



**Lao People's Democratic Republic Peace
Independence Democracy Unity Prosperity**

**National Science and Technology
Policy of LAO PDR
up to the year 2010**

**Prime Minister's Office
Science, Technology and Environment Agency
Vientiane, 2003**

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Prime Minister's Office

No.: 09 / PMO

Resolution of the Government of Lao PDR on the approval of the National Science and Technology Policy

Chapter I

Policy Context of Science and Technology Development

1- Globalization and trends of science and technology

At the end of the 20th century, many areas of science and technology like information technology, telecommunications and biotechnology have been widely and thoroughly developed such that they have become integrated into the different levels of transnational businesses and associations. The contribution of science and technology development has enabled "the globalization" efforts of organizations and "the globalization" of the national economy, culture,

education, and the way countries interact with one another.

Globalization means peaceful, cooperation and competition as the main factor for development. Based on the advanced progress of science and technology, the old and newly industrialized countries seeking ways to reduce the cost of production through transnational corporations. These corporations take advantage to get returns in terms of funds and technology, low labor costs and cheaper raw materials that will allow them to be more competitive in the world market.

To realize the advantage of globalization, many countries in the world have concentrated on research investment as well as science and technology application so as to accelerate the socio-economic development, develop the capability of production and use innovations of technology. The neighboring countries of Lao PDR particularly China, Vietnam and Thailand have already taken steps to develop opportunities for research and human resource development.

According to the World Science Report in 1995, the Research and Development expenditure as a proportion of GDP in the following countries was: USA and Japan approximately 2-3%, Singapore and Taiwan approximately 1-2%, Malaysia 0,34%, Thailand 0,12%, Indonesia and Philippine 0,2% and Vietnam approximately 0,22%. Scientists around the world have forecasted that in the 21st century, there will be further advancements in areas such as information

technology, automation system, new materials, biotechnology and new energy technology. Advancements in information technology will effectively eliminate borders.

As for biotechnology, it will have major impact on agricultural production, artificial insemination and tissue culture in the production of new products that will provide sufficient food for mankind. Biotechnology reduces our dependence on nature alone. In the meantime, automation systems using robots will become more prevalent in industry, transport and services. As well as the production methods in the future will be based on the modern industry "Micro-particle". Therefore, the dimension of the production in great part will be in small and medium scale with modernized and efficiency feature. The distribution of manpower will be then divided in the society and create new employment in different forms. The working time and man forces will be diminished and replaced with automated machines. In the information society, these trends will be continuously and progressively developed.

2- The Science and Technology Policy Context of Lao People's Democratic Republic

Science and Technology play an important role in socio-economic and industry development. Science is the basis for knowledge creation and understanding the cause of nature and events occurring around us. Scientific research is a decisive factor in technological innovation, which can bring new knowledge and skills for solving

problems, particularly in the adaptation of technology imported from abroad in support of industrial production. Technology transforms raw materials and develops human resources to produce products and carry out the production process so as to raise the living standard of people. The formulation of appropriate policy coupled with considerable investment in science and technology in support of a socio-economic development plan can help change society and develop a country's economy, culture, social and political systems.

Faced with the situation of economic competitiveness in the region, the Lao Government has made a great effort to build up the socio-economy, acquire modern science and technology knowledge including the seeking of funds and create opportunities for international aid so as to contribute to national development to be equivalent with other countries in the near term. Moreover, the Government has integrated science and technology activities into the national development plan and socio-economic development policy as well as increased investment in human resource development and priority action programme.

3- Socio-economic situation in Lao PDR

The Lao Government has attained rapid, unprecedented and comprehensive economic growth. The budget revenue has been increased from 6,8% of GDP in 1996 up to more than 7,3% in 1999. The Lao Government has implemented the new transformation policy

and open-policy of international economic relation, the utilization of market economy mechanism coupled with the fact that Lao PDR is a member of the Southeast Asia Region and the Mekong River Sub-Region countries contribute to our capability for strong and rapid economic development in the future and indeed for our competitiveness in this region.

In the past five years, the implementation of socio-economic development plan has led to the upgrading of living conditions of the Lao people and improving step by step our security in the supply of staple foodstuffs. The results have shown as: GDP per capita has increased approximately from 379 US\$ in 1995/96 to 400 US\$ in 2001. Even though, the GDP has increased 6-7% per year however the ratio of encouraging the budget revenue is low approximately 13% of GDP comparing to the neighboring countries such as: Vietnam and Thailand, which are higher than 20%. The investment mostly more than 90% came from international aids, loans and investment. The economic component structure in GDP in 2001 for the agriculture covered 50,9%, industry 23,4% and service 24,8%. The poor of the population covered 39%, in rural areas 40% and urban area 26%, literacy rate covered 72,8% and life expectancy approximately 53 years old.

Agriculture-based nature in the past years has not reached self-sufficiency in the production of foodstuffs, in spite of difficulties caused by natural disaster and desertification. The agricultural production from surface land area and focused areas is only for

local consumption and has not met the needs of production for substitution of imports and for export. The agricultural production can be sufficient for local consumption and for a certain number of exports. The distribution of agricultural products between zones is not yet attainable.

The industry sector is to produce hydro-electricity power and wood exploitation and transformation. For transformation industry, it is still a small industry at the local level. The number of firms having less than 10 workers accounts for 93% of the total. Firms having more than 100 workers account for only 1,3% of the total, but the production output covers 77% of the whole industrial output. A large part of the industry is classified as the product transformation manufacture or produced only final products, which used traditional technology and techniques. The key technology is imported from abroad. The electricity generation industry is considered the export industry, which generates the main revenue for the nation.

