VIETNAM ACADEMY OF SCIENCE AND TECHNOLOGY

Annual Report 2013

Hanoi – 2014

Preface

This brochure is the annual report 2013 of the Vietnam Academy of Science and Technology (henceforth abbreviated to VAST). It presents the main activities and distinguished achievements of VAST and provides the readers with an overview of VAST in the year 2013.

Annual activity report (Annual report) is a document written using general standard of the research institutes around the world to help partners, especially foreign partners, and management agencies to better understand the function, task and development orientation of VAST and to strengthen cooperation.

The Editorial Board thanks scientists, staff and subordinate institutions of VAST for their help and support during the preparation of this brochure. Any comments or feedback are welcome.

Table of content

1. Introduction

1.1. Organization of VAST

1.2. Function and mission of VAST

According to the Decree No. 108/2012/NĐ-CP signed on December 25, 2012 by the Prime Minister, VAST is an organization directly belonging to the Government. VAST carries out fundamental research in natural sciences and performs technology development with a focus on national priority targets, with the aim of providing a scientific basis for the management of science and technology, and for the making of socio-economic policy, strategy, planning, and the training of human resources of high scientific and technological qualifications according to the laws.

1.3. Directorate of VAST

- President: Prof. Chau Van Minh
- Vice-Presidents:
    - Prof. Nguyen Dinh Cong
    - Prof. Duong Ngoc Hai

1.4. Particular situation in 2013

Year 2013 was the first year of implementation of Government Decree 108/2012/NĐ-CP, defining the functions, tasks, powers and organization structure of the Vietnam Academy of Science and Technology. The second year of implementation of the "Master plan for development of the Vietnam Academy of Science and Technology 2020, with a vision to 2030" was approved by the Prime Minister in late 2011. All staff of VAST combined effort to complete the tasks of scientific research and technology development proposed in 2013.

VAST has implemented Resolution 01/NQ-CP dated 07/01/2013 of the Government on the key measures of direction and implementation plan of socio-economic development and estimated state budget in 2013. Development of science and technology associated with the resolution has an emphasis on product quality. VAST prioritized resources to carry out high-tech development programs (such as space technology, biotechnology, materials sciences), to encourage the registration of intellectual property, support the application and transfer of scientific technology, and to enhance international cooperation.

Currently, VAST has 50 units including 34 national research institutes. VAST has more than 4,000 members (more than 2,600 permanent staff), including 48 professors, 178 associate professors, 741 PhD's and Doctor's of Science, 781 MA and 749 B.Arts Engineers. In 2013, 4 new Professors and 17 new Associate Professors were recognized. The number of PhD staff of VAST significantly increased compared to the previous year.

2. Research activities in the year 2013

2.1. Fundamental research in Mathematics and Physics

2.1.1. Fundamental research in Mathematics

Currently, the Institute of Mathematics (IM) of VAST has 79 research staff, of which there are 18 professors, 11 associate professors, 20 Doctors of Science and 34 PhD. Around ten years ago, approximately one third of active mathematicians (i.e. those who have had a publication in an international journal in the last three years) in Vietnam worked at IM, and produced about half of all mathematical papers published by Vietnamese authors. Currently, this number is only about one fifth and one quarter respectively. This means that the leading role of the IM in the mathematical community in Vietnam has diminished. In general, this trend is good, because it shows that universities and colleges can attract more and more young mathematicians, and successfully develop their research capability. It supports the conclusion that a better combination between teaching and research is being established in the whole country. On the other hand, this new development trend raises the question on the future role of IM.

Staff-power of IM in the last three years

Year	2011	2012	2013
Total number (Permanent + Contracted)	**92** (64 + 28)	**96** (61 + 35)	**96** (68 + 28)
Researchers	**76** (58 + 18)	**79** (55 + 24)	**79** (62 + 17)
Professors	**17** (16 + 1)	**17** (14 + 3)	**18** (16 + 4)
Assoc. Professors	12 + 0	13 + 0	11 + 0
Doctors of Science	**18** (17 + 1)	**18** (15 + 3)	**20** (16 + 4)
PhD	30 + 0	30 + 0	33 + 1
Admin. Staff	16 (6 + 10)	17 (6 + 11)	17 (6 + 11)

In 2013, IM published 61 papers in international journals, of which 27 papers were in SCI listed journals (shortly SCI papers) and 23 in SCI-E papers. In the whole of Vietnam there are estiamted to be 300 mathematical SCI and SCI-E papers. This means IM contributed around 15-20% of the number of papers. When only comparing with the total number of SCI and SCI-E papers inside VAST, then the contribution of the IM is around 10-11%. A total of 27 research projects of the IM were supported by NAFOSTED.

Similar to previous years, in 2013, Optimization and Control Theory remains the leading research field with 10 SCI papers, 11 SCI-E papers and 1 paper in an international journal. The most productive mathematicians are: Phạm Hữu Sách, Vũ Ngọc Phát, Đinh Nho Hào, Phan Thành An, Nguyễn Đông Yên, Phan Thị Hà Dương, Nguyễn Quốc Thắng, Nguyễn Duy Tân and Hoàng Lê Trường.

Institute budget (unit: one million VND = 50 USD)

Year	2011	2012	2013
From VAST	9 628	11 045	10 656
From NAFOSTED (50% for IM members)	3 054	1 529	12 347
Graduate fees	470	210	553
Other sources	1 000	500	0

In the last year, together with other institutions, IM organized five international conferences and five other conferences. The biggest conference was the Vietnam Mathematical Congress (VMC) organized by IM in collaboration with 3 other institutions. The VMC was held in Nha Trang and attracted over 700 participants with over 300 talks. There were many weekly seminars. The IM also maintains good international relationships with many foreign institutions. Some institute members are associate editors of prestige international mathematical journals. Last year was the first year of cooperation between IM and Springer in the publication of its journal - Acta Mathematica Vietnamica (AMV). As a result of this, the number of submissions for publications in AMV substantially increased and the journal quality has improved.

The IM always places its attention on graduate and post-graduate training. In 2013, three PhD theses were successfully defended and two other PhD theses completed the first round (in Vietnam each PhD thesis should be defended in two rounds). There were 7 new PhD students and 114 master students, of which 44 were new. In collaboration with Hanoi National University of Education, IM also offered the International Master Program (IMP), where students study the first academic year at IM and the second year in an overseas Institution if the IM can find enough financial support from partner institutions for them. In the academic year 2012-2013, 7 out of 8 students from the IMP received grants to study their second year abroad (mainly in France). This is a good continuation of the former IMP in the years 2007-2011 supported by the so-called Project 322 of the Ministry of Education and Training. Most of the students of the IMP studied well abroad. Many of them could get grants to pursue further PhD theses. Some of them have already received PhD degrees and returned to to Vietnam, in particular to the IM. Therefore, one can say that the IMP is a very successful program.

2.1.2. Fundamental research in Physics

The research activities and achievements in physics at VAST have substantially developed. There are more than 80 scientific projects in physics that have been funded by NAFOSTED and coordinated by the physicists of VAST. The number of projects has increased by more than 15% in comparison with 2012.

Furthermore, many research projects in physics have been carried out under the various programs and tasks approved by VAST such as international scientific cooperation tasks, implementation of young staff program and scientific & technological tasks/ projects. More than 70% of the research tasks/projects in physics at VAST have been coordinated by young physicists. This research has related to various physical topics such as theoretical physics, computational physics, high energy physics, astrophysics, condensed matter physics, nano-materials sciences, nuclear physics, optics, spectroscopy and photonics, applied and engineering physics.

In 2013, VAST physicists published more than 200 refereed papers, almost all of the publications are presented in international journals and proceedings, including more than 80 publications in SCI and SCI-E listed journals.

• ***Regarding the research in theoretical physics and computational physics:***

In 2013, some research topics were highly evaluated such as computational physics, quantum information, high energy physics, modeling physics and biophysics. The number of international publications in these research topics is considerably larger than that of other fields. VAST physicists published 50 scientific papers in SCI and SCI-E listed journals. The research results concern to:

- Non-Abelian Gauge Symmetries beyond the standard Model.

- Transport and optical absorption in semiconductor nanostructures-quantum wells based on polar materials

- Modeling of bio-molecules and biological complex systems.

- Theoretical study of quantum information.

- Electron correlations in topological insulators and quantum criticality

- Theoretical model and some applications of nano-devices, quantum system, medical-bio-physics and econo-physics.

• ***Regarding the research in nuclear physics:***

Under the international co-operations with research centers of nuclear physics in Dubna (Russia), ORSAY (French), POHANG (R. Korea) and RIKEN (Japan), the research activities in nuclear physics have been carried out by the physicists at IOP, VAST. In 2013, the number of scientific publications in nuclear physics was 15 and the results covered the following research:

- Study photonuclear reactions from electron accelerators

- Microscopic study of nuclear structure at excitation energy.

- Study of nuclear reactions and charge exchange reaction at accelerators.

- Investigation of exotic nuclei using accelerators.

• ***Regarding the research in condensed matter and materials physics:***

The number of research projects activated in condensed matter and materials physics is more 70 % of the projects in physics at VAST and NAFOSTED. Almost all research activities have been carried out at the Institute of Physics, Institute of

Physics in Ho Chi Minh city, Institute for Applied Materials Science and, in particular, the Institute of Materials Sciences. The number of publications in these fields increased substantially in 2013; more than 100 refereed papers were published (among them 64 papers in ISI listed journals and proceedings).

• ***Regarding the research in quantum electronics, optics, photonics, spectroscopy and atomic physics:***

In these research subjects, almost all investigations were carried out at the Center for Quantum Electronics, IOP and Division of Optics and Spectroscopy, IMS. In 2013, 01 patent of photonics & laser was issued and 35 research results were published in international journals and proceedings. These results concern the following research:

- Investigation of physical and chemical properties of star covers using molecular emissions.

- Nano-photonics for bio-medical application.

- Photonics in study of interactions of biomocules using nano materials as cellular biomarker, applied for cancer diagnostics and therapy.

- Physics of the interaction between nano-gold particles and organic dye centers and the application to generate short pulse laser.

- Physics and technology of all solid state lasers.

The 3rd National Conference on Applied and Engineering Physics

In 2013, VAST physicists successfully organised several scientific conferences: The 38th National Conference on Theoretical Physics; The 3rd National Conference on Applied and Engineering Physics; The First International

Workshop on Theoretical and Computational Physics. The meetings attracted many foreign scientists from Australia, France, Germany, Japan, S. Korea, regional countries, and nearly 300 Vietnamese participants. It is noted that the 3rd National Conference on Applied and Engineering Physics was re-organized 10 years after the 2nd one, therefore, it continued to provide chances to develop the fields of applied and engineering physics in Vietnam. Furthermore, at this occasion the board of the Society of Applied Physics (SAP) was voted and Ass. Prof. Le Hong Khiem (IOP, VAST) was elected to be the President of SAP for the period of 2013-2018.

About training activities in physics:

At the Institute of Physics, the number of Master and PhD students is nearly 180 (including 54 PhD and more than 123 master students).

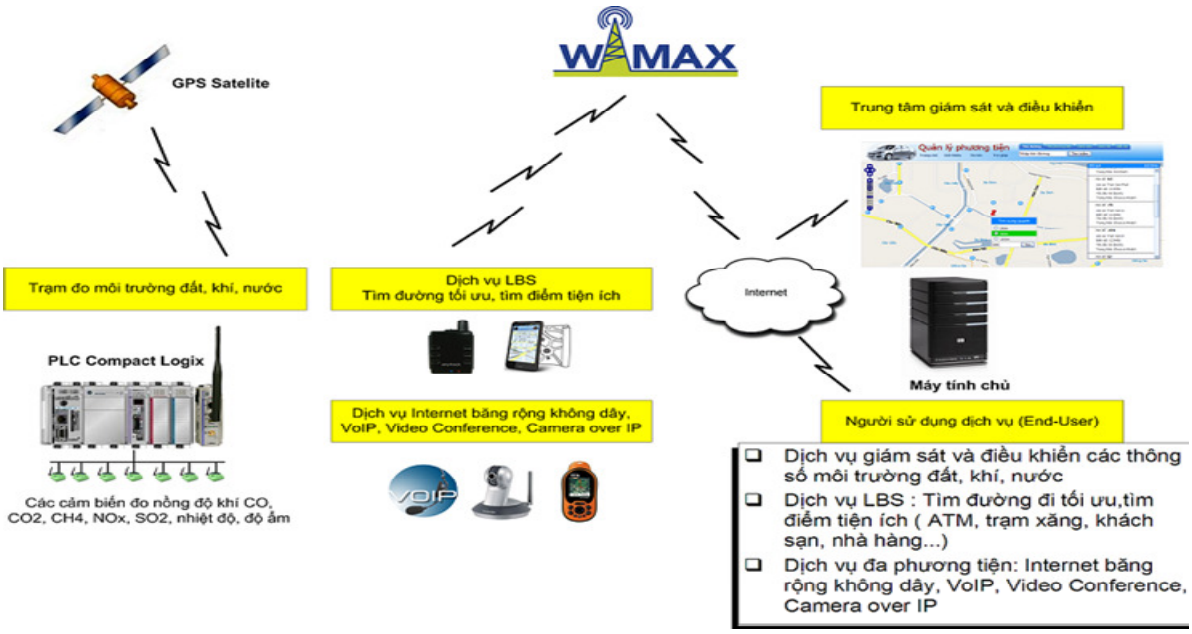
In 2013, the physicists of VAST organized successfully three international colleges (College on Photonics and Applications; Vietnam school of Physics on Theoretical and Computational Condensed Matter Physics and Regional School on Theoretical Physics in Topological Phases and Quantum Computation) for nearly than 150 young scientists and postgraduates. In particular, they organized successfully the 3rd Academic Conference on natural Science for Master and PhD students from ASEAN countries (11-15 Nov. 2013 in Phnom Penh, Cambodia). The meeting attracted more 150 scientific presentations, 250 participants from ASEAN countries and some international professors from France, Germany, Italy, Korea and Sweden.

Finally, it must be noted one important event of Vietnam physicists is that the VII-th National Congress of Physicists was successfully organized on 31st October 2013. The very important missions set to Vietnam Physical Society (VPS) and physicists was to advise the government and the implement Program for Development of Vietnam Physics to 2020. The board of Vietnam Physical Society was voted for the period of 2013-2018; some physicists of VAST were elected to take the most important responsibility of Vietnam Physical Society (VPS) such as: Prof. Acad. Nguyen Van Hieu (VAST) as the Honorary President of VPS; Prof. Nguyen Dai Hung (IOP, VAST) as the President of Vietnam Physical Society; Prof. Nguyen Quang Liem (IMS, VAST) as the VPS Vice-President; Prof. Nguyen Toan Thang (IOP, VAST) as the General Secretary of VPS. Furthermore, some physicists of IOP, VAST have been elected to the presidents of 6/8 specific societies of Vietnam Physical Society.

2.2. Information Technology, Automation, Electronics & Space Technology

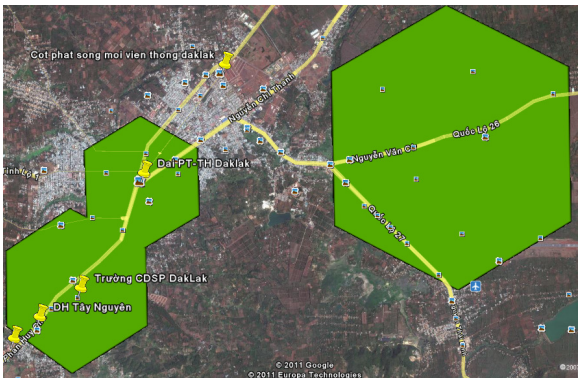
2.2.1. Information and communication technology

a) The project TN3/C07 in Tay Nguyen 3 program “Multimedia service and and environment surveilance based on WiMax in Tay Nguyen” is a research project in next generation network technologies and applications field. The high-speed WiMAX broadband will be implemented to ensure the bandwidth for multimedia information systems and automation systems. On WiMAX infrastructure, the project’s products include environment surveillance, camera surveillance, video conference and LBS services to support enterprise, social security, and travel.

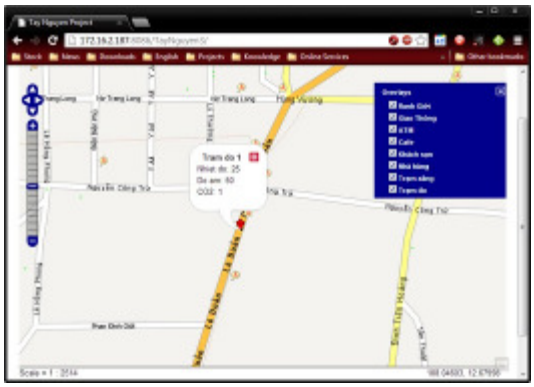


The product's architecture

Camera surveillance at center of Buon Me Thuot city



WiMAX Coverage



LBS service

WiMAX has been tested in the area of 8 km^2 from the center of Buon Ma Thuot city to the rubber plantation 30/4 and supports the following system services:

Environment data is measured and collected based on SCADA system

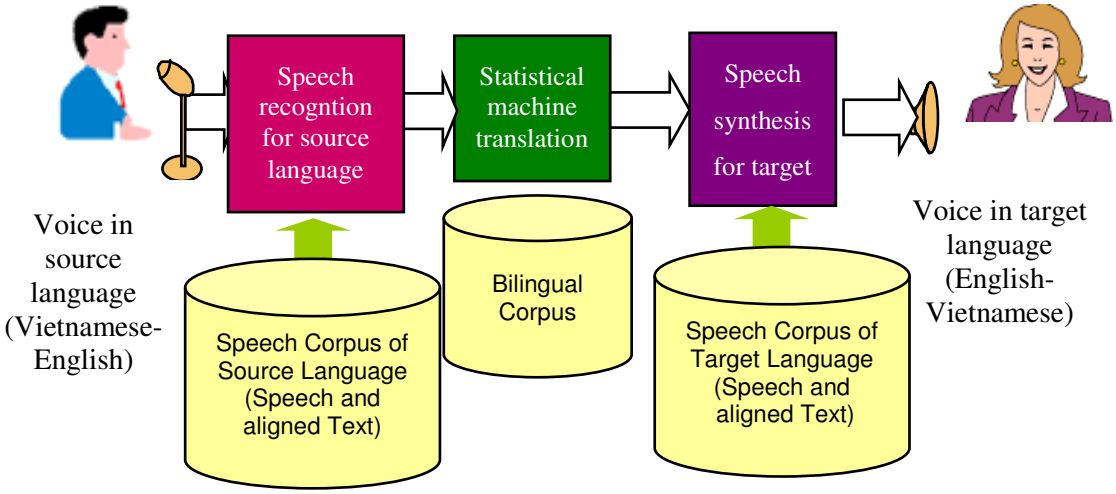
Provide wireless internet and multimedia services (VoIP, video conference, Camera surveillance).

Provide LBS service.

High-speed Internet access over the air.

WiMAX equipment and antenna

b) In the research topic "Speech Translation", the project KC01.03/11-15 named "Research on Vietnamese-English speech translation in specific domain" has developed some basic technology for speech translation issues for Vietnamese-English and English-Vietnamese with a statistical approach, in specific domains (for instance: in conversation, in travelling). The main product is the iSolarSpeech software, the bidirectional speech translation for Vietnamese-English and English-Vietnamese, running on smart phone devices with Android OS.



The model of the bidirectional translation for Vietnamese-English

The speech translation system, iSolarSpeech, has applied several results of Vietnamese speech recognition (SR), Vietnamese Text-to-speech (SS), and Machine Translation (MT). These results were developed with advanced techniques, in collaboration with advanced international research communities, including:

Automatic speech recognition for Vietnamese (SR) with a very large corpus of words in specific domains, focusing on the dialog conversation field.

Developing the machine translation technique based on the statistical methods (SMT).

Research on the problems of Vietnamese Speech synthesis (SS), with different approaches and models for Vietnamese, and integrated into several other applications.

Design and construct the corpus database for communication fields (conversation, travelling) for two areas: the standard database of Northern voice (male and female), and standard database of Southern voice (male and female).

Design and implement the integrating model (in the form of the standard STML- Speech Translation Markup Language), including the engines of SR, SMT and SS.

