

# EC mission to the Asia – Europe Dialogue on NanoSafety and NanoProduct Specification

28 – 30 November 2017

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## List of Abbreviations

7 <sup>th</sup> Framework Program	FP7
Asian Nano-Forum	ANF
BioNanoNet	BNN
Communities of Research	CoRs
Engineered Nanomaterials	ENM
European Chemicals Agency	ECHA
European Committee for Standardization	CEN
European Commission	EC
European Medicines Agency	EMA
EU- Nanomedicine Characterisation Laboratory	EU-NCL
European Observatory for Nanomaterials	EUON
European Union	EU
French National Institute for Industrial Environment and Risks	INERIS
Horizon 2020 Program	H2020
Institute of Standards & Industrial Research of Iran	ISIRI
International Organization for Standardization	ISO
Iran Nanotechnology Initiative Council	INIC
Nanomedicine	NM
Nanosafety	NS
NanoSafety Cluster	NSC
Nanotechnology	NT
Risk Assessment	RA
Thailand National Nanotechnology Centre	NANOTEC
Technical Assistance and Information Exchange Instrument	TAIEX
Tehran University of Medical Sciences	TUMS



## Summary

From November 28-30<sup>th</sup> 2017 scientific experts representing the [European Commission \(EC\)](#), several of its Horizon 2020-funded nanosafety projects ([NanoFASE](#), [NanoReg2](#), [EC4SafeNano](#), [ACEnano](#), [npSCOPE](#), [SUN](#), [FutureNanoNeeds](#), [SmartNanoTox](#)), representatives of the [EU NanoSafety Cluster](#), and representatives of numerous former EU FP7 projects, visited the city of Tehran, Iran to explore, discuss and elaborate the existing opportunities for further EU cooperation with Iran and other Middle and South Eastern Asian countries. The Asia – Europe Dialogue, on Tuesday 28<sup>th</sup> November, was hosted by the [Iran Nanotechnology Initiative Council \(INIC\)](#) at the [Tehran University of Medical Sciences \(TUMS\)](#), and included a visit that evening to the INIC building which hosts a museum of nano-enabled products. This was followed by the [2<sup>nd</sup> Nanomedicine and Nanosafety Conference \(NMSN 2017\)](#) on Wednesday (29<sup>th</sup> November) and Thursday (30<sup>th</sup> November). In additions, two state-of-the-art laboratories for preclinical and brain studies were visited by representatives of the EU Delegation, which showed excellent capacity in performing high quality research. Following short presentations from local scientists, discussions were held on potential project collaborations.

The EC Delegation actively contributed during both the Dialogue on 28<sup>th</sup> November, with details on the activities and initiatives of the [EU NanoSafety Cluster](#), the current EU Regulatory Landscape and project and country specific presentations on the state-of-the-art in NanoSafety and NanoMedicine in the EU. Representatives from Russia, Iran, Thailand, South Korea and Taiwan gave presentations on the nanosafety societal dialogue taking place in their countries and on the nano-standardisation and nano-certification activities in their countries, the Asian region and their vision for further collaboration with the EU. Strong interest on strengthening the communication and cooperation was demonstrated from all parties during the dialogue, and besides the agreed ongoing collaboration to identify common points of scientific interest, the first collaborations on standardisation, societal engagement and sharing of detailed of regulatory decision-making criteria are being set or discussed between the interested parties.

**The organisation of the Mission was excellent.**



Figure 1: The EU and Core Asian Delegation during the Asia – Europe Dialogue on Nanosafety and Nanoproduct Certification

## 1. Background and Aim of the Mission

The Technical Assistance and Information Exchange Instrument (TAIEX) of the European Commission (EC) supports public administration by presenting EU legislation and facilitating the sharing of EU best practices. Besides countries of the European Union and enlargement areas, the TAIEX mandate to provide assistance also covers partner countries around the world. Funding in this case is provided via the Partnership Instrument (PI), which is designed to advance and promote EU and mutual interests abroad. The PI aims at addressing global challenges such as climate change, environmental protection and energy security and at supporting the external dimension of EU policies. It also addresses specific aspects of the EU's market access, trade, investment and business opportunities and supports public diplomacy and outreach activities. In this context, providing technical assistance helps the EU to enhance policy cooperation with countries of strategic interest.