The services and basic infrastructure are not widely developed namely, banking, transport, posts, communications, commerce and the travel services. Communications and roads are not yet comfortable. At the same time, the running in all economy sectors including foreign private sector has encountered a range of obstacles such as in the facilities of carrying out activities, funding and incentives and clear policy.

Social development remains at a low level. The living conditions of our people are predominantly poor, depending on the nature. The

knowledge and skills level are low, the labor force has a low skills level and cannot enter into competition with those abroad. The illiteracy rate for adults is higher than 32,7%. The maternal mortality rate for birth child is 530 deaths per 100.000 live births. The under five mortality rate for children is higher than 107,9 deaths per 1000 live births in 2000. The mortality for paludism accounts for 37% of total deaths. There is one doctor per 4545 people.

4- Science and Technology Development in Lao PDR

Because science and technology is important for socio economic growth, the government has established the main organizations and institutions to undertake research and development as is summarized below:

4.1- Activities in institutions:

In 1967, the Geology and Minerals Department was established to undertake the major task of managing and developing the minerals industry and providing technical views, upon the request of local and foreign investors intending to establish manufacturing companies. The issue of decision to implement industrial activities, follow-up and control the activities and industrial projects must be taken into consideration.

In 1982, the State Committee for Science and Technology was established and was now renamed the Science, Technology and

Environment Agency as a coordinating point to ensure the implementation of science and technology activities in service to the national socio-economic development.

In 1983, the National Arts and Literature Research Institute renamed the Culture Research Institute in 1993 and attached to the Ministry of Information and Culture was established with the main role on the research of history, origin of spirituality, living, costume, tradition, belief, fine arts, handicraft, art, music and literature.

In 1985, The NaPhok Station was established to develop plants and rice varieties in the plain field and mountainous zone. The Salakham Station was then set up for research and development of the varieties and to analyze plants disease and insects. The NongTeng Center is also set up for research and development of fish species.

In 1999, the Agricultural and Forestry Research Institute was established which consists of 10 Research Centers, Projects, Stations and Experimental Centers in the Provinces and Districts in the whole country related to the plantation, livestock, fishery, forestry, agricultural irrigation, meteorology and inundation such as: Soil Survey and Classification Center, Plants, Vegetables and Fruits Research Centers, Coffee Research Center, Nordic Agriculture-Forestry Research Center, Livestock Research Center, Fishery Research Center, Forestry Research Center, Forest Survey and Planning Center and Agricultural and Forestry Mechanization

Research Projects. These Centers aim to undertake the centralized and systematical experimentation research throughout the country by focusing on defining strategic planning and development of agriculture and forestry in line with directive and policy of the Party and Government defined in each period of time.

In 1995, The Higher Education Institute under the 10 ministries was assembled into the National University of Laos. In the past years, the Educational Science Research Institute was established to promote research on educational science, develop the appropriate teaching and learning and curriculum, design the educational materials and disseminate the education information.

In 2000, the Health Science Institute was established, and the past few years there were Traditional Medicine Research Institute, Paludism Center, Analytical and Epidemiology Center, Maternal and Children Health Center, Ophthalmology Center, Health Information Center and Clean Water Center attached to the Ministry of Health were set up. They have the function to develop the research on health science for improving the analyze system of the disease, prevention and treatment system and health promotion in order to ensure good health and long life. In addition, it should concentrate on training the medical staff to help reduce illness and mortality of ethnic people.

4.2- Strengths and opportunities

Lao PDR has a great potential that give the opportunity for socio economic development. For this reason, the government had focused on the establishment and improvement of organizational structure and development of capacity and skills of staff. Many sectors have had a series of important research projects and reached some achievements in the field of: Education, transport, telecommunication, health, agriculture-forestry and science and technology.

Education: Education in the public sector has been established and education in private sector was promoted. A professional development center for curriculum and professionals development was created. Upgrading of teacher skills and professionals both inside and outside the country even in public and private sector to meet the real labor market situation in new technology eras have been initiated. The number of graduates increased from 1,595 in 1995-1996 to 2,157 people in 1999-2000. In the past five years, there was an increase in higher skilled technicians and bachelor degree holders inside the country making up a total of 13,280 people. Students graduated abroad with higher education totaled 1,321 comprising 333 master degree holders and 89 Ph.D. holders. The proportion of students at higher education per population is 223 per 100,000 people in 1995-1996 and 316 per 100,000 people in 1999-2000. The comparison of education investment in public sector with respect to the GDP is 1,3% in the year 1995-1996

and 0,9% in the year 2000-2001.

Communications and Transport: Roads and bridges linking districts and provinces in order to facilitate the distribution of goods and tourism have been constructed and are in good condition for communication even though the quality may be low and accessibility in remote areas will need further improvement. At the same time, the telecommunication system has been rapidly developed to support transmission of data, images and sound in digital mode. At present, there are installed home telephones in 58 villages and 300 public telephone units at the end of 1999. There are 10,000 mobile phone users in the Lao Telecom Network using GSM 900 MHZ and serving the municipality and Vientiane Capital, LuangPrabang, Savannakhet, Champassak, Khammouane and Oudomxay Province. The network has also provided the service for calling abroad with connection to 238 countries using fibre optics cable. In addition, the Internet system with the speed of 64 Kbps in 1999 has been upgraded to 512 Kbps. With the law of telecommunications, the management of domain name in the country is attached to the Ministry of Communications, Transports, Posts and Constructions in collaboration of the relevant sectors.

