000 are EU funding
Webpage	http://www.acenano-project.eu/

ACEnano is concerned with the development and improvement of methods and tools for the physicochemical characterization of nanomaterials in order to facilitate the assessment of safety risks and to enable a reliable grouping of nanomaterials. The aim is to create a framework for quality control and risk evaluation based on approved methods.

## **BIORIMA**

Title	BIOmaterial RIsk MAnagement
Duration	1.11.2017 - 31.12.2021
Coordinator	Institute of Occupational Medicine, UK
Austrian partner	Bionanonet Forschungsgesell- schaft mbH und Joanneum Research Forschungsgesellschaft mbH
Budget	€ 8,761,418.75 of which € 7,999,981.25 are EU funding
Webpage	https://www.biorima.eu/

The aim of the BIORIMA project is to establish an integrated risk management system for nanoand biomaterials used in innovative drugs and medical devices. The project will develop guidelines and strategies for health and exposure risk assessment and a database on health and environmental hazards based on bionanomaterials. This will support the standardisation and regulation of nanomaterials in the medical sector.

## caLIBRAte

Title	Performance testing, calibration and implementation of a next generation system-of-systems Risk Governance Framework for nanomaterials
Duration	1.5.2016 - 31.10.2019
Coordinator	Det Nationale Forskningscenter før Arbejdsmiljø, Denmark
Budget	€ 9,828,106.25 of which € 7,999,687.50 are EU funding
Webpage	http://www.nanocalibrate.eu/home

The project endeavours to bring together and validate several approaches of risk assessment for health, environment and exposure and to provide models and methods for risk assessment at the workplace, for consumer protection and environmental protection within a consistent framework. The aim is to establish a Nano Risk Governance Portal, which provides information and strategies for risk avoidance of nanomaterial-based products from development to consumption.

#### EC4SafeNano

Title	European Centre for Risk Management and Safe Innovation in Nanomaterials Nanotechnologies
Duration	1.11.2016 - 31.10.2019
Coordinator	INERIS – Institut National de l'Environnement Industriel et des Risques, France
Austrian partner	Paris-Lodron-University of Salzburg
Budget	€ 1,999,013.75 of which € 1,999,013.25 are EU funding
Webpage	http://www.ec4safenano.eu/

The aim of the project is to establish a central contact point for nanoregulation. This will provide information and a directory of services for risk assessment and safety management in research and production.

## **EUNCL**

Title	European Nanomedicine Characterization Laboratory
Duration	1.5.2015 - 31.12.2019
Coordinator	CEA – Commissariat à l'énergie atomique et aux énergies alternatives, France
Budget	€ 5,627,303.50 of which € 4,995,181 are EU funding
Webpage	http://www.euncl.eu/

EUNCL is a network of nine leading laboratories working to improve and provide analytical services and harmonize test protocols and quality standards in nanomedicine.

## **EU-ToxRisk**

Title	An Integrated European 'Flagship' Program Driving Mechanism-based Toxicity Testing and Risk Assessment for the 21 <sup>st</sup> Century
Duration	1.1.2016 - 31.12.2021
Coordinator	Universiteit Leiden, Netherlands
Austrian partner	Medical University of Innsbruck and University of Vienna

Budget	€ 30,122,153.25 of which € 27,798,299 are EU funding
Webpage	http://www.eu-toxrisk.eu/

The objective of the project is the development of new methods for the risk assessment of chemicals and nanomaterials. A paradigm shift to economically viable, mechanism-based and animal experiment-free safety assessments is promoted by combining computer models and in vitro assays, as well as approaches from metabolomics, proteomics and transcriptomics.

## Gov4Nano

Title	Implementation of Risk Governance: meeting the needs of nanotechnology
Duration	1.1.2019 - 31.12.2022
Coordinator	Rijksinstituut voor Volksgezondheid en Milieu, Netherlands
Austrian partner	Bionanonet Forschungsgesellschaft mbH and University of Vienna
Budget	€ 8,678,466.50 of which € 7,795,549 are EU funding
Webpage	https://www.gov4nano.eu/

The project aims to establish a well-positioned, science-based and broadly supported body for the governance of nano-risks (the Nano Risk Governance Council, NRGC). Gov4Nano will develop a transdisciplinary model for an NRGC based on the established structure of the International Risk Governance Council (IRGC) and involving stakeholders (including regulatory authorities) to proactively address nanospecific safety issues.

