

## **Environmental Problems of Yangon City: Establishment of Industrial Zones**

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### **Introduction**

In Myanmar, after immense political changes in 1988, the State adopted the market oriented economy. Since then changes have occurred in many aspects as the State is prepared to adapt to the new economic policy. One distinct phenomenon is the establishment of industrial zones, especially in Yangon City. Although it is favorable to enhance the economic development of the country, there are also negative effects due to the rapid establishment of industrial zones. For, any development scheme uses to have negative effects on the natural environment and in developing countries, such problems usually reach a more severe stage within a short period and solutions to these problems are usually out of the reach of their coping capacity. Thus, the main aim of this study is to examine the environmental problems related to these industrial zones in Yangon City before they become too severe to solve.

It tries to point out the recent situation of industrial zones in Yangon City in order to highlight the fact that research activities are desperately needed in many aspects for proper development of the industrial zones in Yangon City. This is primarily a descriptive approach assessing the existing environmental problems with the aim to help develop an effective strategy to care for the environment in industrial zone development planning.

### **Development of Industrial Zones in Yangon City**

Before 1988, under the Socialist economic policy, there were no definitely defined industrial zones in Yangon City. With later political changes, the State Law and Order Restoration Council (SLORC) which is now State Peace and Development Committee (SPDC), was created. Under this new government, six New Towns were established around the city to relocate the congested population of downtown Yangon and to ease the traffic congestion of that area.

According to the derivative policy of the State, many New Towns were established within a short period of time around Yangon City and the creation of industrial

zones followed soon after these new towns were established. The Department of Human Settlement and Housing Development (DHSHD) has the responsibilities for the establishment of new towns incorporating the creation of industrial zones.

The objectives for the development of industrial zones by the State are:

- To promote the urban economy by creating employment opportunities and income,
- To develop the State's economy by promoting the participation of private enterprises and cooperatives in the State's industrial sector,
- To relocate the scattered industrial activities within the city into a proper agglomeration under the urban renewal program of Yangon City, and
- To attract direct foreign investments (DHSHD 2002).

The objectives of establishing industrial zones in New Towns of Yangon City were to promote the economy of these New Towns by creating employment opportunities and generating income. As such, three main industrial zones, Shwepyitha, Hlaingthayar, Dagon Myothit and many smaller industrial zones sprung up. Figure 1 shows the total number of industries in various sizes in the main industrial zones of Yangon City. Figure 2 shows the distribution of industrial zones.

Types of industry	Industrial zones					Total
	Hlaingthayar	Dagon <sup>1</sup>	Dagon <sup>2</sup>	Dagon-Seikkan	Shwepyitha	
Construction material	19	2	11	2	0	34
Consumer and household goods	74	16	35	4	22	151
Chemical	12	0	0	1	2	15
Electrical	6	25	63	2	3	99
Food processing and beverages	72	4	13	0	39	128
Garment	83	10	14	6	40	153
Iron, metal and machineries	12	17	175	1	6	211
Paper and related works	7	6	68	2	5	88
Plastic	0	20	98	0	0	118
Rubber and related works	0	7	18	0	0	25
Wood and forest based	27	8	39	10	14	98
Others	104	20	23	4	6	157
Total	416	135	557	32	137	1277

Fig. 1: Types of industries according to industrial zones of Yangon City [Source: Industrial Zone Management Committees (Hlaingthayar, Dagon 1, Dagon 2, Dagon Seikkan, Shwepyitha), 2002]

## Shwepyitha Industrial Zone

It is the earliest zone established and located in Shwepyitha New Town. The construction started in 1990 as an industrial region. Later, it was upgraded as Shwepyitha Industrial City and the area was also extended. The expansion and provision of infrastructure took place phase by phase. At present, it has four parts, and construction of part 4 was started during 2002. The whole industrial zone was scattered within Shwepyitha Township, and the total area of this zone is about 345 hectares (part 1 is 125.5 hectares, part 2 is 78.56 hectares and part 3 is 140.56 hectares) whereas part 4 is still under construction.

In this zone, the land plots for industrial purposes vary from 0.1 hectares to 1.2 hectares. At present, there are totally 474 land plots of various sizes but only 137 plots are occupied. The management fee for land in Shwepyitha Industrial City (in part 2 and 3) is 7500 Kyat per hectare per month for local entrepreneurs and about 50 FEC (Foreign Exchange Currency/ 1 FEC = 1 US\$) for foreign investors. In 2002, there were 4307 male workers and 11525 female workers, making