The Asian region is one of the regions of strategic interest to the EU and TAIEX is looking to strengthen the communication and collaboration between the two and establish a close and continuous relationship. This relationship can be translated into actions and scientific projects in common points of interest like nanotechnology, nanosafety, nanomedicine and nanoproduct certification and standardisation. It is the opinion of the EC that both the European and Asian regions can benefit from such a relationship and the exchange of ideas, experience and scientific knowledge.



Based on those principles the EC and TAIEX in collaboration with the EU NanoSafety Cluster (NSC), EU projects from the 7<sup>th</sup> Framework (FP7) and Horizon 2020 (H2020) Programs, the Asian Nano Forum (ANF) and the Iran Nanotechnology Initiative Council (INIC) organised an EU Scientific Mission to attend the Asia – Europe Dialogue on Nanosafety and Nanoproduct Certification. The aim of the Mission was to identify areas of common scientific interest within the fields of nanosafety (NS) and nanotechnology (NT) (covering biotechnology and nanomedicine) and encourage technological research and development (R&D) activities. The activities will include not only the fields of NS and NT, but also nanomedicine and most importantly nano-certification and nano-standardisation for processes, instruments and nanoproducts. Since those fields can be considered as non-competitive it is the belief of the EC that the public in both regions will significantly benefit from such a cooperation and potential harmonisation activities. The Mission also looked to establish relationships with Asian countries, institutes and scientists and explore the benefits of potential involvement of Researchers from those countries in future EU projects.

The Asia Nano Forum (ANF) is a network organisation, founded in May 2004 and is now a registered society in Singapore, known as Asia Nano Forum Society, since October 2007. Its mission is to promote responsible development of nanotechnology that educationally, socially, environmentally and economically benefits each economy by fostering international network collaboration. The ANF objectives include:

1. Foster nanotechnology in the region by creating mechanisms to share information, human and physical resources and expertise
2. Support regional economic and environmental development through joint projects addressing major regional issues, with an emphasis on support of developing and emerging economies
3. Coordinate joint investment in and mutual access to major infrastructure by member economies
4. Promote and coordinate standardization and safety of nanotechnology concepts and measurements
5. Act as an advocacy group for nanotechnology in the region and for adequate regional representation of nanotechnology at global forums
6. Initiate, promote and manage co-operative scientific and technology research projects within the member economies
7. Enhance public awareness and education of nanotechnology and associated social, environmental, health and economic issues

## 2. Participants

The participants of the meeting, on behalf of the EC, were selected based on their scientific expertise in the fields of NanoSafety and NanoMedicine, and their active role in running and supporting respective EU FP7 and H2020 projects. The mission was headed by Georgios Katalagarianakis (EC) and Fergal Donnelly (EC).

Table 1: EC Delegation

Name	Organisation
Georgios Katalagarianakis	European Commission DG Research
Fergal Donnelly	European Commission DG Research
Alexander Pogány	Federal Ministry for Transport, Innovation and Technology (AU)
Iseult Lynch	School of Geography, Earth and Environmental Sciences, University of Birmingham; EU NanoSafety Cluster Cordination Team (UK)
Andreas Falk	BioNanoNet; EU NanoSafety Cluster Cordination Team (AU)
Arno Gutleb	Luxembourg Institute of Science and Technology (LU)
Olivier Joubert	Université de Lorraine France (FR)
Emeric Frejafon	National Institute for Industrial Environment and Risks (FR)
Anastasios Papadiamantis	School of Geography, Earth and Environmental Sciences, University of Birmingham (UK)
Luigi Ambrosio	Institute of Polymers, Composites and Biomaterials, National Research Council (IT)
Matteo Santin	School of Pharmacy and Biomolecular Sciences, University of Brighton (UK)
Pedro Silva	Knowledge Transfer Office, University of Minho (PT)
Teresa Fernandes	Institute of Life and Earth Sciences, Heriot-Watt University (UK)
Damjana Drobne	Department of Biology, University of Ljubljana (SL)

