Fourth Regional 3R Forum in Asia
"3Rs in the Context of Rio+20 Outcomes – The Future We Want"
Ha Noi, Viet Nam, 18-20 March 2013

Country Analysis Paper

(Draft)

<Myanmar>

The Republic of the Union of Myanmar

Ministry of Industry

H.E U Thein Aung

Deputy Minister

Country Analysis Paper on 3R Practice in Myanmar

Fourth Regional 3R Forum in Asia 18-20 March 2013

Introduction

Myanmar is a South-East Asia Country and a Member of international organizations such as UN and WTO also regional organizations such as BIMSTEC, ASEAN. Myanmar has a total area of 677,000 square kilometers is covered as a national region with the longest width of 936 km from east to west and 2,832 km from north to south. Bay of Bengal and Andaman Sea favour the country to get the monsoon in such initially tropical region entered from southern side by 2,282 km total coastline.

Total population is over 60 millions and there are 135 national races. Geographically, Myanmar sharing frontier border with the People's Republic China, Lao PDR, Thailand, India and Bangladesh. Most of the area of Myanmar is covered with deep forests, springs, water falls, rivers and mountain ranges. As geographic advantages four numbers of principal rivers flow from north to south inside the country. There are three season: summer, rainy and winter seasons, rotates regularly in a year.

Policy concerned

Myanmar is agriculture based country but she emphasizes on industrial development to become an all round modern developed nation at present. Efforts are made to improve the country's basic infrastructures such as roads, bridges and communication system. The change to market oriented economic system and the intensive development of basic infrastructures created many economic activities.

The constitutional government has been formed recently. President outlined the policies and objectives of the new government with a view to build a modern and democratic nation. The priorities of the new government are to achieve good governance and clean government, fundamental rights of the citizens, transparency of rules and laws, fight against corruption, reduction of income disparity, creation of opportunities and environmental conservaiton. President has also instructed eight government ministries to implement the Naitonal Rural Development and Poverty Alleviation Plan. The current poverty rate of 26 percent is expected to drop to 16 percent by the year 2014-2015 in order to meet the Millennium Development Goals by 2015.

We firmly believe that Myanmar's experience in agriculture and rural development could serve as the model for the countries in our region. Myanmar

possesses diverse geographical conditions, cultures and national races. The 70 percent of the population who live in rural areas are engaged in agricultural activities. Agricultural development means rural development that could reflect to contribute toward enhancing sustainable livelihoods.

Trading

Export Value

(US$ Million)

FY	Total	Government	Private*
	Value	Value	Value
2008-2009	6779.1	4310.1	2469.0
2009-2010	7586.9	4495.8	3091.1
2010-2011	8861.0	5362.2	3498.8
2011-2012	9135.6	5064.0	4071.6
2012-2013 (Apr-Oct)	5181.8	2816.0	2365.8

Note : *. Include border trade

Foreign Trade

(US$ Million)

FY	Export		Import	
	Domestic Export	All Export	Import	All Import
2008-2009	5580.4	6779.1	3540.8	4543.3
2009-2010	6766.7	7586.9	3679.8	4181.4
2010-2011	7870.3	8861.0	5850.2	6412.7
2011-2012	8266.2	9135.6	8325.6	9035.1
2012-2013 (Apr-Oct)	4703.2	5181.8	4553.9	5067.5

Note :1. Foreign trade includes border trade
2. All export include re-export
3. All import include draw-back items

Sources: Custom Department
Department of Border Trade

The import by major trading countries are the People's Republic of China, France, Germany, Hong Kong Special Administrative Region of the People's Republic of China, India, Indonesia, Japan, Republic of Korea, Malaysia, Singapore, Thailand, United Kingdom, United States.

The Export by major trading countries are the People Republic of China, Germany, Hong Kong Special Administrative Region of the People's Republic of China, India, Indonesia, Japan, Republic of Korea, Malaysia, Pakistan, Philippines, Singapore, Thailand, United Kingdom, United States.

Natural disaster

During this decade, Myanmar also notably suffered the effect of climate change likewise the global nations. Heavy rain, vigorous storm and highest temperature changes strike the country remarkably and frequently. The most recordable effect was "Cyclone Nargis" hit on 2 nd and 3 rd May, 2008 which was the strongest one within the past hundred years, and damages and numbers of death are also considerably the highest quantity. Natural disasters of earthquake stroke in eastern part of Myanmar, Kyaing Tone on 24 th March, 2011 with the Ritcher scale 6.9 and central part of Myanmar, Mandalay and Saging Division on 11 th Nov, 2012 with the Richter scale of 7.3. This disasters are heavy destructive ones in our country. According to this experience, the government paid attention on the activities of Environmental Protection which can keep climate as normal, calm and far from the vigorous disasters.

Industrial Sector in Myanmar

Ministry of Industry as State-owned industries, 18 industrial zones, 3 special economic zones and private industries play in industrial sector. Moreover, seven industrial zones will be extended. The Government has concentrated the industrial sector to minimize the pollution to environment. Besides, the Government facilitates the enforcement of laws, by laws, regulations, orders, instructions, rules to be safe the workers in occupational areas and to be prevented the industrial accidents.

To prevent from pollution and damage on the natural environment by the wastes discharged by the factories of the industries, the Water and Air Pollution Control Plan(Standing Order No.3)was issued in 1995. In this order, the control of wastes, reduction of wastes and elimination of wastes must be progressively developed and carreid out.

Hydro-power Utilization

The electricity generation, transmission and distribution is also placed as high priority in the Myanmar development agenda. The Ministry of Electric Power had studied and identified many potential hydroelectric power sites. The Government prioritizes the development of hydropower projects to increase the installed capacity of the country by utilizing its own hydro resources as much as possible. Although several hydropower projects around the whole country have completed, some under construction and some planned to be constructed in the near future, the existing Gas Turbine Power Plants still play an important role for the power system.

Biofuel

To reduce dependency on imported liquid, fuels, to overcome the current energy situation and to minimize the Global Warming condition. Myanmar has been embarking on development of bio-fuel production for use as renewable energy. The Government is conducting development of rice husk gasification technologies for use in power generation and other purposes. Also, bagasse produce from sugar refining is used as fuel for power and heat generation in the sugar factories.

Solid Waste Management Programme

Myanmar Agenda 21 (1997) identified four programme areas in Environmental Quality Management and Enhancement. One of the four main objectives is " To provide a strategy and implementation plans for the changing and strengthening of values, knowledge, technologies and institutions with respect to environmental protection and development". The general aim of Myanmar Agenda 21 is to facilitate the integration of environmental and sustainable development considerations into the daily activities and decisions of individuals, households, communities, corporations and the Government. The City Development Committees of Nay Pyi Taw, Yangon, Mandalay and other relevant City Development Committees manage the solid waste systematically.

Re-use, Recycling and Waste Management

Composed Municipal solid waste in the country are collected as 73% of organic waste, 18% of paper / cardboard, 4% of wood, 2% of plastic, 2% of textile and 1% of other waste. Solid waste generating in Yangon City is average 0.3kg /cap / day but 0.53 kg/ cap /day in Mandalay City. As industrial waste, hazardous waste, toxic waste, radioactive wastes, chemical waste and sewages are normally disposed.

For municipal solid waste management, City Development Committees, Township Development Committee are responsible. Hospital waste are collected and disposed by cleaning development using incineration process or submerged to deep well process, designated by concrete well and sealed type. Plastic waste (Plastic shopping bags) are collected and then sorted, washed, extruded, pellet, pressed to use

again as plastic container production process. Likewise, the wastes of small plastic containers are reused as raw material for manufacturing of large size of plastic containers. PVC wastes are also reused for new PVC pipes production. Industrial wastes are controlled by the relevant industry. Waste water treatment factory was established in Yangon region and purified waste water is being disposed into Yangon river.

