C. Trade and Industrial Policy

Working Group Report

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1. Industries in Myanmar

Endowed with abundant labour and agricultural, forestry and fisheries resources and mineral energy and tourism resources; occupying a strategic location in a high growth region of Asia sharing its borders with giant China and India; and having, as a late-starting developing nation, the possibility of leapfrogging other nations amid global technological innovations, Myanmar has the potential to develop into a major industrial nation in the ASEAN. It is expected that the progress in regional unification as represented in AFTA and plans for a free trade agreement between the ASEAN nations and China will heighten the merit of Myanmar's strategic location. On the other hand, Myanmar is currently under economic sanctions by the advanced, industrialised nations and the realisation of Myanmar's economic potential will depend largely on when and if such sanctions will be lifted. While a number of scenarios are possible, if the sanctions are lifted soon and if the government of Myanmar implements necessary policy reforms, it is possible to draw an industrial vision in which "the status as a newly industrialised nation will come in sight for Myanmar" by 2020. Then, the development of industry will have made progress and it is possible that per capita GDP will have increased to US$1,500-2,000 from the present US$200-400 (estimated); the ratio of the industrial sector to GDP will have risen to approximately 35% from the present approximately 10%; and that of manufactured products to total exports will reach 60%.

While the share of the industrial sector in GDP is over 40% in Thailand, Malaysia and Indonesia, that in Myanmar is only approximately 10%. The slow development of the manufacturing sector in Myanmar can be attributed to long vicious cycle, which has resulted from the combination of the effects of domestic policy factors and foreign economic sanctions. The policy factors are characterised by i) the delay in the development of an environment conducive to a market economy, ii) an inward-looking economic policy which has emphasized import substitution, and iii) inadequate levels of transparency and continuity of policies and efficiency of the government. This report suggests concrete reform measures to correct these shortcomings. They include, for example, phased reform in the so-called export tax of 10% and the launching of an aggressive policy for attracting FDI which is equal to that in the neighboring countries. Prompt policy responses are necessary in a broad range of policies.

2. The Development Potential of the Myanmar Economy

It is especially important to implement priority strategies in stages and change the role of the government in its industrial development strategy to close the gap between the development potential of the economy and the present low level of industrial development in Myanmar. Necessary measures include i) building of a market economy structure that is led by the private

sector; ii) outward-looking economic policy that is geared to the promotion of exports and FDI; iii) diversification of the industrial structure; iv) strengthening Myanmar's advantage in the location of industries; v) shifting the role of the government in industrial development to one that will encourage competition among enterprises and adopting a policy that will indirectly support such competition; and vi) the creation of a system that will support the shift of industrial policy framework in the area of knowledge. In the short term (i.e., from 2003 to 2005), phased implementation of such priority strategies as the introduction of FDI, the development of private enterprises, and an improvement of the international balance of payments is suggested.

3. Strategic Industries in Myanmar

Myanmar's strategic industries should be chosen from the perspective of identifying the industries that will propel the industries as a whole, such as "labour-intensive, resource-intensive industries" and "agro-based industries" in which the country already has a comparative advantage, and in terms of the "possibility of utilising foreign capital" and "raising the industries to higher levels in the medium- and long-term." In the short term, the development of export-oriented industries is important to end the vicious cycle stemming from a foreign exchange shortage. Specifically, such industries include garment- and footwear-manufacturing, assembly of electronic products, mineral resources-related industries and fisheries and wood-processing industries. If the management and technological capabilities are enhanced, food processing also has large growth potential and should be nurtured as a strategic industry. Industrial development should start with simple labour-intensive industries and then identify more advanced, labour-intensive industries, such as electronic parts industry, low-end machinery manufacturing and plastics and material industries as strategic industries. New industries, such as computer software, should also be nurtured.

4. Foreign Direct Investment

The decision-making on and launching of the improvement of the investment environment to attract FDI on a large scale are the sooner the better. The FDI policy to be implemented soon does not necessarily entail large fiscal burden to the government. In the short term, we suggest launching of a series of policies, including the creation of Myanmar Economic Zone Authority (MEZA), which will play the leading role in attracting FDI; enactment of ministerial directives concerning special economic zones (SEZs); and the development of a model SEZ. Since Myanmar does not yet even have export processing zones (EPZs), we may be able to go as far as to say that foreign companies are not yet even contemplating Myanmar as a possible host for their investment. The following six items are policy suggestions which should be implemented as soon as possible.

1. Formulation of a Special Economic Zone Act or ministry directives
2. Early dissolution of disincentive measures
3. Organization of a Myanmar Economic Zone Authority (MEZA, preliminary name)
4. Privatisation of electrical power limited to the SEZ
5. Development of SEZ with a one-stop service function
6. Admission to the ASEAN-Japan Center (FDI promotion)

5. Concrete Policy

As typically demonstrated by Vietnam's success in forming its economic foundation and expanding the scale of its economy in recent years through its policy to attract FDI and promote exports, it goes without saying that a dramatic expansion of Myanmar's exports is closely tied to the introduction of FDI. In addition to the issue of the introduction of FDI, a large number of policy priorities and problems exist in Myanmar concerning export promotion. The following six items are the concrete measures which should be taken as soon as possible.

1. Establishment of a government and private export promotion joint committee sponsored by the prime minister.
2. Abolishment of the so-called export tax (commercial tax and income tax) and the provisional introduction of import surcharge and special import surcharge accounts.
3. Opening up exports to the private sector starting with sesame (the steady opening up of restricted export items to the private sector).
4. Abolishment of export and import licenses and the introduction of a "negative list" in exceptional cases.
5. Gradual abolishment of restrictions on dollar imports for the purpose of "trade first," but not for "exports first" or "imports first" and provisional introduction of a foreign currency allocation system.
6. The prior introduction of special export processing zones.

6. Potential Items for Export Promotion

With respect to export promotion, an examination by item shows that there are items that should be opened further to the private sector or that are competitive in export markets and should be newly designated as export promotion items. They include sesame, sesame oil and copper cathodes, just to name a few. The opening of rice and sesame exports to the private sector is likely to dramatically improve Myanmar's trade balance. The government makes deep interventions in exports by the private sector though the control of exports themselves, price

controls and the exchange rate. The government should reduce its intervention, such as the application of inferior exchange rates to the sesame and garment industries and price controls on rice and fish, in the exports of domestic products that are competitive in export markets; enhance export incentives for the private sector; and work to increase exports.

7. The Promotion of Private Enterprises

The government of Myanmar has been promoting the development of private enterprises since the second half of the 1980s. However, the efforts to promote the development of private enterprises (manufacturing) are facing many problems due to the deterioration of the fiscal balance and foreign exchange revenues resulting from the Asian currency crisis of 1997, requiring further efforts to attain the government's objectives. Today, with the exception of some large enterprises in the garment, beverage, footwear and wood processing industries, most of private enterprises in Myanmar are small and medium-sized enterprises (SMEs). In the master plans for the development of private (manufacturing) industries, the macro structure (GDP composition, the number of registered enterprises, the scale of enterprises based on the number of employees, etc.) was analysed through statistical analyses, followed by the identification of micro problems and priorities (power shortages, shortages of raw materials and parts, difficulties in fund-raising, shortages of information, various problems, including the cumbersome export and import system, etc.) through questionnaire and interview surveys. Policy proposals by industry (export-orientation, import substitution, supporting industries, rural industries, etc.) and policy proposals for SMEs (a redefinition of SMEs, the creation of the government bureau for SME promotion, an improvement in company registrations, the enhancement of the functions of chambers of commerce and industry, technological and technical training, measures for the creation of cooperative businesses, measures for industrial land, SME financing, etc.) were then prepared based on the outcome of these studies. As concrete examples of policy proposals by industry, the study has formulated development strategies for the garment and foot-wear industries.

8. Human Resource Development in Industrial Sector

With respect to human resources in the industrial sector, which are one of the propellers of industrial development, there are quite a few problems. They include: i) quantitative and qualitative shortages of skilled labour, ii) an absolute shortage of human resources with technological and technical capabilities, iii) a shortage of opportunities for management education for managers of PMIs/SOEs (Private Manufacturing Industries, State Owned Enterprises), and iv) a shortage of business management capabilities. Thus, we suggest the implementation of the following three priority policies.

1. The establishment of Advanced Vocational Training Centers (A-VTC) and accelerated modernisation of Vocational Education and Skills Training (VEST)
2. The enhancement of managerial education systems, such as PMIs, for reinforcement of managerial ability
3. The establishment of an Myanmar Industrial Research Center (MIRC) and the creation of an industrial information infrastructure.