Table 2: “Core” Asian Delegation

Name	Organisation
Saeed Sarkar	Department of Medical Physicist and Biomedical Engineering, Tehran University of Medical Sciences; Secretary General, Iran Nano Technology Initiative Council (IR)
Ali Beitollahi	School of Metallurgy and Materials Engineering, Iran University of Science & Technology (IR)
Mahmoud Ghazi-Khansari	Department of Pharmacology, School of Medicine, Tehran University of Medical Sciences (IR)
S. Mehdi Rezayat	Iran Nanotechnology Initiative Council (IR)
Il Je Yu	Institute of Nanoproduct Safety Research, Hoseo University (KR)
Maw-Kuen Wu	Institute of Physics, Academia Sinica (TW)
Ramjitti Indaraprasirt	Nanosafety Alliance Section, National Nanotechnology Centre; National Science and Technology Development Agency (TH)
Annop Klamchuen	National Nanotechnology Centre (TH)





### 3. Day by Day Description of Activities

This section provides a detailed description of the day-to-day activities of the delegation and their meetings and visits during the Mission. It also provides information on the “Asian – Europe Dialogue on Nanosafety and Nanoproduct Certification” (28 November) and the “2<sup>nd</sup> Nanomedicine and Nanosafety Conference” (29 – 30 November).

#### 3.1 Asia – Europe Dialogue on Nanosafety and Nanoproduct Certification

##### 3.1.1 Morning Session

The Tehran University of Medical Sciences (TUMS) hosted the Dialogue between the EU Delegation and representatives from Asian countries and South Africa (via the ANF), which was co-organised by INIC, the EC, the ANF, TAIEX and the NSC. Professor Ali Beitollahi, School of Metallurgy and Materials Engineering from the Iran University of Science and Technology, opened the morning session, welcoming all participants and stating the aims of the workshop (WS) on nanosafety (NS) and industrial safety. He also presented the Chairs of the session, himself, Dr Georgios Katalagianakis and Prof Ghazi Khansari. Dr Georgios Katalagianakis addressed the WS and expressed his desire to use science, not only to advance technology, but also to promote friendship between countries and people. He also expressed the vision of the EC to use all possible capacity to build bonds of friendship and promote science and evolution. Prof Ghazi Khansari welcomed the delegates on behalf of the Iranian NS network and discussed the uses of engineered nanomaterials (ENM), their potential release routes and exposure risks for biological organisms and the environment.

The first two technical presenters, Prof Saeed Sarkar and Prof Ali Beitollahi, of the WS focused on Nanotechnology (NT) and Societal Dialogue and a review of the current Global Nanostandardisation and Nanocertification Activities and the challenges which lie ahead respectively. Prof Sarkar discussed public concerns regarding NT and NS and how they can be addressed through systematic social interaction. He presented findings from public surveys demonstrating that the main concerns of the public were about environmental health the ethical use of NT and whether it creates or destroys human jobs. He presented the current phobias of the public, politicians and other stakeholders (academia, industry, media, NGOs etc.) and proposed solutions based on the correct balance between NT, NS and society, and the significance of speaking the public’s language to reassure and inform during the introduction of new technologies. He also introduced the NS and NT awareness and knowledge promotions programs currently running in Iran, aimed to inform politicians, Governmental High Councils, Industrial Managers, media and most importantly the public. Such actions include, among others, public presentations, official reports, High-School awareness events, training workshops. He also acknowledged that public acceptance is the core foundation of all Iranian NT plans and presented how public feedback and polls are used to mirror and reflect on the actions of NT. He finally proposed the creation of an EU – Asia committee on NT public acceptance.

Prof Beitollahi presented the current Iranian landscape of commercial products (> 7,000) linked with NT and the amount of companies (> 1,400) manufacturing or using such products. He also presented the landscape regarding nano-standardisation (e.g. International Organisation for Standardisation (ISO), European Committee for Standardization (CEN)) and discussed the challenges faced, as well as the average time (4 years) needed to publish such a standard. He also presented the first ever initiative on Nano-Certification (Nano Mark) under



the umbrella of the ANF, which includes tests and regulations on nanoscale audit, labelling and product safety, efficacy and durability. He then asked whether it would be possible for the EU and Asia to collaborate to reach a common consensus on nano-standardisation and nano-certification and the prospect of regulatory alignment through extended dialogue and cooperation.