Waste of scraps metal form industrial machining processes are divided into ferrous and non-ferrous. Iron & Steel ferrous scraps are recycled in foundry shop and steel mill using induction furnace and electric arc furnace. Copper, Lead and Zinc metals (non-ferrous)are covered by refines and secondary smelter and foundry. Industrial waste water is usually treated in waste water treatment plant. Waste water for pH level (3 to 4) in which lead content is (30 to 50 mg/L) has to be treated by Batch Type treatment. pH content of treated water will be (5.8 ~ 8.6) and lead content 1 ppm as per Japan industrial effective discharge standard. Regarding to the waste lubricant, refining or purifying process of used oil has not well development for recycling. Environmental issue is releasing the used lubricant into water resources and disposing in land.

Technology needs and gaps for handling waste

We have taken note that the largest capacity of waste disposed in the country is organic waste but the most environmental effected waste is plastic bags waste. The technology on production of PVC, water pipes and plastic containers by using waste plastic bag is properly workable status but still needs to gain other advanced technology. Moreover, e-waste and hazardous waste handling technology are required to set-up in the country for exact requirements in near future.

Regarding to the Energy Policy, extended application of renewable energy, energy efficiency and energy conservation measures are being undertaken widely. For the Transport Sector, CO_2 gas emission reducing programmes are undertaken to substitute natural gas instead of gasoline and diesel in short term plan, and to increase bio-fuel substitution for long term plan. National More Pure Fuel Policy has been drawn.

According to the National Prior Report for the Convention on Climate Change, the statistic revealed that green house gas such as CO_2 gas emission was 74 million tons meanwhile Carbon absorption from the forest was 142 million tons in Myanmar so that Myanmar is a good absorber country on Carbon gas. Action Plan for establishment of environment conservation and bio-recourses nursing plan for Greater Makong Region has been stipulated and hence, more energetic cooperation shall be taken.

Regarding to the municipal waste management network, the following laws are still effective and being practiced;

(a) The Yangon Water-work Act (1885)

(b) The City of Yangon Municipal Act (1922)

(c) The Water Power Act (1927)

(d) The Underground Water Act (1930)

(e) The City of Yangon Development Law (1990)

(f) The Development Law (1993)

(g) The City of Mandalay Development Law (2002)

(h) The Nay Pyi Taw Development Law (2009)

Beside these, the City and Township Development Committees promulgated the solid waste disposal and collection by-law as its measure for legal basis at local level.

Conclusion

Environmental effects and awareness as the base, forestry concerned, energy concerned policies and measures have been stipulated as a foundation in Myanmar. However, the specific industrial concerned, 3R technology practicing related policies as well as Laws, Rules of Law have not been framed. According to the national economic trend which is configured as industrialization framework encouraged since the new Government's initiation, Strategic National Industrial Policy and Law is being arranged to promulgate in which 3R concerned principles have to be included. We really hope that attending to this 3R meeting and mutual understanding and international situation shall strongly affect on our future plan of actions.

Fourth Regional 3R Forum in Asia

18-20 March 2013, Ha Noi, Vietnam

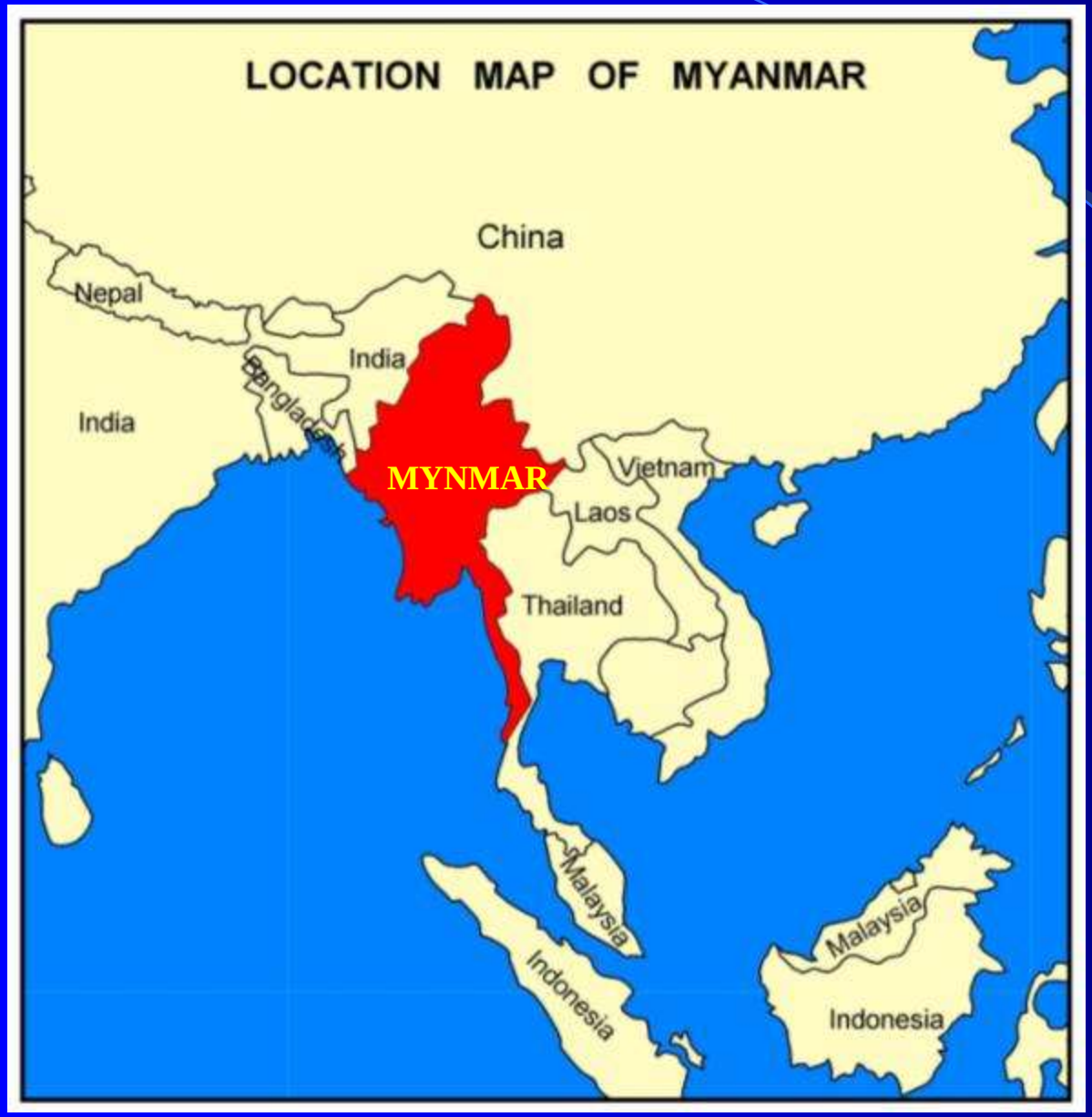
(Myanmar Delegates)

Presentation Outline

1. Introduction
2. National Policy
3. Waste Management and 3Rs Activities
4. Future Plan

1. Introduction

Country Profile



Location

South East Asia

Latitudes = 9° 55′ to 28° 15′ North

Longitudes = 92° 10′ to 101° 10′ East

Area

Total land area = 676,577 km^2

Length (north to south) = 2,090 km

Width (west to east) = 805 km

Demography

Population = 60 million

Pop: density = 87 per km^2

Annual rainfall

5000 mm (maximum)

800 mm (minimum)

Mean Temperature

25° C to 33° C during the rainy season

10° C to 25° C during the cold season

32° C to 40° C during the hot season

Waste Introduction

- Due to the increasing population, rapid urbanization and industrialization, the daily waste generation also increases and threatens to the public health and environment. Traditionally, waste collection and disposal in Myanmar have been the responsibility of local municipal authorities and private sector involvement presently.