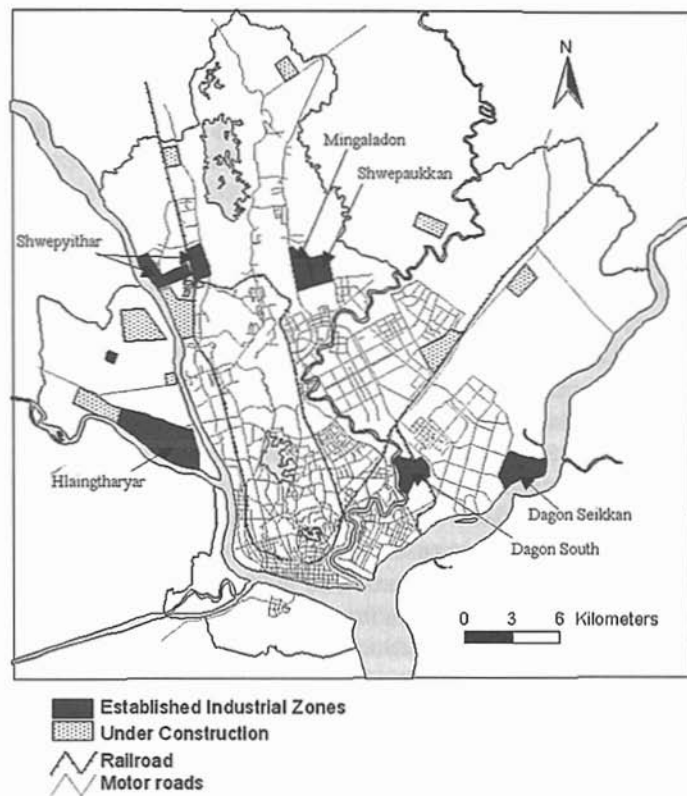


Fig. 2: Industrial zones of Yangon City

a total of 15,832. According to a report on labour, 73% of the total workers were employed in garment factories followed by food processing with 13.2%. The rest were in forest based industries and weaving and wrapping. The total investment of the industrial facilities in this zone until 2002 was Kyat 29,205.4 million and US\$ 2.93 million (Shwepyitha Industrial City Management Office, 2002).

## **Hlaingthayar Industrial Zone**

Although Hlaingtharyar New Town was established in 1985 by relocating fire victims, the construction of its industrial zone started in February 1995. It lies near Byintnaung Bridge and is bounded by the Hlaing River, Panhlaing River and Yangon-Pathein road. The whole industrial city is divided into four zones with an additional zone for cottage industries making a total of five. Zones 1 to 4 are grouped together whereas zone 5 is in a separate place, within the inner part of Hlaingtharyar new town. The total area planned for the whole industrial city was 526.09 hectares.

At present, this is the most developed zone. Thus, it was profiled as an industrial city in July 1996 and a management committee was formed. A management fee is collected from factory owners, namely Kyat 5000 per hectare per month for local investors and US\$ 50 for foreign investors. The total investment of this zone was Kyat 15,814.33 million and US\$ 105.55 million in 2001.

According to data in 2002 nearly 22% of the total was in garment factories, and 82% of the total labour force was involved in these garment factories. The second largest industry was the production of consumer and household goods with 17.75%, in which 10.7% of the total labour force was involved. The third was food processing and beverage with 15.8% and 8.7% of the total workforce. The factories in Zone-1 to Zone-4 are large scale production facilities. Zone 5 is mainly aimed for small cottage industries for those who cannot afford much. The total area of Zone 5 has 28 hectares with 217 land plots which have already been sold since March 1997. As Zone 5 was aimed for small cottage industries, the size of the land plots was only 334 m<sup>2</sup> in the early developing stage and the land price was Kyat 11.1 million per hectare. Later, the area was extended to 86.32 hectares. The size of the land plots increased to 2023.45 m<sup>2</sup> and the land price also increased up to Kyat 22.2 million per hectare.

## **Dagon Myothit Industrial Zones**

The construction of Dagon Myothit (New Town) was started in March 18, 1989. Now this is within the Yangon City area and it has an area of 331.5 square kilometers. For administrative purposes, this new town was divided into four townships

as Dagon North, Dagon South, Dagon East and Dagon Seikkan (port). Among these four townships, industrial zones are located in Dagon South, Dagon Seikkan and Dagon East townships.

Construction of **Dagon South Industrial Zone** started in February 1992 and the official opening as Zone 1 and 2 was in September 1996. Later, in 1997, Zone 2 was divided into two, and the new zone was defined as Zone 3. Generally, Zone 1 and 2 were for large and medium size factories and Zone 3 was for small industrial activities and shop-houses.

**Zone 1** is located in ward 23 of Dagon South Township. The total area of this zone in 2001 was 192.36 hectares. There were 481 land plots. All were sold to private entrepreneurs. The total investment of factories in this zone was Kyat 6022 million in 2002.

**Zone 2** is located in ward 63 and 64 of Dagon South Township. The total area of this zone was 82.46 hectares. Land plots in this zone were of various sizes, having a total of 1741 land plots. Within Zone 2, a plan had been made for four parks and one sports ground, a market place, three ponds and places for government institutions. Upmarket residential apartments were also included. In this zone, the total length of all roads was 23455 meters, of which 7023 meters were in good condition. This means only 30% of the roads are in good condition and much of it needs urgent improvement. The total investment of the factories was Kyat 5562.7 million in early 2002.