The early morning session was concluded with presentations from EU delegates, Prof Iseult Lynch, Mr Andreas Falk, Prof Matteo Santin and Dr Georgios Katalagarianakis and Dr Fergal Donnelly on the EU NSC Programs and Activities, Industrial Innovation, the use of Biomaterials for Health and the Nanosafety Regulation and Research in Europe and Regulatory Science respectively. Prof Lynch presented a brief history of the NSC, its structure, its role, mission and vision for the future. Prof Lynch also described the responsibility of the NSC to promote the communication and synergy between EU projects (currently > 50) and provide strategic guidance to the EC and member states and to assess the safety of ENM in combination with economic development, as well as the dynamic character of the focus of projects throughout the years as more information become available. She also commented on the NSC's international cooperation activities and provided examples such as the Communities of Research (CoRs) with the US, the EU – US Nanoinformatics Roadmap and industrial links. She provided an overview of the structure of the EU NS projects, their scope and how all interconnect to achieve the EC's and the NSC's goals. Prof Lynch was followed by Mr Andreas Falk, who gave a presentation on industrialisation and innovation activities within the NSC. He discussed the role of industry and innovation in EU projects, and in particular the pilot lines projects, and the fact that these projects work towards bringing nanomaterials and nano-enabled products into the market and the work they perform on NS. The NSC tries to integrate this work into the NS field and the attempts to maximise the synergies between industry and NS scientists. He also commented on the need for an industrial strategy and the synergy needed between several sectors to achieve the safe implementation of NT, which is a new part of action within the NSC, and singled out the need for a safe-by-design strategy to help minimise possible risks from an early stage of industrial development. Prof Matteo Santin presented the required steps forward for the Biomaterials community on NT, NS and nanomedicine and gave an overview of the ENM commercially used as biomaterials and as drug carriers, their characterisation and bio-interactions.

During his presentation, Dr Katalagarianakis, proposed to extend the EU – Asia cooperation in biomaterials and defined the EU principles regarding their nanosafety framework, the work being done on a science based definition of ENM, the state-of-the-art in terms of ENM risk assessments and the need for consistency and transparency of application of legislative enforcement across all sectors (e.g. cosmetics, electronics etc.). This was followed by an update on the ENM regulatory environment in the EU and the position of the EC, including an introduction to REACH and regulatory modifications to address concerns regarding ENM. He stated that the way forward in risk assessment was based on a new nano-definition, which is now in recommendation stage and identified as major future challenges the proper identification of ENM forms and ENM characterisation, as well as the differences per sector in existing definitions and significant descriptors. Dr Fergal Donnelly presented the EC's procedures for nanomedicine authorisation through the [European Medicines Agency \(EMA\)](#) and the need for new regulations regarding nanodevices and nanomedicines. The session concluded with Dr Katalagarianakis presenting the EC's data management vision through the,



[European's Chemicals Agency \(ECHA\)](#), [European Observatory for Nanomaterials \(EUON\)](#) and the opportunities for modellers and data experts in EU, Asia and the rest of the world from open data access and the benefits that could arise. He closed the presentation talking about the EU's research policy on NS and the need for international cooperation, which can be achieved through the common funding of EU projects.

The late morning session included presentations by Dr Emeric Frejafon, Mr Pedro Silva and Prof S. Mehdi Rezaayat on the Risk Assessment of Nanomaterials, Nanomedicine Research in the EU and the Nanotechnology Committee and Achievements in the Iran Food and Drug Organisation respectively. Dr Frejafon presented the work of the [French National Institute for Industrial Environment and Risks \(INERIS\)](#) and talked about the key drivers and methodologies for risk assessment (RA) of ENM and the problems and challenges arising from the nanoscale. He also provided an outline of EU projects like NanoReg2 and EC4SafeNano and the focus of H2020 projects regarding standardisation and proposed to link the outcomes of EU projects with those originating from the [Institute of Standards & Industrial Research of Iran \(ISIRI\)](#) and the need to promote global collaborations. He was followed by Mr Pedro Silva who provided an overview of the nanomedicine landscape in the EU, the industrial stakeholders and the pipeline (more than 230 nanomedicines in clinical development, with more than 70 being developed in oncology). Mr Silva also presented the nanomedicine translation hub and complementary service like [nanomedTAB](#) and the research infrastructure [EU- Nanomedicine Characterisation Laboratory \(EU-NCL\)](#). Professor Rezaayat talked about the effects of ENM on human toxicity and the attempts of the Iranian Health Committee to encourage companies to classify their products as nano- and perform appropriate physicochemical characterisations. He also commented on the drug approval processes in Iran and provided information on the products currently having filed for approval. Out of the 314 filed products, 203 were domestic and 111 from international companies, with the huge majority of the latter in cosmetics. He also provided information on the approved products (40 domestic, 21 international). Finally, he presented the challenges and effectiveness of risk assessment of ENM in Iran and closed the morning session.