## **GRACIOUS**

Title Grouping, Read-Across, CharacterIsation and classificatiC framework for regUlatory risk assessment of manufactured nanomaterials and Safer design of nano-enabled products  Duration 1.1.2018 - 30.6.2021  Coordinator Heriot-Watt University, UK  Austrian University of Vienna		
Coordinator Heriot-Watt University, UK		CharacterIsation and classificatiOn ramework for regUlatory risk assessment of manufactured nanomaterials and Safer design
,	Duration	.1.2018 - 30.6.2021
Austrian University of Vienna	Coordinator	leriot-Watt University, UK
partner		Iniversity of Vienna
Budget		
Webpage https://www.h2020gracious.eu/	Webpage	nttps://www.h2020gracious.eu/

The project examines strategies for grouping nanomaterials in order to test safety aspects in a more time- and cost-effective way in the future. The project is developing a framework containing methods and software models with guidelines for the classification of nanomaterials.



## **HISENTS**

Title	High level Integrated SEnsor for NanoToxicity Screening
Duration	1.4.2016 - 31.5.2019
Coordinator	University of Leeds, UK
Austrian partner	Technical University of Vienna
Budget	€ 6,332,825 of which € 6,332,825 are EU funding
Webpage	https://hisents.eu/

The goal of HISENTS is to develop a tool for highthroughput based on nine chip-based screening modules. These simulate different physiological functions on several levels, thus allowing the determination of genotoxicity, cytotoxicity and organotoxicity.

## NanoCommons

Title	The European Nanotechnology Community Informatics Platform: Bridging data and disciplinary gaps for industry and regulators
Duration	1.1.2018 - 31.12.2021
Coordinator	University of Birmingham, UK
Austrian partner	Bionanonet Forschungsgesellschaft mbH und Paris-Lodron-University of Salzburg
Budget	€ 5,586,000.46 of which € 5,400,000 are EU funding
Webpage	https://www.nanocommons.eu/

The aim of the project is to support risk assessments by preparing and providing data sets, tools and computer models from more than 60 different projects in the field of nanomaterial safety in the form of a user-friendly database. The database will contain protocols and quality criteria for the characterization and interaction mechanisms of nanomaterials, as well as tools for statistical and mechanical modelling, risk prediction, life cycle evaluation and grouping.

## NanoFASE

Title	Nanomaterial FAte and Speciation in the Environment
Duration	1.9.2015 - 31.8.2019
Coordinator	United Kingdom Research and Innovation, UK
Austrian partner	University of Vienna
Budget	€ 11,296,701.25 of which € 9,954,475.50 are EU funding
Webpage	http://www.nanofase.eu/

NanoFASE conducts life cycle assessments of nanomaterials and investigates the distribution, bioaccumulation and modification of nanomaterials in living organisms, soil and water. It aims to establish standard procedures for each point in the value chain and to develop models for risk prediction through the collaboration with partners in politics and industry.

## NanoGenTools

Title	Developing and implementation of a new generation of nanosafety assessment tools
Duration	1.1.2016 - 31.12.2019
Coordinator	Universidad de Burgos, Spain
Austrian partner	Bionanonet Forschungsgesellschaft mbH
Budget	€ 706,500 of which € 706,500 are EU funding
Webpage	http://www3.ubu.es/nanogentools/

This project is dedicated to the identification and to the control of hazards which are associated with nanomaterials. An approach combining genomics, proteomics and various multidisciplinary sciences is used to develop fast in-vitro high-throughput (HTS) assays combined with molecular-based computer models to assist in assessing risks in a swift and cost-effective manner.

## NanoInformaTIX

Title	of a Sustainable Modelling Platform for NanoInformatics
Duration	1.1.2019 - 28.2.2023
Coordinator	CSIC – Consejo Superior de Investigaciones Científicas, Spain
Budget	€ 7,751,271.25 of which € 6,783,556.25 are EU funding
Webpage	http://www.nanoinformatix.eu/

The aim of the project is the development of a self-sustaining web-based nanoinformatics platform for risk assessment in the production process. The platform will be composed of data sets from various EU projects, models for the "bottom-up" design of new materials and on the fate and distribution of nanomaterials in the environment and the associated ecotoxicity (fate exposure, dose-response modelling).

## NanoLables

Title	Labelling of engineered nanomaterials for nanosafety tracing
Duration	1.2.2018 - 27.2.2020
Coordinator	University of Birmingham, UK
Budget	€ 195,454.80 of which € 195,454.80 are EU funding
Webpage	https://cordis.europa.eu/project/ rcn/209328/factsheet/en

The project addresses different labelling methods for nanomaterials (fluorescent labelling, isotopic labelling) in order to understand the distribution and fate of nanomaterials in the environment.