Health: Disease research in some areas was undertaken that contributed to defining the strategy of prevention and treatment of diseases. A series of pilot research projects was initiated. Between 1991-95, the mortality of children, diarrhoea disease, pulmonary disease, malaria, quality control of drug, the treatment of new

child-birth, health education, hepatitis and others were studied. Health sectors had strengthened the cooperation for health research by using limited budget. Traditional medicine is one important sector contributing to disease treatment combined with modern drug which led to doing research of new drug from natural products. Moreover, there are research laboratory to analyze diseases and trained health researchers and specialists.

Agriculture-Forestry: It has a series of research projects concerning selection, breeding and production of plants, animals, wood, aquatic, forage varieties and species, plants for animals foods and forestry products in order to produce the foodstuffs for human and animals and to promote widely the production of agriculture and forestry including the research of forest regeneration, soil research and micro-bacteria research in soil, water, plants, climate condition, prevention of diseases, agriculture mechanization, handicrafts tools for production.

Science and Technology of State Committee on Science and Technology: 1984-85, it has undertaken experimental research and transform the tools and mechanics such as: threshing machine and rice-mills in many dimensions and types, the maize shelling machine, pump water machine and oil pressing tool and running by motor, grass-cutter, seed-sprinkled and making water pipe for garden, weaving spare parts and home ware made by wood, tools using solar energy for producing the solution, producing vegetables and dried foods, freezer, electricity production

and water pump, biomass furnace for producing gas and chemicals for home use, oven using wood and charcoal in saving manner, car run by wood energy, use of mechanic characterized by the combination of water energy for producing electricity, rice saw-mills, cereal mould, oil pressing and others, use of biotechnology in tissue culture for selecting plants varieties as needed without disease, resistant to the climate and rapid growth such as: rice, timber, flower plants and use micro-bacteria for producing new products, use computer system and information technology in collecting data, information and disseminating science and technology information and natural resources in different forms such as: CD, internet, aerial photo, satellite images and others, remote sensing, to manage the work and provide the data and information to the society. At the same time, it has trained staffs and researchers in computer knowledge both inside and outside the Committee, promoted in a wide range the registration of trademark for many countries (USA, Europe, Asia and neighboring countries) and companies in the countries. In addition, a series of regulations, laws for science and technology management in each area were formulated such as: environmental protection law, intellectual property decree in terms of trademark and decree of the management of standardization and quality control of goods products.

Parallel to the strengths mentioned above, Lao PDR still has geographical and natural resources opportunities that offer the development of the country.

Geography: Lao PDR has the area of 236,800 km². The forest surface land covers approximately 11 million hectares or equivalent to 40% of total area in the whole country. Forests have economical value and are capable of generating enormous revenue to the country. On the other hand, Lao PDR is located at the center of the Southeast Asia Region and the Sub-Basin of the Mekong River Countries that are undergoing economic growth driven by commerce, business service and tourism.

Natural Resources: Lao has water resources and their tributaries cover approximately 35% of total water resources that can be tapped to build more than 50 electricity dams for producing approximately 134.649 Gigawatts per year of electricity for use in irrigation up to 305.270 hectares. Lao has mineral resources not yet exploited. Such refined resources consist of iron, gold, lead, coal, gypsum, gas oil and others. Moreover, it still has wealthy nature, tourism source, history and culture that will be contributed to tourism industry in the future.

4.3-Difficulties

During the past few years, we have made limited progress in many fields. There remain difficulties to be overcome in socio-economic development, particularly in science and technology field. We may say that research and application of science and technology in Lao PDR is in the initial phase of development in terms of concept, organization and implementation. Many ministries have

carried out the scientific and technological research with very limited resources. They have not put a systematical management and coordination among them on science and technology activities has not yet lead to meet the requirement of production. There is no policy plan and unified project concerned with the training, administration and use of research staff. Specialized structure was not yet matched to the needs of socio-economic development and the qualification level of the research staff has not yet met the needs of the key sector of development. The education system tends to develop in quantity and teaching system is still limited in quality. The improvement and development of vocational and higher education are not widespread and have not met the need of socio-economic development and the labor market in the new period. The training of teachers had not been preferably targeted. So, they should be effectively upgraded and standardized. By the fact, Lao PDR is in the initial phase of the construction and growth of socio-economy, science and technology activity lacked the material base to develop research and development of technology, research investment, research staff and research content planning and coordination. The development of technology did not get actively the appropriate support and the promulgation of the integrated and completed science and technology policy. There is no regulation on science management, which caused an ineffective organization and control of science and technology implementation.

Some of the machines imported for the production in the country were outmoded and old. They broken down easily often requiring

repair with a high cost, the spare parts were rare and affected the negative impact to the environment. These problems do not contribute to upgrading productivity. So much time was spent. Some of manpower did not receive in terms of the development of their knowledge to adapt the new technology as for applying to the production in order to get the good result of production and produce faster. As results, the products are not standardized and are not in a good quality. They are not responded to the taste of consumers even it can not compete with international market. Therefore, they have no experience in seeking international aid for joint venture in industrial development. It is observed that the skills level of staff allows them to use technology but not how to imitate, apply and adapt anymore.