- In Nay Pyi Taw, Yangon and Mandalay, autonomous City Development Committees and their Pollution Control and Cleansing Departments (PCCDs) with a network of branches and sub-units are tasked with solid waste management within their municipal areas. In other parts of the country, Township Development Committees under the Local Government manage municipal waste collection and disposal.

General responsibilities of local municipal

- General responsibilities of local municipal, particularly cleansing department, regarding to solid waste management are:
  - Supervising, controlling and inspecting storage, collection, transportation and disposal of solid wastes,
  - Cleaning main drains and lateral drains to get proper flow,
  - Allotting, supervising and inspecting cemeteries, constructing and maintaining crematoriums,
  - Rounding-up, keeping in custody of wandering animals and disposing them, and
  - Issuing and collecting licence fees for trade connected with the development works, restaurants, hotels, motels, etc.

2. National policy

National Policy

- With specific objectives and activities, Myanmar Agenda 21(1997) identified four programme areas in Environmental Quality Management and Enhancement : namely,

1. Strengthen the comprehensive water quality management programme;
2. Strengthen the air quality management programme;
3. Improve the solid waste management programme; and
4. Promote environmentally sound management of toxic chemical and hazardous wastes.

National Policy Target

- Although Myanmar does not have a specific policy target on solid waste management, the country through its Pollution Control and Cleansing Department has developed by-laws giving considerable focus to waste management.
- The Laws and Acts which have been using for pollution control in Myanmar are :
  - The Yangon Water-Work Act (1885)
  - The City of Yangon Municipal Act (1922)
  - The Water Power Act (1927)
  - The Underground Water Act (1930)
  - The City of Yangon Development Law (1990)
  - The Development Committees Law (1993)
  - The City of Mandalay Development Law (2002)
  - The Nay Pyi Taw Development Law (2009)
  - The Environmental Conservation Law (2012)

National Institutional Capacity

- Yangon City Development Committee
- Mandalay City Development Committee
- Nay Pyi Taw City Development Committee
- City Development Committees under the Local Government Authorities

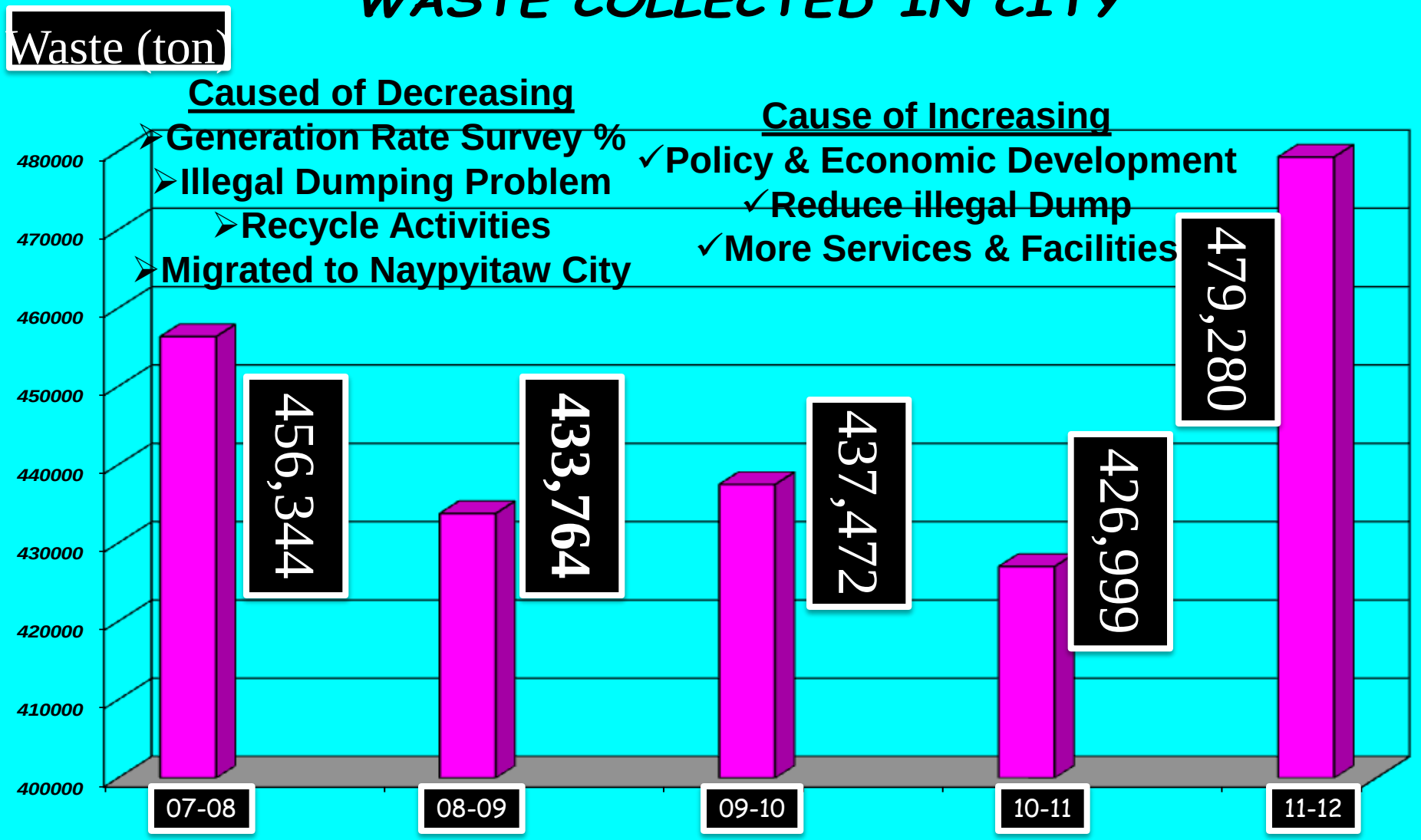
3. Waste Management and 3Rs Activities

Manual loading

Collection and Cleansing of waste in Downtown B.D.S area.