**Zone 3**, which is also located in ward 64, had an area of 14.28 hectares in 2002. Actually, Zone 3 was the earliest one established in this township. The purpose of establishing this zone was to relocate small factories systematically which were scattered within residential areas of Yangon City. Originally, this was a part of Zone 2. Later, according to the nature of its industrial activities and shophouses, YCDC considered to manage it under the Market Department. But in line with the desire of the entrepreneurs and because of its small industry character, it was officially defined as Industrial Zone 3 of Dagon South in February 1998 and a separate management committee was founded with freely selected persons. Later the area increased to 21.57 hectares in 2004 due to an extension.

As it was originally aimed for small workshops, the sizes of the land plots are small. Buildings were constructed by a contract system. There are six types of buildings of various sizes, ranging from 28 m<sup>2</sup> (10×15 feet) to 223 m<sup>2</sup> (40×60 feet). Totally, there were 1401 units of various land plots in 2002. Most of them are constructed as row houses mainly used as shops, houses and workshops for repairing parts. Figure 3 shows the types of industry, investment, energy usage and labour situation of Dagon South Industrial Zone 3.

Types of industry	Total Factories	Investment (Kyat in mil.)	Energy Usage (KW)	Total Workers
Agro-based machinery and spare parts	32	214	282	139
Transport machinery and related parts	28	45.5	138	80
Electrical machinery and spare parts	20	21.5	78	43
Miscellaneous	269	460.6	1407	798
<b>Total</b>	<b>349</b>	<b>741.6</b>	<b>1905</b>	<b>1060</b>

Fig. 3: Type of industrial works in Dagon South Industrial Zone-3 (2001- 2002) (Source: Management Committee, Dagon South Industrial Zone-3, 2002)

In this zone, roads are of various widths, ranging between 5 and 10 meters. The total length of all these roads is 6802 meters, of which 4994 meters were covered with concrete and asphalt in 2002. A total of 92 bridges of various lengths spanning the drains were also constructed. The total cost for the construction of roads, bridges and car parks was more than Kyat 229 million, and the construction was financed by the workshop owners of this zone. Water is provided by three artesian wells and electricity is provided by four 500 KVA transformers which were also constructed on the basis of the self reliance program. The total cost for power supply was Kyat 62 million. Because of the insufficient electricity supply, the zone bought another generator of 750 KVA, which cost Kyat 29 million. But due to the difficulties connected with fuel, the generators cannot operate. There were only 430 telephones in this zone and nearly all the basic infrastructure was provided by a self-help system.

**Dagon Seikkan (Port) Industrial City** was located at the eastern part of Yangon, on the western bank of Bago River (Fig. 2). The reclaiming of land and construction of roads and drains started in 1996. On February 2001, this zone was classified as Industrial City and a management committee was formed with nine selected members. It has two parts with area of 320.8 hectares and 168.4 hectares, making a total of 489 acres. There are 261 plots of land in part 1 and part 2 has 117 plots. A restriction on land plot size was made in this zone that the smallest size should be 0.4 hectare and the largest 6.9 hectares. Usually, the sizes of land plots vary from 0.4 to 1.2 hectares. For transportation, two main concrete roads of 15 meters wide were connected to the main roads to Tharkayta and South Dagon townships. Within the zone, 7.5 meter wide roads, having a total length of 30.3 kilometer were constructed until recently.

For this whole industrial city, altogether 57,438 meters of drains should be constructed. However, only 29,688 meters had been constructed with concrete and bricks with 39 outlets. Thus, only 50% of the drains had been completed. Apart from these drains, a proper embankment and many sluice gates to protect

from flooding by the Bago River tide are needed. In this industrial city, electric power was supplied through a separate transformer. However, insufficiency is high. There were 40 telephones for the whole zone and much improvement is still needed. For shading and greenery, totally 1639 plants were grown. A plan had also been made to grow 10,000 plants per year by 2007.

The planning of Dagon Seikkan Industrial City is the most advanced among the industrial zones in Yangon City at present. It is mainly aimed for large factories and foreign investment. The total investment of factories was Kyat 2140.4 million with US\$ 3.42 million in 2002. One favorable point is that this industrial zone can have direct access to Thilawa container port if the construction of No. 2 Bago River Bridge has been completed.

## Other Industrial Zones

Apart from the above main zones, there are many other industrial zones of various sizes in Yangon City, some are newly developed by joint ventures between private companies and DHSHD and some are formerly established ones.

