

# **VIETNAM - NANO SAFETY MANAGEMENT PROGRAM FROM 2016 TO 2020 AND VISION TO 2025**

## **BACKGROUND**

This program, with the objectives on protection of environment and human health, will focus on following aspects:

- Promote activities in research and management of impacts related to nano technology and nanomaterials.
- Increase awareness of authorities, relevant stakeholders and community on nanosafety.
- Formulate specific regulations for nanosafety management.
- Create conditions for development of nanotechnologies and nanomaterials which contribute to sustainable development of Vietnam.

## **A. THE RATIONALE OF THE PROJECT AND LEGAL FRAMEWORK**

### **I. Program context**

Nanomaterials have been brought into Vietnam in most areas such as electronics, building materials, medicine, cosmetics, chemicals and other new products with application of this material is quite positive. However, determining the impacts and toxicity of the nanomaterials has not gained much attention. Around the world, some countries have started to consider the impact of nanomaterials on the environment and human health, such as the US, EU, Thailand, India, Uruguay, Nigeria.

Toxicity of nanomaterials and of their production, manufacturing process and applications in various fields is not well-defined. Besides that, the field of nano materials technology also has lack of specific policy to manage stages as production, storage, transportation, usage, handling and disposal. It is very important to build a nanosafety policy to manage closely the negative impacts of nanomaterials on the environment and human health in Vietnam.

### **II. Basis for program establishment**

- Law on Environment Protection 2014;
- Law on Chemicals 2007;
- The Strategic Approach to International Chemicals Management (SAICM), with nanotechnology and manufactured nanomaterials established as an emerging policy issue;

- Decision No. 66/2014/QĐ-TTg dated 25/11/2014 of the Prime Minister on approving the list of priority high-tech investment and development and the list of encouraged development high-tech products;
- Decision No. 538/QĐ-TTg dated 16/4/2014 of the Prime Minister on approving the program of bilateral and multilateral cooperation on research science and technology by 2020;
- Decision No. 2075/QĐ-TTg dated 11/08/2013 of the Prime Minister on approving the program of development science and technology market by 2020;
- Decision No. 418/QĐ-TTg dated 11/04/2012 of the Prime Minister on approving the Science and Technology Development Strategy in the period 2011-2020;
- Circular No. 11/2013/TT-BKHHCN dated 29/03/2013 of the Ministry of Science and Technology on science and technology Project Management Guidelines;
- Operational program of the United Nations Institute for Training and research (UNITAR) on nanosafety in the country.

## **B. OVERVIEW OF NANOSAFETY AND NANO TECHNOLOGY MANAGEMENT IN VIETNAM**

### **I. The concept of nanomaterials and nanotechnologies**

Nanotechnology is the technology related to the design, analysis, fabrication and application of structures, devices and systems by controlling shape, size on nanometers scale ( $1\text{nm} = 10^{-9}\text{m}$ ). The boundary between nanotechnology and nanoscience sometimes is not clear, however, they are both based on nanomaterials. Nanotechnology includes the following key issues:

- Nanoscience foundation.
- Methods of observation and intervention at the nanometer scale.
- Production of nanomaterials.
- Application of nanomaterials.

### **II. Effect of nano field on environment**

#### ***2.1. The impacts of nanotechnology on the environment and human health***

Besides these benefits, nanomaterials also have some potentially harmful impacts on human health. Nanomaterials are synthesized from many

different sources, having different structures, with small size, and they exist and disperse in the environment. Therefore potential exposure of nanomaterials to the human body is quite high. Nanomaterials have the ability to penetrate into the human body through different pathways such as respiration, digestion, and absorption through the skin. Furthermore, the nanoparticles tend to accumulate and form larger structures, so its existence in the human body affects human health.

Ultrafine nanoparticles, with high surface area, have lower solubility, so once they enter through the respiratory tract they can cause pneumonia and tissue damage, causing lung tumors. Long and hard nanofibers, once inhaled, can cause mesothelioma (fibrosis). Risks for human health can come from certain aspects of nanomaterials, including:

- The ions dissolved in the nanoparticles (e.g. nano-Ag is typical).
- Due to high adhesion, nanomaterials are shipping agents from environmental toxins in the body.
- Nanomaterials have the ability to build the biological impact on the body due to deposition of protein on their surface, easy to cause cancer.
- Nanomaterials can become catalysts for adverse reactions; reduce immunity of human and animal.

The first influence on the environment is the potential existence of nanomaterials in the environment, however, to determine the presence of nanomaterials in the environment is very difficult. Besides, the identification of factors such as the shape, size, surface properties and chemical composition plays an important role in qualification of the hazardous properties and impacts on the environment of nanomaterials. Similar to the risk assessment of chemicals, the data on the health impact is often considered more important than on the environment, but in the long term, data on nanomaterials assessment in environment is very important because of the impact on the ecology, genetics, as well as chemically modified products will create major risks directly on the environment and then on human health.