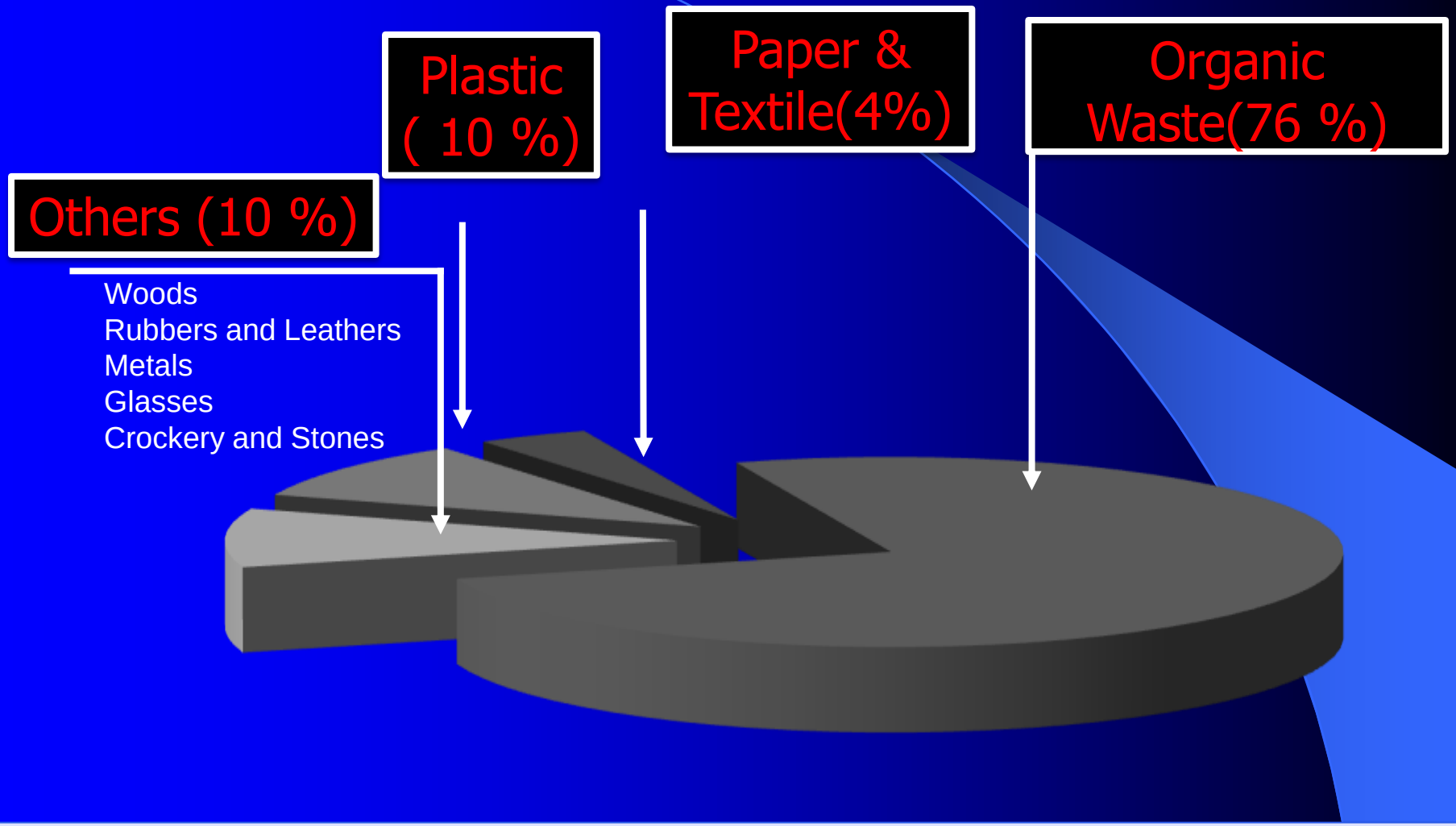
Road cleansing

WASTE COLLECTED IN CITY



2012-2013, Current Generation of waste in YGN is (1690) Tons Per Day
Waste collection is (1550) Tons Per Day

Typical Composition



Base on common composition which a few different percentage.
(Depend upon the Wet Season and Dry Season)

Structure of Recycling Market

House Hold and Waste Generator

Household Collectors

Collector/ Local Buyer

Whole Sellers

Factory/ Recycle

Export

Domestic User

Manufacturing Process of Recycle Product

Plastic Waste

(After Melt)

Infectious, Sharp, & Domestic Waste Bags

Domestic Waste Container

Infectious Waste Container

Sharp Waste Container

Plastic Bags

Plastic Resin

Waste Bags Production

Paper (Recycle)

Old Newspaper
Cardboard
Clean paper
Book (white & newspaper)

Household

Local Buyer & Street Hawker

Retail Shopper

Wholesaler

Factory *(Manufacturer)*

Plastic (Recycle)

Polyethylene
Soft

Broker

Broker

Waste Picker

Retail Shopper

Floating Buyer

Wholesaler

Raw material supplier

Factory
(Manufacturer)

Hard Plastic waste Recycling Processing

Segregating different Hard Plastic

Segregated Hard Plastic

Shredding Hard Plastic

Drying in sunlight after washing

Manufacturing

Different Plastic Product

Metal (Recycle)

Broker and Smelting

Waste Picker

Retail Shopper

Wholesaler

Factory
(Manufacturer)

Glass (Recycle & Reuse)

Households
&
Waste Picker

Retail Shopper

Floating
Buyer

Wholesaler

Factory
(Manufacturer)

Recycling Activities of Private Sectors and wholesale market

Iron to MS rod recycling product,

22

Recycle and Reuse Materials; Direct to Whole Sale Local Buyers ;Data Base on 2012

Particular	Weight (T)	Unit
Plastic	5.1	Ton
Paper	8.94	Ton
Cardboard	11	Ton
Leather	.1	Ton
Iron	0.5	Ton
Metal	0.3	Ton
Copper	0.3	Ton
Lead	0.1	Ton
Glass	40.5	Ton
Tin Can	5.1	Ton

Recycle Waste Generated = 85.84 - TPD

Green composting,
Aerated method and Windrow
pilot plant stopped at 2007

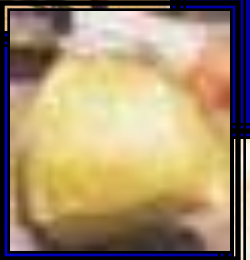
Vermi-culture and vermi -composting, base from worms and market wastes .

SHARP WASTE

INFECTIOUS WASTE

Submerge to deep well process, Designated By concrete well and sealed type.

Incineration process



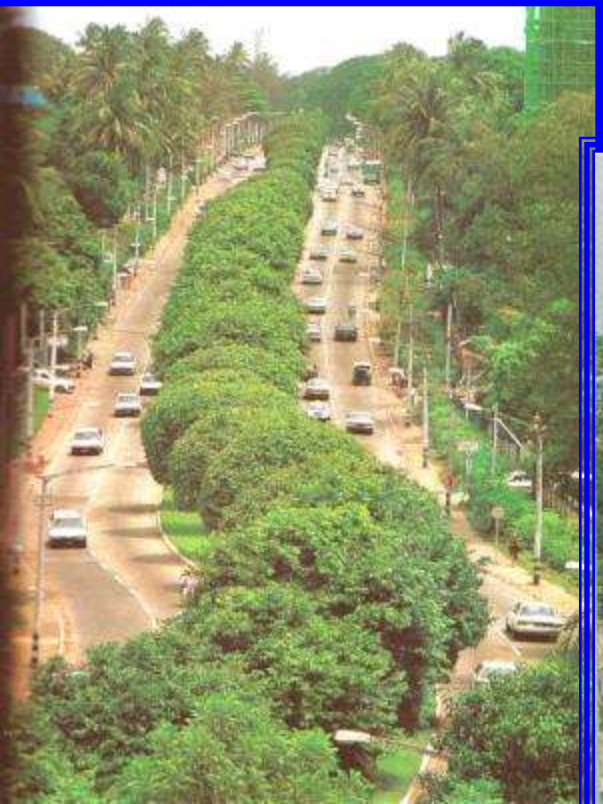
EXPIRED MEDICINE INCINERATION

Incineration process

Submerge to deep Well process

YANGON :"Clean and Green City Activities"

Land Reclamation



Department of Playground and Gardening has already planted 1495561 shaded trees and 1092869 flower plants all over the Yangon City areas.

Thin Plastic Bag Free Zone (Mandalay)

- Mandalay City Development Committee (MCDC) initiated its "Thin Plastic Free Zone" Programme in March 2006.