The government of Myanmar is advised to adopt as priority policies i) obtaining overseas technological information, ii) attracting FDI, iii) expanding opportunities for exchange with foreign enterprises, iv) enhancement of management education programmes for business managers, and iv) a dramatic enhancement of various organisations of private enterprises and the UMFCCI, which serves as their coordinator, and implement such policies as soon as possible.

9. Policy Recommendations

Thus far, we have presented policy suggestions centering on export promotion, attracting foreign direct investment and the development of private manufacturing industries as priority measures to end the vicious cycle that is beleaguering Myanmar's economy. Given the present condition of Myanmar's economy, we will present policy suggestions which should be given special notice as emergency recommendations.

<A> Deregulation and liberalisation

1. Abolish the so-called export tax, excepting some commodities
2. Abolish the export license system
3. Guarantee foreign currency remittance for foreign investors
4. Improve the current unstable condition regarding foreign investors' rights in the legal aspect
5. Abolish the compulsory exchange system with the foreign exchange center rate, which is greatly lower than the market rate, for CMP-based businesses (regarding workers' wages)
6. Improve the transparency and through notification regarding trade and investment
7. Promote simplified, transparent and prompt administrative procedures for the following: new company or business registration, export and import license issuance, authorisation for direct foreign investment, approval for capital increases of companies, customs clearance.
8. Abolish restrictions on direct trade by foreign companies

<B> Establishment of special economic zones (SEZs)

In the present situation, in which even industrial zones in the export processing zone format, not to speak of special economic zones, do not exist in Myanmar, there is very little incentive for foreign companies to invest in the country. We may be able to go as far as to say that Myanmar is not even considered as a host country for a full-fledged foreign direct investment. Economic sanctions by Western countries and other political situations are certainly disincentives for investment, but they are not critical factors in the absence of foreign direct investment in Myanmar. Rather, the deep-rooted perception in foreign countries that "military regime means a lack of peace and order (public security), a lack of transparency in government policies and the absence of investment guarantee for foreign companies," which can be thought as a partly misguided perception, and the fact that Myanmar does not even have an export processing zone seem to be the critical factors in the absence of FDI. In the intensively competitive business environment revolving around China's strength in production and cost performance, some Asian enterprises' investment behaviours are very business-like. Therefore, it is suggested that the government of Myanmar develop a pilot SEZ and improve the investment environment through the creation of industrial zones. Along with the "availability of abundant, inexpensive labour force," "the existence of peace and order (public security)," "the pervasive influence of Buddhism and a society of friendly people," "existence of very few labour disputes" and "the top-down management style and the diligence of workers" should prove to be major attractions for foreign capital.

If the prompt launching of an SEZ development project proves to be difficult, we suggest that Myanmar conduct a preparatory study for attracting foreign capital and a study to find out the detail conditions for success for Myanmar-model SEZs. It is extremely important to carry out analyses of investment behaviour, centering on an analysis of cost competition in the Asian region and an analysis of industrial siting behaviours to choose optimum locations for production for industries, Asian enterprises and product groups which are likely to become potential investors or objects of investment in SEZs in Myanmar. The success of Myanmar's SEZs will depend largely on such studies.

D. Information and Communication Technology Working Group Report

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Acronyms

ADSL	Asynchronous Digital Subscriber Line
AFSIT	Asian Forum for Standardisation of Information Technology
AIST	Agency of Industrial Science and Technology, Japan
AMPS	Advanced Mobile Phone System
ATM	Automatic Teller Machine
BCT	Bagan Cybertech
CA	Certification Authority
CAD	Computer Aided Design
CAM	Computer Aided Manufacturing
CDMA	Code Division Multiple Access
CDP	Computing Development Project
CICC	Centre of International Cooperation for Computerisation, Japan
CIO	Chief Information Officer
CMMI	Capability Maturity Model Integration
CRM	Customer Relationship Management
D-AMPS	Digital Advanced Mobile Phone system
DOMSAT	Domestic Satellite
DSA	Digital Signature Act
DTAVE	Department of Technical, Agricultural and Vocational Education
ECA	Electronic Commerce Act
ERM	Enterprise Resource management
ERP	Enterprise Resource Planning
ETA	Electronic Transactions Act
ETO	Electronic Transactions Order
GIS	Geographical Information System
GMPCS	Global Mobile Personal Communication via Satellite
GPKI	Government Public Key Infrastructure
GSM	Global System for Mobile Communication
ICT	Information and Communication Technology
INTELSAT	International Satellite
IP	Internet Protocol
IPRs	Intellectual Property Rights
ISDN	Integrated Services Digital Network

ISO	International Standardisation Organization
JITEC	Japan Information Technology Examination Centre
JITEE	Japan Information Technology Engineer Examination
LAN	Local Area Network
MCF	Myanmar Computer Federation
MCIA	Myanmar Computer Industry Association
MCSA	Myanmar Computer Scientist Association
MERB	Myanmar Education Research Bureau
METI	Ministry of Economy, Trade and Industry (Japan)
MICT Park	Myanmar ICT Park
MLIT	International Symposium on Multilingual Information Technology
MOE	Ministry of Education
MPT	Myanmar Posts and Telecommunications
MRP	Manufacturing Resource Planning
MRTV	Myanmar Radio Television
MSP	Multimedia School Project
OJT	On the Job Training
PKI	Public Key Infrastructure
QAM	Quadrature Amplitude Modulation
RIX	Regional Internet Exchange
SCM	Supply Chain Management
SDH	Synchronous Digital Hierarchy
SDP	Service Delivery Point
SEA-ME-WE 3	South East Asia-Middle East-Europe 3 (an intercontinental submarine cable)
SME	Small and Medium-sized Enterprise
SWIFT	Society for Worldwide Inter-bank Financial Telecommunication
TEDI	Trade Electronic Data Interchange
TRIPS	Trade Related Aspects of Intellectual Property Rights
TTP	Trusted Third Party
UCC	University Computer Centre
UCSM	University of Computer Studies, Mandalay
UCSY	University of Computer Studies, Yangon
UDE	University of Distance Education
UNCITRAL	United Nations Commission on International Trade Law
UNDP	United Nations Development Programme

VSAT	Very Small Aperture Terminal
WAN	Wide Area Network
WAP	Wireless Access Protocol
WDM	Wave-length Division Multiplex
WIPO	World Intellectual Property Organization
WLL	Wireless Local Loop
xDSL	x Digital Subscriber Line

I. Introduction

Information and communication technology (ICT) is recognised as a key element in implementing political, economic and social objectives in Myanmar. The Information and Communication Technology Working Group (ICTWG) believes that Myanmar can compete effectively in the international ICT industry particularly in the software sector. There are many opportunities for the application of ICT in socio-economic organisations to increase productivity and market penetration, reduce costs and improve services so that they can compete in the global market. Systematic efforts in ICT development would provide Myanmar with opportunities to leapfrog and catch up with the developed countries.

Developments in ICT in the last couple of years indicate that there are dedicated and concrete efforts in Myanmar, in both the public and private sectors. But the pace of development can still be improved so that Myanmar can narrow the digital divide.

The ICTWG believes that in order to improve the pace of ICT development, Myanmar requires both technical and financial support along with cooperation and collaboration with other countries. Considering the long history of successful cooperation, cultural compatibility, and ICT-related problems and opportunities of Myanmar and Japan, the two countries have much to offer each other if they collaborate effectively in ICT development.

Based on the preliminary studies, the ICTWG identified five areas of focus: ICT infrastructure, ICT legal infrastructure, ICT education, ICT application and ICT industry. Five study teams were formed accordingly. This report is based on the findings of the ICT survey on public organisations by the ICT Application Committee of the e-National Task Force of Myanmar, the ICT survey on the private sector by MCF, the survey on telecommunication infrastructure in Myanmar by Japanese experts, and in-depth studies by the study teams.

This report describes the present situation and future trend of ICT development in Myanmar. Strengths, weaknesses, opportunities and problems are identified and recommendations are provided for boosting ICT in Myanmar. The ICTWG is confident that implementation of the recommendations would speed up ICT development in Myanmar and provide an excellent opportunity to make great strides in socio-economic development.

The report attempts to provide policy recommendations covering all the areas or programmes for ICT development in Myanmar. The ICTWG believes that Myanmar and Japan can co-operate in almost all areas for their mutual benefit and that Japanese assistance would be welcome in all ICT development efforts.

II. Historical Background

1. Early Computerisation Efforts in Myanmar

ICT was introduced in Myanmar quite early with the establishment of the University Computer Centre (UCC) in 1971. The Computing Development Project (CDP) financed by UNDP was implemented in 1983. The purpose of the project was computerisation of government organisations. Unfortunately, these early efforts could not be sustained due to various reasons.