The research on the import technology capability level is limited and was not multidisciplinary. The coordination between the research institute and industry is not wide for the common research. Meanwhile, the exchange of information, the equipment provision, the use of new result of research and technology development, the advisory service, the design of products and the modern production technology are not yet carried out in a complete system.

In conclusion, we are still far behind in terms of science and technology research and development as we lack funding, highly qualified staff and various research institutes. Meanwhile, we have not defined and promulgated the national science and technology policy. We are unable to develop a sound approach to research,

thus resulting in uncoordinated efforts leading to the ineffective implementation and control of science and technology.

Chapter II

Science and Technology Policy in Lao PDR

1- Objectives and goals of science and technology policy up to the year 2010

1.1- Rationale and necessity for science and technology policy

The National Science and Technology Policy is a directive for socio-economic development and for promoting the application of science and technology. It improves the physical and moral condition of the population including upgrading the research and development capability for creating the condition lead to the technical innovation, improving the scientific and educational infrastructure and technology in all sectors.

Globalization and regionalization go in pair with the disparity in the field of socio-economic due to the divergence level in the real situation of history, great potential and consequences from each country. The science and technology policy shall conceive as high priority in the national development plan in order to resolve the poverty,

upgrade the living condition of Lao population. If it is not done so, the country will be fallen down and widened substantially from rich countries.

1.2- Objectives:

- a) To stimulate and disseminate the application of science and technological results in improving the productivity of production, implement unanimously and focus in terms of science and technology activity aiming to upgrade the living of population and accelerate the national development.
- b) To upgrade the capability of science and technology and promote the capability of scientists including ensuring and improving strongly science and technology infrastructure in different fields.

1.3- Goals

- a) To improve the Research and Development, ensure the mobilization of science and technology resources in Lao PDR in principle, upgrade higher education for serving agricultural and industrial development in order to turn into the industrialization and modernization for reducing the poverty step toward the developing countries.
- b) To recognize the necessity of coordination strongly between sectors and research institutes as well as ensuring the participation of the production sectors and scientific community for the maximum benefit of the country.

- c) To upgrade and strengthen technology knowledge and serve the society.
- d) To promote essentially the adaptation and innovation of technology.

2 - General Policy of Science and Technology in the future

We shall concentrate in terms of research, in particular, the capability of application and innovation the technology by itself and combine with the creation of good condition for the research. This maybe done by enlarging the investment of foreign countries for science and technology research, upgrading scientists and researchers in key sector needed and establishing of research laboratory together with equipping the materials. Also, this concerns the creation and application of the work force skills in domestic and foreign countries in order to promote the industrialization and modernization throughout the country, reduction the import of unnecessary goods and encouragement of the production of goods for export.

3- The science and technology priorities in the few years

The socio-economic development from now up to the year 2010 is a step forward to accelerate the building of economy base for ensuring the stable development. The essential objective is to improve and create a fundamental factor of production in order to establish firmly economy growth. By

means, this should satisfy sufficiently the requirement of goods and social services. In order to create the opportunities of achieving the goals it should focus on the following important concerns:

3.1- Types of priorities:

This has been divided into 2 types:

National cross-sectoral priorities: means the collaboration of sectors in the implementation of works defined in the policy.

Sectoral priorities: means sector to be implemented activities according to its role and function by spreading from the national policy.

3.2- National cross-sectoral priorities:

- a) Strengthen the establishment of science and technology infrastructure: research institute, technology and marketing center and some services like: quality control, advisory service and technology transfer promotion.
- b) Create regulations and legislations for the promotion of research activity of individuals, private sector, business units and professional units as well as focus on protection of intellectual property.
- c) Put the management and development mechanism on science and technology including improving administrative and manage-

ment of science and technology research.

- d) Support enterprises effectively master, import and transfer of technology for improving productivity and quality of products.
- e) Encourage the applied, innovative and adaptive research for enhancing the capability of scientists, researchers for expanding the production, and satisfying the needs of socio-economic development.
- f) Analyze thoroughly the important project of science and technology investment project.
- g) Pay attention on education and training of technical staffs and human resources in multidisciplinary sectors and select the talented persons for innovative research.
- h) Follow-up, control, evaluate and estimate the import of new technology fit to the needs of country development in a new period.
- i) Focus on investigation survey activities to supply database for planning, determine project relative on soil resource, forestry, water, mineral, biodiversity resources.
- j) Use internet, information technology in different sectors: education, health, commerce, production, banking, remote sensing, Geographical Information System and others.
- k) Use biotechnology and genetic engineering in agriculture, forestry, fishery, medicine, pharmaceuticals, food processing and environment.

3.3- Sectoral priorities:

3.3.1- Agriculture and forestry

The agriculture and forest sector consists of an economy component structure in key priorities of government. We should encourage the activities as follows:

- a) Concentrate on the agricultural research by emphasizing on the new varieties production of cereals and manufacturing products that can resist to the climate and attack against the diseases and insects for reducing the use of chemicals and increasing the agricultural productivity. It is also important to study the varieties of animals with high quality by using a wide progress of biotechnology and genetic engineering to breed the animals and plants in food production process for human and animals, including fishery, aquatic and forest research. In addition, the use of bio-chemicals fertilizers, pesticides, materials production and machines in saving energy is to be analyzed in the field of agricultural area. Other methods on the augmentation of the effectiveness of the production and sufficient provision of the raw materials to the agricultural processing industry as well as to produce goods for great export are to be considered.
- b) Develop the effective system of control, protection and prevention of the animals and plants disease aiming to obtain the good performance of plants, animals and food products.
- c) Give the attention to the land use protection, land classification,

the utilization and prevention of the land degradation and desertification as well as ecosystem protection and geology for the balance of nature.