Among these, the largest is *Mingaladon Industrial Park (MIP)* in Mingaladon Township having about 90 hectare. It was the first industrial park in Myanmar and its official opening was made in February 1998. It lies beside No. 3 Highway Road, 30 kilometers away from Yangon port and 46 kilometers from Thilawa port. It was developed under a joint venture between DHSHD (40%) and a Japanese company, Mitsui (45%) with the remaining 15% from two Singaporean companies. This industrial park is aimed at attracting foreign investors. There are 39 plots of land having about 1 to 3 hectares. All basic infrastructures such as electricity, water supply, concrete roads, drainage system, landscaping, street lighting, fire hydrants, etc. is provided. It also provides 300 international direct digital communication lines. One distinct feature of this industrial park is a waste water treatment plant, which has a capacity of 5000 m<sup>3</sup> per day and an environment monitoring laboratory. In this park, tenants are required to have a primary waste water treatment plant to comply with the regulations of MIP.

Another industrial zone is *North Okkalapa Industrial Zone* which was started in 1963 under the Revolutionary Council. Formerly it was known as industrial ward of North Okkalapa Township and reestablished as North Okkalapa Industrial Zone in December 1998. The total area is 44.43 hectares near by the Ngamoeyeik creek. There were 116 running factories, some were newly constructed, and a total workforce of 3549 in 2002. It still has 15 vacant plots. Due to various sizes of land plots, instead of one factory on one land plot, a developer usually needs two to six plots of land to build a factory. In this zone, the dominant type of industry is beverage and food processing which makes 40.4% of the total.



The second is producing consumer and household goods, making 21%. 45.5% of the total labour force are employed in garment factories and 18.65% in beverage and food processing. The total investment of factories in this zone was Kyat 2000 million and US\$1.04 million in 2002. Without any physical barriers such as the Ngamoeyeik creek or the Hlaing River, the location of this industrial zone is generally more favourable than others. However, due to the population densities of surrounding townships, area extension is difficult. Water supply is very limited using the old Gyophyu system with 4-inch pipes. Besides, the electricity supply is insufficient like in all other zones. However, the use was increased from 5.83 MWH in 2001 to 9.14 MWH in early 2002, an increase of 56.84%.

Another is **Shwepaukkan Industrial Zone**, in Shwepaukkan New Town, north of North Okkalpa Township. The construction started in 1991 by DHSHD. At the beginning, there were only 374 plots of land with earthen drains and laterite roads. In August 1999, the area was classified as Shwepaukkan Industrial Zone, and the total number of land plots had increased to nearly 660 with 38.3 hectares. There are 97 factories operating with 3832 workers. According to the Shwepaukkan Industrial Zone Management Office, food processing and beverage occupied the larger share of industries having 24.25% of the total. The second was producing consumer and household goods making 22.3% of the total. Investment for roads and drains was Kyat 3340.778 million and for electricity supply Kyat 133.63 million which were paid by the factory owners. The total investment of factories in 2001 was US\$ 2.8 million and Kyat 130 million.

Apart from these above mentioned industrial zones, further plans had been made to develop new industrial zones. Figure 4 shows the public and private sector involvement in developing industrial zones during 2002 and 2006 within Yangon City area.

Industrial zones	Estimate Area (Hectares)	Developer
<b>Under public development scheme</b>		
Wartayar	101.2	Myanmar Timber Enterprise
Pharmaceutical Industrial Zone	101.2	Department of Health
East Dagon	225.8	DHSHD
Shwelinpan Industrial Zone	384.4	DHSHD
<b>Under private development scheme</b>		
Yangon Industrial Zone	81	Zaykabar Co.
Shwethanlwin Industrial Zone	162	Shwethanlwin Co.
Thardukan Industrial Zone	182	U Than Myint
Myaseinyaung Industrial Zone (1)	384.4	Warwarwin Co.
Myaseinyaung Industrial Zone (2)	142	Olympic Co.
December Industrial Zone	142	U Myint Lwin
<b>Total</b>	<b>1906</b>	

Fig. 4: Industrial zones to develop during 2002-2006 (Source: DHSHD 2002)



## **Environmental problems related to industrial zones of Yangon City**

Industrial zones can affect the environment in various ways. In the neighborhoods of many industrial zones, the natural resources of air, water and land as well as the actual purification capacity of the environment itself have been seriously reduced. If industrial zones are located or developed with little or no concern for landscapes and ecosystems, it can lead to loss of wetlands and other ecosystems, loss of agricultural land and pollution to surrounding areas, consequences which exert significant and widespread disruption to social and community life. As such, the poorly managed industrial zone can seriously degrade environmental resources by contaminating soil, water and air (UNEP 1997).

In Yangon City, environmental problems related to industrial zones are primarily linked with the dramatic change of paddy fields to industrial land plots without prior detailed investigation, later to be followed by drainage and waste disposal problems. With insufficient infrastructure provision, especially electricity and difficulties of transportation and communication, many other problems developed as well.

### **Drainage Problems**

Land cover changes with insufficient drainage system create severe drainage problems although their intensity differs from one zone to the other. All industrial zones were transformed from flat paddy land and their topography is lower than 6 meters above mean sea level. Besides, these lands are mainly composed of loamy soil the infiltration rate of which is poor and enhances the surface runoff.