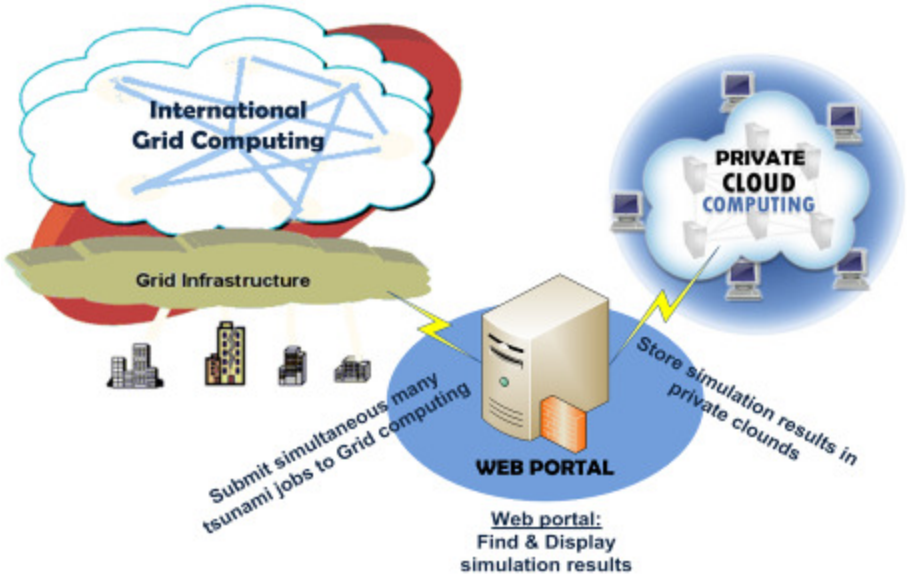
c) VAST project "A grid and cloud-based database of pre-computed scenarios of tsunamis in Manila trench" is a research project in high computing. The problems are solved as follows:

- Defining the parameters of the tsunami scenario parameters in Manila trench which can affect the Vietnamese sea border.

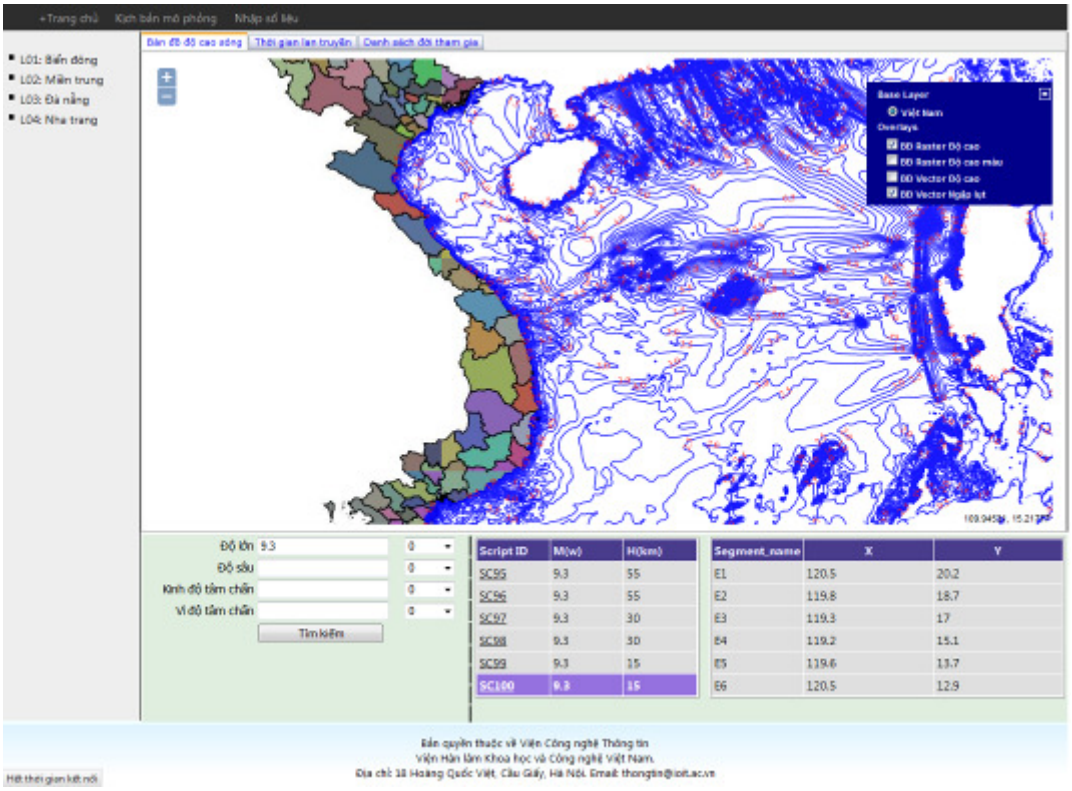
- Building a tool to enable processing of multiple tsunami scenarios through grid computing.

- Building a Tsunami Database for storage tsunami simulations output based on cloud computing.

- Building a Web portal to access, find and display tsunami scenarios from the Tsunami Database.



Solution architecture



Tsunami Web portal

d) In the future, IOIT will focus on some research directions and applications such as:

- In the advanced network technology: research on the problems of network security, cryptography (theory and practice) on mobile networks and other network environments.

- Research on developing the information system and data transporting system on the wire-less sensor network of Zigbee technology.

- Apply research from the computing theory of grid and cloud computing.

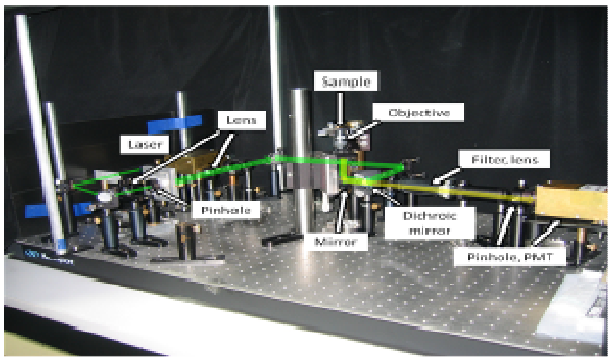
- The combination of video surveillance (the recognition of gesture, human actions) and some advanced research results of Vietnamese speech processing (speech recognition/synthesis).

2.2.2. Electronics

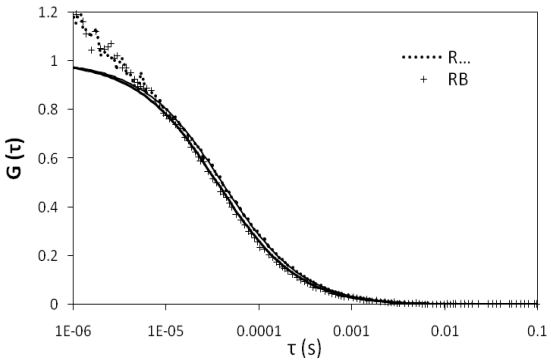
The physicists at Institute of Physics (IOP) have studied, designed and developed successfully *a* "fluorescence correlation spectroscopy (FCS) for single molecule measurement". This is the first FCS system developed in Vietnam. It has an inverted microscope configuration using high numerical aperture microscope objective, light excitation, a CW laser pumped by diode laser or pico-second diode laser and a home-made detector satisfying the requirement of detecting signals from a single molecule as well as some important optic components of high precision micrometer stage.

The home-made FCS system is used to measure, for example, FCS curves for a single fluorescent dye molecule, characteristic parameters of the system and

dynamic parameters for dye molecules such as diffusion time from the FCS curves and characterizing intermolecular interaction of single biological molecules (DNA).



Fluorescence correlation spectroscopy (FCS) for single molecule measurement developed by IOP, VAST.



Measure FCS curves of single dye molecule Rhodamine B and Rhodamine 6G

In fact, the home-made FCS system has been successfully used to measure FCS curves of single dye molecule Rhodamine B and Rhodamine 6G, characteristic parameters for the FCS system (dimensions, volume of the observation volume) and diffusion time of the dye molecules; Intermolecular interactions between DNA oligonucleotides. Additionally, the home-made FCS system has been used to measure FCS of Rhodamine B doped silica nanoparticles, Rhodamine B dye in solutions of different viscosity and premilinary measurement data for CdTe/CdS quantum dot. Measurement data for single molecule/single nano-particle in Vietnam has been obtained for the first time.

The detailed report was presented in Project of code: VAST02.03/11-12, coordinated by Nguyen Thi Thanh Bao under the scientific program: Electronics, Electro-mechanics and Space Science.

2.2.3. Automation

Some significant results of research:

- eRobot for education and research.

- An intelligent mobile robot for education and research.

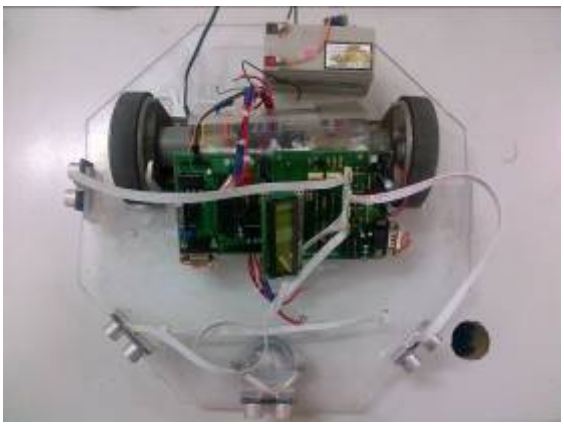
- Soft-ware for simulating and controlling Robots.

- Control hard-wares for controlling Robots.

- Force/position control using a 6-axis compliance device.

- Force/position control algorithm/hardware system using 6-axis compliance device.

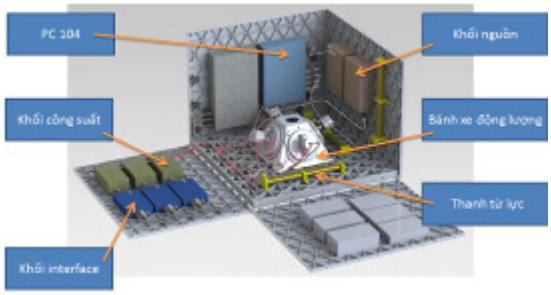
- Force control simulations and experiments for 6DOC.



Future steps

Installation of the necessary hard-ware, soft-ware and equipment for mechatronics design is used for research, development and prototypes of mechatronics products. The devices use the well-known Gough-Stewart platform structure. It employs the orthogonal arrangement of six linear springs, which enables the Cartesian stiffness to be diagonalized and provides a simple design method of an axial or lateral compliance device.

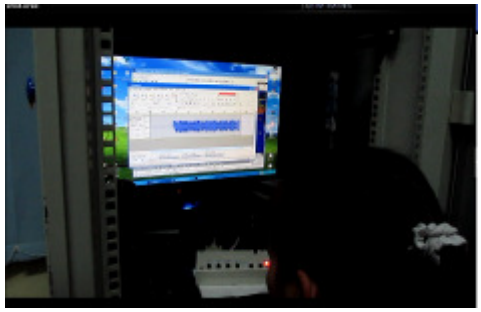
2.2.4. Space technology



BBM module of micro satellite control system

Pico Dragon Satellite

Key members design and manufacture Pico Dragon satellite



First signals of Pico Dragon satellite received at Vietnam National Satellite Center ground station

On November 19, 2013 the Pico-Dragon satellite designed, manufactured and integrated by young staff of Vietnam National Satellite Center (VNSC) was deployed into orbit from the International Space Station ISS. Many ground stations from Japan, Argentina, Mexico and from VNSC have received the signal

"PICODRAGONVIETNAM" of Pico Dragon. With this achievement, Pico Dragon becomes the first micro satellite which is manufactured by Vietnam Academy of Science and Technology and successfully operated in orbit.

Additionally, in 2013 VNSC completed the Design, Manufacturing, Integration and Testing engineering model of module struture and functional model of micro STAR satellite altitude control system within the Protocol framework with Japan. These products are very useful for the research and training activities in Space Technology.

In 2013, Space Technology Institute in cooperation with the Japan Aerospace Exploration Agency (JAXA) and Ministry of Education, Culture, Sports, Science and Technology of Japan (MEXT) oganized successfully the twentieth session of the Asia-Pacific Regional Space Agency Forum (APRSAF-20) in Hanoi. With theme of "*Value from Space: 20 Years of Asia-Pacific Experiences*", the objective of APRSAF is to disscuss space applications in disaster monitoring, environmental protection, satellite information and to enhance knowledge of Space Science and Technology. There were 367 delegates from Asia – Pacific coutries and international organisations and 123 delegates from Vietnam in attendance at this important event.

Asia-Pacific Regional Space Agency Forum (APRSAF-20)

Successfully organizing: The Workshop for Introduction GLOBE Program; the International workshop about module rocket; the International Conference on Space, Aeronautical and Navigation Electronics ISCANE-2013.

Coordination in training and developing training programs for a Space Technology subject at University of Science and Technology of Hanoi and University of Engineering and Technology – Vietnam National University, Hanoi.

2.3. Biotechnology

The Projects evaluated at VAST level in 2013

In biotechnology, one of VAST's prioritized research fields, generally every four out of ten VAST financed projects have to be completed in a year. In the fiscal year 2013 projects that ended their second year of implementation were focusing on the following content :

1. Development of GM rice with improved Omega 7 content.

2. Production of hairy root lines and biomasses in medical plants *Eurycoma longifolia* Jack and *Panax vietnamensis* Ha et Grushv (Ngoc Linh ginseng).

3. Search for new antibiotic substances from marine microorganisms.

4. Analgesic trial of conotoxin recombinant minded from Vietnam Sea conotoxin.

5. Create the rapid biological detection applications of influenza A virus antibody ScFv recombinant single chain.

6. Screening of enzymes involved in cellulose, hemicellulose degradation process using metagenomics techniques.

Overall, in all the 5 completed projects, principal investigators are all quite young Ph.D. staff. Research contents match well with the proposed objectives which were proved by the project evaluation committee with similar members at the proposal approval and at the project result evaluation. The scientific results obtained by these projects mostly show scientific novelty appropraite for acceptance into national journals, but not enough to be sent for international publications. They are also not mature for innovative development of new products which meets practical needs and are not able to be commercialized, although the kit using agglutination mechanism for detecting virus A/H5N1 seemed to be very close to this goal.

Analyzing the circumstances leading to the above mentioned outcomes of the current research projects in the field of biotechnology, all the project evaluation committees are coming to the same following conclusions:

- The project implementation time fixed for 2 years is a real limiting factor for completing a project from new research concept idea to final product or even to a good publication.

- The budget is now fixed to 500 million VND for a two year research project. This is the next limitation considering the fact that many other national funding agencies provide even 5 to 10 times more funding.

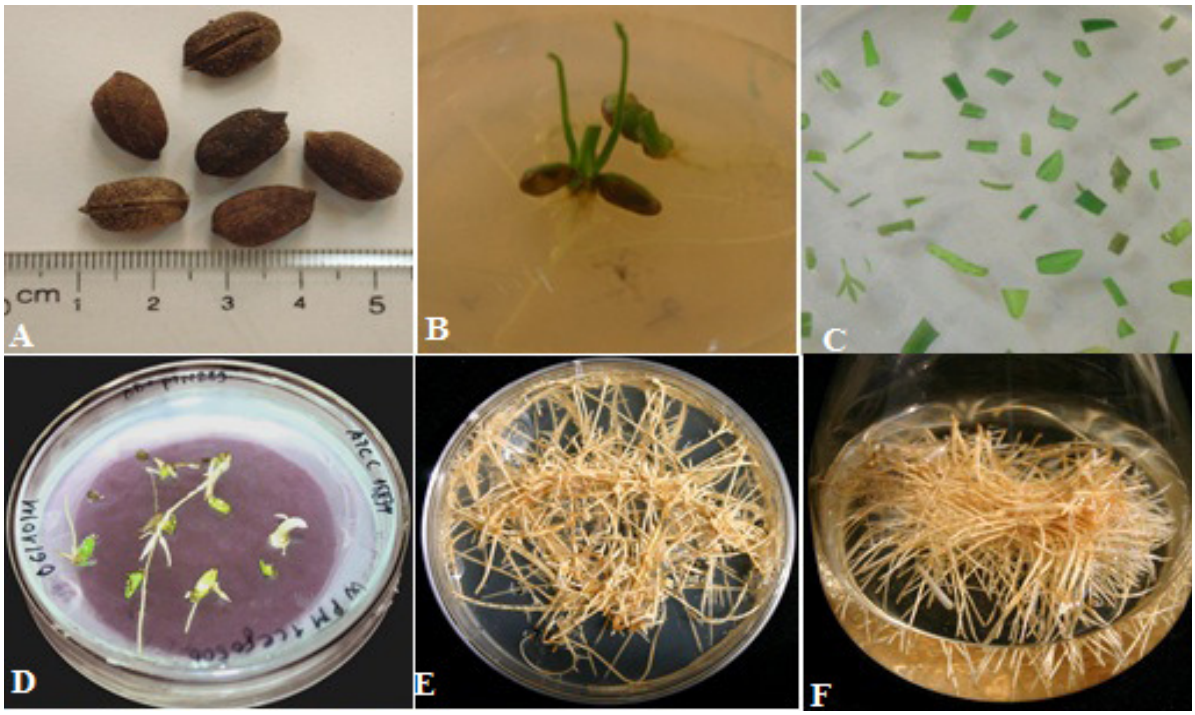
As a National Agency qualified for science and technology investigation VAST needs to reform the funding policy by dramatic improvement in the selection and assignment rules to implementation of research projects in the members. Following suggestions should be considered for classification of two types of research projects:

(i) Fundamental and capacity building project with the objective to gain new results for international publication or to prepare a project proposal applying for

higher funding at higher management level (national or international level). Expected outcome of this type of project is the accepted manuscript or printed international publication of the submitted research proposal. The budget can remain at the present level of 500 million VND per project and the implementation time remains 2 years. In specific cases a maximal extension of one more year could be considered after the final evaluation.

(ii) Research innovative projects focusing on clear objectives of innovative product development and commercialization. Outcomes of this project type are the accepted procedure of product development, patent, product with approval and technology transfer contract. Description of the product and the written statement of the potential stockholder are required. The budget could be higher and the implementation time could be extended from one to two years after evaluation.

Extension of research project implementation is based on written proposition of content and finance and approval by funding agency.



Result of hairy root formation in Eurycoma longifolia Jack by Agrobacterium rhizogenes

Projects completed in 2013 and to be evaluated in 2014

Among the five projects of the financing term 2012-2013, three were implemented at the Institute of Biotechnology and two at the Institute of Tropical Biology. They have gained the following results:

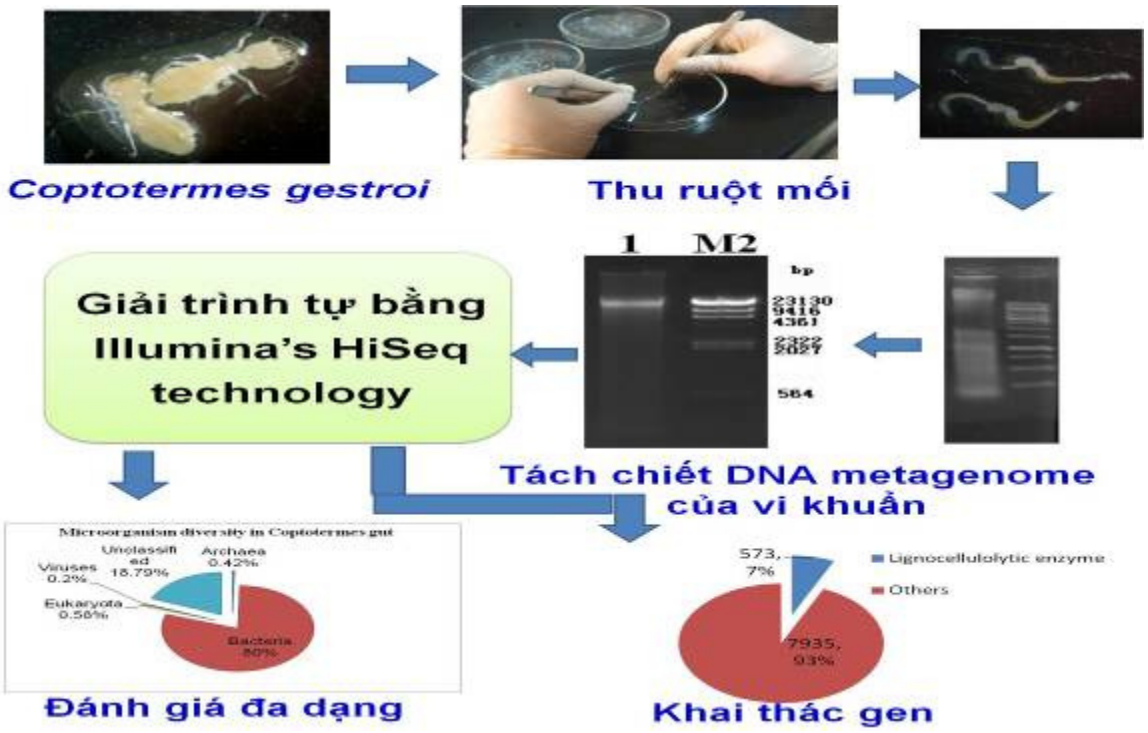
Screening heat resistant enzymes using metagenomics : Identified one protease gene and one amylase gene, showing 95-97 % similarity to in GenBank published sequences; Characterization of the heat-resistant enzymes: Protease T opt is 55°C, pH opt is from 7.0 to 7.5; Amylase T opt is 70°C and pH opt from 7.0 to 7.5; Both enzymes proved to posses high thermal stability.

