Alba Ávila, Ana María Ocampo, Oliver Wootton, Felipe Muñoz, Pablo Vieira

NANOTECHNOLOGY
AND MANUFACTURED NANOMATERIALS
IN LATIN AMERICA AND THE CARIBBEAN

SAFETY ISSUES

Universidad de los Andes
OECD BETTER POLICIES FOR BETTER LIVES
unitar United Nations Institute for Training and Research
Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra
TODOS POR UN NUEVO PAÍS PAZ EQUIDAD EDUCACIÓN
MINAMBIENTE

SCHOOL OF ENGINEERING / UNIVERSIDAD DE LOS ANDES / BOGOTÁ / 22-24 JUNE 2015

Nanotechnology and Manufactured Nanomaterials in Latin America and the Caribbean: Safety Issues

AUTHORS

Alba Ávila, Ana María Ocampo, Oliver Wootton, Felipe Muñoz, Pablo Vieira

School of Engineering / Universidad de los Andes
Bogotá / 22-24 June 2015

Nanotechnology and Manufactured Nanomaterials in Latin America and the Caribbean: Safety Issues (2015: Bogotá, Colombia)

Nanotechnology and Manufactured Nanomaterials in Latin America and the Caribbean: Safety Issues / authors Alba Ávila… [y otros cuatro]. – Bogotá: Universidad de los Andes, Facultad de Ingeniería, Ediciones Uniandes, 2015.

46 páginas; ilustraciones; 21 x 29,5 cm
Otros autores: Ana María Ocampo, Oliver Wootton, Felipe Muñoz, Pablo Vieira
ISBN 978-958-774-305-0

1. Nanotecnología – Medidas de seguridad – Congresos, conferencias, etc. 2. Materiales nanoestructurados – Medidas de seguridad – Congresos, conferencias, etc. I. Ávila Bernal, Alba Graciela II. Ocampo, Ana María III. Wootton, Oliver IV. Muñoz Giraldo, Felipe V. Vieira Samper, Pablo VI. Universidad de los Andes (Colombia). Facultad de Ingeniería. VII. Tít.

CDD 620.5 SBUA

First edition: January, 2016

Ediciones Uniandes
Calle 19 n.° 3-10, oficina 1401
Bogotá, D. C., Colombia
Teléfono: 3394949, ext. 2133
http://ediciones.uniandes.edu.co
infeduni@uniandes.edu.co

ISBN e-book: 978-958-774-305-0

Copyediting: Tiziana Laudato
Design and typesetting: Claudia Rodríguez
All the photos and illustrations: ©iStock [except for the group and blue butterfly photos]
Group and blue butterfly photos: ©Alba Ávila

TABLE OF CONTENTS

Acknowledgements 7
Glossary of Acronyms 9

SECTION 1
Description and Opening Ceremony 11

SECTION 2
Nanosafety and the International Context in Latin America 17
2.1. Management of Nanomaterials as Part of the Chemicals Management Strategy 19
2.2. State of the Art in Latin America and the Caribbean 21

SECTION 3
Collaborative Exercise: Development of a Prospectus to Identify Nanosafety Needs in the Region 29
3.1. Collection of Information from Individuals 31
3.2. Collaborative Workshop 34
Current Gaps, 2015 34
Action Plans for 2020: Short Term 36
Action Plans for 2025: Mid-term 37

Annexes 39
Annex 1. Number of Participants Per Country in the Region and Participant Affiliations 39
Annex 2. Program 41

This publication is available at the following links:

- Unitar link (English): http://www.unitar.org/cwm/nanosafety-regional-workshop-latin-american-and-caribbean-region-colombia
- Uniandes link (Spanish): https://nanoseguridad.uniandes.edu.co

Notes related to the event:

- https://ingenieria.uniandes.edu.co/actualidad/noticias/812-nanoseguridad-una-cuestion-continental
- http://www.unitar.org/cwm/nanosafety-regional-workshop-latin-american-and-caribbean-region-Colombia
- https://www.minambiente.gov.co/index.php/component/content/article/2-noticias/1884-america-latina-y-el-caribe-construyen-ruta-de-trabajo-para-manejo-y-uso-responsable-de-nanotecnologia-y-nanomateriales-manufacturados

ACKNOWLEDGEMENTS

This publication was put together by a group of international experts under the auspices of the United Nations Institute for Training and Research (Unitar), the Organization for Economic Cooperation and Development (OECD) and the Colombian Ministry of Environment, Housing and Territorial Development (MinAmbiente), with sponsorship from the Swiss Confederation. Its content reflects the experience of eleven Latin American and Caribbean countries gathered at Universidad de los Andes (Uniandes) in June 2015, within the framework of the Workshop for the Latin American and Caribbean Region on Nanotechnology and Manufactured Nanomaterials: Safety Issues.

The workshop participants are as follows: Frineé Kathia Cano Robles (Instituto Nacional de Ecología y Cambio Climático); Kurt Kunz (Swiss Ambassador to Colombia); Rubén Lazos Martínez (Centro Nacional de Metrología-Cenam); Pablo Vieira (MinAmbiente); Elizabeth Flores (Ministerio de Ambiente-Ecuador); Juan Carlos Contreras (MinAmbiente); Allen Arturo Puente (Instituto Tecnológico de Costa Rica); Eduardo Behrentz (Uniandes); Gabriela Trupia (Fundación Argentina de Nanotecnología- FAN); Francisco José Gómez (MinAmbiente); Mauricio Escudey (Universidad de Santiago de Chile-Cedenna); Martha Díaz (Ministry of Health); Noela Invernizi (Universidade Federal do Paraná; RELANS); Darwin Dubay (SENA); Jose Mauro Granjeiro (Universidade Federal Fluminense, Brazil); Andrés Hernández (Icontec); María Isabel Cárcamo (Rapal); Hernán Zúñiga (Ministerio de Comercio, Industria y Turismo, Colombia). Eduardo Méndez (Facultad de Ciencias de la Universidad de la República); Helena Groot (Uniandes); Gabriela Medina (Basel Convention Coordinating Centre for Training and Technology Transfer for Latin America and Caribbean Region in Uruguay); Alis Pataquiva (Universidad Jorge Tadeo Lozano); Adela Vega Ríos (Ministerio de Ambiente, Peru); David Andrés Combariza Bayona (Instituto Nacional de Salud,Colombia); Martín Alpírez (Ministerio de Salud, Panama); Juan Felipe Santa (Instituto Tecnológico Metropolitano); Marcus Richards (Government Senior Agricultural Officer); Felipe Muñoz (Uniandes); Vladimir Murashov; Martha Hoyos (MinAmbiente); Brenda Koekkoek (SAICM); Rodolfo Alarcón (MinAmbiente); Mar González (OCDE); Ana María Ocampo (MinAmbiente); Oliver Wootton (Unitar); Alba Luz Castro (MinAmbiente); Alba Ávila (Uniandes).

Mar González (OECD), Gaia Hernández (MinAmbiente), Alba Luz Castro (MinAmbiente), Dr. Alba Ávila (Uniandes), Dr. Ana María Ocampo (MinAmbiente), Mr. Jorge Ocaña (Unitar), Dr. Oliver Wootton (Unitar), Mr. Luis Eduardo Quintero (MinAmbiente) and Dr. Felipe Muñoz (Uniandes) were responsible for managing and organizing the Latin American workshop. The group also collaborated with María Camila Suárez (Uniandes), Sebastián Arévalo (Uniandes), Dr. Fernando Pastrana (Uniandes) and Alejandro Castañeda (Uniandes).

The main authors and editors of this paper were Dr. Alba Ávila (Uniandes), Dr. Ana María Ocampo (MinAmbiente), Mr. Oliver Wootton (Unitar), Dr. Paul Vieira (MinAmbiente) and Dr. Felipe Muñoz (Uniandes).

This report was discussed during the fourth International Conference on Chemicals Management (ICCM4), held in Geneva, Switzerland, from the 28th of September to the 2nd of October 2015.