- By 2009 June, production, trading, and even keeping thin plastic-bag were totally prohibited within Mandalay City area.

Thin Plastic Bag Free Zone (Mandalay)

- In order to support the campaign, multiple-use bags, recyclable bags and paper bags were freely distributed to the shopkeepers in order to replace thin plastic-bags.

Thin Plastic Bag Free Zone (Mandalay)

- As for used plastic-bags, MCDC bought back them as raw materials for recycle products such as rubbish bins and plastic pipes.

- Nowadays, Mandalay city becomes scale-model of plastic-bag free civilization in the country, and Yangon and Nay Pyi Taw are now going to adopt the success of MCDC.

4. Future Plan

Future Plan

Objective : To promote solid waste management and environmentally sound management of toxic chemicals and hazardous wastes

Activities to be completed within 5 years including on-going ones;

- Enact the drafted Myanmar Environmental Protection Law.
- Apply polluter pays principle.
- Develop public awareness to promote community involvement in monitoring and disposal of domestic wastes.
- Strengthen sewage system management and sewage treatment for domestic wastes, especially in big cities.
- Educate the general public to promote environmentally sound waste management including waste reduction, recycling and composting.
- Develop a framework for hazardous waste management.
- Encourage private investments in solid waste management services.

Ref: Myanmar NSDS (2008)

Future Plan

Activities to be completed within 10 years including on-going ones;

- Formulate a solid waste management master plan and guidelines and priority on big cities.
- Enact a hazardous waste law.
- Encourage more interaction with international bodies to obtain information and knowledge about environmental toxicity of chemicals, their assessment and risk reduction programmes.

Ref: Myanmar NSDS (2008)

Challenges in Waste Management and Promotion of 3Rs

- Sound practice of Recycling and Reused Activities in City
- Reduce activity is not proper in City
- Recycling and reused performances are one of the activities for reducing of Natural Resources
- No Rules and Regulations In Industrial Processing
- Not control the quality and quantity of by-products
- Not establish the Incineration Plant in Final Disposal Site for SWM.

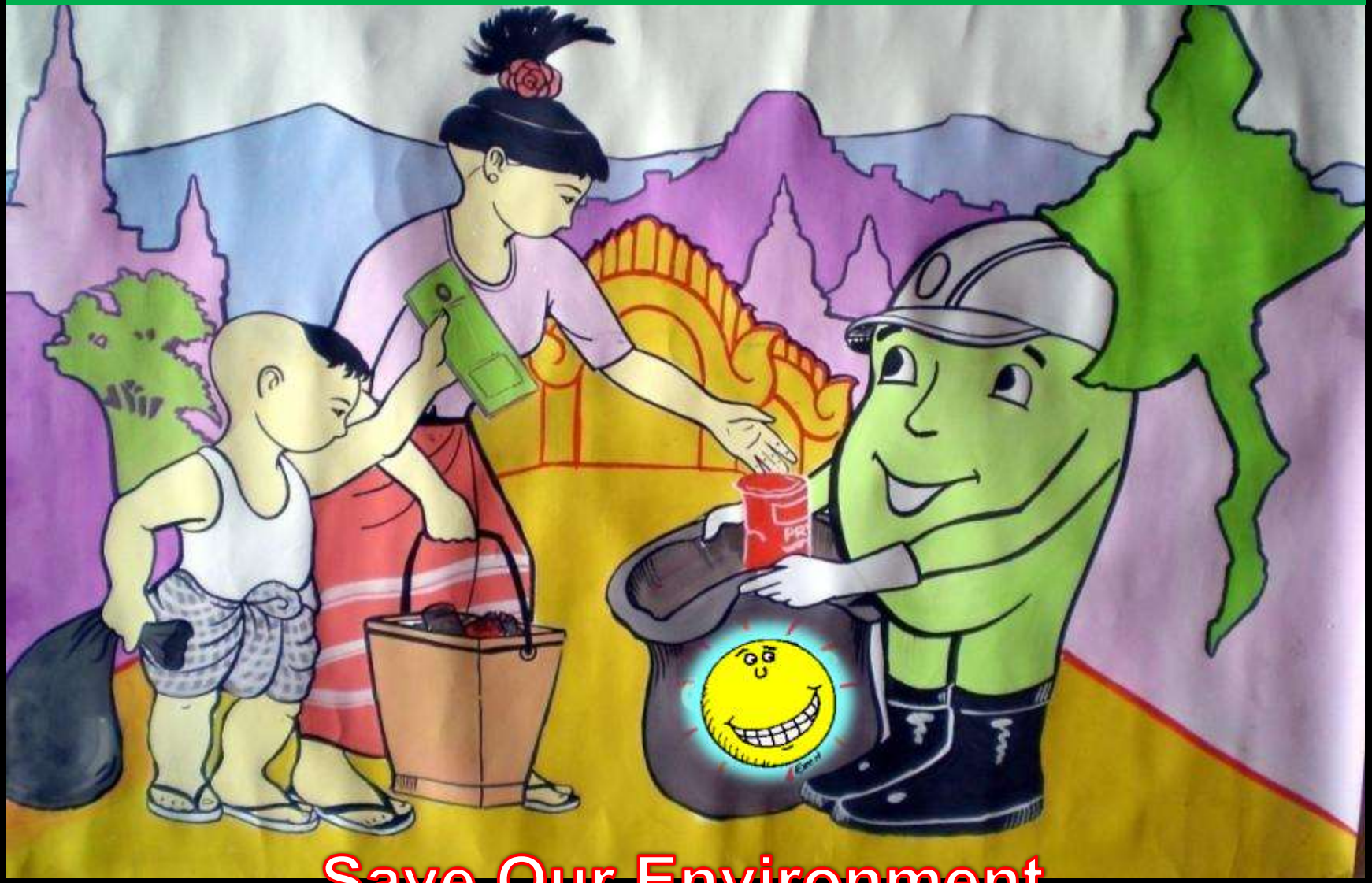
Conclusion

- Municipal solid waste in Myanmar is composed mainly of organic waste (73%) followed by paper/cardboard (18%), wood (4%), plastic and textile (2% each) and others (1%). Fortunately, Myanmar has the highest composition of organic waste and the lowest composition of plastic waste in the ASEAN region. (Fourth ASEAN State of Environment Report 2009)

- Solid waste management system in Yangon and Mandalay has been well established but needed enhancement to cover wider areas. Several other small cities and towns need to set up such system.

- The Government's vision has been articulated in the 'Green & Clean City' campaign without, however, being accompanied by specific quantified targets for the activity.

Thank You For Your Attention



Save Our Environment

The Republic of the Union of Myanmar

Ministry of Industry

H.E U Thein Aung
Deputy Minister

Tools for Green Industry

CONTENTS

- Green Economy and Green Growth in Myanmar
- Overview of Myanmar Energy Status
- Renewable Energy Sources in Myanmar
- Energy Promotion for Rural Village

Green Economy and Green Growth in Myanmar

GREEN ECONOMY AND GREEN GROWTH IN MYANMAR

Advantage Myanmar!

- Low population density;
- Rich and diverse natural resources;
- Present state of isolation, in terms of political, geographical, trade and commercial situation;
- Relatively low productivity as well as low-carbon growth; and
- Green cultural and religious heritage.

GREEN ECONOMY AND GREEN GROWTH IN MYANMAR

Advantage Myanmar!