### 3.1.2 Afternoon Session

The afternoon session included country-specific reports on their actions on Nanosafety, Nanomedicine and Nanostandardisation. The countries represented were Austria, Iran, Republic of Korea, Russia, Taiwan and Thailand. Mr Ramjitti Indaraprasirt presented Thailand's approach towards NS and standardisation, its policies, research testing and public engagement. He also described the current National NS and Ethics strategic plan and the country's vision towards sustainable and safe development. Mr Indaraprasirt provided information on Thai policy regarding standardisation and its approach to adopt only NT standards (e.g. ISO) that relate to local needs. He also presented NanoQ, a voluntary standards association, which gives industry the opportunity to increase public trust and facilitate trade while protecting the public and responsible companies. He also revealed that Taiwan and Vietnam have entered into discussions with Thailand to join NanoQ, to facilitate their exports to Thailand. The NanoQ mark is administered following a strict process of testing and expert committees visiting companies. Mr Indaraprasirt concluded his talk by stating that Thailand had difficulties understanding the EU approach to standardisation and hoped that a dialogue could commence to bring the two parties closer.



Mr Alexander Pogany presented Austria's actions to reach 3.76 % of GDP spending for science and research and the main fields of application including NS and NT. He also presented an overview of the current actions in toxicology, regulation and policy recommendations regarding nano-EHS in Austria. He stated that the topics of interest and specific goals of nano-EHS in Austria are expressed through [BioNanoNet \(BNN\)](#), which is an association of 42 members. Mr Andreas Falk on behalf of BNN expanded on the current network and offered the network's help for the identification of potential partners for inclusion in future EU projects funding applications. Mr Pogany closed his presentation talking about the NanoTrust project, the Nanoinformatics Commission Tasks and the Sino-Austrian cooperation through which Austrian companies are funded to employ Chinese students. Finally, Mr Pogany, on behalf of Austria, offered to host the next EU – Asian dialogue during the Industrial Technologies Conference to take place in Vienna in November 2018 as part of the Austrian presidency of the EU.

Professor Beitollahi, on behalf of Iran, presented the current industrial nano-landscape and presented the functionality of the Iranian Standardisation Committee, which includes more than 100 experts from all relevant stakeholders. He analysed past and current actions of the committee on standardisation and the ongoing work regarding polymeric nanocomposites, nano-clays and nano-enhanced air filter media. He also expanded on the advanced public awareness schemes of Iran, which includes workshops, seminars and an extended public dialogue. He then presented the structure of INIC and the scope and focus of the Iranian Nanosafety Network which includes exposure and RA for humans and the environment, nano-ethics and the development of relevant guidelines. He finally described the ongoing actions of the network and the discussions with the Iranian Standardisation Committee to acquire the Iranian Nano-Mark and the collaborative work of stakeholders for wider implementation.

Prof Il Je Yu, from the Republic of Korea, presented an overview of the regulatory actions regarding NT in South Korea, where 10 different ministries are involved. He also presented the country's vision for the future, which is firstly based on the creation of a database containing relevant results and extended measurements and analysis. Secondly South Korea is looking to develop the currently existing NS management skills and push forward on standardisation. The long-term goal is to create a process for the safety evaluation of ENM, as well as building an effective management system of NS products. He also informed the delegates that the South Korean government is investing around \$ 40 million towards these goals. Dr Katalagarianakis commented on the successful collaboration between the EU and South Korea in the past, expressed the hope for further strengthening of EU – Asia relations and invited the current, and potentially additional, representatives to join the January delegation scheduled to take place at the University of Birmingham's office in Brussels in January 2018.