GLOSSARY OF ACRONYMS

BCCC	Centro Coordinador del Convenio de Basilea para América Latina y el Caribe
CNB	The National Council of Biotechnology
Cenam	Centro Nacional de Metrología-México
Cedenna	Centro para el Desarrollo de Nanociencia y Nanotecnología de Chile
Concea	Conselho Nacional de Controle de Experimentação Animal do Brasil
CCR	Consejo de Alto Nivel para la Cooperación Regulatoria entre México y Estados Unidos
DEFRA	Department for Environment Food & Rural Affairs - United Kingdom
EPA	Environmental Protection Agency
FAO	Food and Agriculture Organization of the United Nations
FAN	Fundación Argentina de Nanotecnología
GETNano	Ecuadorian Group for Experimental and Theoretical Studies (Grupo Ecuatoriano para el Estudio Experimental y Teórico-Ecuador)
GHS	Globally Harmonized System of Classification and Labeling of Chemicals
GPA	Global Plan of Action of SAICM
ICCA	International Council of Chemical Associations
ICTA	International Center for Technology Assessment
IOMC	Inter-Organization Program for the Sound Management of Chemicals
ISO	International Organization for Standardization
ICCM	International Conference on Chemicals Management
Inmetro	National Institute of Metrology Quality and Technology (Brazil)
INECC	Instituto Nacional de Ecología y Cambio Climático (México)
INS	Instituto Nacional de Salud (Colombia)
IRAM	Instituto Argentino de Normalización y Certificación
MinAmbiente	Ministerio de Ambiente y Desarrollo Sostenible (Colombia)
MinCIT	Ministerio de Comercio, Industria y Turismo (Colombia).
MinSalud	Ministerio de Salud y Protección Social (Colombia)
NIST	National Institute of Standards and Technology
NIOSH	National Institute for Occupational Safety and Health (USA)

NSF	National Science Foundation (USA)
OECD	Organization for Economic Co-operation and Development
NGO	Non-Governmental Organization
OEWG2	The 2nd Open-ended Working Group
Rapal	Red de Acción en Plaguicidas y sus Alternativas de América Latina
RELANS	Red Latinoamericana de Nanotecnología y Sociedad
Rel-UITA	Secretaría Latinoamericana de la Unión Internacional de Trabajadores de la Agricultura y la Alimentación
SAICM	Strategic Approach to International Chemicals Management
SCRC	Stockholm Convention Regional Centre for Capacity-Building and Technology Transfer in Uruguay
SisNANO	Sistema Nacional de Laboratórios em Nanotecnologias (Brasil)
SENA	Servicio Nacional de Aprendizaje (Colombia)
Uniandes	Universidad de los Andes (Colombia)
Unitar	United Nations Institute for Training and Research
WHO/OMS	World Health Organization
WSSD	The World Summit on Sustainable Development
WPMN	OECD Working Party on Manufactured Nanomaterials
WPN	OECD Working Party on Nanotechnology

1

DESCRIPTION AND OPENING CEREMONY

Between the 22nd and the 24th of June, 2015, Bogota (Colombia) hosted the Technical Workshop for the Latin American and Caribbean Region on Nanotechnology and Manufactured Nanomaterials: Safety Issues, organized by the United Nations Institute for Training and Research (Unitar), the Organization for Economic Co-operation and Development (OECD), the Ministry of the Environment and Sustainable Development(Colombia), and Universidad of Los Andes, with funding from the Swiss Confederation. Participants included representatives from Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Mexico, Panama, Peru, St. Vincent & the Grenadines, and Uruguay.(11 countries participated, see Annex 1).

The event included the participation of 16 government representatives, 10 representatives from academia, 2 from regulatory bodies, 1 from the Red Latinoamericana de Nanotecnología y Sociedad (RELANS) and 1 representative from non-governmental organizations.

The workshop was structured as follows (Annex 2):

1. Opening ceremony.
2. Management of nanomaterials as part of the chemical substances strategy: participation of representatives from SAICM (1 presentation), Unitar (4 presentations) and OECD (4 presentations) (Section 2).
3. Presentation of nanomaterials and nanosafety guidelines and roadmaps from Switzerland, Thailand and Uruguay (Section 2).
4. State of the art in Latin America and the Caribbean: presentations from various regional actors (Section 2).
5. Collection of information from individuals: a structured questionnaire was applied to each of the participants to gather information about existing activities in nanotechnology, product marketing, communication, meetings, stakeholders involved in regulatory processes, existing regulations, standardization processes and skills-building for nanomaterials hazards characterization (Section 3).

6. Collaborative building workshop: a perspective-gathering exercise for the establishment of regional nanosafety related needs and challenges (Section 3).
7. Workshop closure.

The event was opened by the Ambassador of the Swiss Confederation, Mr. Kurt Kunz; Deputy Minister of Environment and Sustainable Development, Paul Vieira; Unitar representative, Oliver Wootton; OECD representative, Mar González; and the Dean of the School of Engineering at Universidad de los Andes, Eduardo Behrentz.

During his opening remarks, the Ambassador referred to the need for national and regional action to secure the implementation of nanotechnology as part of the Strategic Approach to International Chemicals Management (SAICM), as was agreed at the 3rd International Conference on Chemicals Management (ICCM3, Nairobi 2012). He also mentioned that it is a priority for his government to manage such substances responsibly, and that his country takes an active role by being the permanent headquarters of Unitar, ILO, WHO, and the secretariats of the Basel Convention, the Rotterdam Convention, the Stockholm Convention and the Interim Secretariat of the Minamata Convention. He drew attention to the importance of the Technical Workshop for the Latin American and Caribbean Region on Nanotechnology and Manufactured Nanomaterials: Safety Issues, and its relationship with the 4th International Conference on Chemicals Management (ICCM4), held in Geneva in September 2015.

The Deputy Minister of the Environment and Sustainable Development, Dr. Pablo Vieira, called on all actors in the room to implement initiatives aimed at the management of emerging risks that are a result of the study, development, marketing, consumption and post-consumption of nanotechnology products. He stressed the agreements made in the ICCM2 and ICCM3 conferences, noting that the OECD will serve as a catalyst for a regulatory framework for assessing both environmental and toxicological risks of manufactured nanomaterials. This process will narrow the gap between research and development and increase understanding of the possible risks. He stressed the urgent need to strengthen Colombia´s institutions through mechanisms of international and regional cooperation, in order to support national level decision-making.

The Unitar representative, Oliver Wootton, welcomed all participants to the workshop and summarized the work of the organization in the area of nanosafety, focusing on projects at national level, regional workshops, the development of guidelines, and online courses.

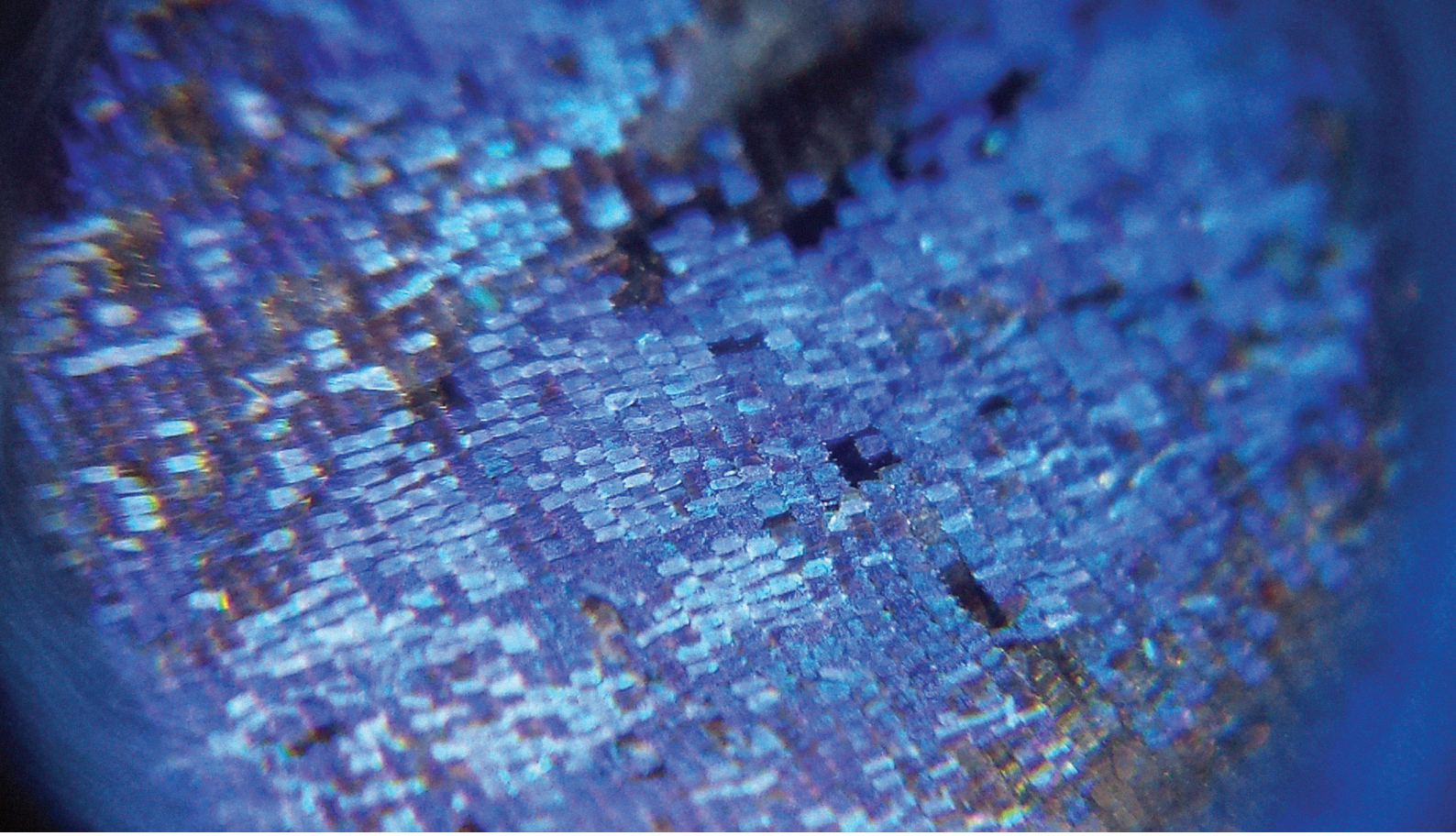
He recognized the support of the OECD, the Government of Colombia and Uniandes in the workshop, as well as the much-appreciated support of the Government of Switzerland. The workshop in Colombia was the second in a series of three regional workshops: one took place in Zambia in April 2015 and a final workshop was held in Bangkok, Thailand, in September 2015. Nanotechnology is one of the most comprehensive and multidisciplinary scientific fields, promising an almost unlimited number of potential applications in almost all sectors of human activity. Identifying products made using nanotechnology and nanomaterials is crucial both to benefit from the "nano revolution," and to recognize the challenges for risk management and regulatory purposes. However, the absence of a clear definition for terms such as nano or nano-applications

makes it a complex task to identify and enumerate these products or applications, and in the absence of appropriate regulation, the uses of nanomaterials in particular products cannot be accurately reported. The safety of nanomaterials can only be the result of combined efforts by researchers, producers and regulators. The Unitar nano guidelines document states that industrialized countries have spent billions of euros and dollars on nano research, mainly involving nano-applications. However, less than 10% of this research effort has been invested in nanosafety research, making nanosafety workshops very important. Oliver Wootton concluded by thanking all participants for their contributions and said that he was looking forward to future regional activities.