*Development of a recombinant antigen from the PRRS virus: S*uccessfully cloned and identified genes encoding for ORF7, constructed 4 types of gene expression vectors harboring ORF7 and demonstrated the expression of ORF7 in *E. coli*. Completed purification process of recombinant protein, products induced immune response in rabbits.

Development and application in vitro screening system for anti-inflammatory substances: 12 plant extracts have been subjected for screening potential anti-inflammatory activity; One potential anti-inflammatory extract was found using TLR4 receptors; One publication sent and one Master student trained.

Production of nano Fe-Al LDH (double layer hydroxides) preparations: Products have been developed and characterized. Testing for potential reduction of acidity effect on rice at field trail 2013 summer-autumn season and 2013-2014 winter-spring seasons. One paper presented in international nanotechnology conference 2013 in Vung Tau.

Studies of genetic diversity of the baculovirus: Collection of 30 leaf worm samples in Ninh Thuan vegetables fileds and found 20 of them are infected with baculvirus. PCR products were sequenced and compared with GenBank and found that the collected baculovirus strains belong to group Alpha, Beta, Gamma or Delta.



Idea of using Metagenomics for evaluation and utilization of genom source from microorganism

National Biotechnology Conference 2013

The National Biotechnology Conference 2013 was held in the National Convention Center Hanoi, on October 17, 2013. More than 400 reports were registered and over 500 scientists participated with poster and oral presentations. The conference proceedings are in two bands with more than 1,000 pages. Of

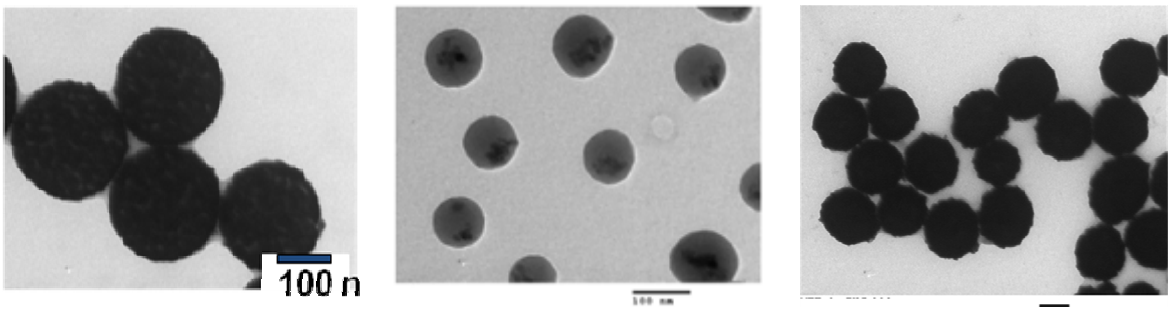
highlight is the participation of several biotechnology companies of Vietnam, and a representative of the NaNoGen Company (Vietnam) who was invited to present a report at the plenary session. The subcommittees covered most of the traditional areas of biotechnology, although the organizers were aware of new trends such as Omics and Systems Biology, but there were not enough participants to hold a separate subcommittee. A second highlight of this conference is to note that all sub-committees had contribution by representatives from all parts of the country from North to South.

The increase in the number of registered conference participation is clearly reflecting the abundant human resources but not necessarily high quality. It is worth noting that at this conference the reports were mostly were presented by young scientists. This is indicative of the support of young scientists, but also the lack of leading experts and researchers with firm expertise, with wide generalization and long-term oriented research ability and sustainability. The lacking participation of international biotechnologists who are well-known in the biotechnology community or having many years of cooperation with Vietnam is also a weakness that could be overcome.

2.4. Material Sciences

In the field of Material Sciences the research activities on nanoscience and nanotechnology were the most active ones and have achieved the following main scientific results:

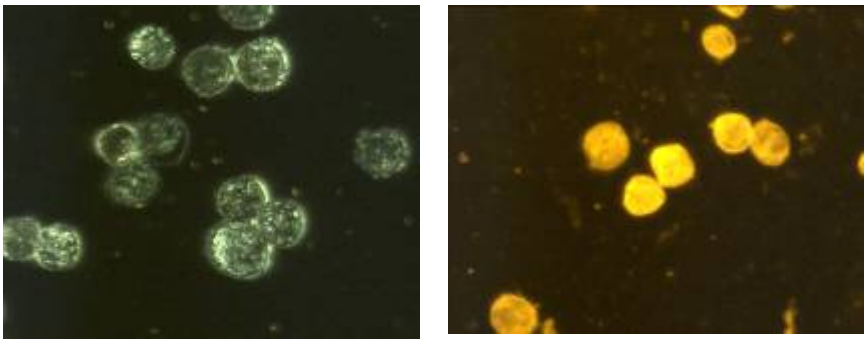
On SiO_2/Au and Fe_3O_4/SiO_2/Au core/shells nanoparticles



a) b) c)

Transmission electron image of core/shells nanoparticles: SiO_2/Au a); Fe_3O_4/SiO_2 b) and Fe_3O_4/SiO_2/Au c).

Multilayer multifunctional gold nanoshells SiO_2/Au and magnetic gold nanoshells Fe_3O_4/SiO_2/Au were synthesized by gold ion plating on hydrophilic-functionalized silica or magnetic iron oxide embedded in silica core, using formaldehyde as a reducing reagent:



a) b)

Dark-field (a) and fluorescence (b) microscope image of BT474 cells recognized by the complex: Fe_3O_4/SiO_2/Au@HER2 a) and Silica@RB-Aptamer HER2 b). (Nikon Ti-E inverted microscope, objective X20)

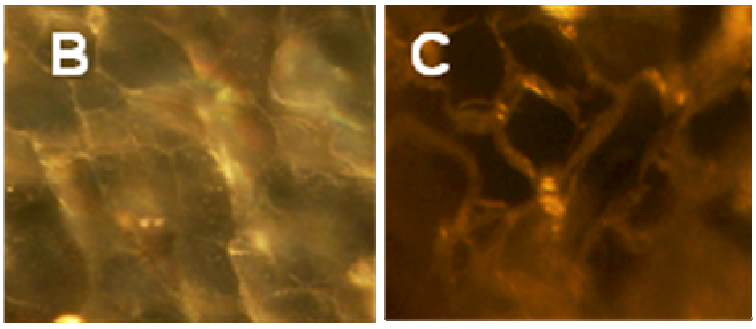
- Gold nanoshells SiO_2/Au have the silica core size from 40 to 180 nm and gold shell thickness of 10 - 20 nm, giving the peak position of the surface plasmon resonance ranging from 550 to 1,000 nm.

- Magnetic gold nanoshells Fe_3O_4/SiO_2/Au size 80 – 100 nm with the silica coated single- or multi-domain superparamagnetic Fe_3O_4 core having the peak position of the surface plasmon resonance variable from 600 to 900 nm.

The SiO_2/Au gold nanoshells and Fe_3O_4/SiO_2/Au magnetic gold nanoshells were conjugated with monoclonal anti-HER2 antibody to obtain the complex nanoparticle@antibody SiO_2/Au@HER2 and Fe_3O_4/SiO_2/Au@HER2.

Aptamer specific HER2 -conjugated gold nanoparticles (Au-AptamerHER2) and AptamerHER2-conjugated RB doped silica nanoparticles (Silica@RB-AptamerHER2) were prepared for specific recognition of breast cancer cells.

The complex SiO_2/Au@HER2, Fe_3O_4/SiO_2/Au@HER2, Au-AptamerHER2 and Silica@RB-AptamerHER2 were used for imaging the BT474 cells. The results show that all complexes are able to detect the target cells. The image of cells labeled with Silica@RB-AptamerHER2 conjugate has very high fluorescence intensity.



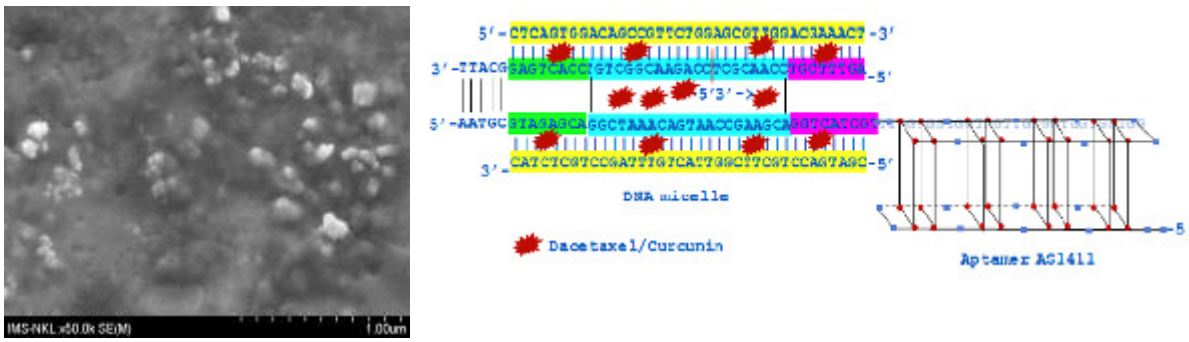
Microscope darkfield image (Nikon Ti-E, objective X20) of chicken tissue treated with nanoparticles: before (left) and after (right) illumination at 808 nm light and I = 30 W=cm^2

The study of the photothermal effect of SiO_2/Au nanoshells and nanorods in chicken tissue under near-infrared radiation demonstrates that both nanoparticle types have a high photothermal transduction efficiency. The temperature of chicken tissue samples reach 60^{o}C and 36^{o}C in presence and absence of the nanoshells when illuminated by 808 nm laser at power density I= 60W/cm^2. The chicken tissue cells are destroyed after 20 min irradiation at 808 nm and I= 30W/cm^2.The results show the ability of multilayer multifunctional SiO^2/Au and Fe_3O_4/SiO_2/Au nanoparticles

to work for theragnostic applications: they can be used as biomarkers also as therapeutic agents.

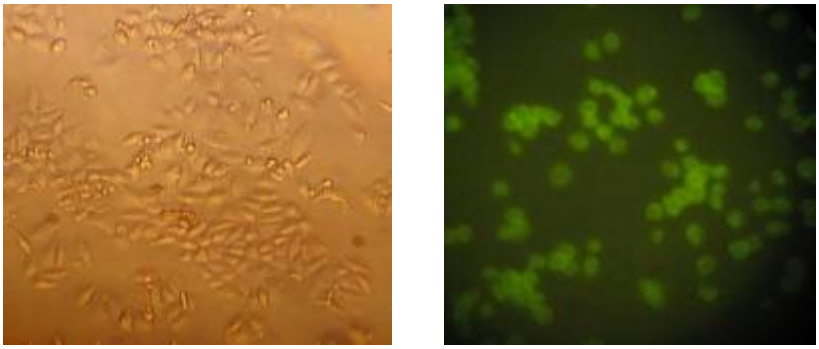
On targeted drug delivery systems for cancer treatment

The modern techniques in molecular biology and nanotechnology are increasingly and effectively applied in diagnosis and treatment of diseases. The use of drugs in the most effective way (high treatment efficacy, maximal reduction of toxicity and undesired side effects) still remains a difficult problem to solve that is of particular interest for the research community. The research field in creating highly effective drug delivery systems, that have the ability to target diseased cells without introducing toxicity and unwanted impacts on healthy cells, has arisen as a new and potential research direction. In Vietnam, the drug delivery systems containing drugs such as docetaxel, curcumin, doxorubicin, etc. using modern techniques in nanotechnology and genetic engineering, have been created. The systems are designed to target cancer cells effectively without introducing toxicity and unwanted effects on healthy cells. The research team of the Institute of Biotechnology has created a drug delivery system in the form of micelle (PLGA-PEG) containing cancer drug Docetaxel using nano precipitation method. This nano system has an average radius of 96nm, low polydispersity of 0.1 and drug encapsulation efficiency of 56%. Zeta potential of nanoparticles in water is -24 mV. The cellular uptake of PLGA-PEG nanoparticles was also observed by the Curcumin's green signal on Hela cell line.



a) b)

SEM images of PLGA-PEG-Doc a); DNA NP construction from six different oligonucleotides b).

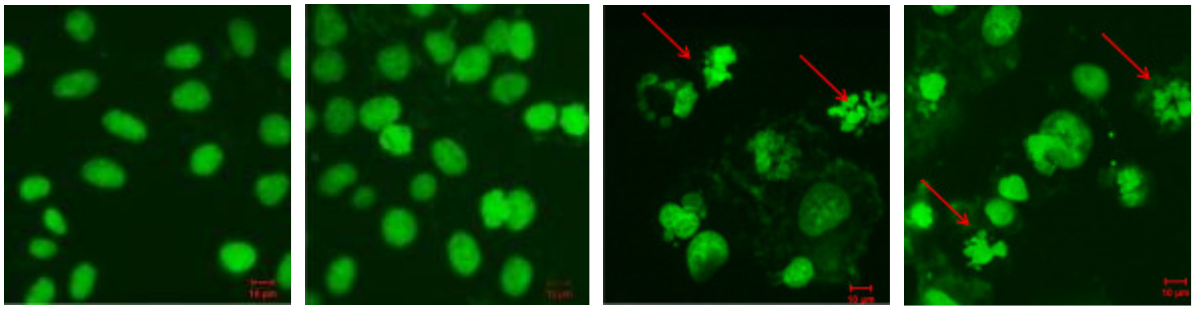


Uptake of PLGA-PEG-Doc by lung cancer A549 cells: transmission image a); fluorescence image b).

a) b)

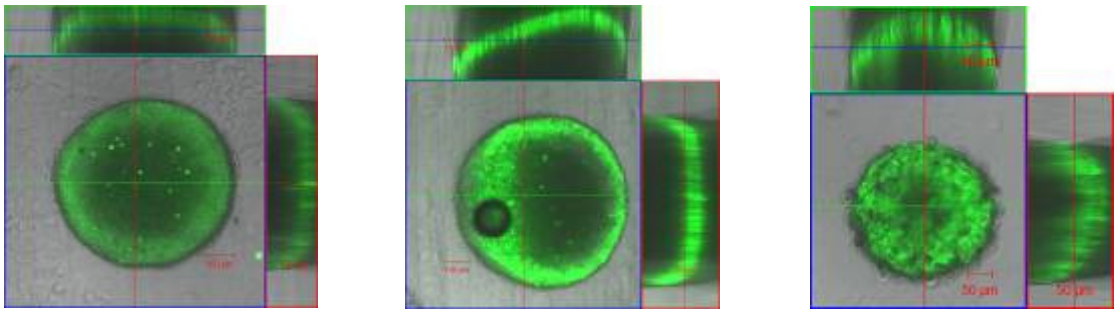
A drug delivery system can be created by the DNA molecules containing the specific aptamer targeted to cancer cells. This system can also act as a DNA vaccine if the system contains genes encoding an antigen of the cancer cells. Encapsulation efficiency of nanocomplexes containing specific aptamer reached 97% for Curcumin and 87% for Docetaxel. Docetaxel in the complex of DNA–Docetaxel has the ability to kill cancer cells in the slow drug release mechanism

On multifunctional nano systems combining Paclitaxel and Curcumin



(a) (b) (c) (d)

Fluorescence microscopy images of control cells (a), cells treated with: CUR (b), PTX (c) and (PTX+CUR) nanoparticles (d).



(a) (b) (c)

The autofluorescence of Curcumin and the morphology of MCF7 spheroids changed under the treatment with CUR (a), CUR nanoparticles (b) and (PTX+CUR) nanoparticles (c).

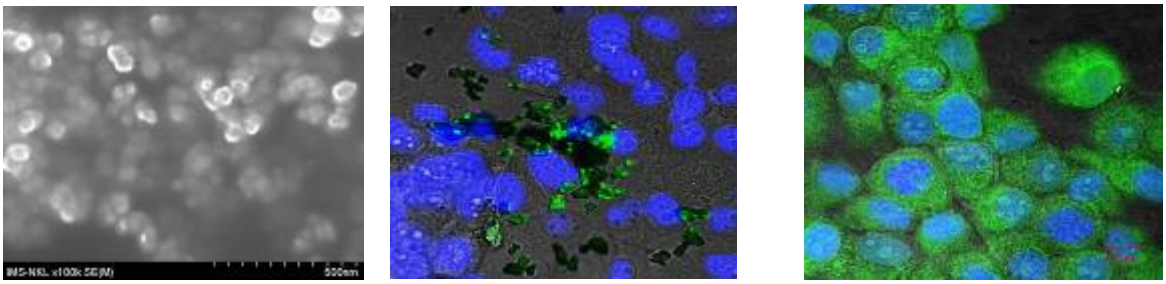
Paclitaxel and its anti-cancer effect have long been widely applied in cancer chemotherapy, but not without considerable side-effects to the patients. Paclitaxel has been combined with many other anticancer drugs to alter its pharmacokinetics, enhance its efficiency and reduce the side effect. Recently, the additive including Curcumin, which is known for its anti-oxidant and anti-inflammatory effect, now add to the list of anti-cancer and chemo-preventive activity. Here we present a novel combination of Paclitaxel and Curcumin-loaded PLA-TPGS nanoparticles (PTX+CUR)-PLA-TPGS prepared by a modified solvent extraction/evaporation technique. The characteristics of the nanoparticles (PTX+CUR)-PLA-TPGS such as surface morphology, size distribution, zeta potential, solubility were investigated in vitro. The obtained spherical nanoparticles were negatively charged with a zeta potential of about −30 mV with the size around 50 nm and a narrow size distribution. This combination of Paclitaxel and Curcumin gave a higher efficiency of both drugs in cytotoxicity, induced apoptosis and effect on cell cycles of KPL4

cell line in compare with the use of Paclitaxel or Curcumin nanoparticles. Furthermore, (PTX+CUR)-PLA-TPGS nanoparticles exhibited a powerful ability in preventing MCF7 spheroids growth/regrowth. Interestingly, Curcumin also functioned as both a drug and a label. Base on the autoflouresecen of Curcumin, the absorption of (PTX+CUR)-PLA-TPGS nanoparticles into MCF7 spheroids could be followed and calculated. These results suggest that the nanoparticle-drug combination may provide a promising multifunctional delivery system for anticancer drugs.

On investigation and application of Nano Curcumin

Turmeric (*Curcuma longa*) is extensively used as a spice, food preservative and coloring material in India, China, Vietnam and South East Asia. It has been used in traditional medicine as a household remedy for various diseases. Curcumin, the main yellow bioactive component of turmeric, extracted from *Curcuma longa,* has been shown to have a wide spectrum of biological actions that includes anticancer, antiulcer anti-inflammatory, antioxidant, anticarcinogenic, antimutagenic, anticoagulant, antidiabetic, antibacterial, antifungal, antiviral, hypotensive and hypocholesteremic activities. Unfortunately, the compound has poor aqueous solubility, which results in poor bioavailability following high doses by oral administration. To improve the solubility of curcumin, a lot of curcumin micro-and/or nanoparticle systems, such as polymer nanoparticles, polymeric micelles, liposome /phospholipid, nanoemulsions, nanogels and polymer conjugates have been intensively investigated and developed.

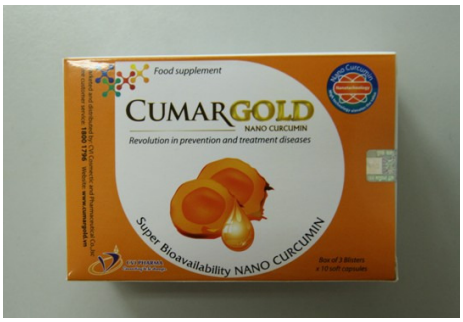
Recently, the curcumin nanoparticle system has been successfully developed by a polymer micelle technique. At the present moment, nano curcumin is being manufactured at the pilot scale under the trade name Curmanano. Curmanano has a reduced particle size of 50-70nm, good water solubility and a much higher absorption capacity (bioavailability) compared with curcumin powder. It is well established that Curmanano can induce apoptosis or cell cycle arrest in human cancer cell lines, including gastric, lung (H1299), pancreatic and breast carcinoma cells (MCF7). Consequently, it is suggested that Curmanano could help improve the bioavailability of curcumin and lower its dosage.



a) b) c)

SEM image of polymer micelles-nanocurcumins a); Fluorescence microscope image of polymer micelles: without b) and with curcumin c)

Owing to its valuable properties, some of the pharmaceutical companies in Vietnam have already been producing various nanocurcumin products in the form of capsules, creams and coloring agents that are warmly welcomed by consumers.



Useful products from nanocurcumins

On electromagnetic radiation shielding composite materials using carbon nanotube

Composite materials based on carbon nanotubes (CNT) filled Epoxy, Polyurethane (PU) and Polymethylmethacrylate (PMMA) resins for the protection of large areas from electromagnetic radiation (EMR) investigated and manufactured. They offer best shielding qualities for protection against high-frequency radiation and (or) against low-frequency electric fields.