## NANoREG II

Title	Development and implementation of Grouping and Safe-by-Design approaches within regulatory frameworks
Duration	1.9.2015 - 28.2.2019
Coordinator	INERIS – Institut National de l'Environnement Industriel et des Risques, France
Budget	€ 11,933,317.52 of which € 9,995,703.75 are EU funding
Webpage	http://www.nanoreg2.eu/

Based on the FP7 project NANoREG, NANoREG II explores the implementation of the "safe-by-design" concept for the evaluation of new synthetic nanomaterials and the resulting products. The project focuses on grouping strategies to enable reliable, cost-effective and time-effective testing of risks caused by nanomaterials, thereby supporting both producers and regulatory bodies.

## NANORIGO

Title	Establishing a Nanotechnology Risk Governance Framework
Duration	1.1.2019 - 28.2.2023
Coordinator	Aarhus Universitet, Denmark
Austrian partner	Paris-Lodron-University of Salzburg and University of Natural Resources and Life Sciences, Vienna
Budget	€ 4,748,740 of which € 4,748,740 are EU funding
Webpage	https://nanorigo.eu/

The main objective of NANORIGO is the development and implementation of a transparent, transdisciplinary and science-based "Risk Governance Framework" (RGF) for managing nanotechnological risks.



#### NanoScreen

Title	Disruptive portable device for pre-screening of Persistent Organic Pollutants -POPs- in food products and water
Duration	1.6.2017 - 30.11.2019
Coordinator	Saftra Photonics, Slovakia
Budget	€ 1,745,335 of which € 1,221,734.50 are EU funding
Webpage	https://saftra-photonics.org/

In the course of the project, an easy-to-use and inexpensive optical device for online monitoring of persistent organic particles in the nano-range in food and water is to be developed.

## NanoSolvelT

Title	Innovative Nanoinformatics models and tools: towards a Solid, verified and Integrated Approach to Predictive (eco)Toxicology
Duration	1.1.2019 - 28.2.2023
Coordinator	Novamechanics Ltd, Cyprus
Budget	€ 6,456,027.50 of which € 6,098,527.50 are EU funding
Webpage	https://nanosolveit.eu/

This project intends to create a platform with tools for the risk assessment of nanomaterials for industry and regulation. In the course of the project, critical properties of nanomaterials for health and the environment and for their use in consumer products will be identified and a fingerprint will be made. Data sets from a number of other EU projects will be merged into a harmonized database and expanded using experimental methods or computer simulations. A planned nanoinformatics platform will provide tools and models for risk assessment.

## NanoStreeM

Title	NANOmaterials: STRategies for Safety Assessments in advanced Integrated Circuits Manufacturing
Duration	1.1.2016 - 31.12.2018
Coordinator	IMEC – Interuniversity Microelectronics Centre, Belgium
Budget	€ 1,157,621.25 of which € 1,157,621.25 are EU funding
Webpage	http://www.nanostreem.eu/

NanoStreeM examines workplace risks caused by nanomaterials in the semiconductor industry. The aim of the project was to identify the need for action and to develop a strategy for risk assessment and governance and implementation of standards.

## npSCOPE

Title	The nanoparticle-scope: a new integrated instrument for accurate and reproducible physico-chemical characterisation of nanoparticles
Duration	1.1.2017 - 31.12.2020
Coordinator	LIST – Luxembourg Institute of Science and Technology, Luxembourg
Budget	€ 7,487,475 of which € 6,661,600 are EU funding
Webpage	https://www.npscope.eu/

The project aims to develop a new instrument by coupling a helium-ion microscope with a mass spectrometer for the physicochemical characterization of nanomaterials.

## **PANBioRA**

Title	Personalized And/Or Generalized Integrated Biomaterial Risk Assessment
Duration	1.1.2018 - 31.12.2021
Coordinator	Steinbeis 21 GmbH, Germany
Budget	€ 7,992,471 of which € 7,992,471 are EU funding
Wohnogo	https://www.pophioro.ou/

The consortium established in the course of the project will provide protocols and tools for a cost and time efficient methodology for characterization and risk assessment of bionanomaterials in medical products and devices. Biomaterials will be tested on several levels: the immune response will be studied using antibodies (Mimotope Variation Analysis); cyto- and genotoxicity will be analyzed through real-time monitoring via electrochemical sensors; organ-specific effects will be analyzed using "organ-on-a-chip"; and computer simulations will be created for effects that are difficult to measure.

## **PANDORA**

Title	Probing safety of nano-objects by defining immune responses of environmental organisms
Duration	1.1.2016 - 31.12.2019
Coordinator	Consiglio Nazionale delle Ricerche, Italy
Austrian partner	Paris-Lodron-University of Salzburg
Budget	€ 2,814,491.16 of which € 2,814,491.16 are EU funding
Webpage	https://www.pandora-h2020.eu/

PANDORA is a training network that trains young scientists in risk assessment of nanomaterials based on immune response. During the project

the immune response of several proband species to nanomaterials will be tested with industrial application.