Although plans had been made, the drains were earthen in the early stages of development. Later, some of the earthen drains in the early developed industrial zones were replaced with concrete drains by factory owners on their own expenses. Because of the poor drainage system and the lack of routine maintenance, which in turn is enhanced by unsystematic waste disposal, drains are blocked with wastes. Water cannot drain out quickly and it lasts several days (even weeks) creating water-borne diseases. When the effluent water from industries is discharged to the drainage channels, it creates bad odors and a severe drainage problem.

Such a situation is common in almost all zones. One example is Hlaingthayar Industrial City, which is perceived as the most developed among all zones at present, where severe drainage problems occur in every rainy season, which cannot be solved yet. Figure 5 and 6 show the drainage situation in the heart of Hlaingthayar Industrial City and Dagon South Industrial Zone 2.



*Fig. 5: Drainage situation in rainy season in central market place of Hlaingthaya Industrial City in 2002. The situation is not obviously improved until now (Photo: Zin Nwe Myint 2002)*



*Fig. 6: Drainage situation of Dagon South Industrial Zone 2 where water cannot drain out and waste is disposed nearby (Photo: Zin Nwe Myint 2002)*

## **Waste Disposal**

At present, waste disposal is becoming an important environmental problem which needs an urgent solution. Although much improvement in the waste collection system has been made, there is no overall systematic plan for waste disposal in Yangon City until now.

In all industrial zones, solid wastes produced from factories are first put aside within their own compound. When these wastes are mounted up, the factory owner calls for waste collecting vehicles from YCDC and let them dispose it in

selected sites. The factory owner has to pay a separate service fee, apart from the regular municipal taxes. To dispose these solid wastes, YCDC selects places and uses land filling methods. Most of the landfill sites are already filled up and YCDC always has to search for new places for waste disposal.

Figure 7 shows the waste disposal site in North Dagon Township, nearby the main road (Bohmu Bahtoo Road) and residential area, where all kinds of solid wastes from industrial zones as well as from other sources, such as market places, schools, etc. are dumped. Close to this main road was a former disposal site with an area of about 1.5 hectare, and it lasted only for nine months. There had been no concern about environmental impacts of these waste disposal sites on neighbouring areas, such as impacts on underground and surface wells as well as toxic gas produced from these landfill sites, such as methane, which is too dangerous for the environment.



*Fig. 7: The present waste disposing site of Yangon City in Dagon North new township where all kind of solid waste are disposed of, from industrial zones as well as from all sources of waste (Photo: Zin Nwe Myint 2002)*

Concerning the liquid waste, although a plan had been made for the location of waste water treatment plants, which are actually not constructed yet, there is no proper management for effluent water disposal. Mostly the waste water is disposed of in setting or evaporation ponds, or discharged into the adjacent river and creeks, sometimes via drains, without any kind of treatment. There will be no examination into this until any complaint has occurred. Even if any complaint had been made, this would have been solved temporarily. One example is in Shwepyitha Industrial City Part 1 (formerly Zone 1), where a liquor factory disposes the wastewater directly into the drain, which is also blocked with wastes, creating bad odors for the surrounding residential area and passers-by. Evidence for this is shown in Figure 8.



*Fig. 8: A part of a drain in Shwepyitha industrial zone, which is block with weed and waste into which the wastewater from adjacent liquor factory are directly disposed of without any treatment. (Photo: Zin Nwe Myint 2002)*

Many factories are usually discharging their wastewater into streams with a high polluting load. A study on a small canal, Tagu canal, about 6 km long and passing through the Shwepyitha industrial zone, was made in 1997. It showed that the Biochemical Oxygen Demand (BOD) reduction was recorded to be more than 90%. This may surely be attributed to the sub-purification process of the canal (Saw Christopher Maung 2005). However, it was not considered yet a sufficiently grave concern to prevent such pollution.

Although considerations were made during the initial planning stage, there is no proper actual plan for both solid and liquid waste disposal in industrial zones, except in some zones which are mainly aimed to attract foreign investors, like Mingalardon Industrial Zone.

### **Insufficient electricity supply**

One of the strongest problems in industrial zones of Yangon City which also create environmental problems is the insufficient supply of electricity.

At present, the major energy types used in industrial zones are electricity, diesel, coal and agricultural residues used for boilers. Because of the great insufficiency in electricity supply, factories in industrial zones of Yangon City have to rely on their own accounts on other energy supply types, especially diesel oil and boilers which use agricultural residues as fuel.

According to statistics, the electric power generation for Yangon had increased from 1140.96 million kWh in 1995-96 to 2150.43 million kWh in 1999-2000 (Cen-

tral Statistical Organization 2000). Although the electricity supply is increasing, it is still far lower than the demand. Within South Dagon Industrial Zone 2, during 2002, the running 557 factories needed 16,710 kilowatt per year whereas the supply was 5,174 kilowatt. Thus, electricity can only supply 31% of the actual need. According to a survey, within 24 hours, the electricity supply lasted only 3 hours and 18 minutes and even during this time it broke down frequently (Dagon South Industrial Zone 2 Management Committee, 2002). The situation has more or less remained unchanged in all industrial zones until now.