The Dean of the School of Engineering, Eduardo Behrentz, presented an overview of the nanotechnology research and development activities undertaken by the Department, revealing the challenges that educational institutions face. He noted that the inclusion of these technologies carries risks that must be managed through the principles of caution and protection, in order to protect our students, researchers, the environment and our infrastructure. He also said that designing safe spaces for experimentation and building a culture of safety around nanotechnology are two of the challenges we face at undergraduate and graduate levels. One of our guiding principles in the formative process is that: “If we provide adequate spaces for experimentation and provide safety and self-care education, our graduates will replicate these practices throughout their working lives.”

2

NANOSAFETY AND THE INTERNATIONAL CONTEXT IN LATIN AMERICA



This section addresses the following presentations:

1. Management of nanomaterials as part of the chemicals management strategy: statements by representatives from SAICM, Unitar and the OECD.
2. State of the art in Latin America and the Caribbean: presentations from various regional actors.

2.1. Management of Nanomaterials as Part of the Chemicals Management Strategy

SAICM seeks the safe management of chemicals throughout their life cycle. Their vision for 2020 is to protect human health and the environment by establishing an Ovrarching Policy Strategy and implementing a Global Action Plan with 273 proposed activities for local implementation.

SAICM was represented by Brenda Koekkoek. Her presentation included the International Strategic Approach to International Chemicals Management (SAICM) and the Global Plan of Action (GPA). She emphasized the need to implement the Globally Harmonized System of Classification and Labeling of Chemicals (GHS) and stressed the importance of the next SAICM meeting (ICCM) to be held between the 28th of September and the 2nd of October 2015 in Geneva, Switzerland. It is expected that during the ICCM meeting efforts will be combined for the establishment of joint actions in relation to emerging risks, and with this, the establishment of a draft resolution for nanotechnologies and manufactured nanomaterials. As a preliminary activity to ICCM4, she invited the countries in the region to identify their nanosafety requirements and their relationships with those proposed by the Open-ended Working Group (OEWG2).

Vladimir Murashov, a senior expert on nanomaterials presented the state of the art in relation to risks from exposure to nanomaterials, from a life cycle approach (workplace, consumption, post-consumer). The analysis included those initiatives coordinated by the Organization for Economic Cooperation, among other efforts of international, regional and national cooperation. In relation to risks in the workplace, he drew attention to the following needs: to identify the synthesis mechanisms used; to establish nanomaterials handling procedures; to define procedures for equipment maintenance; to identify best practices for waste management; and to establish accident scenarios with potential harm to health, the environment, or infrastructure. With the aim of monitoring the danger flows related to nanomaterials in the workplace, Vladimir Murashov presented existing monitoring alternatives, highlighted the need to continue developing systems that allow for real-time analysis, and the relationship between monitoring and exposure controls. He also highlighted the uncertainties still existing in issues related to dose-response, the need for data for hazard characterization, questions still pending in the process of analysis and risk assessment, as well as the techniques and methods used for the distribution of bulk material. He ended his presentation with a list of entities with standardization initiatives for nanomaterials and placed special emphasis on products and initiatives from the ISO Technical Committee 229.

Mr. Murashov also presented the WHO initiative for the protection of workers exposed to nanomaterials, embodied in the WHO Guidelines on Nanomaterials and Workers Health. Its main objective is to improve the safety of workers exposed to nanomaterials in the workplace, including: prioritization of nanomaterials based on hazard; an approximation of risk analysis by control bands; and risk management based on training, monitoring, mitigation, evaluation and effectiveness of control measures.

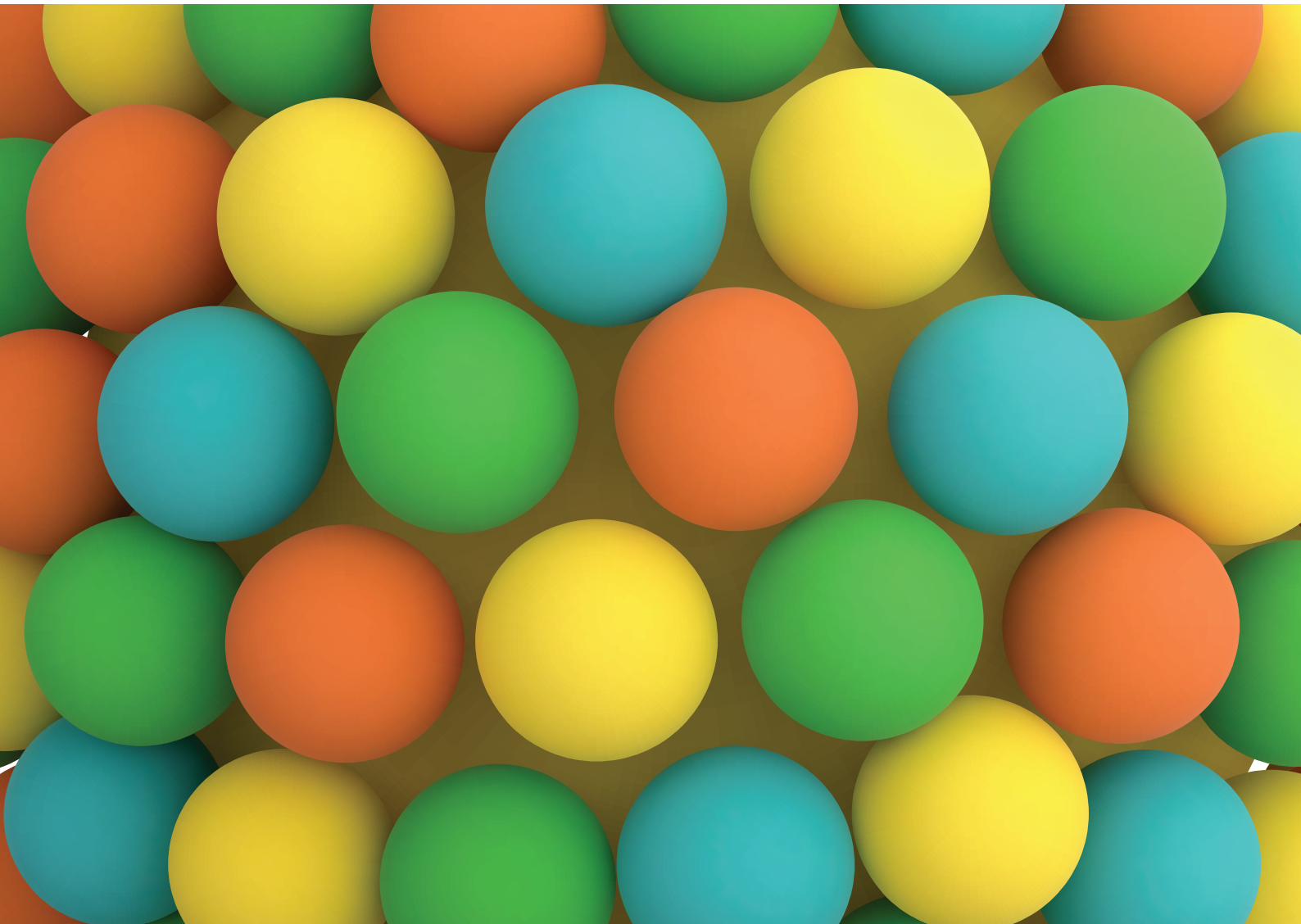
Unitar, represented by Oliver Wootton, continued with a presentation where the link between the Globally Harmonized System of Classification and Labeling of Chemicals (GHS) and its relevance in terms of hazard classification and nano risk communication was made evident. GHS establishes harmonized criteria for the classification of pure substances and mixtures with potential effects on health and the environment by identifying and categorizing hazards criteria. In turn, this allows for establishing harmonized hazard communication elements through technical and iconographic parameters to be used on labels and safety data sheets. Additionally, he presented a general overview of the future prospects of the inclusion of hazard and nano risk in the GHS, as well as the need for more information gathering and categorizing.