The Russian perspective focused on the tools needed for NS, standardisation and certification. Information on the mandatory requirements in the Russian Federation for nano-industry were also provided for sanitary and epidemic purposes, as well as details on the current technical regulations. The delegates also presented the Russian classification system of NT products, including the algorithm used, which is based on mathematical criteria in accordance with REACH, and classifies products according to their hazard potential. The results demonstrated that from the more than 600 official product reports, 80 % were classified as low hazard in Russia. Lastly, the approval process for market authorisation for nano-enabled products was



presented, which is based on certifications, necessary permits, reduced green-house emissions, metrology and other green standards. The international collaboration activities were also presented, whereby over \$ 20 billion have been spent in NS, certification and standardisation projects.

The last two country presentations were from Dr Maw-Kuen Wu and Prof Luigi Ambrosio on Taiwan and Italy respectively. Dr Wu presented the Taiwan Nano-Mark, which was the first ever nano-certification process globally and was established in 2004. The [Taiwan Nano-Mark](#) incorporates 52 testing specifications and includes 3 official certification laboratories and 106 testing items. Dr Wu also presented the registration process for nanoproducts, the current definitions used by the Taiwan authorities for the identification of nanoproducts and nanofoods and the data required during submission. He also presented the inter-agency collaboration in Taiwan regarding nano-risk management and the country's vision for the development of an EHS database, which will include global research and will be used to identify the current gaps in scientific research and more. Prof Ambrosio then presented the short to mid-term plans of Italy to provide legislators with the necessary tools for RA and presented a timeline on the advancement of NT use in the field of biomimetic structures for tissue repair and regeneration.

The second part of the afternoon session contained presentations from EU representatives on EU funded FP7 and H2020 NS and NT projects. Prof Damjana Drobne, Dr Arno Gutleb, Prof Teresa Fernandes and Dr Olivier Joubert presented the scope, initial results and the vision of the projects they are part of. Prof Drobne presented the CEN orientation and the current REACH and CLP guidelines and offered a comparison with Nano-Mark. Dr Gutleb presented npSCOPE and provided an overview of the instrument it is working to build. Prof Fernandes presented an overview of the global NT market and the projections of a \$ 175 billion value by 2025, as well as the SUN and FutureNanoNeeds project. Finally, Dr Joubert presented SmartNanoTox, its scope and details on the tools developed for gauging nano-hazards.

The presentations, which can be accessed via the appendix which includes the agenda and links to the presentations, were followed by an all panel discussion led by Dr Katalagarianakis and Prof Beitollahi on the possibilities on a wider future collaboration between the EU and Asia countries under the umbrella of the EC, TAIEX and the ANF. Four groups of actions were identified, which included product certification, skills certification, the spirit of future cooperation and standardisation processes. The EU representatives were impressed by the level of societal dialogue in Iran regarding NS and NT and the public awareness. The point was made that a significant amount of work exists on risk governance, but not on innovation governance. Gaps also exist in the standardisation processes, which are focused on the speed of the processes, infrastructure and available funding. Another point which was discussed was nano-ethics and the quality of data coming from research. Discussions were held on how modellers from EU and Asia could cooperate and find ways to distinguish high from low quality data. Dr Katalagarianakis also made the point that Asian institutes and industry could join as partners within EU projects. Although for currently running EU projects no funding would be available, future calls could take into account the potential of Asian institutes joining with aligned funding from their national agencies. It was also proposed that a committee should be created to promote EU – Asian cooperation, which would be ongoing and will include named people with specified tasks. It was also decided the next EU – Asia meeting to be held in October 2018 during the Industrial Nanotechnology Workshop in Vienna, Austria.

Following further dialogue, it was decided to organise joint teams with scientists from several countries to work on the identified topics and prepare country specific reports and use them to identify common points of interest for future collaborative projects and aim for a long-term collaboration between the EU and ANF. At the same time, collaborative attempts could commence including reference labs and ongoing and future round robin tests. In fact, the University of Birmingham with the scientific lead of Prof Iseult Lynch and Dr Anastasios Papadiamantis will collaborate in a call regarding “Nanoparticle Size Characterisation”, which was initiated by the ANF and is led by the [Thailand National Nanotechnology Center \(NANOTEC\)](#). The project currently includes representatives from 7 EU and Asian countries and 14 different laboratories.