Effect of CNTs loading on electromagnetic shielding properties of Epoxy/CNT composite and PU/CNTs at 8-12 GHz band was about 23-24 dB, equating to a shielding ability of more than 99%. Typical areas of application are living areas or the protection of whole buildings. Modified-CNT filled polymethylmethacrylate have an electromagnetic shielding effect of about 55 dB at 8 -12 GHz band, a shielding ability of more than 99.999 %. It can be applied to prevent signal trans-receiving of eavesdropping devices.

The materials fabricated can be applied on following purposes:

- Shielding electromagnetic fields emitted by high voltage electrical equipments (painting walls, bulkheads).

- Shielding electromagnetic fields caused by radio stations, television stations and cells phones (BTS) (painting outside or inside of the walls of housing).

- Shielding electromagnetic fields caused by radar stations (painting the walls of working rooms and housing).

2.5. Biodiversity and Biological active substances

The Institute of Ecology and Biological Resource:

- The state independent Project “Investigation and Evaluation on the threatened animals and plants, which should be protected with priority in order to fulfill the Vietnamese Redbook”: Investigations in 14 National Parks and Natural Reservations have been carried out. The information documents for 1,167 animal and plant species, among them 517 plant and 650 animal species, have been established. 600 photos and 100 designs were collected. The map for 920 animal species which are threatened and should be protected, was completed.

The Institute published 54 new species in general, 2 new genera and 37 new species for Vietnam including the higher plants, animals and insects.

In cooperation with the Korea Research Institute of Bioscience and Biotechnology (KRIBB) two patents are registered: WO 2013/002532 A2 "Anti-age constituents containing in the extract of *Mastixia arborea* C.B.Clarke" and WO 2012/177081 A2 "Pharmaceutical contituents for protection and treatment of inflammatory containing the extract of *Ardisia tinctoria"*.

Mastixia arborea C.B.Clarke *Ardisia tinctoria Pit.*

The Institute of Marine Biochemistry gathered interesting results from the state project "Investigation on Isolation procedure of substances with cytotoxic activity, anti-inflammatory and antibacterial activity from some species of Asteroidea, Holothuroidea (Echinodermata) in the Vietnamese sea".

- From the *Asterina batheri*, *Astropecten polyacanthus* eight new compounds have been isolated which are very active against the blood cancer cell-line HL-60, inhibite the IL-12 p40, IL-6 and TNF-α.

12 new compounds with interesting structures from three species: *A.monacanthus, A.polyacanthus anf A.batheri* have been isolated.

Institute of Natural Product Chemistry received a certificate for two functional foods based on the scientific cooperation with Korea. The functional food GLYCOMIS with murrayafolin A as active principle, is extracted from Vietnamese plants. GLYCOMIS is used for health improvement of the heart and to support the treatment of diseases relating to the heart. The functional food

BALVASO with chrysosplenol C as active ingredient is used in protection of the brain blood catastrophe, heart failure and high blood cholesterol level.

The functional food GLYCOMIS with murrayafolin A as active principle, which is extracted from Vietnamese plants. GLYCOMIS is used for health improvement of the heart.

The Institute of Chemistry is applying the results of research on the anti-immune active substances from *Artocarpus tonkinensis*, which have been obtained through the scientific works of many years with the cooperation of scientists in Perugia University, Italy. The *Artocarpus* product (REGIMUNE) is now in clinical study against Arthritis and Luput. The TUE LINH pharmaceutical company financed the cost of the clinical study.

The micell polymer technic nano-curcumin with the trade name CURMANANO was prepared. CURMANANO has good solubility in water, its bioavailability and cytotoxicity on some human cancer cell lines are much higher than that of normal curcumin. Some pharmaceutical companies prepared curmanano into different products, which have been primarily evaluated by the users as good.

2.6. Earth Sciences

Scientific activity report 2013 of the Earth Science Sector includes the results of execution of all science and technology tasks of the Institute of Geological Sciences, Institute of Geography, Institute of Geophysics, and Ho Chi Minh City Institute of Resource Geography.

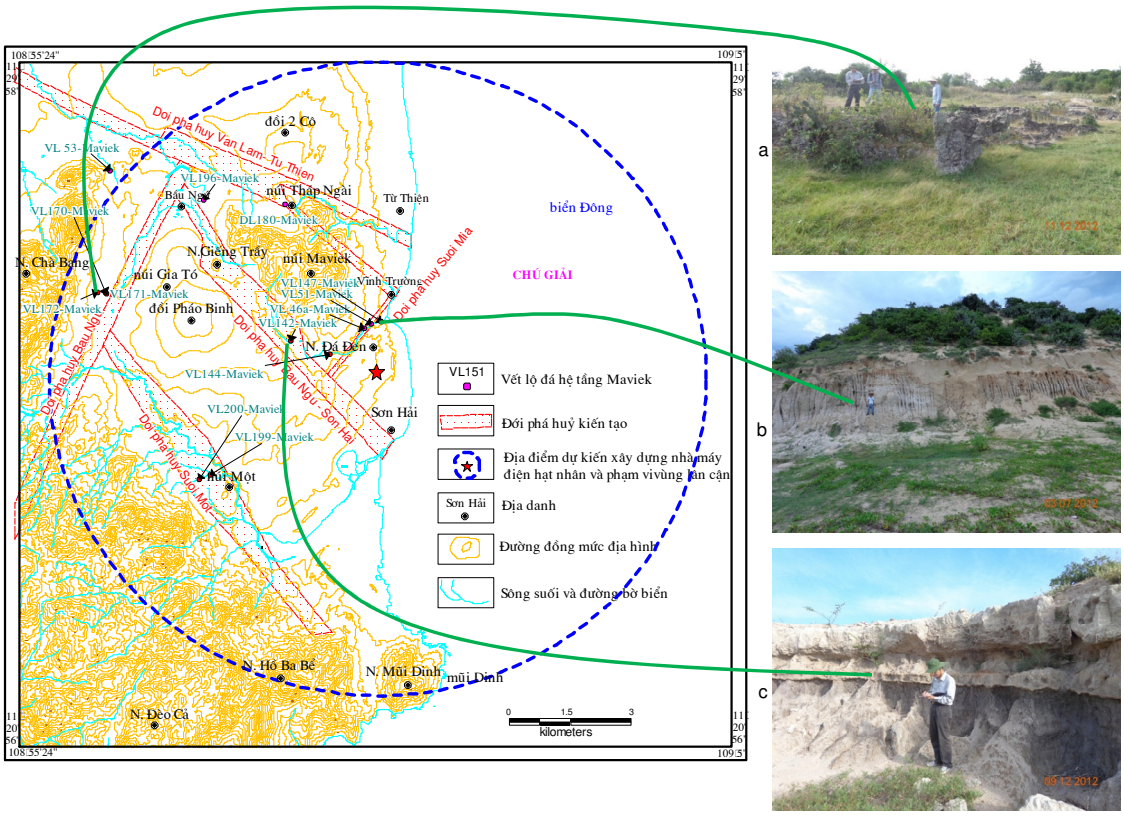
In 2013, Institute of Geological Sciences, Institute of Geography, Institute of Geophysics, and Ho Chi Minh City Institute of Resource Geography completed the successful implementation of 13 state – level research projects (3 international cooperation research projects under the Protocol, 3 independent research projects , and 7 basic research projects funded by National Foundation for Science and Technology Development (NAFOSTED)). There are also 10 scientific research projects of Vietnam Academy of Science and Technology (7 earth science projects, 2 ministerial-level projects and 1 independent project), and 5 cooperating projects with a number of provinces. In addition, specialized Institutes in the field of Earth Sciences have completed a lot of foundation level threads as well as the tasks of science and technology belonging to ministries, agencies and local-level which is participated or chaired by the scientists of VAST.

Moreover, there are also many Scientific - Technology for the State threads funded by the Government in 2013, as well as scientific research projects of Vietnam Academy of Science and Technology that were accepted to be undertaken in the period of 2011–2015. In 2013, the Institute of Earth Sciences was also

continuing 32 state – level research projects, including 19 projects belonging to the Tay Nguyen 3 Program, KC 08/11-15 Program and Space Science-Technology Program; four international cooperation projects; three independent projects; one basic research project following application deployment of scientific program; five basic research projects by NAFOSTED. At the same time there are also 21 scientific research projects of VAST, including five projects belonging to Earth Science Discipline, three basic research projects, six tasks for provinces, four independent projects of young scientists and three projects cooperated with provinces. Additionally, there are many research projects belonging to basic – level that are complimented by young scientific groups.

Reseach on natural disaster prevention and mitigation

A group of Projects approved by the Ministry of Science and Technology which research and assess the active fault, tectonic movement gradient in Late Pleistocene and modern time, and earthquake and tsunami risk in the area planned for Ninh Thuan nuclear power plants, are important tasks which are completed 1 year after deployment by the Institute of Geological Sciences and Institute of Geophysics. Results of applying the geological survey (including GPS measurement), geophysical and geochemical methods showed that the planned area is located in a relatively stable tectonic region and without clear evidence of active fault. These results form the scientific basis for the authorities to consider the expert documentations of Japanese and Russian partners before deciding the location of the two first nuclear power plants in Vietnam.



Research tectonic deformation in Maviek Formation (Pliocene age) in the vicinity of the planning location of the nuclear power factory in Ninh Thuan 1

Research into the impact of tectonic seismic activity on the stability of Song Tranh 2 Hydropower Dam in Bac Tra My district, Quang Nam province is a very important topic carried out by the Institute of Geophysics in cooperation with the Institute of Geological Sciences. The construction and installation of 10 earthquake observation stations in Bac Tra My and surrounding areas has been completed, with these stations in regular operation, from which 9 stations transfer the recorded data in real time to the receiving and processing earthquake data center in Ha Noi. This is the first very necessary database for detailed evaluation of the risk of earthquakes in Bac Tra My area and earthquakes relating to water storage of Song Tranh 2 Hydropower basin (lake). There must be effective solutions to prevent, avoid and mitigate related disasters.

Studies on the geo-disasters such as crack-subsidence, landslides, flashfloods, mudstone floods, and river-coastal landslides in Tay Nguyen provinces and other important events affecting the economics and welfare of people, including regions of hydropower dams (Project TN3/T04; TN3/T06) and Central Coastal provinces as Quang Ngai, Thua Thien-Hue (Projects VAST 2012 -2013) and the change of coastline in Cuu Long River Delta (Ho Chi Minh City Institute of Resource Geography) formed new databases for establishing risk maps of these disasters, and contributing to the orientation to use territory reasonably. Particularly, the research in evaluation of subsidence-landslide causes in Di Linh district (Lam Dong province) helped local residents develop an effective solution to prevent disasters and stabilize life and production of the local people.

The application of new approachability in the research of flood and drought in Tay Nguyen (Project TN3/T02), and drought in Red River Delta (Project KC08.10/11-15) allowed the status to be determined more clearly and forecast the variation of droughts in the above regions relating to climate changes in the future to find effective preventative solutions.

Research on Rational Utilization of Natural Resources

For the first time in Viet Nam, research in evaluation of mineral resource position in Tay Nguyen was undertaken by applying the cost-benefit analysis as well as socio-economic and environmental factors. The results of evaluation for each mineral type and mineral resource of the Tay Nguyen area, in general, are the important quantitative scientific basis for making the decision to develop a mining industry in Tay Nguyen in the present and in the future (Project TN3/T05)

Studies in evaluation of Indium's prospect and accompanied rare elements (Se, Te, Ta, Nb) in Sn deposits in Viet Nam and in-extractive technology (Project ĐTĐL.2011/T/22), as well as the prospect of invisible gold in gold and gold-bearing sulfide ores in East territory of Vietnam and Au-extractive technology (Project KC08.14/11-15) is a new development of VAST research in discovering new mineral resources for the country. The research results confirm the precence of these ore-types and its prospect. This is very important new data that extents and implements the potential of rare ore-minerals in Vietnam.

It is the first time in Viet Nam this research has been deployed effectively to determine the depth and scale of the thermal basin in Quang Binh (KC08-16/11-15) which has the exploring prospect and can be used as a renewable resource.

The project "Study on degradation, desertification in Tay Nguyen and proposing solution for sustainable land use" (TN3/T01), with the identification of six land degradation processes and the evaluation of desertification, a set of criteria including indicators and technical processes of map construction for land degradation in provinces at a scale of 1:100,000 and in regions at scale 1:250,000 serves for the reasonable use of land and prevention of desertification in Tay Nguyen. The desertification study was also caried out in coastal provinces such as Binh Thuan (VAST project). The results show that desertification has become a real risk that has strongly impacted on socio-economic devolopment in Viet Nam.

The detailed analysis of contradition in using water resource in Tay Nguyen (TN3/T02) opened a new approach for gradual solution of drought in dry season and flood in the rainy season in Tay Nguyen.

Research on Environmental Protection

A study on the solution of problems by finite element method (two problems) gave warnings of environment change caused by exploiting browncoallignite in the Red River Delta and proposed methods to mitigate subsidence and damage of subsidence during and after exploitation (VAST Project). Research results are the scientific basis for authorities to consider the dis-advantage of browncoal exploitation in the Red River Delta.

The results of the study on technological process for producing absorbable materials for heavy metals (Cu,Pb,Zn and Cd) from waste-sludge in Binh Minh and Khe Cham coal-mines indicate that it can be used for treatment of heavy metals in polluted water (Project VAST05.04/12-13).

International cooperation under the Protocol

This is the first time VAST has carried out scientific research of Earth science beyond the territory of Viet Nam, namely in the territory of Laos with two projects:

Research in establishment of risk maps of some natural disasters in Laos (Institute of Geological Sciences – VAST): established two earthquake and landslide zoning maps, two earthquake and landslide risk maps at scale 1:1,000,000, two maps for reasonable land-use at scale 1:1,000,000 and two landslide-risk zoning maps for two key areas at scale 1:500,000. In addition, the project also trained Lao scientific staff for natural disaster management and helped them establish a scientific basis for disaster management.

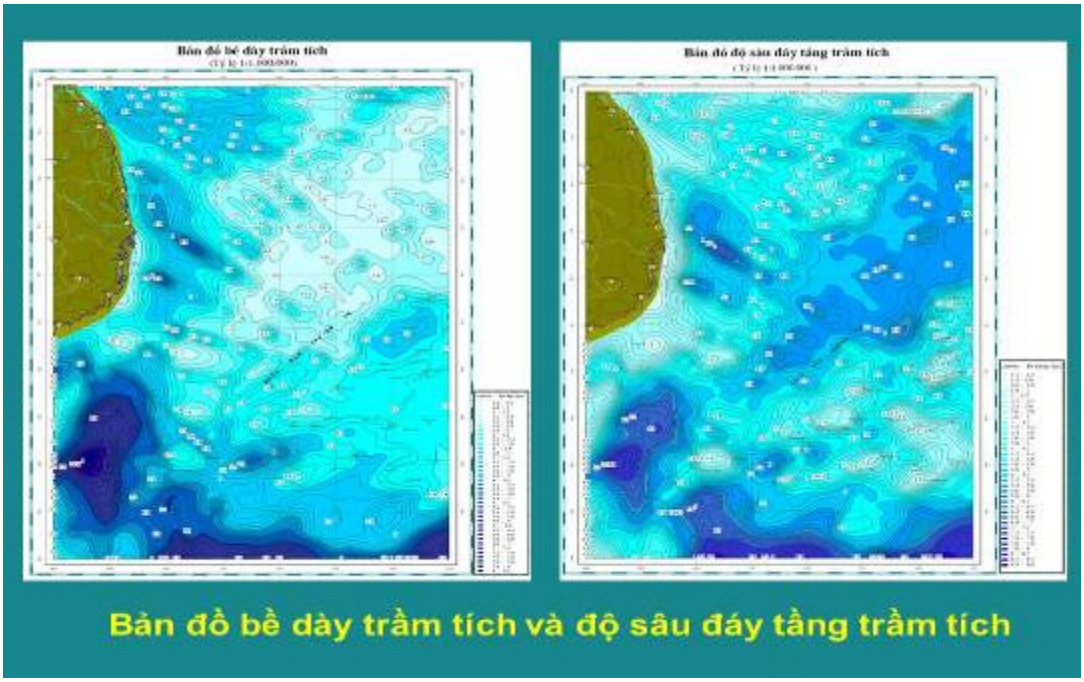
Establish GIS database of natural conditions, social-economic, natural resource and environment serve sustainable development in Savanakhet province, Laos (Institute of Geography - VAST): in addition to the scientific results, the project also trained some Lao experts to use GIS technology for management of natural resource, environment and socio-economics.

2.7. Marine Science and Technology

In 2013, there were seven projects completed, checked and taken over, six subjects summarized, five on-going projects, and a series of other annual activities. The completed projects have achieved their planned targets along with products of science and practice. Here are some of the main achievements.

The research project "To assess the accumulation of toxic pollutant in some special organisms at the tidal flat in the Northeast of Vietnam in order to propose preventable solutions for the toxic accumulation in the human body" showed the figures of toxic accumulation level (Hg, As, PCBs) in valuable species that live in the intertidal region of northern Northeast, and published new data on bioaccumulation factor of main species such as devotees, bored, oysters and proud. It also assesses the level of food safety in the groups of organisms and proposed the safe way to use these as a specialty of daily food by ensuring no accumulation of both drug toxicity food chain and animal models clean.

The research project "Research some ecological characteristics of microbial communities (viruses, bacteria and algae) on coral along the coast of islands in Northern Vietnam to assess the health and propose solutions to sustainable development of coral reef ecosystem" has gained a series of new and synchronised research results of viruses, bacteria and algae. It has identified the current state of fluctuation distribution and spatial density of bacteria, viruses and micro total symbiotic algae on the environment mucus of 19 species of coral and water around Cat Ba Island and Long Chau, and studied the community structure of bacteria, viruses, micro-algae, corals and the symbiotic relationships among them. It was successful in characterizing the fluctuations of healthy and sick communities of bacteria, viruses and micro-algae on coral species. Based on these research results, proposed measures in order to assess coral health were developed and contributed to the sustainable development of coral ecosystems.



The research project "Assessing the environmental capacity of the south-central coastal waters of Vietnam" perfected the methodology and application of environmental assessment capacity for two watersheds: Nha Phu lagoon - Binh Cang Bay and Thuy Trieu lagoon - Cam Ranh Bay and proposed management solutions to protect these watersheds.

The research project "Study to verify the rule of distribution, structure and thickness of sediment on the Vietnam continental shelf and adjacent area based on geophysics data (according to the newest data obtained in 2007-2009 on the East Sea)" has assessed the driven depth of bottom sediments, sediment thickness with a rate of 1:1,000,000 billion on study areas. It also constructed low-density, high and medium maps with a rate of 1:1,000,000 and developed functions according to the geophysical data, as well as provided oriented information about structure with oil and gas potential (the maps are posted in the previous page).

The research project "Study pollution levels of heavy metals (HM) in coastal marine sediments around the Mekong Delta to serve sustainable development" has analyzed more than 100 sediment samples with the results of the heavy metal content (Cu, Pb, Zn, Cd, Cr, As), carbonate content, TOC, radioactive isotopes ^{210}Pb, ^{137}Cs., and constructed the distribution diagram of heavy metals, transport direction, spread and volume convergence of polluted coastal areas in the Mekong delta. Based on the results of activity measurements of radioactive isotopes ^{210}Pb, ^{137}Cs in a sample column, it initially calculated a sedimentation rate of sampling to generate about 0.33 cm/year.

The research project "Calculation, design, renovate water tanks for the DKI work of Truong Sa islands" has summarized the survey data on fluctuations of DKI works, studying and searching for technological solutions to reduce fluctuations of the DKI works to keep water in the rainy and storm season, making two unitary device dissipation fluid power and engineering drawings for water allocation for renovation works DKI_16. While conducting the experiment, it aimed to measure the fluctuations using digital cameras combined with image processing. The most important thing was the improvement of the DKI hanging tank without removing the hook from the tank, the improvement process for the hanging tank was simple and convenient to carry out.

The research project "To develop and perfect the model forecasting storm and tidal surges to the waters of Vietnam" has developed the algorithms to use finite difference methods on irregular grids for a shallow water equation. The project built and packaged software WST12 for calculations to forecast tides, storm surges and river water, and use nets that are not applicable for the calculation details and coastal waters in general. The project updated the data of water levels on topography, shoreline and empty hours at coastal stations and storm in the waters of Nam Dinh, the software WST 2 was also applied to assess the impact of storm surges and high waves on the waters of Nam Dinh, calculate the number of plans and show a number of features of general water levels (tide + storm surge) and waves in stormy periods in the waters of Nam Dinh.