2. Recent ICT Developments in Myanmar

The Myanmar Computer Science Development Law was promulgated in 1996 and consequently the Myanmar Computer Science Development Council, headed by General Khin Nyunt, Secretary (1) of State, the Peace and Development Council, was formed. Three NGOs, the Myanmar Computer Scientists Association (MCSA), the Myanmar Computer Industry Association (MCIA) and the Myanmar Computer Enthusiast Association, were formed in 1998. With representatives from these associations, the Myanmar Computer Federation (MCF) was formed in the same year. The federation and associations did an exceptional job in improving awareness of the power of ICT.

The Ministry of Science and Technology, created in 1997, is specifically responsible for ICT human resource development. Two universities, one in Yangon and one in Mandalay, plus twenty-four regional computer colleges dedicated to ICT professional education, were established under the Ministry.

In November 2000, heads of ASEAN countries signed the e-ASEAN Framework Agreement and the e-National Task Force was formed to coordinate efforts towards the implementation of the Agreement. Six committees were formed: ICT infrastructure, ICT legal infrastructure, ICT education, ICT application, ICT standardisation and ICT liberalisation.

MCF has already prepared and submitted a draft ICT Master Plan to the Council. The draft Master Plan has been approved by the council as the guiding principles for all ICT development efforts in Myanmar.

In 2002, a consortium of private companies established the Myanmar ICT Park, a special zone where adequate facilities and support are provided for ICT companies.

3. Myanmar-Japan ICT Collaborations

Myanmar-Japan ICT collaborations started in the mid-1990s and have evolved in parallel with the Economic Adjustment Policy Dialog between the two countries.

Initial contact between ICT industry leaders and experts from both countries was established in

1996. This happened to coincide with the emergence in Myanmar of the ICT associations mentioned above, and was followed by a series of fruitful and mutually beneficial interactions and collaborations between the two countries.

In response to the global Y2K problems, Japanese experts visited Myanmar and worked with their counterparts to ensure that Myanmar would be prepared for any Y2K trouble. The visits were made possible by the support of the Japanese Ministry of International Trade and Industry (MITI, the forerunner of the current Ministry of Economy, Trade and Industry, METI).

In the field of ICT human resource development, Myanmar has sent trainees to Japan to attend ICT training courses hosted by the Centre of International Cooperation for Computerization (CICC). Although the number of trainees was limited, the programme has promoted mutual understanding.

Collaborations were also visible in the field of ICT standardisation efforts. In October 1998, the 13th Asian Forum for Standardization of Information Technology (AFSIT) and the Third International Symposium on Multilingual Information Technology (MLIT) were held in Yangon through the co-sponsorship of MCF and the Agency of Industrial Science and Technology (AIST), a technology arm of MITI. These international symposium were the first ones held in Myanmar in the field of ICT, and were attended by experts from more than twenty Asian countries.

The most recent and most important event was the creation of the e-Learning Centre in the Myanmar ICT Park, Yangon. Japanese METI helped to bring about this joint project. The centre has produced more than 200 ICT professionals since its inauguration.

Mutual understanding and human resource networks created through these bilateral collaborations have formed a sound basis for fruitful and effective dialog organised under the ICT Working Group.

4. Major Milestones

1996	Myanmar Computer Science Development Law promulgated
	Myanmar Computer Science Development Council (MCSDC) formed
1997	Ministry of Science and Technology created
1998	Myanmar Computer Federation (MCF) formed
2000	e-ASEAN Framework Agreement signed by leaders of ASEAN countries
	e-National Task Force formed
2001	ICT Master Plan (2001-2010) approved by MCSDC
2002	Myanmar ICT Park established
	e-Government projects initiated

III. Summary of Findings

1. ICT Infrastructure

- The basic infrastructure is moderately developed. MPT is constructing optical fibre routes linking major cities as the national backbone. Fibre links between Yangon and Mandalay are completed and links between other large cities is in progress. Fibre links between exchanges in Yangon and Mandalay are completed. Digitalisation of switches is progressing.
- Bagan Cybertech introduced wireless local loop in Yangon and Mandalay and broadband data service using iPSTAR for remote and rural areas.
- An international linking service is provided by both satellite and SE-ME-WE3 submarine cable, but bandwidth is still very low. Internet access quality in terms of speed and reliability needs considerable improvement. Availability of Internet environment is also needed in rural areas to bridge the digital divide.
- Improvement of the 'Last-mile Link', which links subscribers with the network backbone seems quite slow.
- Internet service is still at the initial stage in Myanmar. Dial-up is the main method of access even though some high-end users are installing broadband wireless loop and iPSTAR. Affordability is also a major problem.
- The tele-density in Myanmar is 0.6%, the lowest in ASEAN. Other than a fixed telephone network, mobile telephone networks (Cellular, CDMA, GSM) have been introduced, but they are very expensive and difficult to subscribe to.
- The availability of local content is limited. The role of the private sector is also limited in providing more activities, higher efficiency, lower prices, better quality, and more diversity in services.
- End-user devices are not sufficient. PC penetration is considered moderate, cellular penetration is still low and WAP service is not available. This coincides with the insufficient development of the overall ICT infrastructure.

2. ICT Legal Infrastructure

- The Computer Science Development Law, promulgated in 1996, is specifically designed for ICT development.
- The e-Legal Infrastructure Working Group decided to develop stop-gap measures to speed up the implementation of e-Commerce activities in Myanmar before cyber laws can be promulgated.
- The temporary measures include special orders based on detailed studies of existing laws to

strengthen e-commerce activities.

- On 10 July 2002, the e-Legal Infrastructure Subcommittee released a stop-gap measure order that is largely related to the setting up of wide area networks.
- The first draft of the comprehensive cyber law "Electronic Transaction Law" was completed in November 2002 and is currently under discussion by the subcommittee members. The draft will be circulated among government and private organisations through the e-National Task Force.
- The law is expected to be released before the end of 2003 after going through all the governmental procedures.

3. ICT Education

- Myanmar has set itself the goal of ensuring that every child leaving school is familiar with computers and is scientifically literate.
- The government has collaborated with the private sector and local communities to establish multimedia classrooms and small computer laboratories in high schools. A total of 991 existing schools were implemented as multimedia schools and 3 schools were implemented as 'smart schools'. Out of the 991 multimedia schools, 238 have been upgraded to Electronic Learning Centres.
- The University of Computer Studies, Yangon (UCSY) and the University of Computer Studies, Mandalay (UCSM) offer degrees in computer science, masters degree programmes, pre- and post-graduate diploma and doctorate programmes.
- Twenty-four government computer colleges were opened in states and divisions.
- There are a total of 150 universities and colleges that are administered by 13 Ministries in Myanmar. Out of 152 institutions, 62 are colleges, degree colleges and universities and institutes under the Ministry of Education. A thirty-year education development programme was introduced starting from the year 2000. ICT learning centres, electronic resource centres and computer training centres were formed at these institutions.
- Every student must take 30 hours of ICT literacy courses in an academic year as a compulsory course in universities and colleges.
- The Ministry of Education with the co-operation of the Ministry of Information launched the Data Broadcasting System for Distance Education. A total of 189 townships have been provided with learning centres - 238 centres at high schools and 66 centres at universities. More than 304 learning centres have been established at colleges, degree colleges, universities, institutes and multimedia high schools.
- The Ministry of Education has already established an education intranet system in Myanmar

by using fibre optic lines, VSAT and iPstar. The Intranet links the Ministry office, the Department of Higher Education (lower & upper Myanmar), the Department of Education Planning, the Department of Basic Education (No. 1, No. 2 and No. 3), colleges, degree colleges, institutes, universities and New Century Resource Centers. Internet access is provided at the university and college level.

- At present, there are as many as 70 private computer schools in Yangon alone, several of which provide diploma and degree courses.