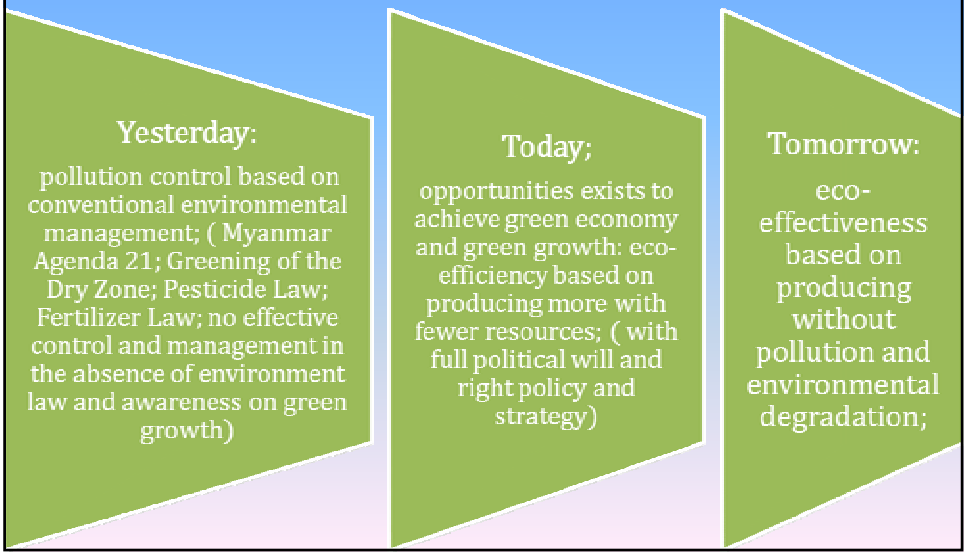
- **AREA:** RELATIVELY LARGE IN SE-ASIA WITH 676 SQ.KM
- **POPULATION**: SMALL - 59 MILLION
- **POPULATION DENSITY**: LOW-
- **LAND RESOURCES**: RICH- TOTAL 65MH, ARABLE/PASTURE 12MH, FORESTS 32MH
- **WATER RESOURCES**: VERY RICH- 1082 KM3 (876 MIL. AC.FT) ANNUAL SURFACE RUNNING WATER
- **FOREST RESOURCES**: RICH- ALMOST 50% OF TOTAL AREA
- **RENEWABLE ENERGY RESOURCES**: RICH- NATURAL GAS
- **AGRICULTURAL SECTOR**: 41% GDP, 18% EXPORT. 56% ACTIVE LABOR
- **USE OF AGROCHEMICALS**: VERY LOW EVEN COMPARED TO SE-ASIAN AVERAGE FAO 2008 (KG/H)- N1.3 VS 58 (16TMT VS 59,566TMT), P1.1 VS 17(14TMT VS 21100TMT), K 0.5 VS 30(6TMT VS12,325TMT)
- **AGRICULTURAL MECHANIZATION**: TRACTORS UNITS (FAO IN 2007)-MYANMAR 7342, THAILAND 830,000, VIET NAM 163,000, THE PHILIPPINES 63,000, TOTAL SE-ASIA 1 MIL.
- **INDUSTRIAL GROWTH**: LOW-MANUFACTURING 22%GDP,11% ACTIVE LABOR, 75% FOOD & BEVERAGES, MAINLY AGRICULTURAL AND NATURAL RESOURCES BASE, MOSTLY PRIVATE OWNED
- **TERMS OF TRADE**: LOW- EXPORT USD7.6b AND IMPORT USD4.2b

GREEN ECONOMY AND GREEN GROWTH IN MYANMAR

Greening of Villages as a powerful strategy for Myanmar:

1. Strengthening of rural development and poverty eradication activities, very high on the Government's Development Agenda;
2. Reconciling the conflict between the pathways for the achievement of MDG 1 on poverty reduction and MDG 7 on environmental sustainability; and
3. Creating win-win synergy between the environment and economy;

GREEN ECONOMY AND GREEN GROWTH IN MYANMAR



WE HAVE THE WILL TO MAKE THE CHANGE!

…..creating a unique 'green economy' that can restore ecosystem functions while bringing forth prosperity and welfare for the people of Myanmar…..

If there is a **'GREEN'** will there is a **'GREEN'** way!

Overview of Myanmar Energy Status

PRIMARY ENERGY RESOURCES IN MYANMAR

1	Crude Oil (Offshore & Onshore) (Proven + Probable)	648.59 MMBBL
2	Natural Gas (Offshore & Onshore) (Proven + Probable)	166.13 TSCF
3	Hydro	108,000 MW
4	Coal	711 Million Metric Tons
5	Biomass	52.5 % of total land area covered with forest potential available annual sustainable yield of woodfuel-19.12 Million Cubic Ton
6	Wind	365.1 TWH per year Coastal strip of 2832 Km with South-westerly wind -9 months North-easterly wind -3 months
7	Solar Power	51973.8 TWH per year
8	Geothermal	93 Locations

Source: Energy Planning Dept, Ministry of Energy

THE ENERGY POLICY FRAMEWORK

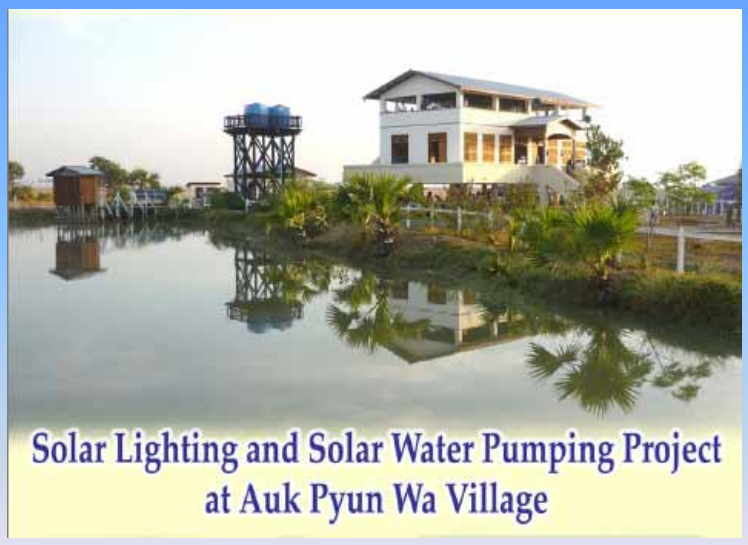
- To maintain the status of energy independence
- To promote wider use of new and renewable sources of energy
- To promote energy efficiency and conservation
- To promote use of alternative fuels in household

ASEAN Policy is for all ASEAN member countries of utilize 15 % of it's energy requirements from " New and Renewable Energy " sources by 2015.

Source: Energy Planning Department, Ministry of Energy

Renewable Energy Sources in Myanmar

Solar Energy



Solar Lighting and Solar Water Pumping Project
at Auk Pyun Wa Village

Project Name	- Rehabilitation of Auk Pyun Wa Village by Solar System.
Project Site	- Auk Pyun Wa Village, Ngapudaw Tsp, Ayeyarwaddy Division

Installed Capacity

Solar Lighting system	- 85 Wp Suntech Solar Pannel (20 Nos.)
	- Eco Lamp LED Lantern (160 Nos.)
Solar Water Pumping System	- LORENTZ Solar water pump (3 Nos.)
	- 60 Wp Suntech Solar Pannel (6 Nos.)
Application	- Night Time lighting & Day Time water pumping
Name of Village	- Auk Pyun Wa Village
Families	- 135
Primary School	- 1
Clinic	- 1
Storm Shelter	- 1

Laying Water Pipes to Individual Homes

Villagers Conveniently Receiving Running Water at their Homes

Wind Energy

WIND POWER

- 2832 Km costal strip facing the bay of Bengal and Andaman sea.
- Potential available wind energy-365.10 TWh/Yr (NEDO, 1997)
- Only on R & D Phase
- Individual scale of water-pumping, wind mill & generate electricity in rural area.