One of the regular tasks is to observe the coastal environment; this task has been carried out regularly for more than 10 years by the Institute of Marine Resources & Environment, Institute of Mechanics, and Institute of Oceanography. In order to have a reliable data set, the Institutes have agreed to use a monitoring method such as data collection, sample analysis, observation time. From north to south, there are monitoring stations: Tra Co, Luc, Son, Cua Lo, Gap Width, Thuan An, Da Nang, Dung Quat, Sa Huynh, Quy Nhon, Nha Trang, Vung Tau, Rach Gia. The observed areas include environment monitoring and water quality, the environment and sediment quality, and biological environment with changing parameters measured from 30 to 36 depending on the annual funds. The time of observation should be in April-May and September-October of the year. So far the marine environmental data of Vietnam in 2012 has been issued and used.

In 2013, five projects at branch level and two projects at Institute level are going to be summarized. The assignment and tectonic characteristics of deepwater areas in West and Southwest of East Sea deep structures identified by Kainojoi sediments, mapping the distribution of basalt is one project. The study of fossil hydro dynamic of Co To - Vinh Thuc has established a range of flow, high of wave, average fossil dynamics of season at the rate of 1:200.000 based on the model MIKE 21.

The research project on the coastal sand Northeast gave solutions to promote the use and value of all sand tourism and protection of the natural landscape and environment. The project studied the nature of circulation along some islands on the Gulf Island of North Korea, the accounting tools and specialized software has been used to determine the nature and perfect circulation model building methods of propagation material polluting waters around the Island.

The research project on the biodiversity and bioactive compounds of Hai mien in Con Co Island has determined the structure of the four isolated compounds from Hai mien, the analysis of genetic diversity at the molecular level and assessment of bioactive compounds that isolated according to the oriented antioxidant, antimicrobial and cytotoxic. The project assesses the accumulation of heavy metals in some organisms to identify organisms for environmental monitoring of heavy metals that were analyzed in four species and being selected as monitoring species for the environmental monitoring system.

In order to carry out the resolutions of the committee, the Second National Marine Geology Conference was held in October 2013. There was a participation of 205 delegates and scientists from 37 Geological agencies, units of geological investigations in the country. There were 19 scientists from four countries; Germany, Russia, France and South Korea. The conference published a collection of works with 91 articles, 1,108 pages, published by the Publish House for Science and Technology ISBN number 978-604-913-134.9. There were three sub-committees in the conference, 25 presented reports and 21 poster presentation reports. There were more than 30 conference participants who participated in the field trip in Quang Ninh for 2 days. The Conference evaluated the outstanding achievements of Marine Geology in Vietnam after the first conference (2008), to evaluate the existing marine geological research and discuss the future direction of

the investigation and research to the year 2020. The agreed orientation in the Conference, hopefully, was the basis for building geological tasks by MOST in the KC09/16-20 program, the Ministry of Natural Resources and Environment constructed the task of Article 47, and set directions for Vietnam Academy of Science and Technology, and Petro Vietnam Corporation to build the science missions for the coming years.

Asso. Prof. Phạm Huy Tiến, Chairman of Marine Science and Technology Committee, VAST delivering an opening speech at the Conference

2.8. Environmental technology and energy

In 2013, the environment and energy division carried out nine projects in which four are transitional and the other five are new openings. The total budget is 3,500 million VND, 1,250 million VND for transitional projects and 2,250 million VND for new ones. All projects were chaired and operated properly according to the plan. Here are a few results:

1. Completed and finished the production technology of materials – catalyst nanocomposite Fe/MgO, $Fe_2O_3.H_2O$ on bentonite carrier to be utilized as material to remove H_2S cleaning biogas aiming to replace foreign-imported equipment and materials. Have successfully built dry technology models for design, manufacture and installation of H_2S processing system at pilot level.

2. Completed the isotope dilution method to assess the pollution level of toxic heavy metals in children's food.

3. Researched, calculated design, built and installed model and assessed the treatment efficiency of COD, BOD, SS, T-N, T-P, coliform in domestic and industrial wastewater which is rich in nitrogen and proposed some appropriate technologies to treat N-rich wastewater using membrane bioreactor.

4. Researched to propose and issue the draft of the technical standards for power stations using renewable energy to connect to the national power grid including power station of solar power generation, power station generators using wind power with small and medium capacity, power station hybrid generator using

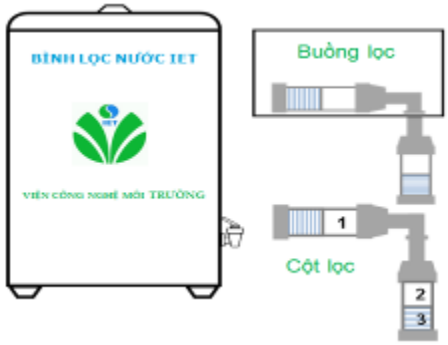
wind power with small and medium capacity, power station generator using biogas energy, biomass and other renewable energy sources.

5. Established sampling procedures and analysis of dissolved organic compounds by high resolution mass spectrometry (FT-ICR-MS) and nuclear magnetic resonance (NMR). Combining survey tool GEM to evaluate origins of pollutants in the water of the Red River upstream to propose solutions and directions to overcome limitations of long-term contamination.

6. Collected, surveyed and added data on Cau river water quality and built two climate change scenarios B1 and B2. Modified GIBSI model for the data from the years 2009-2012 and ran the model for scenario B1.

7. Researched and established the analysis procedure, constructed probing sensors and accessories to detect trace level of Hg in the environment setting the stage for the manufacture of devices to satisfy the practical application in domestic demand.

Sagi Bio thermophilic microorganism product



IET water filter using nanofiltration technology

8. Researched and established the analysis procedure for simultaneous determination of As(III), As(V), mono-methylarsonic acid (MMA) and dimethyl-arsonic acid (DMA) in well water, urine by HPLC-ICP -MS contributing to the research of decreasing the toxic effect of arsenic in groundwater in Vietnam.

9. Researched and evaluated the drying equipment using solar radiation energy and heat pipe to independently separate flows; calculated design and built the hot air supply system model from the solar radiation energy.

Moreover, the Project "Manufacturing technology development and application of nanocomposite materials to treat contaminated water in areas of flood water into domestic water at the household scale" have built IET water filters using advanced nanofiltration technology which enables 100% removal of bacteria, viruses, toxic organic compounds, heavy metals, ammonium. The outlet water met the quality standards QCVN 02: 2009/BYT.

Sagi Bio thermophilic microorganism was transferred from Institute of Environmental Technology to the Sagi Construction and Environment Technology Limited Liability Company for production and business.

3. Technology Applications and Deployment

3.1. The policy to strengthen the application, implementation, transfer technology and commercialization of the products of science and technology

Construction Project of Laboratory Drug Chemistry - Pilot pharmacy chemicals in the framework of cooperation with the People's Committee of Ho Chi Minh City and National of Pharmaceutical Chemistry Program. Currently the project has been approved by the Government.

Build the Regulation of Application and Development Technology Fund of VAST. Currently the Regulation has been built, and it has been submitted to be approved.

Joint construction project "Vietnam Inclusive Innovation Project" by the Ministry of Planning and Investment.

Signed an agreement with Quang Tri, Dong Nai, Thua Thien Hue, Quang Ninh province and Bi Dup-Nui Ba National Park.

Working with the provinces to develop programs to sign the cooperation of second stage: Ho Chi Minh City, Hai Phong, Bac Giang, Dak Nong province.

Working with Dak Nong province; at a meeting the sides exchanged around the issue of applying the results of scientific research to promote social and economic development of Dak Nong province to ensure faster, more efficient and more sustainable development.

Working with the Hanoi People's Committee, Ho Chi Minh City and Ba Ria - Vung Tau province on solid waste processing. Project coordination undertaken by Hyundai Group and Halla Group, Korea.

Joined delegation working group with the University of Paris Sud about pharmacy chemistry.

Working with the Department of the U.S. Geological Survey, the two sides agreed to develop cooperation about Remote Sensing and GIS applications in sustainable development of economic society in Vietnam. In this phase two sides will focus on: 1) "Building information systems for environmental monitoring Ba Che district of Quang Ninh province in order to sustainably develop pharmacy materials" and 2) “Application of remote sensing and information technology to monitor the environmental resources of coastal Quang Ninh".

Working with the American Museum of Natural History, New York Botanical Garden on the development project on the use of biological resources to serve socio-economic development. The two sides agreed to develop projects: 1) Study and formulate breeding processes, develop herbal medicinal plants resource in Ba Che district, Quang Ninh, 2) develop a formulate planting, growth and caring nursery for the medicinal plant for Vietnam.

Exchange of information, agreed working principles as well as strengthening and promoting scientific cooperation with the cooperating Provinces.

3.2. The cooperation project in level VAST

Continue to carry out the cooperation project with the Ministries and Provinces: Continue 12 projects; Open 13 new projects; Open 3 new technological applications ordered project.

Pilot production project: Continuous five projects; Start eight new projects.

Assessment of the projects finished in 2012: Completed assessment for 4/6 of the subjects ended in 2012; preparation of assessment for two projects.

There are 13 provinces which VAST cooperates with to carry out the project: Đien Bien, Lao Cai, Phu Thọ, Thai Binh, Hai Phong, Ha Tinh, Quang Tri, Đa Nang, Quang Nam, Thanh pho Ho Chi Minh, Đong Thap, Tra Vinh, Ben Tre, and Dong Nai.

Midterm evaluation: total of 12 projects were evaluated, including financial assessment.

Overall Assessment

The cooperation project has been evaluated with good results, and was highly appreciated from Provinces.

Continued development topics into Pilot production project in collaboration with the General Technical Department - Ministry of Police, Institute of Biotechnology. Application of sperm conservation technology and artificial insemination to produce professional police dogs. Began producing herd dogs by artificial methods, the quality as high as natural method. Storing frozen sperm resources to expand production.

The majority of projects are carried out on schedule and content follows the approved proposal.

Results of the implementation of some pilot production projects has been done to applications into products.

Some intitutions have actively transferred research results to business and get profits from the commercerlization of scientific and technological results. Nha Trang Institute of Technology Research and Application gained nearly 150 million profit from the transfer of the management products FUCUDAN.

In general, the projects that cooperate with ministries and Provinces have been created from actual urgent needs of the local community so these projects have been widely applicated, highly applicable and have a real contribution to the economic development of the local society.

In 2013 VAST handed over the results of projects including:

Manufacture and delivery of modern systems of infrared laser equipment to serve research and training in optics and laser weapons for Military Technical Academy. It is the product of a scientific and technological project of VAST.

Production and complete process technology of creation of the composite materials PE/gypsum to produce hard plastic tube. Denatured the Gypsum by stearic

acid (GbtAs) and PE-g-acrylic acid (GbtAA) on high-speed mixing equipment. Project in collaboration with a company to produce and consume more than 80,000 meters of PE / gypsum twisted tendon rigid pipe. Revenue reached 2.2 billion.

Pilot production of high performance lighting products based on applications of effective technology power coefficient correction (PFC), super bright (LED) technology and technology of automatic adjustment of power use (dimming). Provide 14,236 system of high performance T8 fluorescent for 1,200 classrooms in 150 schools of Thai Binh province. This is the aim of National Programme for Energy Saving

In 2013, The Department of Application and Development Technology operated, developed and provided the transfer of 21 processes of technology, and technology products to market. This included two products from the Institute of Environment and Technology, one process from Institute of Marine Biochemistry; five from Institute of Natural Products Chemistry; one from Nha Trang Institute of Technology Research and Application; one from Institute of Mechanics, three from Institute of Applied Mechanics and Informatics; three from Centre for High Technology development, one from Institute of marine geology and Geophysics; one from Vietnam National Satellite Center; two from Institute of Information Technology and one from Institute of Materials Science. Those are the processes of technological, scientific products of the project of VAST.

3.3. National pilot production project:

There are three projects that have been carried out under the Institute of Biotechnology, Institute of Natural Products Chemistry and Institute of Environmental Technology, with a total budget for the three projects of 4,800 million.

3.4. Technology contracts and Technology transfer contracts

In 2013, the institutions of VAST signed a technological contract with a total budget of 229,962 million, the budget of 2013 is 116,789 million. The institution with highest budgets were: Institute of Environmental Technology (43,575 million), Institute of Energy Sciences (12,048 million) andInstitute for Materials Science (5,912 million) which are the institutions always leading highest contract budget in recent years.

3.5. Promoting the application and development technology

Construction of a database of 100 products of science and technology for commercialization, to upload on the website of VAST for widespread introduction of products to facilitate potential customers.

Joined the Techmart Demo of Red River delta in Thai Binh Province on 15 to 17 August 2013. There were three institutes participating: Institute of Environment and Technology, Centre for High Technology development and Institute of Chemistry.

Joined techmart of Tay Nguyen area in Dak Nong province. VAST participated with 17 booths of 9 institutions: Institute of Environmental

Technology, Institute of Geology, Ho Chi Minh city Institute of Resources Geography, Ho Chi Minh city Institute of Physics, Publishing house for Sciences Technology, Institute of Tropical Biology, JSC Biotechnology, Institute of Applied Physics and Scientific Instrument, Tay Nguyen 3 Program, and three booths of VAST to show a general introduction.

Ministry of Science and Technology has published a Catalogue about 1,302 equipment, software solutions, services and products which could transferred to companies. VAST has 152 technologies including: Institute of Environment Technology (28 technologies); Institute for Information Technology (29); Institute of Oceanography (6); Institute of Chemical (30); Institute Energy Science (10); Ho Chi Minh city Institute of Applied Material science (16); Tropical Biology (25); Ho Chi Minh city Institute of Physics (8), Institute of Ecology and Biological Resources (4); Institute of Applied Informatics and Mechanics (36).

Joined techmart Demo for economic development in the Mekong River Delta in Vinh Long. The participating institutes were: Institute of Chemical Technology, Institute of Environment Technology; Ho Chi Minh city Institute of Resources Geography, Institute of Applied Mechnics and Informatics, Institute of Tropical Biology, Joint Stock Company of biotechnology and VAST.

Sampling and analysis of Molecular Genetics at the request of the Soc Trang provincial court on disputes of a cow. This task was resolved in 2 weeks. Based on result of molecular genetics, it has identified the genetic relationship of the cows, and sent this information to court of Soc Trang.

During November 2013, the Institute of Geophysics recorded and provided information about a mild earthquake in Dak Krong district, Quang Tri province. The information provided assurance for local people in the district.

Working on scientific and technological applications to promote socio-economic development of the provinces of Dien Bien, Cao Bang and Quang Ninh.

Working with the provinces to develop programs to sign the cooperation of second stage: Ho Chi Minh City, Hai Phong, Bac Giang, Dak Nong province.

Working with the Ministry of Defense about the possibility of cooperation in science and technology between the two agencies. At the meeting, both sides reviewed the collaboration research between VAST and Ministry of Defense, and drew a new prospect route for the future.

3.6. Intellectual property

In 2013, the number of registrations for Intellectual Property of VAST Institute increased in both quantity and quality. There were seven patents of inventions or utility solutions, six have been published.

Attending advanced training "intellectual property management and technology commercialization" in the Law-University of California, Davis, USA sponsored by the United Nations.

To promote the work of intellectual property, VAST has proposed a model of developed intellectual property of VAST.

4. Education and training activities

4.1. Results of postgraduate training achieved in 2013

VAST is the leading Institution for science and technology, and has an important role in scientific and technological development in Vietnam. VAST has many high qualified staff of science and technology including 44 Prof., 161 Associate Prof., 35 Doctor of Science, 706 PhD and modern facilities for experimental activity. Annually, VAST provides many master and doctoral degrees for students who are qualified for the industrialization and modernization of the country.

In 2013, VAST had 19 Institutes engaged in postgraduate courses. The number of students participating in doctoral courses increased by 16 % compared with 454 in 2012 and 353 students participated in master courses, an increase of 31% compared to 2012. More than 80 PhD thesis were completed and 29 textbooks were compiled for doctoral training.

All Institutes participating in postgraduate courses are implemented seriously following the education regulation of the Institute and the Ministry of Education and Training in the stage of admission, examination, training procedures and giving the Diploma. The training of VAST is always associated with scientific research. The PhD and MSc graduate students will meet the demands of practice. VAST has four specialized research institutes like Institute of Mathematics, Institute of Physics, Institute of Geography and Institute of Materials Science which were accepted by Ministry of Education and Training to implement the Program, namely "Training qualified teacher for the university colleges for 2010-2020 ", the total number of PhD students employed under this Program was 10 people in 2013, bringing 21 PhD students in total. In addition, VAST also has many master training courses affiliated with other Universities like University of Natural Sciences - National University of Ho Chi Minh City University of Natural Sciences - National University of Hanoi, Thai Nguyen University, and CTU. The specialized research institutes also regularly collaborate with foreign universities to organize training workshops to learn from experience and improve the quality of training.

Thanks to the close guidance of the Leadership of VAST and the efforts of the specialized research Institute, training in VAST has achieved good results and initially meets the requirements of enhanced quality of postgraduate training. However, the training is still difficult, especially funding for training of specialized institutes is limited, and there is a lack of equipment for training and connection of library systems.

To uniformly manage training activities to enhance graduate training quality, VAST has actively formulated a Project established at the Academy of Science and Technology based on 19 specialized research Institutes having postgraduate courses and was reorganized into 11 faculties, in which the training activity remained at specialized research institutes. The management and general operating of training is implemented by Academy of Science and Technology.

On August 2, 2013, the Prime Minister agreed to establish the Academy of Science and Technology under VAST on Dispatch No. 1152/TTg-KGVX and

assigned to the Ministry of Education and Training in coordination with other ministries and agencies concerned with appraising investment projects on the Academy of Science and Technology as prescribed, have noted peculiarity of the Academy, and submitted this to the Prime Minister for consideration and decision .

The launch of the Academy will raise the master and doctoral courses of VAST to a higher level and contribute importantly in the rapid development of scientific human resources and leading experts in natural sciences and technology during the period of international economic integration.

4.2. Training officials and civil servants

In 2013, VAST sent a number of staff to participate in the training of political theory, state management and professional knowledge to initially meet the requirements of preparations; improve knowledge, management skills and professional skills for human resources of VAST. For the details:

Training in political theory:

VAST sent 21 leaders and managers to attend administrative-political theory senior class (in-service) and 18 staff to attend administrative-political theory class (in-service), organized by Center Training Politic of Party Executive Committee of Central Agencies.

Training in state administrative management knowledge and professional skills training for staff:

+ Dispatched one leader to attend the state administrative management senior official class, organized by the Center Training Politic of Party Executive Committee of Central Agencies and coordinate with Ho Chi Minh National Academy of Politics and Public Administration.

+ Collaboration with the Hanoi University of Home Affairs opened two state administrative management classes for training officials (60 staff) and two classes for training principal officials (70 staff) in the Northern region.

+ Collaboration with the Hanoi University of Home Affairs opened one state administrative management class for training officials (34 staff) and one class for training principal officials (30 staff) in the Southern region.

+ Dispatched staff to attend the bidding class, organized by the Center for Training, Consulting and Technology Transfer in combination with the Department of Procurement Management, Ministry of Planning and Investment (five staff).

+ Dispatched staff to attend the policy class, organized by the Department of Public Asset Management, Ministry of Finance (seven staff).

+ Dispatched staff to attend funding settlement policy class about science and technology, organized by Financial Magazine, Ministry of Finance (26 staff).

+ Dispatched staff to attend class of study in-depth training professional inspection, and check processing, systematization of legal documents, organized by the Academy of Justice, Ministry of Justice (five staff).

+ Collaboration with small and medium enterprises development support center opened one class of professional training procurement course in the Southern region (46 staff).

+ Collaboration with the University of Training Officers, Ministry of Home Affairs opened a training course on leadership skills, and international economic integration (47 staff).

+ Collaboration with the University of Training Officers, the University of Training Officers, Ministry of Home Affairs opened administrative organization class (40 staff).

+ Collaboration with Institute of Economics opened two classes to provide knowledge about the world economic integration for 100 staff (Northern region) and 70 staff (Southern region).

In general, the training of the officials and civil servants at VAST was closely associated with the planning of leaders and managers at all levels and followed by the training plan, which was approved by the President.

5. International co-operation activities

In 2013, VAST sent 29 delegations to visit and work with overseas partners, nine of which were led by VAST's leader to international scientific organizations, research centers such as CNRS, Russian Academy of Sciences, Polish Academy of Sciences, Far Eastern Branch - Russian Academy of Sciences (FEBRAS), Astrium Group - France, International Institute for Applied System Analysis (IIASA) in Austria. Remarkably, it was VAST's delegation led by Prof. Chau Van Minh, President of VAST to attend the 30 years anniversary of cooperation between VAST - CNRS in early July last year, that proved the close collaboration between the two leading scientific agencies of the two countries; Vietnam and France. The President of VAST and the President of CNRS highly appreciated the gained achievements of the past 30 years. In particular, the presentations of scientists from VAST and CNRS on the achieved results in the bilateral projects which are co-sponsored as well as the highlights of 14 French -Vietnamese Schools in Do Son. The delegation of inter-ministerial (Ministry of Science and Technology, Ministry of Finance) and the Vietnam Academy of Science and Technology led by Prof. Nguyen Dinh Cong, Vice President of VAST had a working visit to FEBRAS. At the meeting on September 10th, 2013, the two sides agreed to sign an Agreement on long-term cooperation on marine research, with priority given to put the BOGOROV ship of FEBRAS into a permanent mission at the Nha Trang port to carry on the research and training for Vietnamese scientists in the field of marine research; Prof. Duong Ngoc Hai, Vice President of VAST, accompanied the Deputy Prime Minister Nguyen Thien Nhan to visit the Institute of Organic Chemistry and University of Finance. The visits of VAST's leadership to the leading scientific organizations of the countries that proved VAST's international cooperation activities have concentrated on the key partners in order to take their advantages to strengthen the implementation of the key science and technology.