4. ICT Application

- Application of ICT in the government and public sectors is slower than in the private sector.
- Application of ICT in the trading sector is increasing gradually. Large supermarkets and export/import companies are computerising their activities at various levels, mainly for sales processing, inventory control, accounts and office work. A very low percentage of small- and medium-sized trading enterprises are computerised.
- Application of ICT is most visible in the financial sector. All private banks have computerised branch activities and some banks are preparing to introduce Intranet systems linking the branches; e-Banking systems have already been initiated. One bank has installed Automatic Teller Machines (ATMs) and another one has introduced the Smart Card system. But computerisation in the public financial sector is lagging far behind.
- Application of ICT in the manufacturing sector has already started, but computerised activities are mostly in traditional areas such as office automation, inventory control, sales and purchases, staff management, payroll and accounts. There are only a few cases of ICT application in Computer Aided Design/Manufacturing (CAD/CAM) and Manufacturing Resource Planning (MRP). ITC applications at the level of Supply Chain Management (SCM), Customer Relationship Management (CRM), Employee Relation Management (ERM), Enterprise Resource Management or Planning (ERP) have not yet been introduced.
- Myanmar's attempt to use ICT in education is encouraging. The government strongly supports the use of ICT in education. Multimedia classrooms are established in almost all high schools. There are attempts to use ICT to teach not only ICT but also other subjects. However, there is little effort spent on content creation. Internet access has not yet been provided for education, but efforts to establish an educational Intranet are in progress. Only systematic and continuous planning and control will guarantee the effectiveness.
- Application of ICT in health is at a minimum level. There is preparation for the creation of an Intranet in the Ministry of Health with the goal of improving medical education. There is little effort on application of ICT in improving public health care.

- Application of ICT in environmental protection does not seem to receive the proper attention. There is little effort on electronic handling of science, social, geographic, natural resources, and population information.
- Computerised systems are mainly in transaction processing and operational control and the use of ICT in strategic-level planning is very rare.
- ICT is used mostly in support functions such as accounts, payrolls, and office work. Use of ICT in main activities such as production, supply chain management, customer relationship management, and human resource management is rare.
- Most computerised applications are standalone. Development of more beneficial integrated systems within and between organisations, between regions, sectors and the national level is still rare. Considerable efforts on cooperation and standardisation will be necessary.
- The batch processing mode is more common. On-line and interactive processing using the existing infrastructure is difficult and costly.
- Distribution and application of ICT is concentrated in Yangon and Mandalay, making it very difficult to develop information systems, which need coverage at the regional and national level.
- The following are identified as main factors that affect the level of ICT application:
  A) Appreciation of ICT power
  B) Financial constraints
  C) ICT infrastructure (e.g. telecommunication and power supply)
  D) Cost of ICT application
  E) ICT education
  F) Proliferation of standards
  G) Government involvement
  H) Economic and social conditions
  I) Legal environment
  J) Management practices

5. ICT Industry

- The advantages of Myanmar in developing an ICT Industry, particularly in the software sector, are availability of knowledgeable manpower and comparatively low labour costs.
- The quality of ICT professionals still requires improvement in order to meet international standards. This gap can be closed quickly only through effective human resource development programmes.
- Compared internationally, the wage rate of Myanmar ICT professionals is much lower, giving

Myanmar a very good competitive advantage.

- The hardware market is expanding rapidly. Almost all computers are PCs. Almost all are distributed by local vendors and most of the assembly is done in Myanmar. There are a couple of factories that manufacture computer-related parts, but their contribution to the market is very small.
- The domestic software market is still very small but is increasing gradually. There are few software developers and only a couple of software houses are receiving outsourcing jobs from developed countries. Export earnings from software is negligible.
- The content industry is at the infancy stage.

IV. Summary of Recommendations

1. ICT Infrastructure

- Strengthen and extend the existing infrastructure including broadband, particularly outside urban areas. A pilot project covering selected villages should be conducted with the installation of appropriate infrastructure, development of applications and training.
- Construction of a telecommunication infrastructure covering the industrial zone would be very beneficial for industrial development.
- Construction of a network for the government and some private banks would improve the financial system, which is one of the key elements for e-Commerce and e-Government development.
- Improve end user device penetration, especially outside the main cities. This should inevitably coincide with the efficient development of the infrastructure using adequate new technologies.
- For the development of local content, an expanded role of the private sector should be encouraged through adequate industrial policies.
- The e-National Task Force should coordinate/regulate to provide a single-point interface with citizens and business.
- Develop plans for national capacity building; attract funding from bilateral and multilateral aid agencies. Institutional capacity building is also necessary. It would constitute one alternative to transforming the telecommunication part of MPT toward a financially independent public corporation-type organisation.
- Adopt Internet-friendly tariffs, particularly for rural areas and educational institutions.
- Attract private sector cooperation through the introduction of liberalisation, privatisation, and competition.
- Improve urban Internet access using broadband services. Affordability is also an important element for both individual and business users through an adequate access tariff policy.

2. ICT Legal Infrastructure

- It should be noted that while e-Commerce laws enable electronic transactions to take place with trust, confidence and certainty in cyberspace, they must be complemented by other related legislation to ensure that the interests of businesses and consumers are protected. Relevant legislation, regulations or codes of practice include:
  - A) Data privacy and protection
  - B) Consumer protection
  - C) Computer crimes/computer misuse

D) Copyright, trademarks, intellectual property rights

E) Admissibility of computer output as evidence in court

- An Internet Code of Practice and an Advertising Code of Practice should also be covered in the comprehensive cyber law.
- Due to the dynamically changing nature of the technology, where legislation, regulations or codes of practice are inadequate or inapplicable to cyberspace, amendments and updates would have to be carried out continuously.
- In cross-border e-Commerce, some of the issues that need to be addressed are:

A) Jurisdiction - Which court shall hear and resolve a dispute between contracting parties from two different countries? Which laws shall be used? Shall the court judgement obtained in one jurisdiction be enforceable in another jurisdiction?

B) Taxation - Where should the sources of income be from if an electronic transaction occurs in multiple countries? Which tax regime should be used? Which jurisdiction should the taxes accrue to?

3. ICT Education

- Development of ICT depends on the effective use of human resources. A national-level programme should be drawn up and implemented. The programme should specify how public and private sectors should cooperate.
- Certification programmes should be strengthened, which would recognise computer professionals who acquire their knowledge and skill other than through formal education.
- In all courses, students should have the opportunity to use a computer in both teaching and learning.
- A programme for providing ICT education for both public and private employees should be implemented. States should provide assistance for conducting in-house computer training courses. Special computer courses should be arranged for staff from organisations that are not able to conduct in-house training courses.
- Internet access should be provided at schools and universities.
- Research and development projects on computer application in education should be carried out.
- ICT resource centres should be established throughout the country. Internet access should be provided at these resource centres.
- More effort should be invested into establishing computer labs in universities and schools. These computer labs should be used for improving computer application and increasing problem-solving ability.

- Implementation of a training programme for ICT trainers should have priority.
- Multimedia classrooms should be established in every basic education school.
- Seminars, symposiums and conferences should be conducted throughout the country. These promotional activities can be conducted through TV and radio or by regional computer associations.

4. ICT Application

- Promote widespread application of ICT in state management with the intention of providing better services to the public, improving efficiency and reducing costs.
- Promote widespread application of ICT in business organisations to improve productivity, render better services, penetrate into the international market and reduce costs.
- Promote widespread application of ICT to improve the educational level of the entire population.
- Facilitate the growth of e-Commerce at national, regional and international levels. Develop regulatory and legislative frameworks.
- Launch demonstration projects to display the benefits of ICT application and to motivate public and private sectors and the entire population to use ICT extensively.
- Provide incentives to business organisations to create better conditions for ICT applications, foreign investment and technology transfer.
- Develop standards for the development of integrated systems.
- Make arrangements for local ICT organisations to become involved in major projects that require foreign expertise to provide opportunities for technology transfer.
- Provide reliable Internet access to economic, education, health and social sectors.
- Develop programmes to familiarise the entire population with ICT.

5. ICT Industry

- Develop the ICT industry as a main economic sector.
- As the largest buyer of ICT products and services, the state should act as the main demand force.
- Promote and facilitate liberalisation in investment, production and distribution of ICT products and services.
- Develop human resources so that a sufficient number of ICT professionals are available for both ICT industry and ICT application.
- The development of the software industry and penetration into the international market should be a high priority task.

- Establish ICT zones for providing financial incentives, research facilities, and adequate ICT infrastructure.
- The government should provide support for promotional efforts to enable the introduction of software products into the international market.
- Create an environment in which software developers could share ideas and experiences.
- For keeping pace with the rapidly changing trends in software technology, software developers should be encouraged and supported to acquire software productivity. Quality tools and information on software technology trends should be made easily available.
- Certification programmes should be made available to ensure that the high quality of software services and software products exported is maintained.
- Funding should be provided for study projects to understand the problems precipitated and solutions required for entering the international market. The findings would be publicised through the appropriate media to all software developers.
- Create a venture capital fund for start-ups and entrepreneurial efforts in the ICT Industry.
- Encourage services for providing market intelligence on domestic and global services industries to disseminate information such as new trends, market conditions, key indicators, new opportunity areas, etc. Conduct research and suggest the best practices for positioning Myanmar as a software developer, and helping start-ups with marketing plans and contact databases, etc.