In such a situation, nearly all factories have to install generators run by diesel oil. For example, in the Dagon South Industrial Zones, each factory, medium or small scale, needs to install a separate generator to supply electricity when the supply by the authorities breaks down. All these generators are creating serious problems of noise pollution. Some factories use boilers to generate electricity by using agricultural residues as fuel for the boilers. Brewery and paper mills mostly use boilers, fueled by paddy husk. Dust and smoke pour out from chimneys and the ash is deposited in the surrounding vacant area. During dry seasons, when the wind blows, the ashes disperse to neighbouring areas creating an unpleasant air situation. During rainy seasons, the disposed ashes drain with the rainwater causing drainage channel sedimentation, contamination and blocking. Finally, the drains become shallower and cannot drain the water quickly enough and cause undesirable flooding in rainy season. When effluent waters are disposed from factories directly into these drains, as there is no proper plan for liquid disposal, it can cause environmental deterioration and harmful impacts on human health. However, there is no concern about this chain of events until now. Figure 9 shows the chain of events related to insufficient electricity supply in industrial zones of Yangon City.

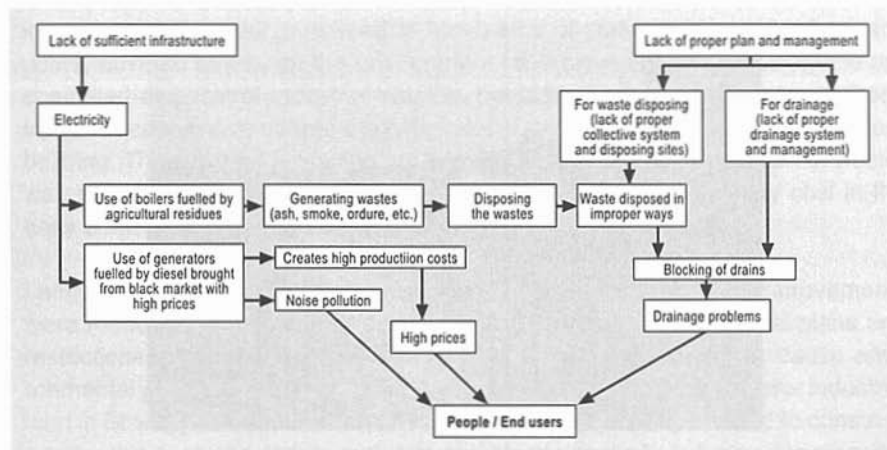


Fig. 9: A flow chart showing the chain of events due to insufficient electricity supply

Figure 10 shows a brewery in Shwepyitha Industrial City Part 1 which uses boilers fueled by paddy husk: fumes are pouring out into the air, and Figure 11 shows that the ashes are deposited in front of the factory nearby a drain. To the immediate north of this factory there are residential areas. As the wind normally blows from the south, the air pollutants and ashes, accompanied by stench, drift to these residential areas. If complaints occurred, the problem would be solved temporarily and the same problem would occur repeatedly. This is mainly the result of inadequate planning of industrial zones in the initial stage which becomes very difficult to solve now.



*Fig. 10: One of the famous liquor factory in Shwepyitha Industrial City Part 1 which use boiler, fuel by paddy husk and pouring out the fume into the air as there is no control for it. (Photo: Zin Nwe Myint 2002)*



*Fig. 11: The residues, ashes, are disposed in front of the factory nearby a drain which was already filled with plastic wastes. (Photo: Zin Nwe Myint 2002)*



## Water use

In all industrial zones of Yangon City, there is no proper plan for water supply and a sewerage system. Only in some old industrial areas, like North Okkalapa industrial zone, there is water supply from the Gyophyu pipe system for some factories. Even this is limited. Further repair and upgrading of the old pipe system is needed.

Factory owners in all industrial zones have to drill tube-wells according to their needs depending on the type of industries. In this case, water-intensive industries can deplete local water resources, especially ground water. There is no checking on this and no concern about the ground water level changes or contamination.

## Reexamining the environmental problems of industrial zones in Yangon City

During the early 1990s, in the initial stage of developing industrial zones, there seemed to exist no proper plan except transforming agricultural land to industrial land plots with earthen drains and roads. Only main roads were built with concrete but without pavements and proper drainage channels. In formerly developed Shwepyitha and Dagon South industrial zones, the size of land plots were various and there were no restrictions on type of industries. Various kinds of factories were randomly built. In this early development stage, restrictions concerning type of factories could not be made as it was necessary to give some incentives to relocate the companies from downtown.