The OECD, represented by Mar González, presented its vision of the organization and that of its members. She mentioned the areas of work related to manufactured nanomaterials that are handled within the organization, including: testing and assessment, risk assessment and regulatory frameworks, exposure assessment, mitigation and sustainable use of manufactured nanomaterials. Her presentation included an introduction to the IOMC ToolBox, an instrument that supports decision-making in issues related to chemicals management and, at the same time, an invitation for the participants to make intensive use of the IOMC ToolBox and its platform (http: //www.who.int/iomc/toolbox/en/). In relation to testing methods and evaluation of manufactured nanomaterials, advances made by the OECD were presented; in particular, those for nanoparticles made of gold, silver, zinc and cerium oxide, silicon dioxide and titanium, multiwall

and simple carbon nanotubes, nano clays, dendrimers and fullerenes. These include: the identification of nanomaterials, characterization and physicochemical properties, toxicology, environmental fate, ecotoxicology, evaluation of physical hazards and protective measures. She clarified that the work being conducted by the organization is not intended to be used for reaching conclusions regarding risks, but that it could be used for assessing techniques, methods and existing guidelines at the micrometer scale.

2.2. State of the Art in Latin America and the Caribbean

The workshop also considered a round of presentations by governmental, non-governmental, and academic representatives, in which institutional, national and regional realities were introduced. The exercise covered topics such as the penetration of nanotechnology in the region and the state of its development, the national actors involved in this process, the processes of national, regional and international cooperation, as well as major regional initiatives related to nano risk and its relationship as part of the chemicals management strategy, the concerns of non-governmental organizations, and finally the developments in standardization and legislation (https://nanoseguridad.uniandes.edu.co).



Noela Invernizi, coordinator of RELANS, presented the network goals, which include building a space for discussion, the exchange of experiences and information on issues related to nanotechnology in Latin America, with special emphasis on its political, economic and social implications. The network proposes a holistic multilateral and multidisciplinary approach. RELANS has established strong links with academic, government and social institutions, aimed at building regional knowledge based on the realities of the region. Such alliances have allowed the publication of more than 13 studies; 11 meetings to exchange experiences on courses, workshops, seminars and conferences; and participation in the 7FP.NMP.2013.4.0-5 project (Deployment of societally beneficial nano- and/or materials technologies in ICP countries) and the SAICM strategy (Preparation of a prospectus: Social and environmental implications of nanotechnology in Latin America). The network has also promoted other activities focused on risk reduction, nanotechnology information, governance, skills-building, technical cooperation and prevention of illicit trafficking, all in line with the SAICM goals (http://www.relans.org).

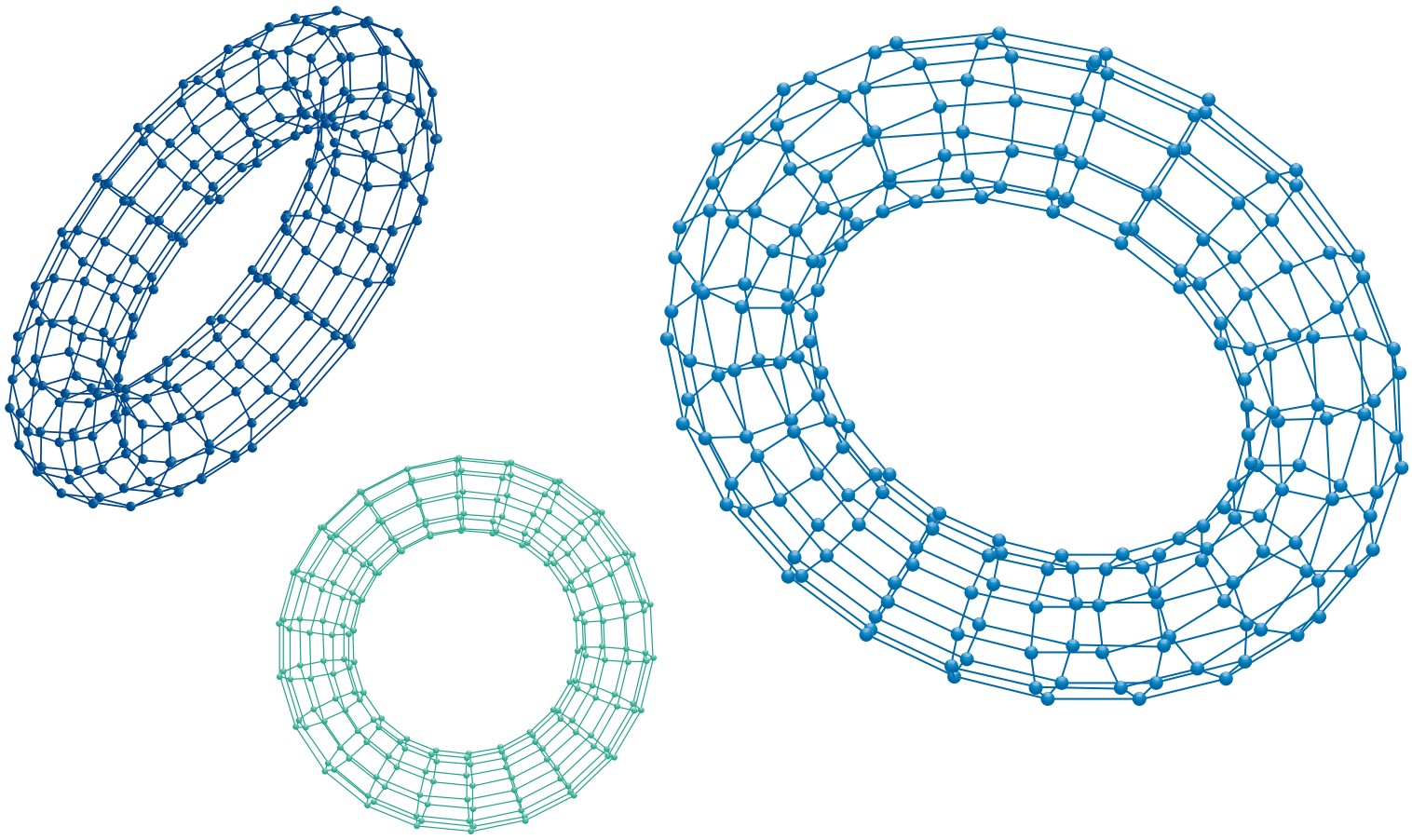
The Argentina Nanotechnology Foundation (FAN), represented by Gabriela Trupia, presented the country's initiative to promote nanotechnology as a priority area, given its inclusion in the National Plan for Science, Technology and Innovation: "Innovative Argentina 2020." FAN assumed a leadership role in 2012, taking on the responsibility to promote nanotechnologies and support work related to identifying health hazards, dangers to the environment and the processes of analysis and risk assessment. The Foundation has also directed actions and issued recommendations on topics related to risk communication, safety and good practices at state, industry and academic levels. In relation to voluntary standards, she stressed that in Argentina, the IRAM institute is participating in the discussion and adoption of ISO (http://www.iram.org.ar). The challenges force them to recognize that nanosafety is a key issue in the application of nanotechnology in the country, stating the need for standards or legislative instruments for support and efforts articulated at regional and global levels (http://www.fan.org.ar).

Jose Mauro Granjeiro, representing Inmetro, described the nanotechnology initiative in Brazil and highlighted the strategy to promote the application of nanotechnology in industry, through the National System of Nanotechnology (SisNANO) (http://www.inmetro.gov.br). The system generates and articulates opportunities for the exchange of experiences, and so-called common spaces comprising researchers, industry and academia. Through this mechanism, 26 laboratories have been selected to support national needs in methods and techniques for the characterization of nanomaterials and nanocomposites (8 strategic laboratories and 18 associated laboratories). He also mentioned the existence of other national networks interested in: regulation, risk assessment, toxicity of nanoparticles in biological systems, aquatic toxicity, nanostructured compounds, nano-toxicology of nanoparticles for applications in the medical and pharmaceutical, and the gas and oil sectors. He added that Brazil is part of a Global Research Area (Glorea) collaboration, which integrates developed and developing countries with interests in nanotechnology and nano risk. He also stated that Brazil bases its nano risk management strategy on the guidelines issued by the OECD, the implementation of predictive toxicology methods, and their integration with omics technologies.

Allen Puente, from the Technological Institute of Costa Rica, introduced various initiatives aimed at strengthening national awareness on issues related to nanomaterials

and nanocomposites, and their relationship to the area of occupational health (http://www.tec.ac.cr). He emphasized that the main actors in the country are represented by researchers associated with the Technological Institute of Costa Rica, the National University of Costa Rica (http://www.una.ac.cr) and the National Nanotechnology Laboratory (http://www.cenat.ac.cr/gestion-ambiental/lanotec/reSena). He also gave an account of the different spaces and outreach activities being carried out inside and outside of the Technological Institute of Costa Rica that have served to raise awareness among actors pertaining to the country's science and technology system. As a result of this work, one specific need was identified: the need to establish policies to protect experimenters and the environment in the implementation of nanotechnologies in research and academic spaces and laboratories. This whole process has helped improve the structural conditions for experimentation in the aforementioned institutions.