6. Conclusion

Based on these findings and broad policy recommendations, the specific areas requiring cooperation between Myanmar and Japan should be identified. Concrete and measurable programmes should be agreed upon and committed to by both sides for successful implementation. For that purpose, the ICTWG would need to conduct pilot projects in order to estimate the extent of effort, time schedule, risk factors and resource requirements.

[1] UNCITRAL (United Nations Commission on International Trade Law) is the core legal body within the United Nations tasked by the UN General Assembly to further the progressive harmonisation and unification of international trade law, including international e-Commerce law.

V. ICT Infrastructure in the Union of Myanmar

1. Part I: Analysis of Telecommunication Infrastructure -Summary of Findings and Recommendations-

Part I is prepared as one of the activities of ICT Working Group, Myanmar-Japan Economic Structural Adjustment Committee. It includes the comprehensive analysis of the current telecommunication infrastructure in Myanmar. The basic framework of the report was agreed in February 2002 by both Myanmar and Japan sides. It is prepared by the Japanese side, based on the intensive research made mainly in June and July 2002, in cooperation with Myanmar counterpart and MPT. Its findings and recommendations are partly incorporated into the summary of policy recommendations in the final report of ICT Working Group, after the review from Myanmar side. Summary of findings and recommendations are as follows.

1. Telecommunication infrastructure provides the basic and indispensable element for the development of whole information technologies. In Myanmar, its tele-density is only 0.6% and is among the lowest in ASEAN countries. E-National Task Force aims at the rapid development of the telecommunication infrastructure. To attain this aim, the concrete institutional development is required.

2. Worldwide trend is toward the liberalisation and internationalisation of telecommunication. In the ASEAN area, too, Myanmar has committed to liberalise the industry by the target year of 2008. In Myanmar, telephone and the development of telecommunication infrastructure has been under the monopoly of MPT, although in IT areas such as internet services, liberalisation has been made partly. Development of the telecommunication infrastructure, which is currently well behind, will have to be the responsibility of the public sector. However, to aim at the efficient development, the telecommunication part should have the institutional framework to handle revenue and costs, and also to plan the development in an integrated way. It will constitute one alternative to transform the telecommunication part of MPT toward financially independent public corporation-type organisation.

3. The installation of telecommunication networks in rural areas requires a huge amount of funds. An effective means should be selected, taking into account prevailing technological trends. It is rather an advantage for Myanmar that the nation does not have much traditional legacy system. It is important to select the site-specific combination of suitable technologies through the accumulation of experience from case studies and pilot projects.

4. Domestic and international telecommunication services

Telecommunication tariffs should be changed to the tariff system based on market economy, gradually from the current tariff system.

Although the development of the basic telecommunication infrastructure is the responsibility of the public sector, value-added services will be better promoted if they are provided by the private sector. In this field, more activities, higher efficiencies, lower prices, better qualities, and more diversity of services in the telecommunication sector must be encouraged through adequate policies such as the introduction of privatisation and competition. As a first step, MPT should examine the possibility of reorganising itself suitable for competition by, for example, introducing profit center type structure by sector, so that the profitability by service becomes clear.

5. Internet services

Internet service is still in its initial stage in Myanmar. Dialup is dominantly used as an access method, but some high-usage subscribers began to use dedicated access line using wireless system. For the meantime, dialup method will be the major way of expansion. ADSL method can provide another important method as a nest step, although the existing copper-wire cable system may have to be replaced in some cases. At the same time, the possibility of broadband access network by radio must be examined.

The expansion of internet services requires the development of the telecommunication infrastructure and the upgrading of the quality. At the same time, policies to upgrade the internet environment are also important, which encourage the participation of the private sector entrepreneurs who will produce applications and contents.

Myanmar should make efforts to catch up in this field, and should also intend to work cooperatively with the outside world. For this purpose, the creation of specialised government organisation, which takes responsibility in this field, and the strengthening of research organisations are necessary.

6. International network

The policy to develop international telecommunication links through sub-marine cable Sea-Me-We 3 and Intelsat earth station should be maintained. In the case of the international links with ASEAN and neighboring countries, however, it is worth examining the introduction

of other more efficient terrestrial telecommunication systems, depending on the future development of political and economic activities with these countries.

The possibility of installing international telecommunication facilities in Mandalay, in addition to Yangon, should be examined, too.

7. Backbone network

It is natural that Yangon, the capital of the nation, will be the center of the nationwide network. The backbone network, which connects Yangon, Mandalay, the second largest city, and other major cities, and lines which connects to backbone network, must be analysed first. In each part of this nationwide network, the best method and the best facilities must be chosen in comparison with the communication capacity and the construction costs. Some candidates of networks using current technologies are shown below.

(a) Large scale fibre optic cable system using technologies using the technology of WDM (wave-length division multiplex) and SDH (synchronous digital hierarchy)
(b) Large scale microwave communication system using QAM (quadrature amplitude modulation) technology
(c) DOMSAT (domestic satellite system) and VSAT (very small aperture terminal) system suitable for remote thin-route communication network (this may not be for backbone, though)

8. Access network

The method of access line, which connects each subscriber to the backbone network, must be chosen, considering the population density and the prospect of future economic development. Copper-wire cable and WLL will be the major alternatives. However, in the case of big users such as companies and research organisations, fibre optic cable constitutes the possible alternative.

xDSL (x digital subscriber line), which utilises the out-of-voice band of copper cable is an effective method for the internet access with broadband capability.

ISDN (integrated services digital network) has been recently provided in some parts of Myanmar. In the future, however, the whole telecommunication network will be more and more IP-based. So, the plan of developing ISDN network must be reconsidered.

9. Fixed telephone network

The delay of the development in telecommunication infrastructure has been quite visible. The tele-density in Myanmar is 0.6% and is among the lowest in ASEAN countries, only next to Cambodia. There are various reasons for this delay. One important reason is the lack of fund for the development due to insufficient foreign currency and the current tariff rate structure for telecommunication use. Telecommunication is now the basic social infrastructure and it must be developed under the responsibility of the nation. The long-run master plan with clear objectives must be made.

In developed countries, there are cases where the number of fixed line subscribers have leveled, or even have begun to decline due to the rapid expansion of mobile phone usage. In Myanmar, though, the development of fixed line network must be the first priority as a telecommunication infrastructure. The access line of the fixed line network does not have to be the installation of the actual line. Nowadays, there is an alternative of using radio-based access line, depending on the location and economic advantage.

Until recently, the access line of fixed line subscribers had been copper-wire cable. Nowadays, however, WLL (wireless local loop), the access line of fixed telephone by wave, is an example of the technology with relatively low cost and high performance, and is adequate in rural areas where population scarcely distributes. Further, the wireless alternative provides an advantage of the shorter installation period in comparison with the wire network.

Development of nationwide telecommunication network must be carefully planned with enough consideration of efficient resource usage. The master plan of telecommunication network must be formulated, reflecting the future development of telecommunication traffic after analysing the geographical distribution of the density of social and economic activities.

10. Cellular mobile network

AMPS (advanced mobile phone system) and D-AMPS (digital-AMPS) are the mainly used method of mobile phones in Myanmar. CDMA (code division multiple access) and GSM (global system for mobile communication), the second generation mobiles (2G), have been already introduced. The method with cost and quality advantages will prevail as 2G mobile phones.

Mobile phones are more expensive than fixed-line phones for users, so users will be limited

at the beginning, although the applications well exceed the availability at this moment. However, the tariff of mobile phones can become lower, if the cost of 2G facilities becomes lower. Then, the usage of 2G mobile phones will expand gradually. There also exists demand for mobile phones for those who can not wait for the completion of fixed-line network.

Regarding 3G mobile phone development, it can be introduced as possible IT terminal in the future, while examining what happens in other countries.

11. Satellite network

In Myanmar, DOMSAT and VSAT system, which is, is under operation as a telephone network to connect Yangon and remote ten to twenty cities. However, some equipment of the system often has failures, and the usage rate is rather low.

Satellite communication system will surely become more IP-based in the future in accordance with the tendency of the terrestrial network to be more and more IP-based. In the future satellite network system will have to also include internet transmission in addition to voice communication. Myanmar should examine the introduction of the IP-based satellite communication system, which is advantageous in usage of frequency resource.

12. Rural network

Myanmar must correct the difference of tele-density by region. (However, this poses the issue of prioritisation under the situation that urban areas also have low tele-density in comparison with other countries.) Clear target figures must be shown by region. The selection of the best technologies suitable for each region is also important. At the same time, future expansion of IP-based system must be taken into consideration in the strategy of geographical expansion.