The establishment of industrial zones and the development and construction of factories create job opportunities and this helps to improve the quality of life for local people. However, on the other hand, after operating the factories for many years, adverse effects on the environment have been felt due to a longtime uncontrolled disposal of industrial wastes. Besides, most factory owners in these industrial zones have utilized the entire plot of land for construction of their factory building. This resulted in leaving not enough space for the construction of wastewater treatment facilities which was also perceived as unnecessary cost in the early stage of development.

Later, in the late 1990s, some weaknesses were overcome and improvements were made in the newly developed industrial zones. Better land use plans and restrictions were also made for some type of factories which can cause environmental problems. For example, during the later reclamation of new industrial land in Shwepyitha, fisheries and cooling factories were only allowed to construct nearby the river and creek, and this was strictly controlled. A plan for greenery



and shade, an area for waste water treatment plants were also included in later plans of industrial areas.

In Shwepyitha Industrial City, the main industrial works are garment (29% of the total number of factories) and food processing (28.7%). In Dagon Industrial Zone, Zone 1 the emphasis is on plastic, food processing and garment. Plastic occupies nearly 15% of all factories and the second is food processing, 12%. But Zone 2 focuses on ironwork, which is mainly melting, grinding and molding of iron. Ironwork consists of 30% of the total number of factories. The second is producing plastic products representing 18% of the total. The Zone 3 of Dagon South is different from all industrial zones of Yangon City. This zone is mainly for small workshops emphasizing repair, assembling of machines, producing spare parts and shophouses which mainly sell miscellaneous things of iron and metal, electrical, plastic etc. Dagon Seikkan Industrial City is mainly aimed for large industries and many factories are still under construction. The zone itself is not completely finished in providing infrastructure.

Among the industrial zones of Yangon at present, Hlaingthayar Industrial City (Zone 1 to 4) is most developed. Most of the land plots are occupied with factories and warehouses. Land prices are also the highest among all zones. The investment was also highest among all industrial zones in Yangon City until 2002. Whereas Zone 5 is for cottage industries aimed at domestic markets and this zone is not well developed yet.

Nearly in all industrial zones, most of the manufacturing investment is concentrated in processing domestic raw materials, producing consumer products for the domestic market and labour intensive industries. Insufficiency of infrastructure provisions is the most common feature in all zones. At present, it is the main reason of causing environmental problems in industrial zones of Yangon City. If the infrastructure provision is adequate, these problems can be eased.

The basic infrastructure like roads, drainage, electric power supply and waste disposal etc. is provided by a self reliance program in all industrial zones. Electricity supply is the most insufficient and it is out of reach of any self-reliance program to promote the supply. Factory owners can solve their electricity insufficiency by installing generators or using boilers. A flowchart illustrates the chain of events due to the insufficiency of electricity supply to industrial zones leading to the environmental problems. With the lack of proper planning and management, and lack of adequate infrastructure provision, these problems consequently can have negative impacts on the social and health situation of people which is of no concern until now. The situation is even more undesirable when there is no proper regional plan that should be embedded in the main land use plan of Yangon City within the context of the State's economic development policy.

## Conclusion

In a developing country like Myanmar, the priority aim is to develop the State's economy as much as possible. As such, it is necessary to promote the industrial sector. One kind of promotion in Myanmar was the establishing of industrial zones where industrial activities are concentrated and investment for infrastructure is made. In this aspect, the establishment of industrial zones in Yangon is favorable.

As industrial areas need vast flatlands and good natural drainage, the physical situation of Yangon, having a low central ridge surrounded by flatlands with big rivers and creeks which can act as natural drains and transport routes, greatly favors the establishment of industrial zones.

To provide new infrastructure which can support efficient operation of industrial zones, large investments will be needed. In this case, the infrastructure situation of Yangon in terms of international communication is the best and most advanced when compared with other places of the country. Concerning transportation, since it is a transport terminal by all means, Yangon here plays a prominent role. The transport of raw materials and manufactured products is much easier and this is one factor favoring the industrial zones development in Yangon. This existing infrastructure of Yangon can support additional industries.

As it is the most densely populated area with a high educational level (the graduate educational level is highest with 10.2% of whole Myanmar), the availability of skilled and semi-skilled labourers is also highest in Yangon City (Central Statistical Organization 1999). Besides, it can be a substantial market for the products from industrial zones.

It seems that the major purpose of establishing industrial zones in Yangon City is to extract labour force from the new towns and to help develop the region. Such encouragement for the development of industrial activities of a particular area to provide employment is favorable. Besides, relocation of industries as part of an urban renewal program is also appropriate.

Although the establishment of industrial zones around Yangon City is favorable, there are no clear statements concerning planning and protection from environmental deterioration.

At the beginning, there were no restrictions on the type of industries and every kind of factories were allowed everywhere within the zone. Thus, all types of factories are mixed and one factory's effluent causes harm to the others and, as a consequence, may become dangerous for the consumer. There is no central water and sewerage system, no adequate energy supply, no proper drainage

system, with no systematic waste disposal system, all in combination create problems. With a lacking proper plan, these problems become more acute. It seems that there are no restrictions on effluent and waste disposal, a situation which combined with an inappropriate drainage system creates environmental deterioration and is becoming difficult to solve now. Kelleher (1992) described it as: "Overall the planning of the estate can be described as chaotic".