## ***2.2. Studies and surveys for assessment of the harmful effects of nanotechnology***

In recent years, the evaluations of the effects of nanomaterials on human health are being implemented in some countries, but most of the assessments have been limited to direct contact with nano materials. However the existence of nanomaterials is very diverse and from various sources, so it is difficult to establish the accuracy of the evaluations of the impact of

nanomaterials on human health. Moreover, many types of nanomaterials are still in the research phase of their effects on humans.

On the other hand, the study of specific reactions that may occur in the presence of nanomaterials is the basis for building predictive models on the impact of nanomaterials, to improve the fabrication of materials and minimize the impact for human health. Besides, the research of life cycle of nanomaterials and application will facilitate the management on production and use of materials.

For nanomaterials in its life cycle, at different stages they will potentially contain different properties with different effects. Therefore, determining the source and life cycle of nanomaterials will minimize potential risks from exposure to them. Currently, there is no result on risk assessment for human health while exposed directly to nanomaterials. However, in a research of the Institute of Nanotechnology in the United Kingdom (UK) on emissions assessment of nanomaterials in some workplaces, a paucity of published data. Therefore, several preventative methods are widely used, such as use of personal protective equipment; applying secure production methods and implementing health care epidemiology test for workers. However, in developing countries with average and low incomes, the use of these measures is limited.

Normally, after research in the laboratory, new technologies of nanomaterial are introduced to the market. These technologies can bring enormous benefits in terms of economy, science and technology, but there will always exist the risks that should be addressed. The problems will not only occur in a certain country but also at the global level. Balancing the benefits and the risks will allow us to use nanotechnology to confront such challenges as climate change, water shortages, food production, health problems and other social issues.

Nanotechnology is often mentioned as having a potential to generate significant economic benefits. On the other side, however, without careful management, there are also the potential risks to human health and the environment and increasing social costs. Socio-economic analysis will facilitate the identification of methods to minimize the risk when using nanomaterials.

Currently, studies on the impact of materials and nanotechnology on the environment and human health in Vietnam have not received much attention and support because of various social and economic reasons. With this project, we hope Vietnam will be among the active countries in the nano safety, contributing to environmental protection and human health.

## **C. OBJECTIVES, TASKS AND RESOURCES FOR CONSTRUCTION NANO SAFETY MANAGEMENT POLICY**

### **I. Objectives and tasks**

#### ***1.1. Objective***

##### **a. Overall objectives:**

The objective of the program is that by 2020 Vietnam will develop a national policy for nanosafety. Policy on nanosafety is the main direction for the development of the national provisions on the management of product and using nano materials; raising awareness of manufacturers, users and management agencies and contributing on the environmental protection and human health.

##### **b. Specific objectives:**

Period 2016 - 2020:

- To develop a roadmap for addressing nanosafety management policy issues takes into account economic – social factors.

- To establish a system of standards and regulations relating to the nanosafety.

- To raise awareness and responsibility of organizations and individuals in nanosafety issues on environmental and human health.

- To develop the technologies to control and treatment harmful elements to the environment and human health of nano technology.

Vision to 2025:

- Minimize the risk of damaging the environment and human health from nanomaterials.

- Control nano pollution for habitat.

#### ***1.2. Mission***

- a. Establish and improve organization, mechanisms, policies and legal documents on nano safety.

- Establish a unit within Vietnam Environment Administration in charge of nanosafety management in Vietnam.

- Review and supplement mechanisms, policies and legislation on nanosafety and related subjects.

b. Construction of nanosafety project for environment and human health.

- Study and set up a schedule for the development of a national program on nanosafety until 2020, with a vision to 2025.

- Integrate the nanosafety into the relevant strategic development.

c. Organization of scientific research, transfer and application for control and treatment technology of nano pollution.

- Establishment of scientific research organizations, technological development to provide services for control and treatment of nano pollution;

- Research, transfer and applications of new technological advances, new technologies to meet the requirements of environmental protection before the pollution of nanomaterials technology;

- Strengthening international cooperation in the scientific research activities and technology transfer served to control and treatment of nano pollution for protection of human health and environment.

d. Education to raise awareness and responsibility for nanosafety.

- Conduct activities and programs on education, awareness raising on nanosafety in order to increase understanding on impacts of nanomaterials, suitable measures for management for stakeholders and community;

- Training and capacity building for management and technical issues related to nano-safety

- Establish national database on nanosafety.

## **II. The basic contents for the nanosafety management policies**

### ***2.1. Implementation contents for establishment of nanosafety management policies***

- Survey and assessment on status of production, transport, storage, use and disposal of nanomaterials.

- Establish a system of standards on safety technology in nanomaterials.