13. IP-based network

At this moment the introduction of IP-related technologies is way behind in Myanmar. This is not simply due to the technological, or hardware problems, but rather due to the immaturity of policies and institutions to promote and administrate the spread of these new technologies. The conventional telecommunication technologies had developed with the involvement of the central government. However, these new IP-related technologies have developed in the atmosphere of democratic discussions of academic groups and of private sector. So, it is

necessary to develop this environment of academic and private groups for the future introduction and development of these new technologies.

In addition to the historical evidence, there is no room for doubt, regarding the international trend that IP-based network will be developed as a common infrastructure for transmission and processing of all kind of information. There exists IP-based network in Mandalay and it provides the internet access point Further expansion of internet-connecting service areas and the incease in IP access point are necessary.

From this point of view, Myanmar has to keep eyes on the development of internet-related technologies and institutional matters in the world, and also has to begin to create the adequate institutional structure.

14. Power supply

There are many areas where commercial power is not yet available. So, when it is not financially realistic to complete the power system including household sector in the short run, another realistic alternative for the moment is to install stand-alone generating facilities in the public telephone office, tele-service center, etc. Diesel engine generator is the most commonly used solution for this purpose, considering its sufficient generating capacity. When there is a problem of fuel transportation, however, the combination of solar cell panel and re-chargeable battery provides another alternative. The electrification of the area as a whole is of course the long-run pre-condition for the development of telecommunication infrastructure.

15. End user terminal equipment

Myanmar must import most telecommunication-related devices. However, certain areas, such as assembling of PCs, are suited for domestic production and have already begun. At the same time, the development of software industry based on the unique demand of Myanmar should be encouraged

16. Human resource development

Training centers for telecommunication technologies are operated under the umbrella of MPT. They emphasise IP training. However, the training should be expanded to cover new technologies such as broadband satellite communication, broadband IP switch, third generation mobiles, rural telecommunication, network planning, and intelligent network. It

is important to study technologies such as VoIP (Voice over IP) and IP broadband network, if we consider the future transition to IP based network. In this area, Japan and other developed countries can effectively help the human resource development of Myanmar through technical assistance by dispatching experts.

At the university level, educational system is not well established to teach technologies and institutional matters on telecommunication. Further, the educational system suitable for IT era, where information processing and telecommunication technologies are combined together, is far behind the necessity. The basic framework and the development of IP-related environment will have to be the responsibility of the government, or the public sector. However, its actual introduction and spread requires the wide-range participation of the private sector, and the enlightenment of ordinary IT users. In this sense, it is necessary to examine policies of human resources development in various levels including from upstream to downstream.

2. Part II: Brief Description of Telecommunication Case Studies

Part II is prepared as one of the activities of ICT Working Group , Myanmar-Japan Economic Structural Adjustment Committee. It is the collection of four separate case studies for the installation of the telecommunication infrastructure. The basic framework of the report was agreed in September 2002 between Myanmar and Japan ICT Working Groups. It is prepared by the Japanese side, based on the intensive research made mainly in September and October 2002, in cooperation with Myanmar counterpart and MPT. These four selected case studies are expected to be exerted as useful examples for the actual, similar, or possible projects in Myanmar.

2.1 Introduction

This report consists of four telecommunication case studies. They are; 1) industrial zone in Yangon, 2) industrial zone in Mandalay, 3) bank telecommunication network, and 4) rural telecommunication network. The fourth one does not assume the actual decided site, but is the virtual case study, based on the field trip to an agricultural village outside Yangon. In this virtual case study, the IP-based LAN system is examined, since it can provide the most efficient method to bridge the digital divide in rural areas in Myanmar.

Applicable telecommunication systems to this study are shown below. Among these alternatives, The most adequate combination is examined, considering the current environment in each case.: They are:

(1) Traditional copper cable distribution
(2) Optical fibre and copper cable hybrid
(3) Wireless local loop (WLL)
(4) Mobile phone
(5) IP-based wireless LAN
(6) IP-based wired network (However, this alternative is not applicable because the network virtually does not exist at this moment in Myanmar. This alternative should be examined separately from this these case studies.)

2.2 Case study 1: industrial zone in Yangon

2.2.1 Telecommunication situation

The working group chose South Dagon Industrial Zone for the study. The Zone consists of zone (1), (2), and (3). The telecommunication demand is high. Telephone supply is low, although a telephone exchange is close to the zone. The zone is in the service area of Bagan Cybertech (BCT)'s broadband wireless access (BWA) service.

2.2.2 Conclusion of case study of zone (1)

There are many large factories. Because of high telephone and data communication demand, the report recommends construction of a new base station for BWA with wireless LAN system. The construction cost of BWA is lower. However, the charge for use becomes higher, since the telephone charge by MPT is set in low level.

2.2.3 Conclusion of case study of zone (2)

There are small factories. The area is small and close to a telephone exchange. Telephone demand is high, but email and Internet demand is low. The paper recommends telephone expansion with the copper cable distribution system.

2.2.4 Conclusion of case study of zone (3)

There are small factories and shops. The area is small and close to a telephone exchange. Telephone demand density is high, but email and Internet demand is low. The paper recommends telephone expansion with the copper cable distribution system.

2.3 Case study 2: industrial zone in Mandalay

2.3.1 Telecommunication situation

Mandalay Industrial Zone locates in the southern part of the city and is still expanding. Telephone exchange was newly built in the middle of the industrial zone. The telephone supply is not bad and telephone quality is good.

2.3.2 Conclusion of the case study

The area is small and close to a telephone exchange and telephone density is high. The paper recommends telephone expansion with the copper cable distribution system.

2.4 Case study 3: bank telecommunication network

2.4.1 Telecommunication situation

Telecommunication system of the local three banks are examined. They all use BCT's VSAT (very small aperture terminal (for satellite communication)) service. They use the service for sending/receiving customer information, email, and reporting among the head office and branches. One bank uses it for a credit card system. One bank has ATMs in Yangon which are connected to the head office with leased lines. The other banks say leased lines are prohibitively expensive. All the banks say VSAT service is expensive and not reliable. The consultants conducted case study using KBZ Bank's branches.

2.4.2 Conclusion of the case study

Because VSAT service is expensive and capacity is small, the paper tries to use leased lines instead of the VSAT service.

(1) Nationwide leased line bank telecommunication network is not possible because some branches are in the border areas and some transmission routes use analog systems.

(2) The consultants conducted networking between the head office and branches in Yangon with the wireless LAN system. It works well.

(3) The consultants also tried networking with increasing the capacity of optical fibre junction transmission. It is also possible technically.

2.5 Case study virtual: rural telecommunication network with IP-based wireless LAN

2.5.1 Situation

Instead of applying telecommunication systems to the real site, a virtual rural model is examined, based on the short trip to a rural village and its vicinity in the northeast outskirt of Yangon. A village of 400 families, 5 acres/family, 3km×3km is assumed as a typical rural farming village in Myanmar.

2.5.2 Conclusion of the study

The IP-based wireless LAN system is expected to provide an important method to bridge the digital divide in rural areas in Myanmar where the legacy system of conventional telecommunication infrastructure hardly exists. It can be also economically more efficient in some cases since it can avoid the duplication of building telephone network and then, IP network. Wireless LAN system is good for networking places in a village and in several villages. Its transmission speed is high and it will open new communication opportunities.

2.5.3 Connection outside

The connection outside can be secured even in the remotest areas through VSAT and satellite broadband network. Connection with BCT's iPSTAR is available any remote areas and is also good for connecting wireless LAN, but rental charge of iPSTAR may have to be transferred to clients. Connection with the telephone network of MPT requires additional equipment such as gateway keeper and gateway router, because both systems use different protocols.

2.5.4 Location of pilot project

The location of the pilot project could be anywhere. Considering the rental charge of satellite, however, the first pilot project should locate in the vicinity of Yangon (for example, within 50km), where the connection to BCT, or MPT is made through radio. If the power supply is not available, diesel generator, or solar panel is needed.

2.5.5 Replication

The project should cover installation of appropriate infrastructure, development of applications, operation, training and study on the effects. The purpose of the project will be to develop a model which can be replicated in other villages in Myanmar.

VI. ICT Industry in the Union of Myanmar

1. Recognition of the ICT Revolution

The great Iron Bridge of Shropshire, England which was completed in 1779 stands as a monument symbolising the Industrial Revolution and its afterwards. The Industrial Revolution was said to have been a 'revolution of power' and included the development of the steam engine by James Watt in 1765 as well as other advancements. Prior to that time, sources of power in the world were limited to harnessing natural forces and the utilisation of human strength. Even Leonardo da Vinci, the active genius of the 15-16th century, had been unable to think of other power mechanisms.