- d) Study, develop, protect, regenerate and use sufficiently, efficiently and sustainably natural water resources for water supply for the agriculture, industry and services.
- e) Protect, manage and develop forestry resources for ensuring the needs of socio-economic development and protection of ecosystem balance and environment quality.
- f) Study the forestry resources with high commercial value for domestic use and for export (rotten, stick lac, benzoin, resin and others).

3.3.2-Industry

Based on peculiarities and condition of geography of Lao PDR for the use and exploit the subjacent potential of natural resource as well as keep the agricultural activity linked closely to the industry, we should make efforts as follows:

- a) Develop and promote small and medium industry development, transforming industry of agriculture-forestry, small-scale industry-handicraft, manufacturing of goods for consumption and construction material manufacturing industry, assemblage industry, micro-electronics industry, mechanics, metallurgy and minerals industry efficiently in order to substitute the import and produce for export; put the agro-forestry production link to the

- industry; use of the natural resources as the raw materials source for sustainable development. However, in order to upgrade the efficiency of industry, the import of technology should be selected for suitable to the production goal including advanced and appropriate technology for the small scale production of farmer family, modern technology but saving materials, without creating lots of wastes harmful to the environment in some areas of the industrial production for the production of goods with quality and standard should fit to the world market as for export. This technology can still create an added value inside the country and offer the opportunity to the location to be able to use the technology for the maximum profit.
- b) Elaborate hydro-electricity policy upon to the geographical potential of the country that is a condition to support the country to create many hydro-electric dams with high power installation of thousand megawatts linked and integrated for the socio-economic development with low-cost and even generate importantly the monetary revenue source to the country. To this fact, the development should be in parallel with the environmental protection for the sustainability of the society. So the choice of hydro-power technology is really important. At the same time, the transfer of renewable technology is still necessary to remote and rural area.
 - c) Establish the technical advisory center, services center testing goods quality and standard for improving the test, measurement and survey materials and equipments efficiently, standardized and ensuring the security, resistance and reliability in terms of quality.

3.3.3- Constructions and transports

Constructions and transports are the keen sectors that we should concentrate on the issues as follows:

- a) Promote the research on creating urbanism system suitable to the particularities of geography, socio-economic development in each area for ensuring the facility, security, beauty and preserving national and ethnic cultural heritage.
- b) Encourage the research on standardized construction materials, secure on safety and environment that meet to the social services and for some export.
- c) Promote the creation of roads and bridges networks in support to the defense, seasonal distribution, markets access between domestic and abroad, tourism ensuring the effectiveness of socio-economic field.
- d) Stimulate the soil classification and land utilization for the order, facility, beauty and conformity to the construction regulations including ensuring the easier management and control of implementation.

3.3.4- Telecommunications, Informations Technology and Information Networks

Recognizing the need for a more accessible and efficient means of distributing information to the country, it should improve and develop the activities of telecommunication, information

technology and information networks as follows:

- a) Improve and develop widely, speedily, reliable and with quality the infrastructure of ICT, Internet applications and multimedia to enable to link to the different areas such as: agriculture, industry, education, health, society and services inside and outside the country.
- b) Use the computers as the aid tools for improving the productivity, the standard, designing software use and managing the industry.
- c) Promote the import of standardized telecommunication and computer equipment and contribute on the link to telecommunication network as well as repair and assembly computers for reducing the low price.
- d) Promote and support the research and development of software in Lao language for widely use.
- e) Create and develop the capability of the national scientific and technological information network including telecommunication and internet system, capable to link with regional and world. Meantime, enhance efficiently the capability of the development of such information system and Internet system throughout the country.
- f) Create the awareness on science and technology and produce information for the profit of society by avoiding dissemination of information affecting the negative impacts to the society.

3.3.5- Remote sensing

Remote sensing application proved to be helpful in achieving natural resources planning and development. It is widely used in various fields ranging from forestry, agriculture, geology, hydrology, environmental studies. Some research activities shall be conducted as follows:

- a) Carry out the assessment and monitoring of forest cover, forest fire, land-use/land cover management, meteorological and disaster situation.
- b) Focus on the research of soil erosion, agricultural crops monitoring, geology and rural settlement.
- c) Study and evaluate the flooding, drought, water shortage and water storage area of the dam.
- d) Set up the network of geographical information system for the exchange of data and distribution among agencies and research institutions.
- e) Promote and encourage the application of satellite data for natural resources survey and planning in the priority areas and impact assessment.

3.3.6- Environment

Preserving a wealthy and healthy environment requires the appropriate measures in science and technology as follows:

- a) Study, encourage and develop efficiently appropriate technology for natural resources use and management and for the prevention, reduction and minimization of the pollution and waste.
- b) Study and develop the capability of science and technology application for sustainable development.
- c) Choose and use clean technology such as production technology and use recycling waste, reducing and minimization pollution technology like: water pollution treatment and smoke from industries, the renunciation of certain chemicals such as: CFC, saving energy and material technology and promote the utilization of renewable energy particularly solar energy, wind energy and bio-gas.
- d) Undertake the evaluation and Environmental Impact Assessment for new project.
- e) Promote the utilization of modern technology for creating the data for follow-up the pollution development and standardized environmental management.
- f) Enhance the creation of awareness of Lao people on environmental protection and sustainable natural resources application.
- g) Focus on bio-diversity research with economical value and study the utilization of sustainable biological resources and analyze the impact of environmental change.