### 3.1.3 Evening Session

The evening session was hosted by INIC and included a visit to its headquarters, a tour of the INIC nano-gallery which included nano-enabled products of Iranian origin like water-repellent runners, decorative tiles, a car prototype with parts containing nano-enabled products etc. The session also included a presentation from Prof Saeed Sarkar on the commercial actions of INIC to promote NT and the subsequent results, the societal actions regarding public awareness and the academic activities of Iran in NS and NT, and the country’s international ranking regarding the amount of publications produced each year. An extended dialogue followed between the INIC representatives and the EC Delegation on the actions of INIC and a comparison with practices in the EU and the rest of the world.



Figure 2: The EC and core Asian Delegation along with the INIC hosts during the visit to the INIC museum of nanotechnology.



Figure 3: Overview of the INIC museum of nanotechnology.

### 3.2 2<sup>nd</sup> Nanomedicine and Nanosafety Conference

On 29<sup>th</sup> and 30<sup>th</sup> November the Mission Delegates attended the 2<sup>nd</sup> Nanomedicine and Nanosafety Conference, which was organised by TUMS and aimed to cover all medical and safety aspects of nanomaterials in human, animals and environment. During the conference presentations from members of the EU delegation took place, along with presentations from representatives of the ANF, the Iranian academic community (academic staff, PhD and graduate students) and representatives from other countries like South Africa, Russia and the USA. On behalf of the EU delegation presentations on the research strategy of the EU on NT and advanced materials and its respective regulatory environment were given by Dr Georgios Katalagarianakis (see Figure 4) and Dr Fergal Donnelly. Other presentations were given by Mr Andreas Falk (infrastructure innovation), Dr Arno Gutleb (instrumentation innovation), Prof Matteo Santin (nanobiotechnology), Prof Luigi Ambrosio (ENM biointeractions), Prof Damjana Drobne (TiO<sub>2</sub> regulation issues) and Dr Olivier Joubert (transcriptomics and its use to study *in vivo* and *in vitro* nanotoxicology).

The NMNS 2017 Conference also hosted poster sessions of research from University students of all levels studying in Iran, which gave the opportunity of EC Delegates to interact with the younger NT and NS generation, to exchange information and ideas, and widened the prospect of future collaborations and potential student and researcher exchange between the two regions. Members of the EU delegation (Dr Fergal Donnelly, Dr Olivier Joubert) also participated in the evaluation of the presented posters and offered their opinions on the science and on the prizes given on both days of the conference.



Figure 4: Dr Georgios Katalagarianakis, the Head of the EU Delegation, addressing the 2<sup>nd</sup> Nanomedicine and Nanosafety Conference (NMNS 2017) on 29<sup>th</sup> November 2017.

### 3.3 Laboratory Visits

On 29<sup>th</sup> November some members (Dr Georgios Katalagarianakis, Dr Arno Gutleb, Dr Olivier Joubert, Mr Pedro Silva, Prof Damjana Drobne, Dr Anastasios Papadiamantis) of the delegation also visited two of the key INIC laboratories on pre-clinical studies and brain imaging.

The Delegation members visited two laboratories recently set up in Tehran to strengthen nanobiomedical research at a national level: the TUMS Preclinical Core Facility (TUMS PCF), and the National Brain Mapping Laboratory (NBML). Both labs represent recent public investments and were converted in 2017. The labs provide access for the research community (public and private) to state-of-the-art equipment and can be considered as technical platforms reflecting the commitment of the Iranian government to offer the necessary tools for improving research outcomes and translation efforts.





Figure 5: An Iranian made high resolution animal SPECT imaging system placed at the TUMS Preclinical Core Facility (TUMS PCF).

### 3.4 International Nano-Olympiad planning session

On 29<sup>th</sup> November, some members of the delegation participated in a planning meeting for the upcoming 1<sup>st</sup> International Nano-Olympiad being organised by the ANF. Prof Iseult Lynch is European member of the organising committee, and she, Dr Fergal Donnelly and Mr Pedro Silva attended a brief planning meeting, where each of the countries involved who were present (Iran, Thailand, S. Korea, Russia and Europe) gave an update on their current status in terms of recruiting teams. Prof Lynch noted that there might be up to 3 teams coming from Europe, and that the internal selection round was on 15<sup>th</sup> December 2017. The committee discussed the topics of mentors for the project teams, spanning the technical, business and regulatory aspects of the challenge, as well as the need to judges also representing these three areas. It was agreed by all parties that the mentors and the judges should be different people to ensure impartiality and fairness. Plans for visibility for the winning teams were also discussed, and Prof Lynch suggested the possibility of a feature in Environmental Science: Nano for which she is an Associate Editor. INIC are offering a cash prize for the winners, and a proposal was put in place to register the Nano-Olympiad as an international organisation to allow it to collect sponsorship and support the long-term organisation of the event. Note that the 1<sup>st</sup> Nano-Olympiad will take place in Tehran from 1-8<sup>th</sup> April 2018.