However, by learning from the weaknesses of the former ones, a lot of improvements were made in land use planning for the later industrial zones and also in upgrading some existing zones. Road sizes and drains were improved. Areas for waste water treatment plants were also included although actual plants are not constructed yet.

At present, the infrastructure provision is still far from being sufficient, especially the electricity supply and it is not clear how reliable the services will be. There is still no proper plan which takes care of the environment. But, trees are usually grown alongside the roads in the rainy season, although it is difficult to maintain them later. In largely planned Dagon Seikkan Industrial City, there are some plans to grow trees for greenery and shade. Nevertheless, at present the situation is quite satisfactory and the present greening can absorb environmental pollution to some extent.

The industrial zones developed with a larger share of foreign companies, such as Mingalardon Industrial Park, have facilities such as an environmental monitoring laboratory and a waste water treatment plant. Tenants are also restricted to have primary waste water treatment plants to comply with the regulations of MIP. By this, it is obvious that privately developed industrial zones under joint venture with foreign companies can effectively plan to protect against environmental deterioration much better than the industrial zones developed by local organizations.

An industrial zone which is run by a government department often suffers from rigid and cumbersome budgetary and administrative procedures as it is not usually possible for government departments to operate in a flexible and business like manner. Another problem is the taking of responsibility in solving problems between government departments. In Yangon City, YCDC is the responsible Department for all administrative matters and services, acting comparably to ministerial levels. But establishing industrial zones and managing them was under DHSHD. The owners of a factory have to pay a management fee per month to DHSHD and extra charges to YCDC. In this situation, institutional responsibilities for solving environmental problems and protection become unclear although both have responsibilities.

Concerning the industrial zones of Yangon city, three important recommendations were made by Kelleher in 1992. The first was to establish a series of standards

for protecting the environment and procedures for ensuring that those standards are upheld. The second was to conduct a market research to determine private manufacturing sector interests in industrial zones and related issues. The third was that the planning process for the industrial zone should begin again from first principles based on the results of the market research and a clearly defined set of objectives, and that the disposing of sites by auction to the highest bidder should be abandoned.

With regard to setting standards, YCDC called a meeting in July 2001, to introduce for discussion its proposed environmental Standards for Yangon which include standards on emission, noise, wastewater effluent and toxic chemicals (Saw Christopher Maung 2005). However, there were no further continuations on this matter. There are legislative laws and regulations to control wastewater pollution. However, enforcement of the environmental laws and regulations cannot be made effectively unless appropriate standards are adopted from which the degree of pollution can be measured for any type of pollution. These standards are yet to be approved and adopted. This is now in urgent need, for the environmental problems related to industrial zones are worsening and they should be coped with before they are too severe to solve. Although some considerations were made mainly focused on the extraction of labour force and on transport routes, there was no market research prior to the establishment of industrial zones. There seems no regular market research until now.

Later, land was allowed to be developed into industrial zones by private companies such as Shwethanlwin, Wahwhawin, etc. It is not clear whether this was mainly because of demand or not. Besides, the question of land ownership is also not clear between DHSHD and the entrepreneurs. Many new industrial zones are continually created despite the insufficient infrastructure and inadequate energy supply suffered by existing zones, and a lot of land is still vacant in formerly established industrial zones.

Industrial zones are part of the whole economic and social situation extending over the city. Thus, the priority of planning should be put for the whole city and subsequently for the industrial zones. At present, the environmental problems related to industrial zones mainly occur because of lack of sufficient infrastructure. In the overall situation, the environmental problems related to industrial zones can be controlled by adopting proper plans and management with sufficient provision of basic infrastructure. But it should be done immediately.

The following are the suggestions which should be considered for industrial zone development with least negative effects:

- (1) To provide sufficient infrastructure, especially energy supply,
- (2) To adopt an overall planning of industrial zones ensuring prevention of environmental deterioration,

- (3) Criteria and standards should be adopted for protecting the environment and also laws and procedures for ensuring that those standard are sustained,
- (4) To promote the environmental awareness of the public,
- (5) To control the creation of new industrial zones,
- (6) To carry out market research not only to know the demand of land for industrial purposes, but also to ensure the adoption of environmental standards,
- (7) Effective laws and enforcement protecting against environmental pollution should be made.
- (8) To promote the awareness of the entrepreneurs that the cost to cure the environmental problems is higher than that of preventing them.

This is just a first stage exploration to know the present environmental situation of the industrial zones in Yangon City. It is mainly aimed to point out that research is tremendously needed for industrial zone development with least negative impacts on both human and natural environments. Besides, it is to point out that the planning and management of industrial zones should be embedded within Yangon City's long term land use plan for ensuring sustainable urban development of the City.

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