3.3.7- Health

Protecting human health in a changing world requires emphasis on the following:

- a) Consider primarily the prevention and the treatment as an important one. However, for reaching the goals of upgrading the efficiency of prevention and treatment activity and step forward to the modern hospital, it should be necessary to upgrade gradually the knowledge, skills, expertise of staffs and modernize the medical materials in parallel. Meanwhile it should also improve thoroughly health science research infrastructure, undertake the fundamental research related to the specific field and disease problems derived from social situation of the country condition.
- b) Undertake the production of drugs in the country and improve step by step drug quality, promote strongly the use of traditional medicine combined with traditional technology and modern technology and build-up the capacity of drug production for export in the future.

3.3.8- Research and development

Science and technology research make greater contribution to economic growth and improve social and cultural attainment, the quality of life for bearing the nation future. We shall aim to a number of targets as follows:

- a) Focus on the applied and adaptive research. For fundamental research, it should be developed in some particular important field and served as the scientific data and enhance the level of science and technology.

b) Pay attention on the analysis of socio-economic and technological of scientific project in detail and thoroughly for maximum profit.

3.9- Economy:

Economy is a factor for growing the production and driven to industrial competitiveness and technology change in order to improve the production effectiveness and quality of produced goods. We shall focus on the important issues as follows:

- a) Invest to infrastructure development necessary to rural area like: science and technology education, research, health, telecommunications and information system, roads, markets system such as: goods market, labor market, currency market for changing economy component structure as a proportion of GDP as follows: agriculture 36,6%, industry 31,5% and service 31,9%. The revenue per capita shall be approximately at least about 800-1000 US\$.
- b) Promote the growth of production, change in the products and production process leading to the improvement of products quality, change of technology and change of markets upon to the production factor for ensuring the domestic consumption and producing for export. It will also ensure to generate firmly the revenue source of foreign currency and the stable and sustainable economic development.
- c) Create the opportunity for more export of goods and industrial

products with international standard and quality that is to be able to take into competition with foreign goods.

- d) Support the funding for the Research and Development in terms of production process and creation of the products efficiently.
- e) Promote the population distribution in balance between district and rural, between localities in the country, the creation of high professional skills, the application of appropriate technology and creation of employment for ensuring widely revenue distribution.

3.3.10- Commerce, service and tourism:

With the opportunity that Lao PDR is the center of Southeast-Asia Region and rich of natural resources, the commerce, service and tourism is considered to be the potential for the future development that we shall concentrate on the following:

- a) Develop communications and transports infrastructure for the costly passage, develop finance, bank, commerce, service system and e-business and so on.
- b) Enlarge the commercial relation and international investment, study and establish finance market and funds market, develop the potential in all fields for the participation of liberalization trade zone.
- c) Develop the natural, historic and cultural tourism symbolizing the nation including the protection of old archeological site and national heritage for the next generation and world people in the future. In parallel, it should pay attention to the pollution prevention and tourism source protection for preserving a beautiful

place and healthy environment.

3.3.11- Social and human science

Social science is a tool for solving the society problem. In order to make science acceptable or to create the responsibility for social means, it is necessary to do the research on social science in connection with natural science that it has become to the human science. By this reason, it should study the evolution, existence and development of human both in physical and morality for the need of development, of the spirituality and the existence of human in the society for the civilized and progressed future. Meantime, it should promote the management, encourage the research, preserve, protect and develop the heritage and magnificent culture of the nation and ethnic minorities including the sustainable restoration of artifacts, archeological sites and ancient historical sites of the country as usual.

Chapter III

Major Policies for the implementation of Science and Technology Development

1 - Direction of the development and promotion of science and technology

The progress of science and technology is an important and decisive factor for the development around the world. Actually, economic growth, competitiveness of trade, employment, long life and healthy and safety environment lead to the civilized and sustainable future. We shall essentially concentrate on the active promotion of research and development to meet the need of socio-economic development, create a new modern industry and develop rapidly the progress of information technology and telecommunication in all sectors, solve the common problems such as: environment, food, energy and resources, pay attention on health protection, disease prevention and disaster protection emphasizing on satisfying the need of the human. In order to implement policy direction in concrete action as defined in the objectives and goals, we shall focus on the activities as follows:

1.1- Human Resources Development:

- a) Define the human resources development plan in medium and

long term at all levels, integrate the human resources development plan to be lined up with socio-economic plan including follow-up and control it regularly for satisfying the need of the development in each period.

- b) Develop the technical capability of the National University of Laos to provide opportunities for Masters and Doctoral students in science and technology.
- c) Develop the capability of appropriate research centers to conduct training courses in priority areas: agriculture, agricultural economics, agricultural engineering and others.
- d) Promote the establishment and expansion of vocational and technical schools both public and private sector. Reform the educational system in science and technology, engineering education and promotion of science and technology at schools and university, general education and professionals. Study the need of bringing modern science and technology into the teaching-learning for change of new attitude of science and for integrating the progress of science and technology in the spirit, moral and the society.
- e) Encourage the training for high qualified and talented young scientists in innovation to meet the need of development.
- f) Assess the absorptive capacity of graduated scientists and technologists. Attempt to match the supply and demand for science and technology professionals in niche areas.
- g) Promote a science and technology culture in the curriculums of primary, lower and upper secondary education, higher education and university.