## 4. Evaluation and Follow-Up

### 4.1 Organisation

Organisation of the mission in both scientific and organisational terms was excellent. The EU Mission faced no issues while travelling and visiting Iran and the invaluable help of Mrs Caroline Dellatre (EC) and Mr Afshin Ramzi (INIC) needs to be acknowledged as they made sure everything was in order prior to and during the Mission.



The Asia – EU Dialogue, the laboratory visits and the NMNS 2017 Conference helped the EU Delegation to formulate a complete and positive opinion on the work taking place in several fields of interest in Asia and the willingness of the ANF governments and scientists to innovate, progress and promote global collaborations.

#### 4.2 Future Collaborations

Huge interest was expressed from all parties to ensure the success of the EU – Asia collaboration and dialogue. The Asian delegates were really keen to communicate and establish future collaborations with their EU counterparts and to be part of current and future EU projects on nanosafety, nanotechnology and nanomedicine. Similar views were expressed from the EU delegates. In fact, the first collaboration is already ongoing with the University of Birmingham’s representatives joining ANF’s initiative on “Nanoparticle Size Characterisation”. Further collaborations on nano-standardisation, nano-certification, innovation and data management are under examination.

#### 4.3 Research & Development

The Iranian capacities, as presented to the EU Delegates, are of high-quality and an impressive number of nano-laboratories exists throughout the country. The use of those laboratories for educating secondary school students in nanotechnology ensures a new dynamic generation of nano-scientists who can significantly contribute to innovation with fresh ideas. Although the delegation did not visit any nano-laboratories, due to time constraints, the research presented during the NMNS 2017 reflects huge research potential. The cross-institute collaboration as described by local scientists is also promising and could ensure the completion of demanding experiments. Questions still remain on the types of instruments available throughout the various nano-laboratories and the fragmentation of those laboratories throughout Iran and the ease of access during future collaborations.

#### 4.4 Regulatory, Standardisation and Certification Schemes

Strong interest was expressed from Asian countries on the regulatory and legal EU landscape and the EC’s vision for the future. In several cases, questions to the delegates intended to examine the potential of regulatory and legal harmonisation between the two regions to facilitate trade. The delegation was clear that this was something it could not comment on and that the scientific landscape was at the heart of its interest, although significant divergence seems to currently exist. On the other hand, the EU Delegates demonstrated strong interest on the Asian standardisation and certification schemes, which seem to be more advanced than those of the EU. The Delegates looked at specific examples that could potentially be tested in the EU in the future.

#### 4.5 Follow Up

Based on the results of the Mission future collaboration in the fields of nanosafety, nanotechnology and nanomedicine are achievable and highly desired. The establishment of country specific teams that will prepare reports, which will be used to identify common points of scientific interest and prepare joint proposals for future European and Asian calls. In the mid to long term the establishment of an EU – Asian scientific committee is envisaged, which will facilitate the future dialogue and collaboration. A great number of contacts have also been established between the EU and Asian Delegates and discussions and planning on future collaborations are already ongoing. The Scientific Leads on behalf of the EC can be seen in



Table 3. The Leads are to report at the NSC Coordination Team, Steering Group and EC representatives during the next NSC Scientific Meeting, which is scheduled to take place in Athens, Greece in March 2018.

**Table 3: EC Scientific Leads**

<b>Field of Interest</b>	<b>Scientific Lead</b>	<b>Affiliation</b>
Scientific Data Collaborations	Iseult Lynch	University of Birmingham
Nano-Certification	Emeric Frejafon	INERIS
Social Dialogue and Governance	Andreas Falk	BioNanoNet
Nanosafety and Nanomedicine Characterisation	Matteo Santin Pedro Silva	University of Brighton University of Minho
Nano-Standardisation	Damjana Drobne	University of Ljubljana