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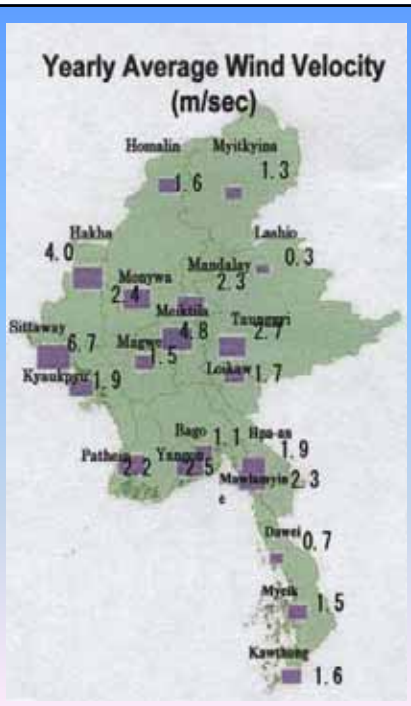


Project : **Wind Turbine System Installation**
Demonstrative Research on Photovoltaic Power Generating System
NEW JEC Inc. International Operations, Japan

Location : **Chaung Tha Beach , West Coast, Myanmar**

Period : **January 2003 to March 2003**





Biomass/Biogas/Biofuel

BIOMASS ENERGY

- Myanmar covers an area of 676,756 square kilometers (261,228 square miles), making it the largest mainland country in Southeast Asia. In FY2005 around 49.5% of the total land area of Myanmar was forested (CSO, 2005).
- Out of which 30.5 percent are reserved forests and 69.5 percent are unreserved ones. Wood-fuel plays vital role for cooking and cottage industries in both urban and rural areas. The main supply of wood-fuel comes from natural forests, fuel wood plantations, homestead garden, community forests and tops and lops from timber extracted areas.
- Natural forests produce about 14.06 million cubit tons of wood fuel during 1999-2000. Also as a measure to protect against deforestation and making the dry and arid regions green and forested, the government has launched a Greening Programme within the 9 Districts of Central Myanmar Region.

BIOGAS

- As an agriculture-based economy, Myanmar has many cows, particularly in Mandalay, Sagaing, and Magway divisions in the central region of the country. On the average, a medium-sized animal produces 10 kg of dung per day - enough to produce 0.5 m^3 of biogas through anaerobic digester/ bio-gasification.
- The biogas produced can be used for cooking, lighting, preservation of grains, preparation of fodder, and driving internal combustion engines. There are two types of biogas plant: plants with a movable gasholder; and plants with built-in, fixed dome gasholder.

BIOGAS

- The Government had launched a program to propagate the biogas utilization since 1980 and in 1983 Biogas Steering Committee have been formed.
- ***A total of 867 floating type biogas plant,*** family size digesters have been constructed and utilized in 134 townships in all 14 States and Regions with highest figure in central Myanmar Region where fuel-wood was becoming scarce.

Community Size Biogas Plant Established by MOST (2003 – 2005)

Sr.	State/Division	Nos. of Biogas Plant	Total installed (KW)
1	Mandalay Division	89	801
2	Sagaing Division	12	108
3	Magway Division	3	27
4	Northern Shan State	1	9
	Total	**105**	**945**

BIOGAS

- Typically a village with 100 cows can generate 50 m3 fixed dome type biogas plant is about MMK 2.5 million including the cost of a 25 horsepower, 15 KVA genset for lighting 300 homes.
- As by products 400 gals of effluent slurry are produced which can be applied as organic fertilizers. This is equivalent to 125 bags of urea, 50 bages of superphosphate and 96 bags of potash in one year
- This amounts to annual saving of MMK 2.3 million per year and also increase the yield of rice by 15% , of wheat by 10 % and vegetable by 25% .

Fixed dome type biogas plant

Construction Record Photos of Fixed dome type biogas plant




Biofuel Options

Biofuel resources can be divided into three categories:

1)crop resources such as sugar- and starch-based crops such as sugarcane, sweet sorghum, cassava, palm jaggery (obtained from palmyra tree, Borassus *flabellifer L.), maize, switch grass,* rice, and wheat, and oil-bearing crops such as palm oil, coconut, jatropha, rapeseeds, and groundnut;

2)unused biomass such as rice husk, straw, corn stover, corncob, biogases, coconut husks and shells, and palm oil fiber, including empty fruit bunch, sawdust, thinned wood, and wood waste; and

3) waste biomass such as animal dung, food waste (e.g., used cooking oil), peeling and scrap waste from the fruit and vegetable industry, waste paper from municipal waste, construction waste, pulp black liquor, and sewage sludge.

Biofuel Options

In 2008, the Ministry of Energy submitted a draft statement to the government which states the type of biofuel that private entrepreneurs, state, and cooperative agencies can produce, procure, transfer, blend, and deliver. The five types of biofuel are:

- **bioethanol**—a substiute for gasoline, produced from sugar- and starch-based crops such as sugarcane and cassava;
- **gasohol or ethanol**—a gasoline blend, referred to as anhydrous alcohol (at least 99.96%) blended with gasoline at a specified blended ratio;
- **biodiesel**—referred to as diesel fuel obtained from inedible oil plants (e.g., jatropha) and edible oilseed crops (e.g., palm oil, coconut, rapeseed, and soybean) through a chemical reaction process;
- **biodiesel blend**—biodiesel blended with diesel at a specified blended ratio; and
- **diesohol or ethanol**—a diesel blend obtained from mixing bioethanol and diesel.

Biodiesel Production

- Biodiesel is being processed under a pilot project run by the research team of Myanma Industrial Crops Development Enterprise and the Ministry of Agriculture and Irrigation (MOAI) in Yangon. The output capacity of the pilot plant is 100 gal/day of biodiesel.
- Parallel attempts to fabricate prototype or model pilot biodiesel pants are being carried out at the Myanmar Agriculture Service, the MOAI and the Ministry of Industry No.2, the Ministry of Science and Technology, and the Ministry of Energy.

Pilot Plant of Boidiesel Processor 60 litre/day

30 gal / day capacity Biodiesel Pilot Plant

Source: Ministry of Science and Technology

Engine Performance Test

MS 1100 Diesel Engine

single-cylinder, four-stroke, horizontal type

Source: Ministry of Science and Technology

Bioethanol Production

Several participants are entering the sugar production business and the resultant surplus sugar output is being diverted to bioethanol production. Feedstocks for bioethanol production include sugarcane, maize, cassava, potato, sweet potato, yam, and sweet sorghum.

Government Sector – 99.5 % Ethanol Plant in Myanmar

1. Distillery No.2 Sugar mill (500 gal/day)
2. Kan-ba-lu Distillery (3,000 gal/day)
3. Taung-sin-aye Distillery (3,000 gal/day)
4. Mat-ta-ya Distillery (15,000 gal/day)

5. Existing ethanol producers include the **Myanmar Economic Corporation** established two large bioethanol plants with a total annual capacity of 1.8 million gal of sugarcane-based ethanol. Commercial production, distribution, and use commenced in April 2008.