- h) Develop bilateral and multilateral programs for training the trainer in priority areas.
- i) Science, Technology and Environment Agency shall take on the role of providing guidance for the selection of science and technology schools.
- j) Organize regularly the training in different forms such as: training at professional schools, on-the-job training and distance learning, sometimes, it is necessary to collaborate with the foreign experts in certain research sector to send the staff to undertake the research in abroad.
- k) Mobilize the funds to establish some institutes with high quality in agriculture or some priority areas.
- l) Apply effectively the science and technology human resource development to fit the knowledge, competence and skills, userwards system and congratulate the person who has got the new creativity in science for the profit of the society.
- m) Focus on the implementation of incentive policy for scientists and researchers in order to encourage strongly science and technology activity.
- n) Strengthen the creation of awareness in science and technology and impregnate into life style.

1.2- Industry led science and technology:

- a) The development of a vibrant industry sector is an important step in achieving national development goals, notably poverty

reduction. Globally competitive industry requires knowledge and technology to produce goods and services to an acceptable world standard.

- b) Recognize that substantial growth of the science and technology system in Lao PDR requires a strong demand from the trained and qualified personnel and even though the strong support of business enterprises.
- c) Encourage National University of Laos and research institutes to work closely with local industry, through provision of training, consultancy and testing services, exchange of staff/students, and sandwich courses, where students do spend their time during the course to work within an enterprise.
- d) Explore strategies to attract and exploit the knowledge, skills and technologies of foreign companies in strategic sectors: incentives, joint ventures, technology licensing agreements and exchange of staffs.
- e) Utilize existing indigenous knowledge (e.g. herbal medicines) and find ways to combine traditional and western knowledge in productive enterprises.
- f) Organize a discussion on initiative for supporting the development of industrial technology in the future.

1.3- Science and Technology for natural resources and agriculture

Lao PDR has abundant biological resources and has a high proportion of the population rely on subsistence agriculture.

So that, the application of appropriate science and technology make an economical value and still attract international assistance for baseline studies of environment, biodiversity, sustainable management of natural resources and development of ecotourism.

1.4- Management and coordination of science and technology

- a) The National Science and Technology Council should be established and be headed by the Prime Minister, or alternatively an Advisory Board should be headed by high-level appointee with direct links to Prime Minister. It should play a role of advisor in science and technology to the government.
- b) The Council should consist of a mix of cabinet ministers whose ministries benefit from science and technology, of representatives from the productive sector, and experts in science and technology for development.
- c) The Council should establish the direction in science and technology policy for the development.
- d) The Science, Technology and Environment Agency (STEA) should undertake the function as the Ministry of Science, Technology and Environment and has supporting and coordinating function, promoting science and technology activities in the various implementing agencies and help translating policy into action. STEA might establish a Science and Technology Policy Support Programme (STEPS) to support the implementation of action programmes in human resources development, training in research and development, planning concerning science and

- technology and obtaining budget for targeted research areas. It might lead to establish the Science and Technology Foundation.
- e) Establish a National Science and Technology Research Institute in which carry out the Research and Development in strategic fields, the management of research and training the researchers.
 - f) Strengthen the Council of Science and Technology in the ministries as Advisory Board Committee to the ministry.
 - g) Establish a division for the science and technology management in each ministry and locality.
 - h) Develop the appropriate and collaborative research center in close collaboration with the National University for improving the capability of science and technology research aiming to promote the production and industrial development.

1.5- Science and technology investment

The science and technology investment is actually the main important factor that relates to the economic growth and technological changes of our country. Thus, for reaching gradually the goals of change in economy component structure according to the direction of the industrialization and modernization, it should make the efforts to the investment in science and technology from now up to the year 2010 as follows:

- a) Allocate 4-5% of GDP per year for science and technology research and development.

- b) Use effectively the funds allocated.
- c) Mobilize the funds from private sector and attract the international assistance for science and technology development.
- d) Create science and technology foundation to develop scientific research.

1.6- Institutional arrangements for science and technology

Strengthen the establishment of science and technology network by setting the research laboratory, the multidisciplinary institute combining with higher education and research institutes in different sectors. In addition, the Research and Development Institutes benefit the rights to do different functions: from Research and Development to transfer technology and advisory provision, allowing the permission to the institutes and universities to be able to generate the income from Research and Development.

1.7- Promotion and establishment of science and technology research and culture

The focus of scientific and technological research is as follows:

- a) Create the spirit of science and technology, promote the competitiveness in science and technology.
- b) Scientists and technologists should be promoted to play effectively their role in the society.

- c) Send regularly scientists and technologists to take part in training, seminars and workshops in order to increase their capability.
- d) Attract and incite the Lao scientists from abroad coming to Lao PDR as expert or advisor in science and technology.
- e) Promote different incentive scheme for scientists in science and technology development.
- f) Reduce taxation or tax exempt for company including enterprises, manufactures applying new technology and exempt import tax for the acquisition of materials for the purpose of research and development of research institutes.

1.8- International cooperation in science and technology

To capture the international technology flows, many efforts have to be made on the following:

- a) Establish strategy of science and technology.
- b) Attract the international organization for contributing on human resources development both in quantity and quality, technology transfer, information network and joint research activities.
- c) Mobilize foreign financial resources for set up some educational institutes and upgrade the qualified scientists in different levels particularly in Master and Doctoral degrees.
- d) Organize technology training that is useful for industrial development of the country and send regularly Lao researchers to the seminar, workshop, training in science and technology in abroad.