It is said that the 'ICT revolution' of the 21st century will equal the Industrial Revolution of the 18-19th century. The essence of the ICT revolution comprises a 'revolution in information transmission' via the Internet, and its effects will include the realisation of 'information sharing on a global scale.' In the history of man, various information transmission means have been used such as fire signals, the written letter, the telephone, and wireless communications, etc. But there had been no method of global information transmission that was capable of overcoming the barriers of distance and time.

However, the technology of the Internet has enabled information transmission to be conducted on a global scale at an extremely low cost. And it also has allowed rapid information transmission to take place between any corner of the globe in a wide range of formats including text, voice, images, animation and shared information. The ICT revolution continues to advance as computer and Internet technology merges on a worldwide level. Clearly, information and communication technology will serve as a fundamental basis for global society in the 21st century.

2. Development of the ICT Industry

ICT-related business consists of four main pillars: ICT infrastructure (telecommunication networks), hardware, software, and contents. The telecommunication industries of advanced nations such as Japan have experienced growth, and businesses in this field have changed significantly. However taking into consideration Myanmar's current status, it remains difficult for private companies to freely enter the telecommunications industry in the country. In the hardware sector, the area of PC-assembly could possibly hold potential, yet as long as foreign companies are discouraged from investing in Myanmar, the possibility of further expansion in the hardware sector will be limited.

On the other hand, the software sector depends largely on the knowledge and ability of engineers, and it is highly possible that this area could experience considerable growth as an industry in Myanmar, similar to India. It is therefore necessary to place focus on outsourcing business-related initiatives that incorporate a customer base in surrounding countries in the future, even if the initial efforts include serving as subcontract businesses of companies in countries such as India and China, etc. In addition, it is also necessary to create Myanmar's own original product brands in the future. There are a number of problems that first must be overcome however.

In addition, it is recommended that Myanmar concentrate on contents-related business areas such as e-Learning, music, images, pictures/paintings, and video games, etc. in the future. Participation from an eclectic talent pool of human resources such as software engineers, painters, composers, musicians, photographers and producers is required for contents-related business, and it will have a very substantial impact on society in Myanmar.

3. Problems Regarding ICT Industry Development

There are some problems that need to be solved in order to develop the ICT industry in Myanmar. They include: completely opening up access to the Internet; liberalisation of the import/export of equipment related to ICT and priority focus plans for the ICT industry; deregulation in the mobility of human resources; and deregulation regarding investment from foreign countries. These problems will remain insurmountable unless there is active cooperation on the part of the Myanmar government, and proactive support measures are also essential.

E. Agriculture and Rural Economy

Working Group Report

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I. Overview

Myanmar is endowed with bountiful resources in land, water, fauna, and flora. Man-land ratio is still highly favourable. Industrial development is under process, but currently the agriculture, livestock, fisheries, and forestry sectors still remain dominant. A significant portion of the population and labour force are also located in rural areas. Tangible progress has been achieved in the sown acreage, production, and exports, but achievements, however, are far short of its true potentials.

With Myanmar's rich resource endowments, a considerable scope exists for a substantial expansion in agricultural output, which will have positive impacts on rural economy and individual farm income, thereby contributing to the prosperity of national economy. The constraints inhibiting the agricultural potentials are the lack of appropriate policy adjustments in land tenure, input supply, output pricing and marketing, agricultural export, and investment for/in agriculture.

1. Vicious Circle

The goal of agricultural policies in Myanmar could be summarised into three components: food security, export promotion, and increasing income and better welfare, all of which are closely interrelated. Increasing income and better welfare is the ultimate goal for any country. For Myanmar economy to achieve this goal, meeting food security needs and promoting export to earn sufficient foreign exchange are definite prerequisite. The agriculture and rural economy in Myanmar today, however, seems to be still somewhat trapped in a vicious circle, in which these goals have not yet harmonised fully in an efficient way. This could be due to the inadequacy of the present approaches, the state-led approach and rice-production orientation approach, which have hindered the achievement of a desirable market-oriented goal. Instead, the approaches have led to institutional inflexibility and slow changes in agriculture and rural economy.

This vicious circle is characterised by the necessity to (i) expand the availability of farm machinery/ equipment, agricultural input and credit supply, and accessibility, (ii) establish necessary agricultural pricing policies, (iii) strengthen planning and monitoring of land use and crop production, research and development (R&D) and extension services, etc. Due to these constraints, Myanmar agriculture and rural economy have been changing slowly with sub-optimal land use and agricultural production, fluctuation in prices and output, stagnation in agricultural export, insufficient collection of revenues, etc. The net results of the vicious circle are the high cost on farmers' welfare and continuing disparity among rural classes.

2. Virtuous Circle

Turning the present vicious circle into a virtuous circle could be possible with several structural changes. The present economic objective of Myanmar places reliance on agriculture as the base for all-round development and the initiative of shaping the national economy in the hands of the state and national people. The changes needed in order to achieve a virtuous circle can be summarised in two: state/private harmonised approach and rural-welfare oriented approach.

The first is the harmonisation of state and private sectors. The state sector under the current state-led approach still tries to dominate every sphere of agriculture and rural economy, beginning from planning to execution, and from general services to investment, covering both farm production and agro-based industries. In order to achieve full potential of Myanmar's agriculture, including securing the world markets for Myanmar's agricultural commodities, the state sector needs to be flexible and responsive to changing market conditions. The spheres of the state activities need to be minimised, as discussed in details below. Transforming current procurement of agricultural commodities and State Economic Enterprises (SEEs), particularly those involved in procurement, trade, and processing of agricultural commodities, in accordance with the changing market-oriented economy, should be seriously and urgently implemented.

At the same time, the state can improve its effectiveness in guiding the economy toward the three goals already mentioned earlier by expanding the role of market and by expanding the freedom of choice of crop for individual farmers based on potentiality of market. It constitute the essence of the state/private harmonised approach, and although calling for a limited role of the government, the state still plays a very important role, as under the alternative approach, its role in guiding the private sector becomes more critical. It will be necessary to put more resources in R&D and extension services, market information services, price stabilisation policies, managing buffer stock, etc.

The second is the orientation of agriculture and rural economy policies toward the welfare of the people. Production should be recognised as a tool to improve rural welfare. The current policies pay too much attention to production. What is important is the income growth, its stability, and its sustainability in the Myanmar economy. Production is merely a tool to achieve this objective.

Producing more rice is of course important in enhancing rural welfare for the following reasons: it creates an environment for more efficient marketing with larger surplus from better endowed areas; it increases farm income in these areas; and it increases macro surplus for export and for

taxation. However, producing rice to the limit or even beyond the limit in marginal regions does not serve these three functions.

As concrete measures of these approaches, structural adjustments are necessary in the following areas:

(i) Strengthening of research and extension systems;
(ii) Efficient and sustainable land utilisation;
(iii) Rationalisation of public investment in/for agriculture;
(iv) Establishment of land users' rights;
(v) Reforms in land and water taxation;
(vi) Strengthening of agricultural financing;
(vii) Establishment of pricing policies including reforms in procurement policies;
(viii) Trade and marketing policies favourable for enhancement of agricultural production and export; and,
(ix) Creation of favourable environment for private investment (including Foreign Direct Investment) in/for agriculture.

With these structural adjustments, desirable results and outcome are expected. Since the structural changes could contribute to the achievement of the national goals, it would enable the agriculture and rural economy in Myanmar to rid itself from the vicious circle, and enter a virtuous circle.

II. Major Challenges: Issues and Necessary Structural Adjustment

Myanmar's agricultural sector has huge potential to achieve a sustained production growth of over 5% per year over the next 10-15 years, thereby contributing to the national economy in improving people's welfare on a sustained basis. In achieving this target of agricultural production, due consideration should be given to major factors such as land development, proper irrigation management, and concerted actions to increase per-hectare yields. Technically, these will be achieved through the following elements: (i) sound selection of land use and cropping systems for different agro-ecological zones; (ii) usage of quality seed of high yielding and high quality varieties; (iii) acquisition and proper usage of fertiliser and other chemicals; (iv) proper application of pre- and post-harvest technology, milling, and processing; etc.

To realise these elements, adjustment of certain policies and strategies is of vital importance because the elements above cannot be delivered solely by the state without coordinating efforts by individuals. Individuals make sincere efforts only if they are given proper incentives. Farmers need secured cultivation rights and more liberty in agricultural production so that they can harvest the full gain of improved production environment. Traders require a ground of fair and active competition so that they can serve the role of intermediary efficiently. Consumers need flexibility in their consumption choices without the fear of undue fluctuations in the price and supply of essential commodities. Capital and market information need to circulate the whole economic chain smoothly. Areas in which structural adjustments are needed are elaborated as follws with emphasis on concrete measures in agriculture proper.