- Research on control technologies and nano pollution treatment for protection of human health and environment.

- Establish national database on nano pollution and propagation and education to raise awareness and responsibility for nanosafety.

- Draft legislation for nanosafety and nano-related fields.

### ***2.2. Financial resources for implementation***

The funding sources to implement the contents and tasks of the program should be mobilized from various sources from:

- The state budget;

- Financial resources of enterprises, associations, NGOs, etc. by participation in various activities such as research and development in nanotechnology and nanomaterials, environmental sound management of chemicals and wastes, environmental health, etc.

- Aid, grants, investments by countries, organizations, individuals and other legal sources.

## **D. SOME SOLUTIONS TO IMPLEMENT THE PROGRAM**

### **I. Implementation methods**

1. Surveys, research, evaluation, forecasting / warning nano pollution in Vietnam

2. To raise capital for nano safety management

3. Develop specific standards for nanosafety, management of nanomaterials used in some major applications in Vietnam.

4. Capacity building for nanosafety management

### **II. Some specific solutions**

1. The solution on organization, management, mechanisms and policies:

- a) Review, propose and improve organization, mechanisms, policies and legal documents on nanosafety management;

- b) Develop National Plan for nano pollution control and handling and submit to the Prime Minister for approval;

- c) To integrate the control and treatment of nano pollution into strategies and environmental industry development plans and in social-economic development plans of regions and localities;

- d) Develop, promulgate and apply the standards and technical regulations of nanosafety;

- e) Promote socialization to attract, strengthen and diversify investment resources for sustainable development of nano safety to protection of environment and human health;

- f) Encourage the establishment of consultancy businesses on nanosafety.

2. Solutions of investment, financial and market:

a) The state support for researching, developing and applying technologies to control and handle nano pollution;

b) To encourage national and international organizations and individuals to invest in development of technologies for control of nano pollution in different sectors;

c) To support enterprises working in nanosafety by policies in land, capital, tax prescribed by law;

d) To encourage organizations and individuals to establish nanosafety fund; to develop economic instruments to promote investment in technologies for control and treatment of nano-pollution;

e) To establish, develop and promote a market for nanosafety sector.

### 3. Solutions on science and technology:

a) To promote scientific research, application and effective transfer of new technologies, new products created in the country in activities in the fields of nano safety management;

b) To link scientific research and technology development of research institutes, universities with enterprises related to nanomaterials technology.

### 4. Solutions on international cooperation and human resource development:

a) Formulation advance and implementation of cooperation programs and projects with developed countries to develop technologies for control and handle of nano-pollution in Vietnam;

b) Issue incentive policies and encourage the participation of foreign experts, especially overseas Vietnamese people in nano safety management;

c) Promote training and capacity building for officers working in the field of nano-safety management.

### 5. Solutions on public communication, awareness-raising:

a) Strengthen and diversify the forms of communication and education to raise awareness and responsibility of stakeholders in nanosafety;

b) Establish and apply national database of nanotechnology, nanomaterials and nanosafety to support the management of nanosafety in Vietnam. This database should be linked or referred to existing databases on chemicals, products and wastes.

## **E. IMPLEMENTATION**

### **I. Establishment of Steering Committee**



- Ministry of Natural Resources and Environment (Vietnam Environment Administration): responsible for leading implementation of the program.

- Ministry of Health.
- Ministry of Science and Technology.
- Ministry of Planning and Investment.
- Ministry of Finance.
- Ministry of Industry and Trade.
- Ministry of Education and Training.
- Ministry of Health.
- Ministry of Labor affairs.
- Ministry of Information and Communication.

## **II. Assigning implementation**

1. The Ministry of Natural Resources and Environment in collaboration with the Ministry of Science and Technology and other relevant ministries, organisations and localities have responsibility to implement effectively, timely of the Program and annually report to the Prime Minister the results.

The Minister of Natural Resources and Environment establishes an Executive Board to help deployment, implementation of the Program. The composition and operation regime of the Executive Board are decided by Minister of Natural Resources and Environment.

2. The Ministry of Planning and Investment in collaboration with the Ministry of Finance to allocate funding from the state budget to implement the program.

3. The Ministry of Science and Technology, ministries, organisations and People's Committees of provinces with their duties and jurisdiction have responsibility to coordinate with the Ministry Natural Resources and Environment to efficiently implement of the program; submit annual report implementation results to the Ministry of Natural Resources and Environment for reporting the Prime Minister.

## **F. LIST OF PRIORITIZED PROJECTS**

Project 1: Investigating, assessment of the status of production, transport, storage, use and disposal of nanomaterials.

Project 2: Develop a system of standards, technical regulations on safety of nano materials.

Project 3: Study on technology for the control and treatment of nano pollution.

Project 4: Development of the national database on nano pollution; promote activities in education, awareness and responsibility related to nanosafety.