## **PATROLS**

Title	Physiologically Anchored Tools for Realistic nanOmateriaL hazard aSsessment
Duration	1.1.2018 - 30.6.2021
Coordinator	Swansea University, UK
Budget	€ 13,108,347.50 of which € 12,714,180 are EU funding
Webpage	https://www.patrols-h2020.eu/

The PATROLS project will provide a set of innovative methods and computer simulations for the prediction of health and environmental hazards posed by industrial nanomaterials. Furthermore, the project will develop grouping strategies, realistic test methods with a focus on long-term exposure at low concentrations and alternatives to animal testing.

## **PROSAFE**

Title	Promoting the Implementation of Safe by Design
Duration	1.2.2015 - 30.4.2017
Coordinator	Ministerie van Infrastructuur en Waterstraat, Netherlands
Budget	€ 3,095,073.47 of which € 2,512,612 are EU funding
Webpage	https://cordis.europa.eu/project/rcn/194431/factsheet/en

PROSAFE builds on and complements the NA-NoREG project. The aim is to support risk assessment and governance and to further develop and implement the "safe by design" concept by collecting and processing data on toxicity tests, exposure monitoring, life cycle analyses and disposal of nanomaterials.

# RiskGONE

Title	Risk Governance of Nanotechnology
Duration	1.1.2019 - 28.2.2023
Coordinator	NILU – Norsk Institutt for Luftforskning, Norway
Budget	€ 4,999,980 of which € 4,999,980 are EU funding
Webpage	https://riskgone.wp.nilu.no/

The aim of RiskGONE is to establish a science-based, self-sustaining Risk Governance Council (risk evaluation body). To this end, the project is concerned with bringing together information on environmental and health hazards and providing tools to assess them.



## SmartNanoTox

Smart Tools for Gauging Nano Hazards
1.3.2016 - 28.2.2020
University College Dublin, Ireland
€ 7,996,124.88 of which € 7,996,124.25 are EU funding
http://www.smartnanotox.eu/

SmartNanoTox brings together in vivo, in vitro and in silico methods in order to use QSARs models to understand the distribution, mechanisms and modifications of nanomaterials in the organism and draw conclusions about health risks.

## SOS-Nano

Title	Structure – Oxidative Stress relationships of metal oxide nano- particles in the aquatic environmen
Duration	1.11.2015 - 31.10.2017
Coordinator	University of Exeter, UK
Budget	€ 183,454.80 of which € 183,454.80 are EU funding
Webpage	https://cordis.europa.eu/project/rcn/195051/factsheet/en

The SOS-Nano project addresses structural properties of nanoparticles as a means to predict potential toxicity. The toxicity of metal oxide nanoparticles in the aquatic environment is investigated by examining physicochemical and electrochemical properties of the particles and the oxidative stress caused by the particles.

## **STARNANO**

Title	Spheroids as a Tool to Assess Realistic long term effects of mixtures of nanomaterials and chemicals
Duration	1.2.2018 - 31.1.2020
Coordinator	INIA – Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria, Spain
Budget	€ 158,121.60 of which € 158,121.60 are EU funding
Webpage	https://cordis.europa.eu/project/rcn/208596/factsheet/en
Webpage	https://cordis.europa.eu/project/

STARNANO examines the interactions of nanomaterials with other substances in the environment through studies on cell cultures in order to investigate long-term effects and intracellular fate. Furthermore, the project aims to promote the safe handling of nanomaterials in industry and to support REACH.

## ToxEcoGraphene

Title	Assessment of ecocorona acquired by Graphene Family Nanomaterials during exposure to biofilms and fate following uptake
Duration	1.5.2018 - 30.4.2020
Coordinator	University of Birmingham, UK
Budget	€ 195,454.80 of which € 195,454.80 are EU funding
Webpage	https://cordis.europa.eu/project/ rcn/215578/factsheet/en

The project investigates the fate of graphene in the environment and develops protocols and methods to track transport, bioaccumulation and modification and to identify resulting risks for health and environment.

## Notes and References

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## Conclusion

The projects funded in Horizon 2020 address a wide range of EHS-related topics. In this Framework Programme, the development of uniform regulatory guidelines and competencies for reviewing them, the promotion of computer-assisted tools and the integration and harmonization of databases play important roles. As in previous Framework Programmes, most projects funded in Horizon 2020 are large-scale in terms of budget and cooperation partners, with several Austrian institutions being represented.

## MASTHEAD

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