The potentially undesired effects attributed to the mobility of nanomaterials in soil were presented by Mauricio Escudey, researcher at the Centre for the Development of Nanoscience and Nanotechnology (Cedenna, http://cedenna.cl). In his talk, he drew attention to the growing presence of anthropogenic nanoparticles from unintentional and intentional activities, and high levels of mobility in porous media such as soil. He warned those present of the emerging environmental risk of the presence of such materials in soils and geological structures in the region, emphasizing the need for concerted research efforts to estimate the transport of nanomaterials in porous media, as well as the need for developing real-time monitoring systems. At the same time, he invited others to join the Cedenna initiatives, among which: the popular science lectures, the Seventh Chile-Mexico Workshop (Arica, September 3 to 7, 2015) and Cedenna Nano-Business (http://cedenna.cl/nanonegocios/).



Frineé Robles Cano, representative of the National Institute of Ecology and Climate Change in Mexico (INECC), mentioned how nanotechnology has quickly permeated her country and listed the collaborative projects that have contributed to the state of the art of nanotechnology (http://www.inecc.gob.mx). Among the achievements, special emphasis was placed on the results of the cooperative initiative with the United Kingdom (DEFRA, http://www.inecc.gob.mx/insq-cop-int), under the framework of Dialogue for Sustainable Development. She shared the material developed in her country for the promotion of nanotechnology aimed at a non-specialist public (posters, brochures and audiovisual material), some of which is used among middle school students in order to encourage their interest in the subject. These materials briefly explain what nanotechnology is, its presence in Mexico, some of its benefits and potential environmental risks, also mentioning the uncertainty surrounding their adverse effects. Additionally, a communication tool for the general public called Nano World was presented (http://www.revistas.unam.mx/index.php/nano). The INECC participates in the development of legislative and regulatory instruments, and develops projects under the framework of national plans and scientific networks.

Cenam Mexico (Cenam, http://www.cenam.mx), was represented by Rubén Martínez Y. Lazos who mentioned that Mexico has a Sistema de Metrología, Normalización, Evaluación de la conformidad y Acreditación (MNEA) administered by the National Committee for Standardization, which establishes responsibilities for coordination, monitoring and accreditation of the different national actors in the field in order to promote the competitiveness of national producers and to protect society and the environment. In applying this scheme to nanotechnologies, he presented the relationship between foreseeable mandatory regulatory instruments (currently nonexistent for nanotechnology in Mexico) that would have to be issued by the government institutions involved, such as the Ministry of the Economy, the Ministry of Labor and Social Welfare, the Secretariat of the Environment and Natural Resources, among others, and the publication of voluntary regulatory tools by the National Standardization Technical Committee on Nanotechnologies, whose products are available at (http://www.economia-nmx.gob.mx/normasmx/index.nmx). The mandatory regulatory instruments, such as the voluntary application, reference publications OECD, ISO TC 229, VAMAS, CCQM from CIPM, and projects such as Horizon 2020, Bisnano or Nanosafety. He stated that these efforts are intended to harmonize its legislation with the international scope empowered by the nanotechnologies component of the US-Mexico High Level Regulatory Cooperation Council (CCR, http://mex-eua.sre.gob.mx). They are designed to ensure a full and competitive development of nanotechnology in Mexico and to ensure the protection of the health of the population while also protecting the environment from any potential risks associated with nanomaterials.

Gabriela Medina, director of theBasel Convention Coordinating Centre for Training and Technology Transfer for Latin America and Caribbean Region in Uruguay, introduced the Nanosafety Pilot Project (http://www.ccbasilea-crestocolmo.org.uy/es). The Center's mission is to strengthen regional capacities in Latin America and the Caribbean for the implementation of the Basel, Stockholm, Rotterdam and other conventions, on issues related to chemicals and hazardous waste. The Pilot Project in Uruguay Nanosafety, Unitar/BCCC-SCRC, helped identify the national needs related to the integrated

management of chemicals, particularly in terms of engineered nanomaterials (http://www.ccbasilea-crestocolmo.org.uy/es/noticias/proyectos-actuales/nanoseguridad/).

The workshop was also attended by María Cárcamo, Rapal representative from Uruguay, who presented its contributions in relation to the use of nanotechnology in agriculture (http://www.rapaluruguay.org/). The representative shared a number of concerns about the proliferation of nanotechnology products associated with seeds, fertilizers and agrochemicals. She drew a parallel between the emerging concerns of biotechnology and nanotechnology. At the same time, she opened the discussion on the implications of the use of nanotechnology by farmers in Latin America and the Caribbean, with particular emphasis on economic, social, and environmental implications. She demonstrated that the incorporation of nanotechnology in products such as herbicides and pesticides has become a marketing argument with many significant uncertainties in terms of toxicological and ecotoxicological effects. At the end of her presentation, she asked what role the World Health Organization (WHO), the Food and Agriculture Organization (FAO) and the Codex Alimentarius should assume in protecting the region's consumers and agricultural workers in the region.

The Undersecretary of Environmental Quality at the Ecuadorian Ministry of the Environment, was represented by Elizabeth Flores (http://www.ambiente.gob.ec). In her presentation, she emphasized the current environmental legislation, which includes: the Environmental Management Act (1999), the Law on Prevention and Control of Environmental Pollution (2004), and other regulatory instruments. In addition, Ecuador has supported their environmental protection actions by signing and adhering to international conventions and strategies, such as Basel, Rotterdam, Stockholm, SAICM and Minamata. She stressed that the country has not worked on nanotechnology-related regulations, but acknowledged the work of the Ecuadorian Group for Experimental and Theoretical Study GETNano, which involves first generation manufactured nanomaterials and their applications in remediation, energy, and water, among others (http://www.utpl.edu.ec/getnano/). Finally, she mentioned that the Ecuadorian government has planned to sign a letter of understanding with the Iranian government in order to strengthen and encourage research and development of nanotechnology in Iran.

Panama's Health Ministry, represented by Martín Alpírez Guardado, outlined the WHO/PAHO and ILO guidelines for the protection of the population and the environment (http://www.minsa.gob.pa). He continued with the legislative instruments in their Constitution that align to protect the population's health and promote healthy work and community environments, the sanitary code and the National Health Policy on the surveillance of workers including processes to protect workers in their jobs, especially those related to emerging technologies. He highlighted work on nanotechnology-related issues being conducted by the Technological University of Panama, including studies related to nano-structured systems for assembly in smart windows (http://www.utp.ac.pa). Finally, he highlighted a number of outstanding tasks, which include: 1) Strengthening transparency and workers' and consumers' rights to information through mandatory registration and labeling of products; 2) the implementation of the Globally Harmonized System (GHS); 3) the development of policies, programs and training materials related to occupational health, safety and environment; and 4) ensuring that nanotechnologies focus on the satisfaction of social needs, training of the workforce, and a compensatory policy against technological unemployment.

Marcus Richards represented St. Vincent and the Grenadines (http://www.gov.vc). He pointed out that there are no nanotechnology-related studies underway in his country. However, he expressed concern about the negative impact of the consumption of nano formulated products on health and the environment (*e. g.*, personal care products). He stated that the limitations related to human resources represent a challenge for his country, as well as the lack of technical knowledge on issues related to environmental risk assessment and life cycle assessment. He added that advances in areas of energy are of particular interest to his country, given the reduction in costs per unit of energy, but conditioned its use to protecting people and the environment.

Eduardo Méndez from the University of the Republic of Uruguay (http://www.universidad.edu.uy) represented the Biomaterials Laboratory. During his presentation, "Regulation of nanomaterials: Uruguay's vision," he said that the risk assessment process includes determining the dose, exposure probability and time. He mentioned the importance of determining the nature of nanomaterials, as well as all their physical and chemical properties and highlighted the existing gaps between knowledge of emerging

risks and legislative developments and knowledge related to the basic properties of nanomaterials, their applications and formulation. He also discussed the case of silver nanoparticles (AgNPs), with reference to the most recent studies from NIST (http://www.nist.gov) and the EPA (http://www.epa.gov). The former related to the appointment of silver nanoparticles coated with polyvinylpyrrolidone as reference material (RM 8017) and the second, with the characterization of AgNPs in consumer products and their relevance for the prediction of the potential exposure of children to the substances. Additionally, he noted that AgNPs are commercially available in textile, food, cosmetics, electronics and cleaning agents, requiring priority treatment by the public and private sectors, in order to protect consumers. Finally, he presented the efforts undertaken in the areas of nanometrology in Uruguay, led by the nanometrology subcommittee, highlighting the training of technical personnel, protocol creation and interlaboratory tests at national and regional levels (http://www.latu.org.uy).

The Peruvian Ministry of the Environment (http://www.minam.gob.pe), represented by Adela Vega Ríos, detailed the inventory of universities and institutes active in nanotechnologies in Peru, where awareness-raising activities, promotion and training are performed and generally supported by the Peruvian Network for Nanotechnology, the Chemical Society of Peru (http://sqperu.org.pe) and the NanoAndes Network (http://nanoandes.org). She concluded that there are no centers of excellence with adequate infrastructure and that existing laboratories in Peru need to improve their equipment substantially. She stated that the development of nanotechnology is only possible if the main issue is resolved in the initial stage of any new scientific technique, this being the integral training of highly qualified teams and the creation of centers of excellence with modern equipment.