- e) Incite the Lao scientists with technology experiences from abroad to come to Lao PDR as scientific expert and advisor.
- f) Invite foreign expert coming to Lao PDR as an scientific advisor and volunteer or advisor to the research laboratory.
- g) Apply incentives scheme for foreigners in which transfer advanced technology to Lao PDR.
- h) Promote international cooperation with UNDP, UNESCO, JICA, KOICA and SIDA.

1.9- Popularization of science and technology

The popularization project should be emphasized as follows:

- a) Set up association on science and technology popularization at national, regional and local level.
- b) Make a program of science and technology popularization through mass media: TV, radio and others.
- c) Use schools, institutes as Popularization Center on science and technology.
- d) Organize regularly scientific and technological exhibition at different places and establish scientific museum or Science Park.
- e) Deliver regularly awards for the excellent scientists.

Chapter IV

Action Plan for the next few years

The Action Plan for science and technology is established to be consistent with the change situation in each period of time by focusing on accelerating human resources development match to the requirement of research and development. At the same time, it will be necessary to make a survey and investigation of the natural resources: land, water, forest, minerals, biodiversity of the country for enabling to develop infrastructure, offering the greatest impact and good environment to the society and environment, or at least, avoiding to affect the negative impact to the society, improve the technical services, promote the technology innovation and upgrade the quality of some products for export, the Information Technology application and computer in many sectors and branches like: bank, commerce and Internet. The activities of Action Plan should be implemented as the following:

1- Infrastructure Action Programme:

- a) Develop innovation system of researchers, reach to create the environment of research widely, flexible and competitive.
- b) Improve systematically the research institute and university including promote the facilities and equip modern materials and tools for the research.
- c) Improve and develop intellectual property infrastructure for the

research and development.

- d) Improve information and telecommunication infrastructure ensuring the capability of linking to the information network between institutes, university in the country and abroad.
- e) Increase knowledge and competence of continuing professional for science and technology personnel of the public sectors through training on creating the capability of innovation for researchers. Create the jobs for the excellent researchers.
- f) Promote the learning of science and technology by improving science education, engineering education and encourage science and technology.
- g) Increase competitively the investment on research and offer special grant schemes for education in the university and education in abroad.

2- Action Programme for Science and Technology Management:

Establish a series of regulations in science and technology such as:

- a) Transfer of technology
- b) Technology assessment and appraisal in investment projects.
- c) Implementation of policy and planning for science and technology development.
- d) Technology management for sustainable development.
- e) Creation of the foundation and management of finance for research and development activities.

- f) Management and applications of Internet, management of scientific, technological, environmental and natural resources information network through computer networks system.
- g) The congratulation and delivery of awards for excellent scientists and researchers and sanction for the guilty persons.
- h) The right protection of investors, scientists, writers, producers and consumers.
- i) The management and control the quality of products.

3- Action Programme for Human Resources Development:

- a) Identify priority training areas such as: agriculture, agricultural engineering, agricultural economics, plants and animals breeding, fishery, reforestation and wood processing technology, food technology, farming and plantation system, plants biotechnology, the protection and monitoring of plants, technology of pre-post harvest, soil science, prevention and control of diseases, land, water and forest management, rural development, management and application of internet, information network management system, IT, e-business, environmental science, eco-tourism, energy, civil engineering and others.
- b) Organize professional and technical training in traditional industry like: textile design, handicrafts, wood products and so on.

4- Action Programme for the creation National Science and Technology Research Institute:

- a) Support the establishment of National Science and Technology Research Institute for industrial development in Lao PDR by emphasizing on the use of existing technologies and import foreign technology.
- b) Encourage and promote the research and development, researchers by ensuring the implementation of a good incentive policy for researchers.
- c) Promote the linkage between National Science and Technology Research Institute and Industry.
- d) Promote the generation of revenue source for the self-existence.

5- Collaborative Action Programme:

The Science, Technology and Environment Agency plays a supporting role for projects elaboration of various ministries which have significant science and technology contents like: seed and gene bank, aquatic biotechnology and technology support for handicrafts.

6- Some Possible Actions Programme:

- a) Renewable Energy Park
- b) Develop Science and Technology Information Network and

Services, Information Technology for the disadvantaged groups (ethnic groups, poor, handicapped, etc), e-commerce and e-business.

- c) Green Health: sustainable use of natural products for traditional medicines.
- e) Provide the assistance for small business: technical and others such as: finance and tax for upgrading small business through technology improvement.
- f) Links between industry, institutes and university: promotion of services to industry by the institutes and university.

CHAPTER V

IMPLEMENTATION OF NATIONAL SCIENCE AND TECHNOLOGY POLICY IN LAO PDR

1 - Science, Technology and Environment Agency assume its function to operate 4-5% of the budget allocated by the government for sharing with other ministries in the science and technology development in the future. Then, it should follow-up and report the result of the implementation to the Prime Minister's Office.

2 - Science, Technology and Environment Agency advise unanimously the promulgation of the National Science and Technology Policy of Lao PDR for the whole country and coordinate with different sectors in establishing the plans, programs and

projects related to the science and technology.

3 - Ministries, line ministries, provinces, capital and special zone play its own role to implement effectively the National Science and Technology Policy.

Vientiane,
Prime Minister of Lao PDR
Signature and seal

Bounnhang VORACHIT