In 2013, VAST accepted 50 foreign delegations from scientific institutions and international research centers to come and work with VAST in the fields of space technology, environment, energy, biotechnology, natural marine resources survey, biodiversity and conservation, information technology, materials science, chemistry, physics and mathematics.There were delegations from Far Eastern Branch - RAS led by Prof. V.I Sergienko, Chairman of FEB, to visit and discuss on the 4th marine expediture by the Ship "Akademik Oparin " and intent to bring the FABRAS's ship into permanent anchor in Nha Trang for serving the joint marine research between two sides; and the delegation led by Prof. Dr. Boviengkham VONGDARA, Minister of Science and Technology, President of the Lao National Academy of Sciences to visit and work with VAST to summarise the contents of cooperation and propose new projects for the next year; finally, Prof. Pavel Kabat, Director of the International Institute for Applied Systems Analysis visited to discuss about Vietnam joining in IIASA.

In 2013, VAST's institutions also received many foreign scientific delegations attending conferences, seminars and implementing joint collaboration research projects.

5.1. The important international cooperation projects

5.1.1. ODA Projects

a. VNREDSat - 1 Project

The successful implementation of small satellite project VNREDSat - 1 for the period 2010 - 2014 with the amount of 55.8 million euro by ODA from the French Government and 64,820 million VND from Vietnam State Budget and the success of putting the first earth observation satellite of Vietnam -VNREDSat-1 into orbit on May 7th , 2013. The success of small satellite projects VNREDSat-1 marked an important milestone in space S&T cooperation between Vietnam and France and it was the Vietnam's S&T primary basis on acquiring and owning the earth observation satellite technology. The project "The Second Project for Vietnam Natural Resources, Environment and Natural Disasters Monitoring Satellite - VNREDSat - 1B" was approved by the Prime Minister at Document No: 1044/TTg-QHQT on 30/6/2011, with the amount of 63 million euro by ODA from the Belgium Government and 3,1 million USD from Vietnam State budget. In 2013, both sides have effectively held 4 rounds of negotiations in Vietnam and Belgium.

b. National Satellite Center

National Satellite Center - VAST has received , managed and implemented the construction of the Space Center Vietnam projects with the amount of 46,595 billion yen by ODA from Japanese Government and 1,774 billion VND from the Vietnam State budget. In 2013, VAST has conducted the package "Preparing the ground for construction of the South" with amount of 80.620139 billion VND after 1st adjustment and completed 76% volume (equivalent to 61 billion VND). In 2013, 100% was completed. The Center is implementing the package of consulting design verification and total fund for 11 staff to attend a training course on Master of space technology at 05 leading universities in the field of Space Technology in Japan. Currently, the project is being implemented according to the plan. The project

management works are being done in compliance with the regulations of Vietnam and the Agreement between the two governments

5.1.2. The international cooperation projects at VAST level and other international cooperation projects

In 2013, VAST has funded 21 projects for 2013-2014 with an amount of 6 billion VND of which 4 billion is cooperation tasks with FEBRAS on marine research for 2013 - 2014 (total budget is 6.2 billion VND). Most projects are implemented in schedules. There are 27 IC projects for the period 2012-2013 that have been continued, four of which are from 2011-2013. At present, one project was completed on time, the extended projects are 22% because managers have not completed all or part of the international presses and by the document from Ministry of Finance limiting the numbers of delegations abroad, the State Bank has not solved the budget so they have not realized the exchange scientists, some collaboration projects with Belarus have been adjusted for the finance funding by the Belarusian Republican Foundation for Fundamental Research's proposal. In 2013, VAST also conducted the new project selections for the period 2014 - 2015. The estimated number of new projects is 27. Most of the new projects are negotiated and prepared in the detailed outline for approval in 2014. The One More Step project: in 2013 (2^{nd} call), VAST has nominated two scientists (one from Institute of Materials Science, one from Institute of Genome Research) to participate in the post-doctoral programe for 6 months at the University of Dresden, Germany and the University of Trento, Italy in the framework of the One More Step project and also signed to participate in the Swap and Transfer project with the University of Trento, Italy. Additionally, the management and implementation of the bilateral IC projects at VAST level, implementing the guideline of the Prime Minister and President of VAST, the International Cooperation Department co-ordinated with the affiliated institutions to set up programs and projects which submit to the Government, of which must mention: co-ordinated with the Institute of Marine Geology and Geophysics to set up the project "Building the Sea Database Information Exchange System and Network in Vietnam" submitting to the Prime Minister for funding; co-odinated with the Institute of Oceanography and VAST's specialized institutes to outline the international integration project on Oceanography for funding, which was assigned by the Government; co-ordinated with FEBRAS and Nha Trang Institute of Technology Research and Application to set up the project to bring the ship BOGOROV to permanent stay in Vietnam; co-ordinated with the Institute of Geological Sciences, Geography, Centre for High Technology Development and Lao National Academy of Sciences to build the project "Strengthening the Scientific Research and Technology Transfer for the Lao National Academy of Sciences" for funding from Vietnam Government's ODA; Co-ordinated with Osaka University, Japan and Institute of Environmental Technology to build the proposal project "Development Model and Ecology Technology Adapting and Mitigating the Change of Water Environment in the Mekong Delta" for funding from the Japanese Government's ODA; Proposed international integration projects: Oceanography, Aerospace, Biodiversity, Environment, Climate change, New Energy, Information Technology, Biotechnology, Physics, Nuclear and New Materials.

5.2. The signed documents on international cooperation

In 2013, VAST signed four new Memoranda of Understanding, two Agreements and two Letters of Intent on science and technology co-operation with the partners: Bulgaria, France, Belgium, Italy, Australia, Mexico and Republic of Korea. VAST's Institutions also signed 27 documents. In 2013, VAST has negotiated and joined into two important international organizations: Committee on Earth Observation Satellites (COES) and the International Institute for Applied Systems Analysis (IIASA). At the 83rd Council Meeting in Laxenburg, Republic of Austria, IIASA has officially accepted Vietnam - the 21st member country. With the aim of promoting the collaboration research to meet the demand and bring the benefits for the country, along with the IIASA's members, VAST have the right to nominate young scientists to participate in training programs being organized by IIASA, especially attend the post-doctoral training human resources programs which are an urgent need to access and join in the related network data in order to provide an analysis of the national matters in the context of region and global. The signing of the new documents as well as initiative participation into the largest scientific organizations in the world prove that the orientedly extended new partners in the potential countries are interested by VAST's leadership in context of international integration.

5.3. VAST's international conferences, workshops and schools

In 2013, VAST organized 31 international conference, workshops and schools, three of which are VAST level such as: The 2nd VAST - KAST Workshop on Biodiversity and Bio-active Compounds, with the participation of 110 scientists from in and out of country; VAST - IRD Symposium on Marine Science; VAST - ICTP-APCTP Regional Conference and School on Topology Phase and Quantum Computation; Especially, VAST hosted and successfully organized the 20th Asia Pacific Regional Space Agencies Forum (APRSAF), with 350 scientists and managers, of which 150 participants were foreigners.

5.4. Annual membership fee

To maintain and promote the international cooperation activities, enhance the multi- international integration with S & T international organizations, in 2013 VAST has paid membership fees for Joint Institute of Nuclear Research (JINR), Dubna; AUF, APCTP, AASA, IUGG, PSA and CONFRANSIE with amount of 259.700 USD. On the basis of membership payment, VAST has sent four representatives to participate in the annual meeting of Dubna, APCTP, PSA, AUF. In 2013, VAST's activities at JINR have developed more effectively than the previous years. The Number of Vietnam's staff working at JINR has increased more than previous years, with the participation of Institute of Physics and Nha Trang Institute of Technology Research and Application. There are nine Vietnamese scientists working at JINR.

Vietnam has recently become the 21st member of IIASA and will pay the membership fee in 2015.

5.5. Emulation and commendation

VAST commended timely the foreign scientists and international scientific organizations who have significantly contributed to the training and research in S&T for VAST. In 2013, VAST awarded three Degrees of Honourable Doctorate Causa, 11 VAST's Medals for the scientists from Russia, Republic of Korea, Germany, USA, France, Lao P.D.R.

President of VAST- Prof. Chau Van Minh and Prof. Stefan Vodenicharov – president of BAS signed the science and technology agrrement at the President Palace, Hanoi with the observation of President of VietNam- Mr. Truong Tan Sang and President of Bungaria – Mr. Rosen Plevneliev

President of VAST- Prof. Chau Van Minh and Prof. Alain Fuchs – president of CNRS signed the science and technology agrrement at the head quarter of CNRS, Paris, France.

The hand-over ceremony the system of VNREDSat-1 satelline between VAST and EADS Astrium, France

The delegation of VAST, ministry of Science and Technology, Ministry of Finance visit FEBRAS, Rusian Academy of Science

5.6. The remarkable international cooperation events in 2013

VAST has joined into the Commission Earth Observation Satellite (CEOS) and the International Institute of Applied Systems Analysis (IIASA), it has marked an important milestone in the context of multi- international integration on S&T; the first Vietnam's Earth Observation Satellite - VNREDSat-1 was successfully launched into orbit by VEGA rocket from the Kourou Space Airport in Guiana,

France. The 4th Joint Marine expediture in Vietnam sea between VAST - FEBRAS by ship "Akademician Oparin" and "The Second International Workshop on Marine Bio-resources in Vietnam" held at VAST, it should be addressed in 2013; In 2013, 30 years anniversary of cooperation between VAST-CNRS was an important event of Vietnam -France cross - exchanges year on the occasion of 40 years anniversary of establishment of diplomatic relations between the two countries in general. This was VAST's great event in 2013 in particular. In 2013, the delegation from MOST Laos led by GS.Dr. Boviengkham VONGDARA, Minister; the delegation from FEBRAS led by Academician VI Sergienko visited at VAST.

6. Activities of Key Laboratories at VAST

In 2013, four National Key Laboratories at VAST implemented four state independent scientific tasks and 14 scientific themes according to the function of the Key Laboratory. The allocation of independent tasks and functional themes at each laboratory are distributed as follows:

- Key Laboratory of Gene Technology: two state independent tasks and four scientific themes according to the function of the Key Laboratory;

- Key Laboratory of Materials and Electronic Components: a state independent task and three scientific themes according to the function of the Key Laboratory;

- Key Laboratory of Plant Cell Technology: a state independent task and four scientific themes according to the function of the Key Laboratory;

- Key Laboratory of Network technology and Multimedia: three scientific themes in the function of Key Laboratories;

Budget Allocations in 2013

2013 funding to support activities of four Key Laboratories at VAST was 6,600 million (50 million more than in 2012) and the Ministry of Science and Technology has allocated budget as follows:

- Key Laboratory of Gene Technology: 1.750 million VND.

- Key Laboratory of Materials and Electronic Components: 1.800 million VND (50 million more than in 2012).

- Key Laboratory of Plant Cell Technology: 1.750 million VND.

- Key Laboratory of Network technology and Multimedia: 1.300 million VND.

On the basis of the funding for activities per each National Key Laboratory, the Key Laboratory's Director and Director of the Host Institution uniformly distributed in accordance with the specific requirements of each Laboratory.

Funding to support regular operations and activities of four National Key Laboratories to perform themes according to Key Laboratory's functions, payment of electricity, water, repair of equipment, purchase of spare parts.

Implementation of topics and tasks

During the year, Four National Key Laboratories have organized to assess themes according to the Key Laboratory's functions after the end of duration.

The themes and tasks have been implemented on schedule, full implementation of the scientific content has been approved and implemented according to plan, and satisfactory quality was registered. The research results have scientific significance and practical application ability.

The results of the study subjects independent State tasks and subjects under the National Key Laboratory function to facilitate orientation and continued development of new ideas proposed for registration at all management levels in the next year.

Equipment utilization situation

The research subjects achieved good results thanks to modern equipment of four key Laboratories. Also thanks to the modern equipment of National Key Laboratories, VASTs' scientists have good conditions for procurement, registration and implementation of projects of State and Ministerial levels, the science and technology programs, National Foundation for Science and Technology Development (NAFOSTED), program of basic research oriented applications. For example, in 2013, the Institute of Biotechnology performed 46 topics/ projects for scientific research of projects of State and Ministerial levels.

During 2013, the National Key Laboratory of Gene Technology corrected over 100 devices, such as bonding medium, PCR machines, centrifuge, gene sequencing machines, shaker thermostat and thermostat cabinets. With repaired equipment, the National Key Laboratory of Gene Technology has effectively used the device in scientific research.

All equipment are operating with very high frequency such as gene sequencing machines, PCR and real-time PCR, mass spectrometry, high-performance liquid chromatography (HPLC), liquid chromatography purification (FPLC), centrifuge, micro-array system, the 2-Dimensional electrophoresis, protein analyzer, spectrum, fluorescence microscopy-scanning electron microscope (FE-SEM), X-ray diffraction system, the Raman scattering and some instrumentation systems for studying optical properties of the material (measured fluorescence absorption system).

Thanks to the modern Key Laboratory's equipment, several research groups have developed good subjects, science and technology tasks, coordinate training and international cooperation, contribute to numerous articles published in journals of international reputation with a high Impact Factor. For example, in 2013, the Institute of Materials Science has published approximately 70 articles in international journals including journals with a high Impact Factor.

The training and education

In addition to research activities, National Key Laboratory's scientists are also involved in teaching and training. Many of the young scientists doing their

doctoral thesis, master's thesis are under the direction of the National Key Laboratories. PhD fellows, graduate students in and outside VAST have made use of modern equipment to carry out their scientific research.

The utilization of the budget

National Key Laboratories are managed for efficient use of the budget and state property, contributing to the well-functioning of National Key Laboratories. They ensure funds are disbursed according to schedule and budget settlement as prescribed by the State, contributing to the tasks and functions of the Hosted Institutions.

Overall Assessment

Four National Key Laboratories at VAST are always guaranteed to function as open laboratories, they are where the many scientific and technological tasks are carried out at all State, Ministerial and Institution Grassroots levels.

State independent tasks: carried out on schedule, ensuring the content and objectives. Research results created favorable conditions for the implementation of next content.

Key Laboratory functional tasks: carried out according to plan, satisfactory quality as approved. The research results and significant scientific and practical applicability.

Many doctoral and master dissertations have been completed here. Also many research works have been published in national and international specialized scientific journals, based on data collected form the Key Laboratory.

Many outstanding results obtained thanks to the National Key Laboratory equipment by state investment, ensure the problem is resolved through methods / technology / deploy.

Four National Key Laboratories at VAST and Host Institutions have good management and efficient use of state investment.

7. Publishing, Museum and Information activities

7.1. Publishing activity

VAST is a largest science and technology organization of Vietnam, it has been taking part in many international and national science tasks. Therefore, information and propagation of scientific study results in the form of Science Journals, Monographic Books, Reference Books, Textbooks, etc. This is among the important scientific and technological activities of VAST. With its large team of scientists, each year it has hundreds of books, thousands of articles published in 12 journals specialized for science and technology, and hundreds of articles published in international journals with ever-increasing quality. Thses contribute to enhance the scientific and technological position of Vietnam in the region and the world.

7.1.1. Publishing scientific and technological journals.

Currently, VAST is publishing 12 journals specializing in science and technology. These are prestious national journals recognized and licensed by the

government. After 3 years of investment and upgrading, three journals; Vietnam Journal of Mathematics (VJM), Acta Mathematica Vietnamica (AMV) and Journal: Advances in Natural Sciences: NanoSciences and Nanotechnology (ANSNN), were recognized as the regional standard (SCOPUS). These achievements will be a driving force in attracting international and national authors to send their articles to post in the journals and make prerequisite for the three journals to be recognized and ranked by ISI.

After the editorial boards of the journals were reorganized, with the participation of many leading scientists in universities, academies and institutes nationwide, they are effectively operating and have many contributions in increasing scientific quality of journals.

Articles submitted to journals are increasingly including foreign scientists. Up to November 2013, VJM Journal received 192 articles consisting of 38 articles from Vietnamese authors and 150 articles from foreign authors, with 4 articles published. AMV Journal received 105 articles, 86% were foreign authors. Journal of Advances in Natural Sciences: NanoSciences and Nanotechnology (ANSNN) received over 100 articles and published 80 articles in 4 volumes consisting of 42 articles from Vietnamese authors, 26 articles from Asian authors, 8 articles from European authors, and 4 articles from American authors.

The three above journals are published by prestious foreign publishers such as Springer, IOP under the international rules. Therefore, as their international prestige is increasing, their impact factors are also improving, such as AMV Journal which has increased 0.15 to 0.61 from 2008 to 2012.

Editorial boards select the articles to post in the journals in accordance with the detailed and strict criteria, ensuring the novel, scientific, accurate and copyright of articles following the current regulations of the government, and those of the editorial boards. Normally, an article must undergo strict assessment, evaluation, editing and review to ensure its scientific quality and other requirements of the editorial boards before it is published. Many journals only agree to publish 50% of total received articles, in particular VIM Journal only accepted publishing 14.5% of total received articles in 2013.

Facing requirements of integration and development, in 2013 VAST decided to invest in upgrading publishing of its nine remaining journals, after five years they will achieve SCOPUS standard and come to achieve international standards in the following years.

Journals have been published online gradually, and applied online submission software, from the process of receiving an article, peer review, editing and publishing on the internet. This is a big effort of editorial boards, and due to publishing online, the journals have shortened time and steps in the publishing process, creating conditions for journals to publish on time and meet the demands of authors and readers. For example, Journal: Advances in Natural Sciences: Nano Sciences and Nanotechnology (ANSNN) had over 109,000 persons access in 2013.

7.1.2. Publishing scientific works in the form of books

In addition to publishing periodical scientific journals, VAST slates every year a special fund for publishing scientific works in the form of books.

A Monographic Book Volume has been continued to be published, it is divided into 4 fields:

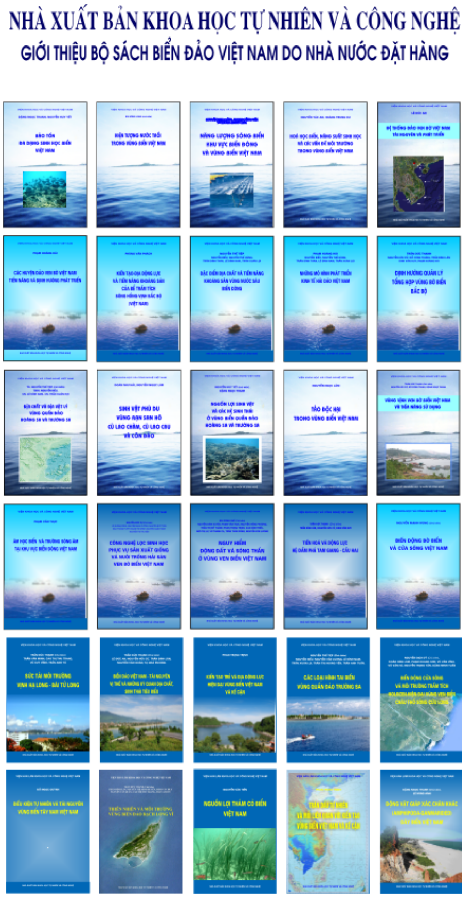
- Monographs in the field of technology and technological development
- Monographs in the field of natural resources and environment of Vietnam
- Monographs in the field of sea and marine technology
- Textbooks for training graduate and postgraduate education.

The monographs selected and published are the results of one field of science and technology by the author or the co-authors after many years of research and summarization. They enhance theory in the higher range and are highly appreciated in the term of science by scientists and managers. Their form is presented consistently, printed with high quality and solemnity. After publication, the PST is released to the required addresses; according to the plan a set of books will be published with about 5-10 book titles per year, and, in 2013 12 monograph books were published and 2 books were selected by the Chairman of VAST.

A set of books on the Vietnamese Sea – Islands continues to be published. This is ordered by the Government which VAST has the strong point. By the end of 2012 the set of books published was 25 book titles in fields related to the sea and islands. By the assessments of scientists and other readers, it has high scientific value and is very useful in popularizing and improving people's knowledge about the marine sector, contributing to National Sea Strategies up to 2020. In 2013, PST published five more book titles increasing the number of Monographs books in the field of Vietnam sea and marine by 30 books.