The Colombian Ministry of the Environment and Sustainable Development represented by Ana María Ocampo Gómez, presented the progress made in implementing the national program for the management of chemicals for industrial use and its relation to manufactured nanomaterials (https://www.minambiente.gov.co). She noted that the SAICM strategy is a useful tool for the exchange of knowledge and information among stakeholders in terms of the sound management of chemicals and waste including nanomaterials. At the same time, she mentioned that ICCM2 and ICCM3 have raised the need to adopt decisions aimed at the handling and responsible use of nanomaterials, emphasizing that developing countries and economies in transition, in particular, need to enhance their knowledge and skills in their proper use and management. The OECD Chemicals Committee created the Working Party on Manufactured Nanomaterials (WPN in 2006), which aims to promote international cooperation on safety aspects of manufactured nanomaterials with respect to human health and the environment and participate in the development of rigorous testing methods to ensure their safety. She considered the effort and strategic approach of the OECD on the issue of nanotechnology and manufactured nanomaterials to be of great importance in terms of the safety of non-traditional chemicals, since these materials have special features that allow their use in various new applications, some of which have already been commercially available for several decades. Finally, she mentioned that the IOMC ToolBox is the focus for the implementation of the industrial use chemicals management scheme in Colombia, highlighting the most important elements for the

assessment and risk management of these substances, in order to reduce the potential effects on human health and the environment. Particularly, Colombia will use the list of 12 nanomaterials presented by the OECD as a base for inclusion in the scheme for the management of chemicals for industrial use.

Universidad de los Andes was represented by Felipe Muñoz Giraldo (http://www.uniandes.edu.co), who spoke about the context of the growing impact of nanotechnologies and nanosafety-related publications in the region, pointing out the outstanding participation of Brazil, Mexico, Argentina, Chile, Colombia and Uruguay. He highlighted the formation of the Icontec 243 Committee, in charge of the standardization process on nanotechnology-related issues in the country (http://www.icontec.org). He continued his presentation by saying that Universidad de los Andes has identified the faculties and physical spaces where nanomaterials are synthesized or handled, in order to manage nano risk, and in doing so, provides adequate protection to researchers (*e. g.*, the School of Engineering: ≈300 researchers directly exposed and ≈60 indirectly exposed). In this context, it has been possible to design activities aimed at hazards identification, analysis and risk assessment, and nano risk management, all supported by communication and awareness tools (*e. g.*, training, NTC protocol). The University has designed an application for smart phones and tablets, called the NanoRisk App, which provides guidance to researchers who face such risks and builds on the work carried out by NIOSH, NEDO, the European Commission (Nanosafe Program) and the Lawrence Livermore National Laboratory (California, USA) in conjunction with the Safety Science Group at the University of Delft in the Netherlands (https://nanoseguridad.uniandes.edu.co). His speech ended with a tour of the campus laboatories, where workshop participants conducted genotoxicity trials on mammalian cells (Laboratory of Human Genetics) and physicochemical characterization of nanomaterials (Center for Microscopy, Laboratory of Mechanical and Electrical and Electronics Engineering - clean room).

3

COLLABORATIVE EXERCISE: DEVELOPMENT OF A PROSPECTUS TO IDENTIFY NANOSAFETY NEEDS IN THE REGION

This section addresses the areas of individual and collective construction, represented by:

1. Gathering of information from individuals: structured questionnaire filled out by each of the participants where information related to existing activities in nanotechnology, product marketing, communication, meetings, stakeholders involved in regulatory processes, existing regulations, standardization processes and capacities for hazard characterization of nanomaterials collated.
2. Collaborative workshop: perspective-gathering exercise for the establishment of regional nanosafety requirements. This work will be used to define future actions that institutions and organizations can carry out cooperatively, and we expect it to be used to define a roadmap for nanosafety in Latin America.

It is important to mention that the information gathered provides an overview of the workshop participants and the group work that was undertaken. Based on information available at the time of its completion, this is not a comparative analysis by country.

3.1. Collection of Information From Individuals

The information highlights that Argentina, Brazil, Colombia, Chile, Costa Rica, Ecuador, Mexico, Panama, Peru and Uruguay carry out activities involving nanotechnologies. For reference, there is evidence that there are nano initiatives in other countries in the region, such as Bolivia, Cuba, El Salvador, Guatemala, French Guyana, Honduras, Nicaragua, Paraguay, Puerto Rico, Dominican Republic and Venezuela. At the completion of this report, no information was available about the penetration of nanotechnologies in Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Dominica, Grenada, Guadeloupe, Guyana, Haiti, Cayman Islands, Turks and Caicos, Virgin Islands, Jamaica, Martinique, St. Barthelemy, St. Kitts, Nevis and Suriname, St. Vincent and the Grenadines, St. Lucia and Trinidad and Tobago.

Fifty-eight governmental actors, 27 industries, 55 academic institutions, 45 research and development institutions, 2 security and defense institutions, and 9 unclassified stakeholders were identified. Workshop participants were able to note collaborations between the actors identified, allowing them to infer significant opportunities for strengthening intersectorial and inter-agency networks and synergies (see Figure 1).

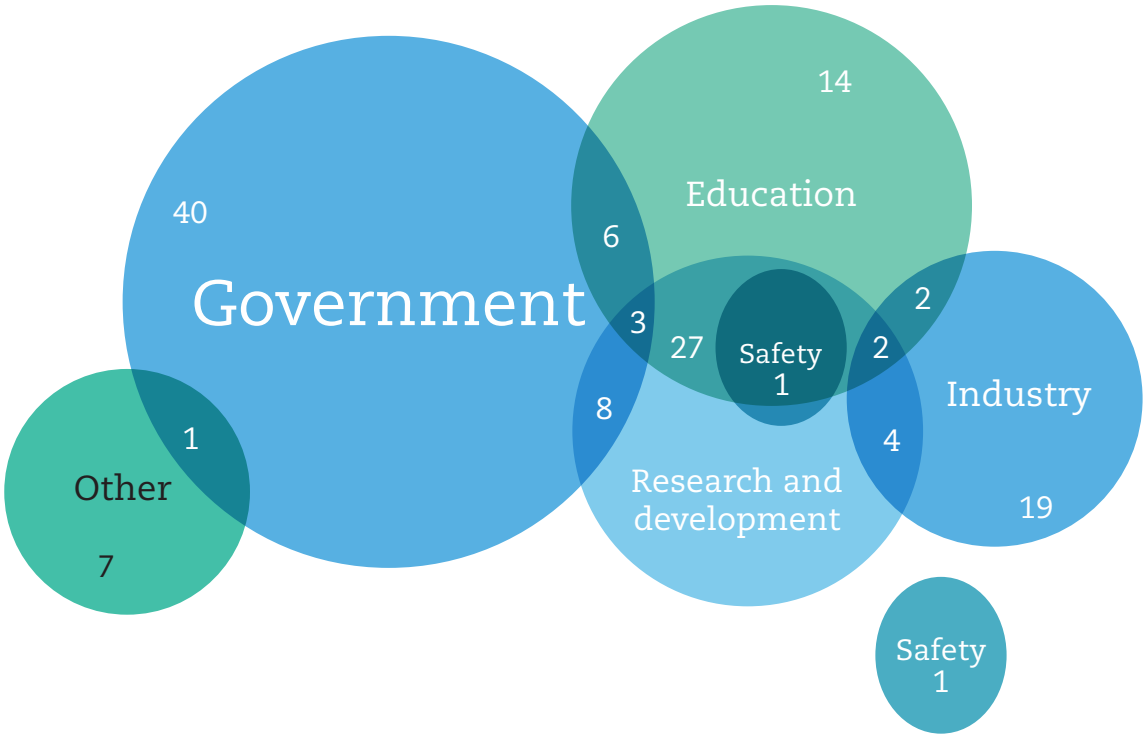


Figure 1. Collaborative intersections between the actors involved in nanotechnology activities in Latin America and the Caribbean.

The most commonly available nanomaterials in the region are silver nanoparticles (AgNPs), gold (AuNPs), titanium dioxide (TiO^2), cerium dioxide (CeO^2), silicon dioxide (SiO^2), zinc oxide (ZnO), nano clays (NA), dendrimers (DE), fullerenes (FU), carbon black (NC), and single- and multi-walled nanotubes (SWNT and MWNT), which may be linked with some applications (see Table 1).

According to information provided by participants, products involving nanomaterials are marketed in Argentina, Brazil, Colombia, Chile, Costa Rica, Ecuador, Mexico, Peru and Uruguay. In Chile, organizations voluntarily report the presence of nanomaterials on the labels of products sold, while in Brazil identification is compulsory. Participants recognized the need to strengthen hazard and risk communication mechanisms associated with the presence of nanomaterials in workplaces and homes. The implementation of the SAICM strategy in Mexico, Ecuador, Colombia and Uruguay includes nanomaterials.