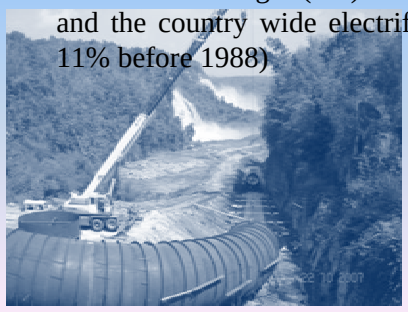
Bioethanol Production Private Sector

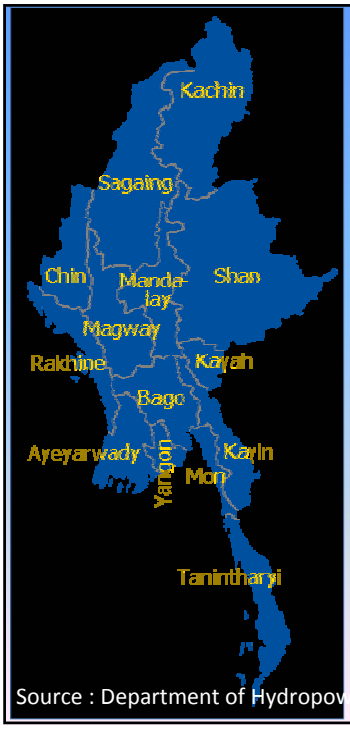
- Myanmar Chemical Engineering Group (3) Co., Ltd.(MCEG) had converted 300 hectares of virgin land which does not have access to electricity into integrated and self-sustainable farm in Kwinkauk of Ayeyarwaddy Region and MCEG installed ***one unite of 1,500 LPD bioethanol plant and one unit of 1,000 LPD syrup production plant.***
- Great Wall- a large private company is also completing the establishment of a factory with **a capacity of 3,700 gal/day** of sugarcane-based anhydrous alcohol, and
- another new factory will be constructed by Shwe Li Energy Company in Katha township.

Hydro Power

HYDROPOWER

- The capacity of RE sources additions will come mainly from hydropower in the near future in Myanmar.
- Myanmar has a hydropower potential of 108,000 MW but up to 2010 only 1500 MW is utilized from that renewable source and the rest is from natural gas and others with total installed electricity capacity of 3344 MW. This is mostly used for urban areas and industrial zones.
- About 4550 villages (7%) are electrified out of more than 65000 and the country wide electrification ratio is only 24% (it was 11% before 1988)





Source : Department of Hydropower

Hydropower Potential of Myanmar

Sr No.	Region (State & Division)	Potential (MW)
1.	Kachin State	2,061
2.	Kayah State	3,909
3.	Kayin State	17,021
4.	Chin State	1,312
5.	Sagaing Division	2,399
6.	Tanintharyi Division	692
7.	Bago Division	483
8.	Magway Division	123
9.	Mandalay Division	3,482
10.	Mon State	292
11.	Rakhine State	247
12	Shan State	7,699
	Total	39,720

Small Hydro

- **Small hydro 1,000 ~ 10,000 kW**
- **Mini hydro 100 ~ 1,000 kW**
- **Micro hydro 50 ~ 100 kW**
- **Village hydro 1 ~ 50 kW**
- **Pico hydro < 1 kW**

Existing Installations

Source of Power	Existing Nos.	Existing Capacity
Small hydro (< 10 MW)	11	34.04 MW
Mini hydro (< 1 MW)	17	5.23 MW
Micro hydro (< 100 kW)	29	378.5 kW
Pico hydro	6	35 kW
	+	+
(< 1 kW)	many individual	many individual

Source : Department of Hydroelectric Power

Tidal Power

Tidal Power

- Myanmar has a coastline of 2832 KM and twice a day experience a powerful water current due to rising and falling of the tide. This is pure renewable energy and free, reliable and predictable.
- Due to it's density which is 832 times of air sea water flowing at 8 knots is equivalent to wind speed of 390km/hr. Many coastal villages along the coastline can harness this nature's gift to generate clean electrical energy.



Geothermal Energy

GEOTHERMAL ENERGY IN MYANMAR

Potential

- Myanmar is one of the countries with numerous geothermal resources that could be represented as an additional source of energy to fulfill its future energy requirement.
- Myanmar has five distinctive igneous alignments related to geographical features of the country, which stretches from North to South. The igneous activity appeared to be more intense during late Tertiary and Quartenary although the activity ranged from Cretaceous to as late as Recent.
- Widespread occurrences of hot springs had been known to exist not only in the younger volcanic regions but also in non-volcanic and metamorphosed areas where round water heated at depths have ascended through faults, fractures and fissues.
- Hot springs are found in Kachin State, Shan State, Kayah State, the Southern Part of Rakhine Stae in Kyaukphyu, Central Myanmar Area, Shwebo-Monywa Area and especially in Mon State and Taninthayi Division. A total of 93 hot springs have so far been recorded and identified.

Geothermal Resources of Myanmar

Sr. No.	State/Region	No. of Hot Springs	Average Surface Temperature Degree C	PH Number
1.	Kachin State	2	-	
2.	Kayah State	5	-	
3.	Kayin State	15	48.61(37.78-61.67)	
4.	Sagaing Region	10	32.41(29.44-48.89)	7.8
5.	Taninthayi Region	19	51.46 (37.78-51.67)	-
6.	Magway Region	5	40.78 (32.22-48.89)	7.6
7	Mandalay Region	3	36.65 (30.56-40.00)	6.5
8	Mon State	19	51.08 (37.78-65.8)	7.7
9	Rakhine State	1	-	-
10	Shan State	17	43.50 (27.8-61.7)	6.9

Energy Promotion for Rural Village

Energy Promotion for Rural Village

Improved cook stoves: more efficient than traditional ones

- Fuel sticks and briquettes: made from rice husks, sawdust and charcoal dust
- Control Fuel Wood Consumption

Energy Efficient Stoves

ACMECS Project

Energy Promotion for Rural Village in Myanmar Project

(Sukalat Village, Kungyangon Tsp,)

- A team of the Thai delegates from Silpakorn University, and Chiang Mai University) visited Su Kalat Village, Kungyangon Tsp, Myanmar and held a meeting, seminar & exhibition, demonstration on an alternative energy technology and energy efficiency at Sukalat Village, and MRTV-4 recorded the activities and it was shown several times in national TV.

- Distributed the energy efficiency stoves (300 Nos.) to the villagers.
- Three public seminars was conducted and attended by more than 300 persons.




Concluding Discussion

- Myanmar is endowed with a geography and climatic conditions that have provided a sizeable forest cover(44%) and arable lands(20%) for food sufficiency and surplus for export.
- Scrubland must also be utilized for growing dedicated energy crops as it accounts for about 33% of the land area.
- For cooking, biomass is still the main source of primary energy in the rural area (70% of population) and lead to deforestation which must be mitigated by providing alternative household fuel such as biomass briquettes, bio-pellets, agriculture short rotation energy crops, bio-gas and other sources(Cooking gas)
- For bringing electricity to the rural areas, biomass, biogas, biofuel must be effectively utilized using appropriate technologies and considerable national resources must be allocated to realize this important objective which is part of the National (8) point plan for reducing rural poverty and raising the socio, economic standard of the rural people.

Concluding Discussion (cont,)

- National efforts and assistance from developed countries is needed in the areas of solar energy, wind energy, tidal energy. geothermal energy where capital cost is high and technologies are more advanced.
- For urban areas like Yangon and Mandalay the utilization of MSW into energy must be considered.
- In consideration of all above mentioned renewable energy projects implementation, Myanmar must build up it's capacity for enjoying the CDM benefits through sales of CERs.
- For Myanmar to reach ASEAN goals of using 15% of energy from Renewable Energy by 2015, all possible ways discussed must be implemented with proper planning, resource allocation, institutional strengthening and capacity building in relevant areas.

Thank you