In 2013 registration of the publishing plan was implemented including 32 times of 130 book titles. Granted decision of publishing for works that enough standards under the criterions in accordance with principles and objectives of the PST, permitted by Government agencies. There were not any errors in publishing works in 2013.

PST continue to participate in Vietnam Book Award held by Vietnam Publisher Association and get high awards.



7.2. Museum activity

7.2.1. Vietnam National Museum of Nature's activities

a. Research activities:

In 2013, Vietnam National Museum of Nature (VNMN) performed 08 national projects (01 protocol and 03 projects of Highlands III programme, 04 projects of Nafosted Fund), 02 projects of VAST, 03 bilateral cooperation projects, 06 of institutional level and 04 of young scientists support, with a total budget of 12,000 million dong. As the results, most projects have articles published in specialized scientific journals domestically and abroad. The Museum's scientific staff has 53 scientific works in total, including 14 international articles (SCI, SCIE and ISBN), and 39 articles in professional journals in the country.

b. Implementation of the tasks given by Prime Minister:

(1) Performing the task of planning the Vietnam National Museum of Nature system according to the Decision No. 86/2006/QD-TTg dated 20/4/2006 of Prime Minister.

VNMN sent the staff to the museums in the System: Do Son Oceanographic Museum, Nature Museum in Central Coast region, Nha Trang Oceanographic Museum and head investment agencies from the project members: Dien Bien Agricultural and Rural Development Board, Board of Science and Technology of Lam Dong Province, Union of Science and Technology services production and Board of History Park - Ethnic Culture Management of Ho Chi Minh city to urge

deployment tasks of Decision No. 86. VNMN advised, helped agencies in Ho Chi Minh, Lam Dong, Dien Bien to build and implement the projects, and made an investment report to submit to the Provincial people committee for approval. In the year, VNMN also held successfully a seminar on "Coordination of museums' activities among museum members in the System" at Bai Chay, Ha Long City, Quang Ninh Province.

(2) Implemented the task of specimens collection for VNMN (under the direction of Prime Minister in Document No. 611/TTg-NN, dated 16/5/2007).

VNMN implemented 33 rounds of specimens' reception from 11 agencies, localities and individuals across the country. Receiving a total of 53 types of specimens, including: death body, skin, bones, claws, fangs, horns of the species: Molamola, whale sharks, bull, bison, hourse bear, black bear, deer, rhinos, tigers, Asian elephants and antelope. Processed exhibits included: Molamola, crocodile, tiger, Sarus Crane, civet and ostrich. Treated and put into temporary storage of over ten samples were tiger's bones, elephant bone, Molamola and monkey.

(3) Implemented the project "Building the National Specimen Collection on Vietnam Nature"

In 2013, the Museum continued to lead and implement three component projects funded by Science and Technology Career Resources and one component project on strengthening equipment funded by Development and Investment. Particularly, component project funded by the Cultural Career has not been deployed yet.

c. Enhancing potential

The project "Organism Evolution Exhibition Room" continue to be deployed, which has completed basically all the remaining investment items as the target of 2013. Currently, VNMN is rushing to complete the installation of equipment and specimens for display with budget of 10 billion dong in 2013 from the cultural career resource. This exhibition room will open to the public in the first quarter of 2014.

Component project "Strengthening potential for Museum" has a total budget of 55,000 million dong, funded by Development and Investment resources. In 2013, it continued to be funded with 10,000 million dong that were deployed on schedule and to plan. The Museum received land of 32 hectares by the introduction of People's Committee of Hanoi City in ecology urban of Quoc Oai ward. The measurement and mapping at the scale of 1/500 was completed. At present, VNMN is applying for the landmark and technical data for the land.

d. International cooperation activities, training and publishing information.

In 2013, the Museum signed 21 Memoranda of Understanding with 21 organizations from Australia, Japan, Italy, China, Taiwan, Singapore. It welcomed and worked with 18 foreign experts from cpuntries including United Kingdom, China, Sweden, USA, Italy. 20 officers were sent to work abroad. In the year, 02 officers have successfully defended master thesis and 06 staff are taking the PhD course, including 03 PhD students studying abroad. Germany, Japan and the

Russian Federation helped Quang Ninh province restore and reconstruct the whale skeleton model for display at the museum of province. They helped the Hanoi Museum preserve animal specimens.

e. Emulation and commendation:

In 2013, VNMN received an emulation flag from the Vietnam Academy of Science and Technology and the Department of sample processing and exhibited design also received the award of "Excellent performance in work".

7.2.2. Activity of Nha Trang Oceanography Museum:

Conducted chemical treatment, relabel, replacement of bottles, etc. for about 1,000 sample jars and 6 large glass tanks. Collected additional 102 dried sea turtle samples from the People's Procuratorate of Binh Dinh Province, and 200 samples of large and small sea creatures of all kinds. Especially, the Museum collected and treated 02 Dolphin samples and 02 rounded tails Molamola specimens (length 1.6 m).

Restored Dolphin skeleton. Repaired and upgraded the exhibition areas at the museum. Organized the technical training course "Oceanographic Museum - Destination for the beach lovers" for the purpose of enhancing communication skills for instructors and collaborators at the Museum.

Attended the Workshop on "Coordination of museums' activities among museum members in the System" organized by the VNMN, welcomed and taught students from universities including the Highlands University, Hue University of Sciences, University of Can Tho, Quy Nhon University.

Up to October 2013 the Museum received 278,350 visitors to visit and study of which 238,921 were domestic tourists and 39,429 were foreign visitors.

7.2.3. Museum activities at the Institute of Resources and Marine Environment:

The compensation for 69 households in the project area has been almost completed with 100% of households receiving compensation and 80 % of households handed over the land to the Board of Compensation and ground clearance in Do Son District. The Institute is working with authorities of Do Son district to implement compensation and support for 15 households building house on agricultural land. As planned, by the end of December the Institute will receive all the project area of 12,047 ha to construct the infrastructure of phase 1 by years 2014-2015. It has also completed project thesis of adjustment phase 1 and submitted this to the Vietnam Academy of Science and Technology for approval.

Seminar: Coordination of museums' activities among museum members in the System at Ha Long

Process Molamola specimen at the VNMN

Treat whale shark specimen at Nghe An

Receive Vooc at Dak Lak

Complete copy specimen of King Cobra snake at VNMN

Model Whale skeleton at Quang Ninh Museum

Continued maintenance and minor repairs: showrooms, warehouses for storing and preserving samples in the aftermath of the storm. The Institute regularly maintains specimens and welcomes visitors. The Do Son Oceanographic Museum is also actively participating in implementing the branch project "Building the National Specimens Collection on the Vietnam Nature".

7.3. Information activity

7.3.1. Regular activities:

Providing readers with traditional library and electronic library services; disseminating information of VAST's outstanding scientific and technological achievements; providing scientific information and intellectual property information; collecting, archiving and preserving scientific and technological documentation; researching Vietnamese calendar; researching, analyzing and synthesizing scientific and technological information to support the research and forecast of scientific development in VAST.

7.3.2. Outstanding achievement in 2013:

- Continuing the implementation of the project of purchasing foreign scientific and technological magazines in the term from 2011 to 2015 of VAST to equip the library with a huge number of foreign online electronic journals, for example: buying access right to foreign electronic scientific and technological journals in 2013: the ScienceDirect database includes 2396 magazine titles in the field of science and technology; 38 ACS journal titles; 11 AIP journals; 7 APS journals; 66 IOP journal titles and ProquestCentral database; equipping libraries in Hanoi and Ho Chi Minh City with Latin and Russian scientific and technological magazines.

Comfortable reading-room with computer system for searching on-site and Wi-Fi support

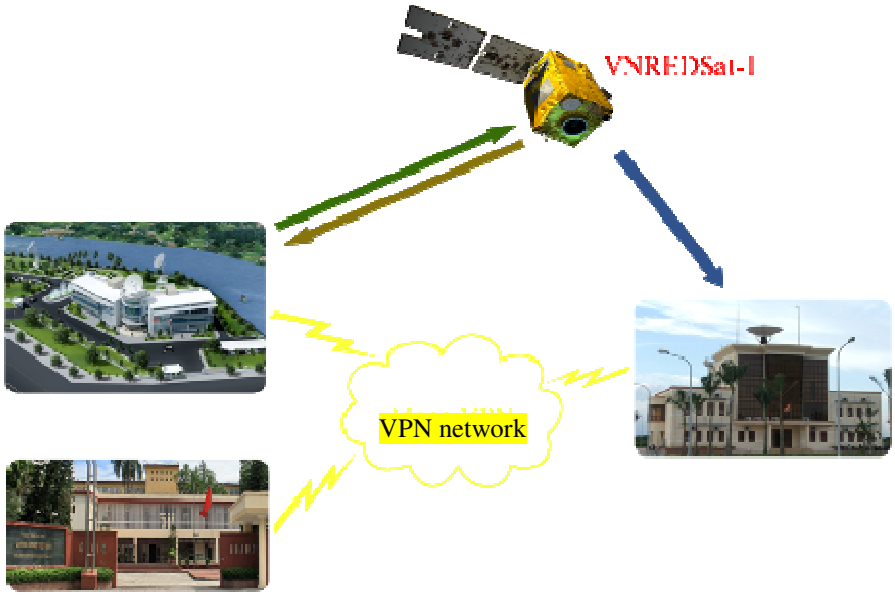
- Promoting the Digital Library (http://elib.isivast.org.vn). Reviewing, updating and granting access accounts for all researchers in VAST. Currently, CSI has granted more 2,000 accounts for researchers and 19 static IP addresses to the subordinated units of VAST. By the end of 2013, there had been 97,477 full-text articles downloaded to serve scientific research activities, an increase of 1.7 times compared to 2012, significantly from ScienceDirect (79,096 articles), SpringerLink (9,068 articles) and ACS (6,381 articles).

- Adding and updating the results of scientific research, unpublished documents, and photographic documents into the database; preserving archives, serving readers, utilizing the archives effectively, pursuant to the Archives Regulations.

- Providing photographic documentation and materials for other units of VAST for research and related activities, such as: providing documents for VAST's Office and Science and Education Department of Vietnam Television on the occasion of 100th anniversary of Professor, Academician Tran Dai Nghia's birth; providing the International Cooperation Department with photographic documentation to make summary record on the occasion of 35 years of establishment; providing photographic and printed documentation to the Center for Science and Technology Communication Reseach and Development of the Ministry of Science and Technology.

8. ODA-funded satellite projects

One of the key misisons assigned to VAST is to realize the Vietnam National strategy for space technology research and application until 2020. Approved by Vietnamese Prime-Minister, the strategy is to implement 03 ODA-funded investment projects on design, manufacture and launch of a small earth observation satellite: (1) Project on Vietnam natural resources, environment and disaster monitoring small satellite system (VNREDSat-1); (2) Project on the 2nd Vietnam natural resources, environment and disaster monitoring small satellite system (VNREDSat-1B); and (3) Project on climate change prevention using earth observation satellite imagery (Vietnam Space Center), among them the projects (1) and (3) are transitional, project (2) is newly-impmenented in 2013.



VNREDSat-1 System

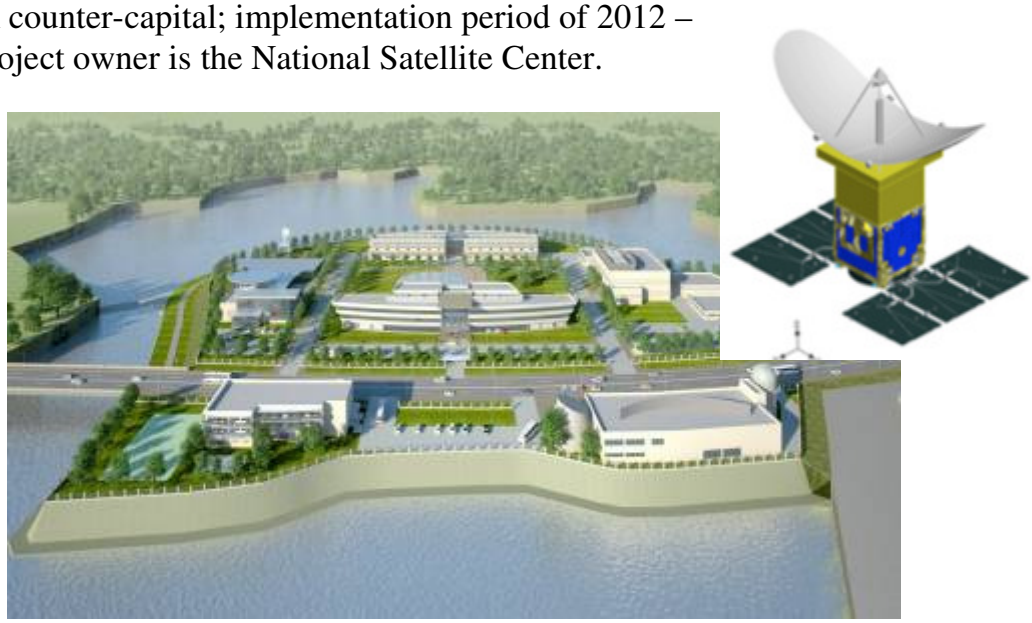
Operation Center: 7th floor, 2H building, 18 Hoang Quoc Viet, Ha Noi
S-band transceiving station: Hoa lac Hi-tech Park
Image receiving Station: Minh Khai, Tu Liem, Ha Noi

(1) - VNREDSat-1 project: funded by France ODA of 55.8 million Euro and over 65 billion VND of Vietnam counter-capital, implementation period of 2011 – 2014; VAST is the project owner. The Satellite was successfully launched in

07/5/2013 from Kourou (French Guiana); after 3 months of commissioning, the VNREDSat-1 System (consisting of a satellite and ground facilities) had been transferred to Vietnam. So far the system is in 100% full operation and exploitation. The project is 6 months ahead of schedule and is the first France financed project which is completed as initial approval, no additional budget required and ahead of schedule and aligns with the approved specifications. Currently, the system is in stable operation and actively acts as image provider for relevant ministries and agencies.

Key VNREDSat-1 parameters are: Optical earth observation satellite; Spectral bands: 1 Panchromatic (PAN) and 4 multi-spectral (MS); Revisit time: 3 days; Sun-synchronous orbit (SSO), altitude 680km; Ground sampling distance: 2.5m (PAN) and 10m (MS); Dimension: 1200 mm x 600 mm x 600 mm; Mass: ~120kg; Design life time: 5 years.

(2) – Vietnam Space Center project: total investment capital of 54,400 billion JPY, consisting of 46,595 billion. JPY of Japan ODA and 1,774 billion VND of Vietnam counter-capital; implementation period of 2012 – 2020; project owner is the National Satellite Center.



The future of Viatnam National Satelline Center in HoaLac Hightech Park

The sub-project "Site preparation", which is financed by counter-capital valued at 115 billion VND, has completed its site filling at the South area (~7 ha), ready for delivery to the Japanese partners for construction; bidding for the site filling of the North area (~2ha) is on-going. The 2nd sub-project: Construction of facilities (infrastructure, workshops) is on the final stage of technical design approval. The 3rd sub-project: Satellite I, implementation period of 2014 – 2017: the bidding plans have been approved for the package of design, manufacture, launch of a satellite and package of project supervision and consultancy. It is planned to start and engineers have been recruited and dispatched to Japanese universities for master training on satellite technology (Keio, Tokyo, Hokkaido, Tohoku Universities and Technical Institute of Kyushu).

(3) - Project "The 2nd Vietnam natural resources, environment and disaster monitoring small satellite system (VNREDSat-1B)" (new project): with investment capital of 63 million Euro financed by Belgium ODA, and 60 billion VND of Vietnam counter-capital; implementation period of 2013 – 2018.

Farewell ceremony to 11 engineers for Master training in Japan

The 3rd negotiation round on VNREDSat-1B in Brussels, Belgium

In 2013, the 1st package – Design, manufacture and launch of a satellite (hyper spectral payload), valued at 62.6 million Euro went through 4 rounds of contract negotiation with Belgian Partnership (3 rounds in Hanoi and 1 round in Belgium). Both sides have reached agreements on the majority of princical subjects and the contract is being finalized for signature, which is expected to be signed on 20/01/2014 on the occasion of a working visit to Vietnam by the Deputy Prime Minister of the Kingdom of Belgium.

9. Investment to strengthen research capabilities and technology deployment

9.1. Present infrastructure and facilities of VAST

Until the end of 2013, total properties of VAST (value of land not included) are approximately 392,294 million VND, of which:

Housing:	~217,581 million VND
Transport vehicles:	~7,303 million VND
Other assets:	~167,410 million VND

About object:

+ Total land area:		142,500 m^2
Of which:	- Land area for headquarters:	2,300 m^2
	- Land area for experiements, research work:	1,947,000 m^2
+ Total building surface area		~150,000m^2
Of which:	- Building surface for Research :	~125,000 m^2
	- Building surface for technology development:	~15,000 m^2
	- Building surface for bases, stations:	~ 10,000 m^2

+ 4 national key laboratories:

- Gen. Technology (Investment amount 57 billion VND)

- Multimedia and networking technology (48 billion VND)

- Electronic materials and devices (56 billion VND)

- Plant cell technology in the south (53 billion VND)

+ 1 Centre for high performance scientific computing (Centre for Information Infrastructure Development);

+ Many advanced scientific equipment for measurement, analysis in the fields of physics, chemistry, mechanics, etc.

+ Cars: 77 pieces

The Academy's facilities and bases (land, infrastructure, office of specialised institutes, equipment etc.) are invested with the main purpose serving scientific research. Investment for Target of research and technology development is not commensurate. Since the end of 1990s and early of 2000's, The Academy made strong moves in equipment investment for research (average 20-30 billion VND per year) but just for deep investment and initial equipment. Investment for research and technology development is still limited.

9.2. Results of investment on facilities construction in 2013

9.2.1. Implementation status of investment projects on capital construction

a) In 2013, three (03) projects were completed, delivered and put into operation:

-Central Building Project: the 10 storey building was delivered and in operation in 7/2013, grade II, total construction area: 7,300 m2, total budget: 100,030 million VND.

- The Project for Tay Nguyen Institute of Scientific research premises: delivered in 4/2013, 3-storey building comprising of 2 units with total construction area of ~3,300 m^2 and budget of 31,400 mil. VND.

- VNREDSat-1 Ground Premises (implemented by the counter-capital of around 65 billion VND) consisting of: S-band transceiving station (S-band Station, new contruction) located in Hoa-Lac Hi-tech Park with area of ~2ha; Center for operation and data back-up located on 7^{th}-floor, 2H building, Nghia Do Hi-tech Zone (renovated); Communication links for the ground premises (new facilities): to connect the Operation Center – S-band Station – X-band image receiving station (Minh Khai Commune, Tu Liem, Ha Noi) and for communication links between premises in Vietnam and Toulouse (France) and with Ground Control Station in Kiruna (Sweden). The VNREDSat-1 ground premises started in mid 2011, and has been competed to meet all technical requirements of the Project and delivered to the French in 7/2012 for installation and commissioning of equipments, ready for the launch of the Satellite into orbit in 07/5/2013. The hand-over of the whole System (including VNREDSat-1 satellite and its ground facilities) to VAST has been done after 3 months of successful commissioning and operating. So far, the VNREDSat-1

System has been operating well and acquired all technical specifications as defined in the system design. The project item “Image Calibration site”, which had been expected to be located in Phu Tho Province, could not start its construction due to failure in site clearance, its total budget allocated for 2013, which is around 5,000 million VND, has been returned to the State Budget.

Some new facility of VAST installed in 2013

b) Two projects are in completion and expected to be delivered and in operation in early 2014:

- Training and Services Project: grade 2 building, 10 storeys, total construction area of 8,500 m2, valued at 115,500 million VND. The projects is in completion and expected to be delivered and operated in 2nd quarter of 2014. Its allocated budget for 2013 was paid in 10/2013 and the advanced budget for 2014 valued at 60,500 million VND has been made.

- Project for Tropical Technology Institute Premises: 6-storey building, grade III, total construction area of 3,282 m2, valued at 38,300 million VND. The project is in completion and to be delivered in late 3/2014.

Premises for Tropical Technology Institute

Training and services Building

c) Transition projects (to be finished after 2014):

Projects for Expansion of Oceanographic Museum and construction of premises for Institute of sea environmental resources located in Do Son, Hai Phong: site clearance done for allocated 12 ha, procedures for site hand-over and site filling for construction are on-going.

Project of enhancement of earthquake monitoring network for earthquake and tsumani warning activities: procurement package for 23 sets of seismic station equipments valued at more than 35 billion VND has been completed. Its main activity to be done in 2014 is to build more than 20 seismic stations according to the approved items.

Project of Vietnam Space Center: consists of 05 sub-projects, 3 of them (I, II and III) have been approved and implemented.