Argentina, Brazil, Colombia, Chile, Ecuador, Costa Rica, Mexico, Peru and Uruguay hold science and technology meetings or nanotechnology programs, in contrast to St. Vincent and the Grenadines and Panama that do not have these government initiatives.

Brazil, Costa Rica, Mexico and Uruguay include the study of risks to health and the environment in their programs.

The region urgently requires nano-related legislation. Countries like Brazil, Chile and Mexico are considered the most sensitive to such issues, but in general, all the workshop participants recognized the urgent need to include such issues in national agendas and their aligment with the SAICM strategy.

Argentina, Brazil, Colombia, Chile, Costa Rica, Ecuador, Mexico, Panama, Peru and Uruguay have actors involved in standardization, be they governmental or nongovernmental. Creating standards requires the development of national capabilities for the characterization of nanomaterials and nanocomposites, as well as for the evaluation of physical, health and environmental hazards. Overall, Argentina, Brazil, Colombia, Chile, Costa Rica, Ecuador, Mexico, Panama, Peru and Uruguay have national capacities for the physicochemical characterization of nanomaterials and composites. Moreover, Argentina, Brazil, Colombia, Costa Rica, Chile, Mexico and Uruguay affirm that they are working to develop national capabilities for the evaluation of physical, health and environmental hazards.

It is a well-known fact that there are potential economic, social and environmental benefits to the incursion of nanotechnologies in the region. Argentina, Brazil, Chile, Mexico, Peru and Uruguay have conducted perception surveys, allowing them to establish a baseline for the evaluation of policies, strategies and plans, while designing tools for prevention, monitoring and control.

Table 1. Interrelationship between nanomaterials and applications in Latin America and the Caribbean (2015).

Applicattion o Sector	Nanomaterial											
	AgNPs	AuNPs	TiO_2	CeO_2	SiO_2	ZnO	NA	DE	FU	NC	SWNT	MWNT
Cosmetics		■	■			■		■	■			
Research and development	■	■	■	■	■	■	■	■	■	■	■	■
Ceramic, textile, chemical and plastic industries	■	■	■			■		■	■	■	■	■
Cleaning agents			■									
Paints			■									
Coatings			■								■	■
Pharmaceutical and diagnostics		■	■			■		■				
Sewage treatment			■									
Electrical components		■										
Fuel Additives									■			
Personal Care						■		■				
Food						■						
Construction and civil works							■				■	■
Agriculture											■	
Education	■	■	■								■	■
Other						■						■

3.2. Collaborative Workshop

The collaborative workshop was carried out by forming two (2) working groups, represented by:

1. Government representatives: legislative, regulatory and policy actors.
2. NGO and academic representatives.

Based on the expertise gathered in the workshop, three time frameworks were established —2015, up to 2020 and 2020- 2025— in order to identify gaps and a prospective exercise for the region.

Current Gaps, 2015

The participants of the working groups identified the following gaps:

1. National and regional information: There are no strategies or systems that allow for the effective consultation of initiatives, capabilities and actors in the region's different countries. This neither promotes the transfer of knowledge nor is it conducive to collaborative activities.
2. Nano-related communication: In general terms, workers and consumers do not recognize the presence of nanomaterials or nano compounds in their jobs or commercially available products. With only a few exceptions in the region, workers and consumers are never sure how dangerous nanomaterials or nano compounds are, as product labeling and safety data sheets do not include this information. Not all countries have conducted perception studies associated with nanotechnologies. The awareness training and education initiatives are not shared among countries and actors in the region, impeding replication in other spaces and contexts.
3. Visibility of benefits: In general, Latin America and the Caribbean do not have effective mechanisms for communicating the potential benefits of the use of nanotechnology to the general public.
4. Collaboration: Existing national and regional capacities lack a strategy that allows for the establishment of cooperative activities and synergies. The exchange of experiences, information and data between regional actors is not promoted, resulting in the duplication of efforts in the region and preventing the realization of interlaboratory work.
5. Nanosafety: The gap in nanosafety-related issues in Latin America and the Caribbean is immense. The region lacks the infrastructure needed to evaluate physical, health or environmental hazards, based on the particular conditions of the region (socioeconomic, environmental and productive). Mutual acceptance of data must be supplemented by local skills-building, in order to strengthen decision-making based on informed risk. It is necessary to adopt an approach that provides the highest levels of protection to workers, consumers and the environment. The region does not have an inventory of experts, groups and resources related to nanosafety issues, and, in Latin America and the Caribbean, there are no mechanisms to support decision-making involving nanomaterials and nanocomposites in emergency conditions.

6. Education: The region lacks training and certification processes for nanosafety issues. It is believed that priority issues include the physicochemical characterization of nanomaterials, toxicology, ecotoxicology, accidental dynamics associated with physical hazards (*e.g.*, fire, explosion), emergency response, hazard characterization, risk analysis, risk assessment and risk management.
7. The weak collaboration links between industry and academia: In general terms, Latin America and the Caribbean do not have mechanisms that allow for the generation of synergies between states, companies and academic institutions in nanosafety-related issues. It is important to promote multistakeholder spaces where the participation of unions, consumer associations and other social organizations is promoted.
8. Labeling: The region does not have communication mechanisms for hazards or risks associated with nanomaterials and nanocomposites. There is no labeling that enables effective communication of the presence of nanomaterials, or the dangers and risks present for workers and consumers.
9. Programs on management of waste generated from nanotechnology–related industrial production and research activities: Latin America and the Caribbean do not include appropriate nano waste strategies that ensure the protection of workers, consumers and the environment.
10. Regional and national policies for nanosafety: The region's countries do not have policies explicitly related to the management of nanomaterials and nano compounds throughout their lifecycle. The lack of regional knowledge on nanosafety issues increases inequality gaps between developed countries, developing countries and emerging countries; recognizing this inequity can energize and strengthen the definition of policies, legislation, standardization and cooperation mechanisms.
11. Legislation: Very few nanosafety statutory or regulatory instruments have been developed in the region and mechanisms to exchange experiences among national regulatory agents are required.

12. Standardization: The region has several public and private national standards institutes. Several of them have nanotechnology-related committees that are adopting or developing technical reports on nanosafety standards. We must identify the existing committees and develop mechanisms to generate synergies associated with nanosafety standards.
13. International cooperation: Nanosafety international cooperation initiatives are not widespread in the region. It is necessary to generate a mechanism for international cooperation aimed at closing the inequality gap in order to increase the levels of protection in the region (for workers, consumers and the environment).
14. Group/Multi-Country projects: Latin American and Caribbean countries have not developed joint projects on nanosafety issues. These are necessary for the creation of mechanisms for regional development projects to help increase knowledge on nanosafety issues (*e.g.*, Horizon 2020, and other meetings or conferences that may be created with regional or global resources).

Based on the process of collective construction undertaken in groups, the following pledges were made by the representatives:

1. Mexico (Cenam): Offered their experience in policy and metrology issues, specifically as this relates to determining particle size by transmission electron microscopy (TEM).
2. Colombia (Uniandes): Offered their NanoRisk App and experience in the development of protocols for the safe handling of single and multiple wall carbon nanotubes.
3. Chile (Universidad Santiago de Chile): Mauricio Escudey offered his expertise in strategic planning processes and decision-making, based on the hierarchical analytical model for the future construction of a roadmap on nanosafety for Latin America and the Caribbean. Mr. Escudey presented the power of this tool and its relevance for future work.
4. Brazil (Inmetro): Offered the possibility of adding one or more Latin American laboratories to their interlaboratory tests network.

Action Plans for 2020: Short Term

- Share the outcomes of the workshop results at the International Conference on Chemicals Management (ICCM4) in October 2015. A speaker will have to be delegated for the Technical Workshop for the Latin American and Caribbean Region on Nanotechnology and Manufactured Nanomaterials: Safety Issues.
- Establish a nanosafety network between stakeholders in the region. This includes government, academia, industry and research centers, for technical, financial, social and economic impact related aspects.
- Enable skills-building taking into account infrastructure, laboratories, human resources, and the education of students. Identify field experts in the region, followed by non-expert officials at different levels of government, media, community and industry.
- Establish national requirements for the registration of nanomaterials in terms of products and raw materials.

- Identify different sources for financing requirements that the region can create and apply according to regional needs.
- Include nanomaterials in the GHS.
- Include nanosafety assessment in the Global Environment Facility (GEF).
- Develop occupational health guidelines for the development of nanomaterials present at the time of the meeting. It was mentioned that these will be developed in Mexico and Brazil.
- Collect industry-related information on nanomaterials best practices and management.
- Identify products with nanomaterials in order to control them.
- Work on documents to reduce the impact of nanomaterials.
- Develop guidelines from the Ministry of Labor in Colombia.
- Develop skills-building in different universities and research centers.
- Develop guidelines in regulations and standards.

Action Plans for 2025: Mid-term

- Implement the regulation associated with identification, regional standardization, monitoring and control.
- Establish a process to promote a nanosafety accreditation program for institutions and agencies.
- Create and maintain an inventory of commercially available nanomaterials and nanocomposites in Latin America.
- Create and maintain an active network of interlaboratory characterization covering 50% of the countries in the region.
- Implement consumer education programs where the foundations of responsible consumption are provided.
- Implement nanosafety outreach programs associated with basic and applied science studies at technical colleges and universities.
- Develop open protocols for operations and training activities in the laboratory network.