1. Land Policy and Land Resource Development

The establishment of a land policy guaranteeing the right to transfer, mortgage, and sale of the land-use right and that enable the government to rationalise land taxation, is probably the fundamental need for agricultural development in Myanmar, even when the state continues to function as the ultimate owner of all natural resources including land. More liberty in land use and clear land-use rights protected by a legal system are prerequisite for farmers to invest in their land and to improve their productivity.

In addition, legally protected land-use rights permit transfer of these rights and the use of land lease as a collateral for loans. The legal transaction of users' rights contributes to a situation in which more efficient farmers are able to produce more. The use of land right as a loan collateral will reduce credit constraints faced by producers throughout the country.

The role of private entrepreneurs in developing land resources needs to be evaluated carefully in the interest of efficiency and suitable growth. The results from the rural micro survey conducted under this project have shown the superiority of small farmers in paddy production. A well-designed land development policy is required, involving (i) large private estates, (ii) peasant farmers (both small and large scale), and (iii) settlement of land-less labourers on newly reclaimed land. Such a policy should encourage the cost bearing by beneficiary farmers in land development.

2. Irrigation and Water Resources Development

The establishment of a comprehensive water policy is required, covering not only agricultural irrigation but also other uses of water resources. Although irrigated land is increased substantially in recent years (the irrigation ratio increased from 12.2% in 1989/90 to 19.0% in 2000/01), its share in total cropped area in Myanmar is still low in the Asian context. Under the current system of irrigation fee at the nominal sum of 10 kyats per acre, improvement and maintenance of canal systems under many projects and further expansion of irrigation through 100 % public investment becomes a huge burden on the national treasury. Through the rationalisation of irrigation tariff structure and the promotion of farmers irrigation management including the promotion of water users' associations, this subsidy should be shared by all the stake holders, particularly by the beneficiary farmers. The resources made available from these adjustments can be utilised in improving the system loss, expanding the area under irrigation, and updating farm-level facilities. The programme should cover all types of irrigation, flood protection, and drainage including simple low-lift pump which are cheap, immediately operational, mobile, and usable in several locations. An in-depth review of the water taxation, irrigation tax, in particular, is essential.

3. Agricultural Support Services and Input Supplies

The entire range of support services, covering research, extension, input supply including seed, agro-chemicals, credit, and training for technical staff, as well as farmer and agri-business entrepreneurs, should be analysed and reviewed in respect of required maintenance and upgrading to ensure reliability and effectiveness. As a first step, an in-depth review and preparation of detailed project/programme proposals should be undertaken.

(i) *Research & development and extension.* In research & development (R&D), the intensification of production and the diversification of farming systems should be the strategy of agricultural technology, which will be effective if technology is developed in a way suitable to local conditions of soil, water, and climate, and economically feasible for the farmers meeting the

market demand. A more emphasis in R&D on agricultural diversification necessitates a shift to cropping system including the integration of livestock and fishery. In extension, the main points to be covered are staff/farmer training and field demonstrations. The extension system should be designed to enhance farmers' income and the welfare of rural population rather than to the increase of production alone. National agricultural research policy and National Agricultural Research System (NARS) should be set-up which consist of the organisations and institutions created or funded by government or both, to generate improved production technologies and provide for the national programme of agricultural development. The size and organisation of the system has to be compatible with the nation's development objectives and available resources.

(ii) Chemical fertiliser and seeds. The current level of fertiliser use (ranging between 21.0 kg and 53.5 kg per ha during the past 5 years) is undoubtedly well below the optimum level of application. Distribution of farm inputs like chemical fertilisers, pesticides, and seeds that were formerly handled solely by the Myanma Agriculture Service (MAS) is being dramatically transferred to the private sector while subsidies on farm inputs are being removed. However, shortage of supply, insufficient incentives, lack of credit, and inadequate extension services constrain farmer's ability to use the optimum level of fertiliser. The private sector is permitted to import and distribute fertiliser but its ability to do so is constrained by lack of distribution network, prevailing import and export regulations, and scarcity of foreign exchange. The amelioration of the stagnating circumstances needs to be addressed. The current level of quality seed provision is also well below the adequate level. In this area also, the harmonisation of the private and state sectors is necessary in enhancing the capacity of supply. Due consideration should be paid in a seed industry development policy with a modern seed law, which are consistent with the international standard in intellectual property rights.

(iii) Agricultural credit. The availability is the biggest problem. The prevailing credit constraint is observed not only in crops subsector but also in livestock and fisheries subsectors. For example, the present seasonal crop loan is less than 10 percent of the production cost of a typical paddy farm. The institutional framework as well as the capital fund have to be strengthened, including lending by the Myanma Agricultural Development Bank (MADB). It is also of critical importance to create an appropriate environment to facilitate greater involvement by private banks. For these purposes and for saving mobilisation, the removal of interest rate regulation could become a key policy adjustment. An option of making small-scale agricultural credit as an ingredient part of micro-finance projects is worth

consideration.

4. Procurement Policy and Government Revenues

The present procurement procedures for paddy put a heavy burden on rice farmers. There is also evidence that export restrictions on rice imply a huge additional export tax, which does not go to the treasury as they are implicit tax. The present quota system of procurement leads to low quality of rice that is often not acceptable for exports or for urban consumption. Therefore, it is recommended that a measure is required to stabilise rice prices at the level that assures profit to producers while affordable for consumers.

Given the detailed land record maintained by the Settlements and Land Records Department of the Ministry of Agriculture and Irrigation, land revenue based on the value of land would be more feasible and overcome the cumbersome procurement policy that is less preferred by the producers. An alternative procurement system, in which milled rice is purchased from traders and millers at market price, is worth further investigation. Procurement from rice-deficit areas does not have economic rationale, considering the farmers' burden and home consumption orientation in such areas. The rice-oriented policy that aims to achieve regional rice sufficiency in these marginal areas may better be suspended.

Given Myanmar's potential for agricultural production, there is little risk of gradual export liberalisation leading to domestic shortages. This is evidenced by the experience in export-oriented pulses production. In fact, as shown by the recent experience of Vietnam, export liberalisation can lead to a substantial increase in production and export of rice, without any adverse effect on food security for the country. Trading, taxation, and fiscal policies need to compliment each other. If necessary, a measure could supplement such a policy mix, in which rice prices are stabilised at the level that assures profit to producers while affordable for consumers.

Particularly, for other crops procured by state enterprises, especially cotton and sugarcane, the current procurement system with fixed quota and procurement price needs to be re-considered to assure profit to producers and processors while affordable to consumers. The role of state enterprises should be minimised in accordance with the state/private harmonised approach.

5. Infrastructure Access, Agricultural Mechanisation, and Agricultural Processing Facilities

Due to shortage of capital investment, Myanmar's agriculture is faced with insufficient and low

quality supply of infrastructure access, agricultural machinery, and agricultural processing facilities. The problem is better understood by distinguishing two dimensions of agricultural investment: (i) investment in agriculture vs. investment for agriculture and (ii) public vs. private investment (farmers and private enterprises).

Investment in agriculture includes land and water resources development, R&D, agricultural input industries, and agricultural mechanisation. The former three have already been discussed. The role of the public sector is the highest in R&D among them. Enhancing the farm mechanisation with appropriate technology is a pre-requisite for both horizontal and vertical expansion in agricultural production. The role of farmers (actual investor) and private enterprises (developer and supplier) should be larger in this area, requiring proper policy and strategy for the development of agricultural mechanisation.

Investment for agriculture includes transportation, communication, and electrification. Rural as well as farm roads are in extremely poor condition, which complicates access to markets and processing facilities. Better communications are a must for all sectors. Electrification in Myanmar, both urban and rural, is also lagging behind all other Asian countries. Therefore, more resource should be allocated to investment for agriculture. Since the role of public investment should be larger in these areas, a careful re-examination of the current budget allocation among sectors is required.

Investment in agricultural processing facilities lies between investment in and for agriculture. Most of the facilities in Myanmar are inadequate in terms of both quantity and quality, which seriously affects competitiveness and prices obtained by farmers as well as export earnings. The rice milling, oil extraction, and other agricultural processing facilities are at present in poor condition due to long years of lack of maintenance and modernisation on account of lack of liberalisation and funding constraints. A comprehensive assessment of the agro-based industries is needed to determine requirements of modernisation and expansion programmes. This should also cover opportunities for agricultural and rural diversification including the livestock and fisheries sub sectors (including fish ponds). The assessment should be implemented under the state/private harmonised approach, leaving the role of main investor to the private sector.

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