The I sub-project "Site preparation for construction" has finished its site filling of the south area which is ~7ha with budget over 80 billion VND, and ready to be delivered to the Japanese partner for construction of approved items funded by ODA and on-schedule; filling of the North area (~2ha) is on-going; its counter-capital for 2013 has been paid and down-payment for 2014 (60 billion VND) has been made. The II sub-project "Construction of premise I": its technical construction design is on-review and expected to start its bidding in 2014. The III sub-project: "Satellite I, facilities I, human resqource training": The bidding plan for following packages of Satellite I have been approved: "Satellite launch service, Facilities I, advanced satellite training" with total value of 15,858,000,000 JPY and over 143 billion VND; the package "Supervision and consultancy and training on satellite image application" valued at 1,871,771,000 JPY (ODA fund) and 42.54 billion VND; the bidding of these 2 packages is expected to be done in late 2nd quarter of 2014.

e) On-schedule start construction of 4 projects: Research and development of premises for Institute of applied material science (located at Thanh Loc, Ho Chi

Minh City, valued at 114,690 billion VND); Investment to modernize Institute of Geology for the 1st period (located at Lang Thuong, Ba Đinh, Ha Noi; total value of 121 billion VND); Premises for Institute of Space Technology and Institute of Marine bio-chemistry (located at Nghia Do; valued at 93,865 billion VND); Construction of ground station for the VNREDSat-1B project (located in Hoa Lac Hi-tech Park; counter-capital of over 9 billion VND).

9.2.2. Implementation status on renovation projects

29,198 billion VND is the investment capital planned for 2013 to complete 35 renovation items of affiliated premises, of which 6,179 billion VND is allocated for 11 items transited from 2012 and 2,301 billion VND for 24 new items. Their implementation status is as follows:

28/35 items have been completed and delivered; 5 items with planned implementation period of 2013 – 2014 are on-going; 02 items were stopped and their budgets have been transferred to other items. Some other new items are behind schedule due to dependence on the plan to change offices to the Central Building which was already delivered and in operation in 7/2013.

General review: Though the budget for renovation and minor construction is modest as compared to the real needs (cover over 60% needs), but it is essential for the urgent requests and efficiency making remarkable contribution to counter-act the downgrade of the internal premises, especially to re-arrange the working space and to complete the general planning for the whole Nghia Do area after the delivery of the Central Building.

9.2.3. Plan for 2014

a) Plan for investment in capital construction in 2014 of VAST: to allocate sufficient budget to pay for the delivered projects avoiding debts; priority will be given to ODA-funded projects in order to meet the schedule as committed with the donors; to finance transitional projects according to schedule; to start 3 new projects. Planned budget for 2014 is 251 billion VND (Science-technology sector), of which 01 billion VND is for investment preparation, 250 billion VND is for project implementation and allocated as follows:

- Budget to be paid for completed projects is 1,622 billion VND (Project for Central Building; Project for Tay Nguyen Institute of Scientific Research Premises; Project for Institute of Tropical Technology premises which is expected to be delivered in 1st quarter of 2014).

- Counter-capital for 3 ODA projects is 40 billion VND: the VNREDSat-1 project expected to be completed in 2014; Construction of ground station for VNREDSat-1B project; Project of Vietnam Space Center.

- Budget for other transitional projects: 8,628 billion VND.

- Budget for start of 3 new projects is 62,5 billion VND: VAST Incubation Zone (total value of 180 billionVND); Zone for Technology Creativity located in Hon Chong, Nha Trang (valued over 57 billion VND); System for human and

Vietnam specific animal genetic decoding (total investment capital of 75 billion VND).

Additionally, budget of 30 billion VND is from the Education-Training sector for the project of Training and Service Zone to pay for the down-payment for 2014 and 15 billion VND from the Cultural Sector for the Project of National Samples belonging to the Project of Vietnam National Museum of Nature.

b) Plan for renovation from scientific-technology non-business expenditure source: planned budget for 2014 is 25 billion VND, ~15% lower than 2013 due to the national economic difficulties. It is allocated as follows: 18,692 billion VND for 10 projects/items which are transitional and will be completed; 6,308 billion VND for 14 new items.

10. Some important statistics

10.1. Statistics on human resources

Qualification of Staff (as of 31/12/2013)

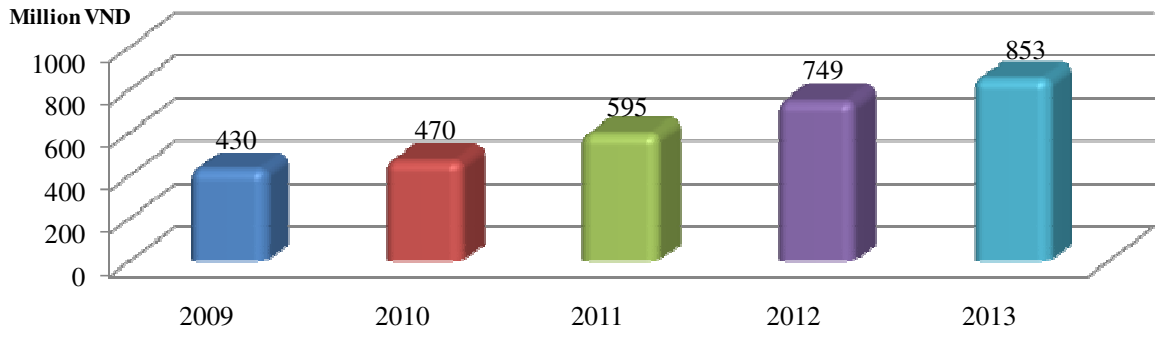
No	Unit	Perm. staff	Title		Degree					Contract signed staff
			Prof	Ass. Prof	Dr Sci	Dr	MSc	BA	Other	
1	Functional departments	45	0	4	0	12	8	25	0	13
2	Administration office	50	0	0	0	0	8	22	20	71
3	People Party Office	7						7		2
5	Institute of Mathematics	70	16	11	16	34	12	8	0	26
6	Institute of Physics	95	5	10	2	47	23	20	3	71
7	Institute of Chemistry	122	2	17	0	59	27	29	7	95
8	Institute of Chemistry of Natural Product	46	1	3	1	15	16	11	2	65
9	Institute of Mechanics	95	3	8	5	24	37	26	3	23
10	Institute of Ecology and Bio. resources	115		11	1	44	44	24	2	14
11	Institute of Geography	80	1	4	1	21	27	28	3	45
12	Institute of Geological Science	99	0	6	2	32	27	34	4	43
13	Institute of Geophysics	76		5	1	18	23	23	11	22
14	Institute of Oceanography	93	1	3		18	31	33	11	41
15	Institute of Marine Environment and Resources	46	0	2	0	10	25	9	2	27
16	Institute of Marine Geology and Geophysics	53	0	0	0	15	18	18	2	13
17	Institute of Energy Science	38	0	0	0	4	15	17	2	48
18	Institute of Materials Science	214	3	14	2	65	73	63	11	33
19	Institute of Information Technology	138	3	10	1	28	44	64	1	29
20	Institute of Biotechnology	161	3	15	0	70	56	23	12	114
21	Institute of Environment Technology	53	1	4		16	23	13	1	112
22	Institute of Chemical Technology	42	1	1	1	16	14	9	2	22
23	Institute of Space Technology	42		1		6	15	18	3	8
24	Institute of Applied Informatics and Mechanics	74		4		8	16	46	4	6
25	Institute of Tropical Biology	63	0	1	0	13	25	22	3	53
26	Institute of Tropical Technology	71	1	5	0	22	24	19	6	8
27	Institute of Applied Materials Science	42		4		13	12	13	4	23

28	NhaTrang Institute of Technology Research and Application	45		2		9	18	15	3	9
29	Institute of Marine Biochemistry	44	2	1	0	21	8	14	1	29
30	National Satellite Center	31		1		4	18	8	1	33
31	Center for Scientific information	30		1		1	6	20	3	3
32	Vietnam National Museum of Nature	32		5		10	10	12		15
33	Publishing house for Science and Technology	28	0	0	0	1	11	16		4
34	Institute of Applied Physics and Scientific Instruments	20	0	0	0	2	7	8	3	2
35	Centre for Training, Consultancy and Technology Transfer	12				1	7	4		9
36	TayNguyen Institute of Biology	25		1		6	10	8	1	22
37	Institute of Resources Geography HCM city	30		2		7	10	12	1	16
38	Institute of Physics HCM City	42		2		8	15	18	1	3
40	Hue Institute of environment recourses and sustainable development	18		1		2	10	6		13
41	Southern Institute of Ecology	11				4	3	3	1	21
42	Institute of Genome Research	15		1		12	1	2		16
43	Center of informatics and computing	14	1	1	2	3	0	9	0	4
44	Center for Technology and Development	26	0	0	0	5	4	15	2	62
45	Institute of Telecommunication Technology	0	0	0	0	0	0	0	0	
46	Center for food technology and Technique Development	0	0	0	0	0	0	0	0	15
	TOTAL	**2453**	**44**	**161**	**35**	**706**	**781**	**794**	**136**	**1303**

10.2. Statistics on finance, scientific publications and education

Statistics on projects and budget of VAST in 2013

No	Type of project	Number of project	Budget (Million VND)
1.	National priority programmes	19	29,862
2.	National projects (Tay Nguyen III Program)	58	88,200
3.	Space sciences and technology program	14	10,000
4.	Application-oriented fundamental research projects	10	8,576
5.	National protocol projects	27	29,384
6.	National level test production projects	3	4,800
7.	VAST priority research projects	16	9,150
8.	VAST priority research projects for young sciencetis	20	3,000
9.	VAST priority research projects	92	32,900
10.	Ministry level Science and Technology key programs	12	10,970
11.	Key program of science and technology (KC)	26	45,738
12.	VAST-ministry and VAST-locality cooperative projects	25	7,080
13.	VAST international cooperation research projects	52	9,060
14.	Missions of President	15	2,565
15.	VAST level test production projects	9	3,800
16.	Fundamental investigation projects	12	3,800
17.	VAST- MOST co-operative research projects	4	2,380
18.	Clean water, environment for rural areas program	6	5,370
19.	Environment protection program	9	2,600
20.	Reciprocal of ODA projects	3	60,624
	Total	**432**	**369,859**
21.	ODA projects	4	650,570
22.	NGO projects	21	21,000



Annual budget of VAST for the period 2009-2013

*Statistics on papers, books, patents and solution of VAST's institutes in 2013**

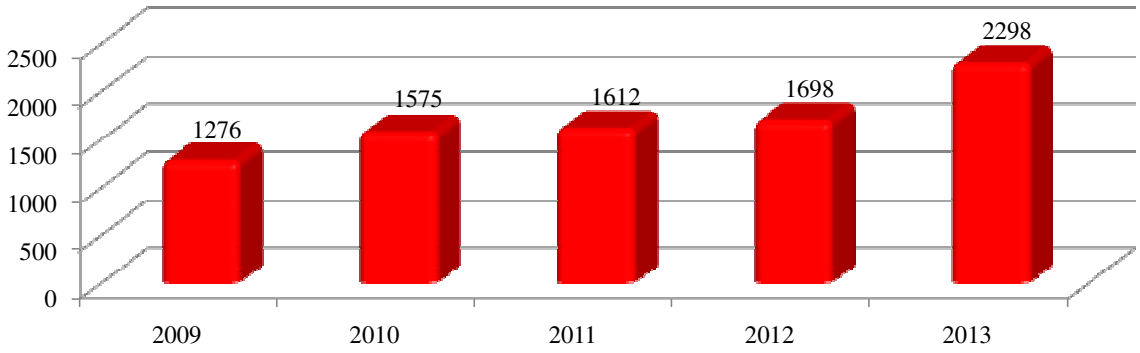
No	Institute	International papers				National papers			Spec. books	Patents	Uti. Solu.
		Total	SCI	SCI-E	ISSN/ ISBN	VAST 1	VAST 2	Other			
1	Institute of Materials Science	85	53	19	13	21	79	42	3	1	
2	Institute of Ecology and Bio. Resources	79	17	34	28		13	146	6	1	
3	Institute of Physics	64	43	4	17	1	10	32	3	1	
4	Institute of Mathematics	49	23	16	10	1					
5	Institute of Biotechnology	49	25	13	11	6	62	124			5
6	Institute of Marine Biochemistry	36	19	13	4		36	30	1		
7	Institute of Chemistry	52	22	7	23	2	106	21	3		
8	Institute of Mechanics	21	10	3	8		10	77	2		
9	Institute of Natural Products Chemistry	29	6	6	17		37	16		2	
10	Institute of Oceanography	19	9	3	7		17	25	2		
11	Institute of Information Technology	22	2	7	13		4	16			
12	Institute of Geophysics	13	8	1	4		11	13	2		
13	NhaTrang Institute of Tech. Research and Application	9	4	5			14	16			1
14	Institute of Tropical Technology	13	5	3	5	3	57	10	2		
15	Institute of Tropical Biology	11	3	5	3		22	23			
16	Institute of Environment Technology	12	6	2	4		10	27		1	
17	Institute of Applied Materials Science	8	4	3	1	3	47	3	2		
18	Institute of Genome Research	10	5	2	3		6	11			
19	Institute of Geophysics	8	6		2		3	5	2		
20	Institute of Marine Geology and Geophysics	6	3	3			25	36			
21	Vietnam National Museum of Nature	14	2	4	8		7	32			
22	Institute of Marine Environment and Resources	7	4	1	2		14	72	3		
23	Institute of Physics HCM City	6	4		2		3	3			

No	Institute	International papers				National papers			Spec. books	Patents	Uti. Solu.
		Total	SCI	SCI-E	ISSN/ ISBN	VAST 1	VAST 2	Other			
24	Institute of Geography	6	2		4		27	38			
25	Institute of Chemical Technology	12		2	10	3	39	9			
26	Institute of Resources Geography HCM city	5	1		4		19				
27	Institute of Space Technology	3	1		2			4			
28	Hue Institute of Resource, Env & Sustainable Dev	1	1				1	7			
29	Vietnam National Satellite Center	2		1	1						
30	Southern Institute of Ecology	10		1	9		1	12			
31	Institute of Applied Informatics and Mechanics	4			4			5			
32	TayNguyen Institute of Biology	8			8		17	1	1		
33	Institute of Applied Physics and Scientific Instruments	3			3			3			
34	Institute of Energy Science							21		1	
35	Publishing house for Science and Technology	2			2		10	1			
36	Center for High Technology Development	1			1		2	8			
Total		**660**	**282**	**153**	**225**	**40**	**709**	**889**	**32**	**7**	**6**

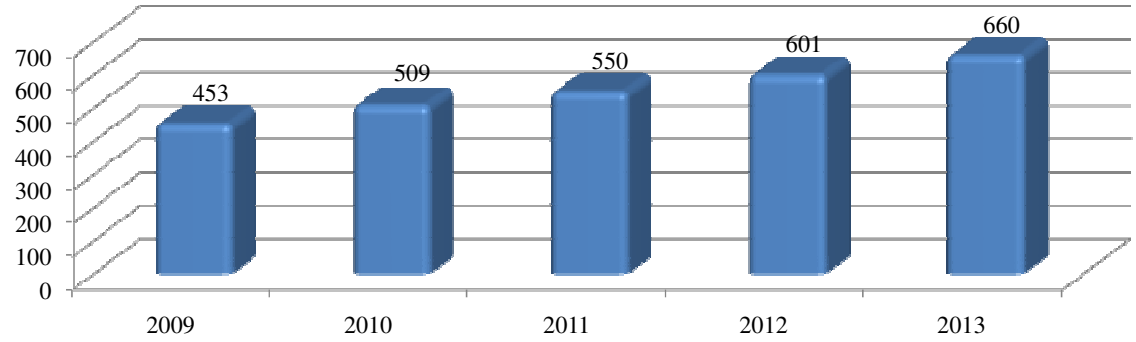
(*) Statistic data 01/12/2012-30/11/2013;

Distribution of the published papers by VAST scientists in the period 2009-2013

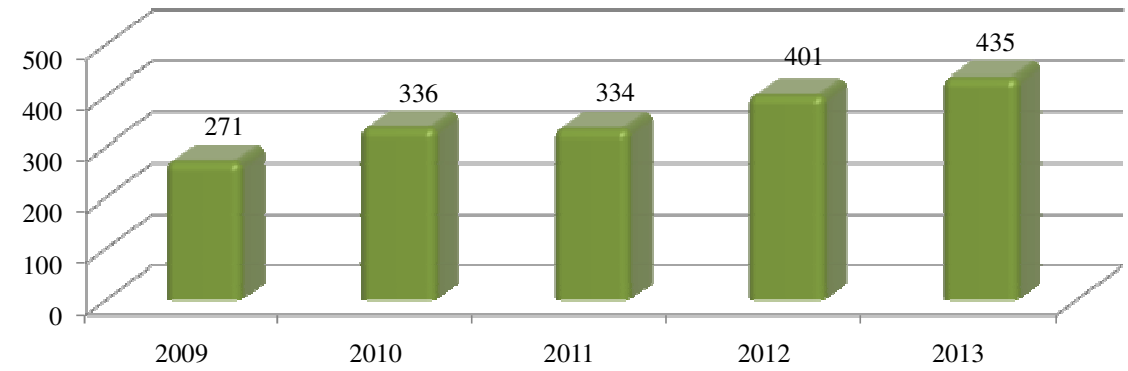
Year 2013: 2298 papers



Year 2013: 660 international papers



Year 2013: 435 SCI/SCI-E papers

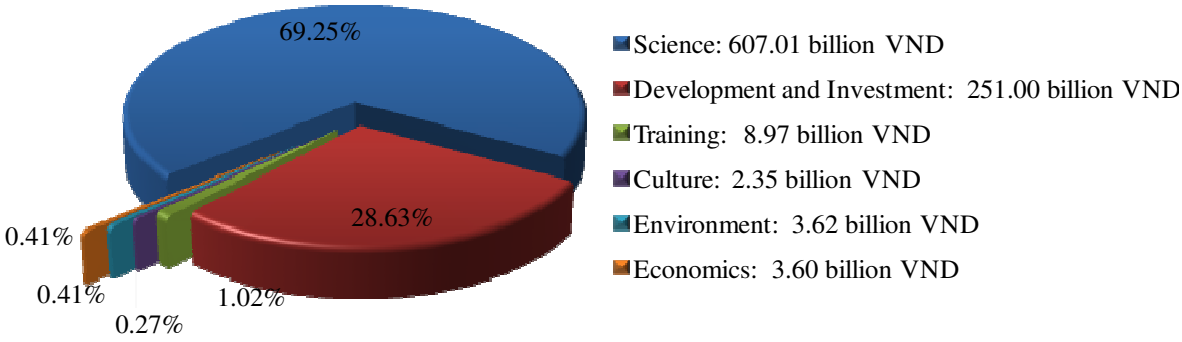


No	Institution	Quantity	
		PhD	**MSc**
1	Institute of Mathematics	20	95
2	Institute of Information Technology	57	
3	Institute of Mechanics	18	8
4	Institute of Materials Science	37	
5	Institute of Physics	36	119
6	Institute of Chemistry	67	16
7	Institute of Chemistry of Natural Product	15	
8	Institute of Biotechnology	45	
9	Institute of Ecology and Bio. Resources	46	113
10	Institute of Geography	31	
11	Institute of Geological Science	9	
12	Institute of Geophysics	-	
13	Institute of Applied Informatics and Mechanics	5	2
14	Institute of Chemical Technology	11	
15	Institute of Tropical Biology	13	
16	Institute of Oceanography	5	
17	Institute of Tropical Technology	23	
18	Institute of Environment Technology	11	
19	Institute of Marine Biochemistry	5	
Total:		**454**	**353**

11. Orientations and plans for the year 2014

In 2014, VAST will continue to implement the scientific and technological plan under the "Master Plan to develop VAST to 2020, with a vision to 2030" approved by the Prime Minister. The focus will be on key science and technology programs of the Govenment and the Academy to gain both quality and quantity of the science and technology research and development. VAST continues to improve the quality of the scientific results at the international level and increase the applications to society.

VAST deploy tasks approved by the Prime Minister: to utilize efectively the application of VNREDSat-1 satellite. To push progress in carrying out the Vietnam Space Center Projects (implemented by ODA, JICA- JAPAN), the project of VNREDSat-1B (implemented by ODA of Belgium).



The budget of the Academy in the fiscal year of 2014

Continue to implement the project "Set up a Collection of national specimens on Vietnamese nature" and submit a project to the Goverment to setup the Vietnam National Musium in QuocOai, Hanoi. Continue to implement the project of "Strengthening the network of monitoring stations to serve the earthquake information and tsunami warning". Continue to implement the National programs TAYNGUYEN III, Space technology. Start to setup 3 Centers of Excellence of VAST, Center of Stem cell,.

- Continue to setup new facility for research institutes, especially the common use equipments.

- Continue to implement the program of the Academy.