ANNEXES

Annex 1. Number of Participants per Country in the Region and Participant Affiliations

Country (or international organization)	Number of participants	Participants	Affiliations
Mexico	2	Frineé Kathia Cano Robles	National Institute of Ecology and Climate Change
		Rubén Lazos Martínez	National Metrology Center
Ecuador	1	Elizabeth Flores	Ministry of the Environment
Costa Rica	1	Allen Arturo Puente	Technology Institute of Costa Rica
Argentina	1	Gabriela Trupia	Fundación Argentina de Nanotecnología
Chile	1	Mauricio Escudey	Universidad Santiago de Chile- Cedenna
Brazil	2	Noela Invernizi	Federal University of Paraná
		Jose Mauro Granjeiro,	Conselho Nacional de Controle de Experimentação Animal, Fluminense Federal University, Brazil
Uruguay	3	María Isabel Cárcamo	Red de Acción en Plaguicidas y sus Alternativas de América Latina (Rapal)
		Eduardo Méndez	Assistant Professor and Head of the Laboratory of Biomaterials, School of Science, University of the Republic
		Gabriela Medina	Basel Convention Coordinating Centre for Training and Technology Transfer for Latin America and Caribbean Region in Uruguay
Peru	1	Adela Vega Ríos	Ministry of the Environment
Panama	1	Martín Alpírez	Ministry of Health
St Vincent & the Grenadines	1	Marcus Richards	Government Senior Agricultural Officer

Country (or international organization)	Number of participants	Participants	Affiliations
Colombia	10	Alba Luz Castro	Ministry of the Environment and Sustainable Development
		Martha Hoyos	Ministry of the Environment and Sustainable Development
		Juan Carlos Contreras Rodrolfo Alarcón	Ministry of the Environment and Sustainable Development Ministry of the Environment and Sustainable Development
		Juan Felipe Santa	Metropolitan Institute of Technology, Medellin
		David Andrés Combariza Bayona	National Institute of Health
		Martha Díaz	Ministry of Health
		Helena Groot	Universidad de los Andes
		Darwin Dubay	SENA
		Alis Pataquiva	Universidad Jorge Tadeo Lozano
		Andrés Hernández	Icontec
		Hernán Zúñiga	Ministry of Industry and Tourism
saicm	1	Brenda Koekkoek	Secretariat SAICM (by videoconference)
Unitar	2	Oliver Wootton Vladimir Murashov	Member of the United Nations Institute for Training and Research (Unitar) Chemicals and Waste Management Program Unitar Senior Expert (Special Assistant on Nanotechnology to the Director of the National Institute for Occupational Safety and Health in the U. S. Department of Health and Human Services in Washington, D. C.)
oecd	1	Mar González	Nanosafety Project Manager

Annex 2. Program

Technical Workshop for the Latin American and Caribbean Region on Nanotechnology and Manufactured Nanomaterials: Safety Issues, 22, 23 & 24 June 2015 – Universidad de los Andes - Bogota, Colombia

Day 1: 22 June		
08:00	Registration of participants	Uniandes/MinAmbiente
08:30	Opening and welcome	Kurt Kunz (Swiss Ambassador) Pablo Vieira (MinAmbiente) Oliver Wootton (Unitar) Mar González (OECD) Eduardo Behrentz (Uniandes)
09:30	Group picture	
10:00	Strategic Approach to International Chemicals Management (SAICM - Teleconference)	Brenda Koekkoek (SAICM secretariat)
10:30	Coffee break	
10:45	Occupational, Consumer, and Environmental Exposures of Manufactured Nanomaterials – Unitar	Vladimir Murashov (Unitar)
11:15	Nanomaterials Classification and Labeling: Status of work undertaken in GHS	Oliver Wootton (Unitar)
11:45	OECD Work on Chemicals and on Manufactured Nanomaterials	Mar González (OECD)
12:15	Lunch (on-site)	
13:15	Strengthening National Capacities to Address Nanotechnology and Manufactured Nanomaterials	Oliver Wootton (Unitar)
13:45	Developing WHO Guidelines for Protecting Workers from Potential Risks of Manufactured Nanomaterials	Vladimir Murashov (Unitar)
14:15	Safe Testing and Risk Assessment of Manufactured Nanomaterials - OECD	Mar González (OECD)
14:45	Coffee break	
15:00	State of the art in the Latin America region. Chair: Felipe Muñoz	
15:05	Latin American Nanotechnology & Society Network perspective	Noela Invernizzi (RELANS)
15:15	Argentina perspective	Gabriela Trupia (Argentina)
15:25	Brazil perspective	Jose Mauro Granjeiro (Brazil)
15:35	Costa Rica perspective	Allen Puente (Costa Rica)
15:45	Chile perspective	Mauricio Escudey (Chile)
15:55	Mexico perspective	Frineé Cano Robles (México)
16:05	Group discussion	
16:20	Uruguay perspective	Eduardo Méndez (Uruguay)
16:30	Cenam perspective	Rubén Lazos (Cenam)
16:40	BCRC perspective	Gabriela Medina (BCRC)

Day 1: 22 June		
16:50	Rapal perspective	María Cárcamo (Rapal)
17:00	Ecuador perspective	Elizabeth Flores (Ecuador)
17:10	Panama perspective	Martín Alpírez (Panama)
17:20	Group discussion	
17:35	End of day and conclusions	Oliver Wootton (Unitar) Alba Ávila (Uniandes)
18:00	Welcome reception (Uniandes)	
19:30	Departure to the Hotel Emaus	
Day 2: 23 June		
08:30	Welcome, review of day 1 and outline of day 2	Mar González (OECD) Felipe Muñoz (Uniandes)
09:10	Peru perspective	Adela Vega Ríos (Peru)
09:10	Saint Vincent & Grenadines vision	Marcus Richards (StV & G)
09:30	Group discussion	
10:00	Updates from SAICM 2nd Open-ended Working Group: CRP-5 nano resolution	Mar González (OECD)
10:30	Coffee break	
10:45	Country roadmaps: Switzerland, Thailand and Uruguay	Gabriela Medina (BCRC) Unitar
11:30	Introduction to the working groups methodology heading Road Map LATAM Chair: Ana María Ocampo (MinAmbiente – Group A) & Alba Ávila (Uniandes – Group B)	
11:45	Session 1: Identifying the needs in the Latin American region	Two groups: SAICM /political level Nano/scientific level
12:30	Lunch (on-site)	
13:30	Session 2: Identifying the needs in the Latin American region	Two groups: SAICM /political level Nano/scientific level
15:30	Coffee break	
15:45	IOMC ToolBox for Decision Making in Chemicals Management	Mar González (OECD)
16:15	Advances in the implementation of the industrial chemicals management scheme in Colombia	Ana María Ocampo (MinAmbiente)
17:00	End of day and conclusions	Mar González (OECD) Felipe Muñoz (Uniandes)
17:30	Departure to the Hotel Emaus	
19:00	International Dinner (MADS)	
Day 3: 24 June		
8:30	Nanosafety approach at Uniandes	Alba Ávila (Uniandes) Felipe Muñoz (Uniandes)
9:00	Hands on experiments	Alejandro Castañeda (Uniandes) Fernando Pastrana (Uniandes)

11:15	Coffee break	
11:30	Closure of Workshop	Oliver Wootton (Unitar) Mar González (OECD) Francisco José Gómez (MinAmbiente) Alba Ávila (Uniandes) Felipe Muñoz (Uniandes)
12:30	Lunch (on-site)	
14:00	Departure to the Hotel Emaus/airport	

PARTICIPANTS

Standing, left to right: Felipe Muñoz, Martín Alpírez, Hernán Zúñiga, Juan Felipe Santa, Allen Arturo Puente, Mauricio Escudey, Kurt Kunz, Eduardo Méndez, Eduardo Behrentz, Marcus Richards, Oliver Wootton, Darwin Dubay, Pablo Vieira, Rubén Lazos, Vladimir Murashov, Noela Invernizzi, Jose Mauro Granjeiro, Gabriela Medina, Frineé Cano, María Isabel Cárcamo, Alba Luz Castro, Juan Carlos Contreras, David Combariza.

Sitting, left to right: Martha Hoyos, Adela Vega, Gabriela Trupia, Elizabeth Flores, Martha Díaz, Mar González, Ana Ocampo, Alis Pataquiva, Alba Ávila.

This report documents the first Technical Workshop for the Latin American and Caribbean Region on Nanotechnology and Manufactured Nanomaterials: Safety Issues, which took place at the Universidad de los Andes in Bogotá, Colombia, from the 22nd to the 24th of June 2015. The organizers were the United Nations Institute for Training and Research (Unitar), the Organization for Economic Co-operation and Development (OECD), the Ministry of the Environment and Sustainable Development of Colombia and the Universidad de los Andes, with funding from the Swiss Confederation. Participants included representatives from Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Mexico, Panama, Peru, St. Vincent & the Grenadines, and Uruguay.

9 789587 743050