Applying the Industrial Pollution Projection System to Myanmar

Data Review and Needs Assessment

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Contents

Abbreviations

ADB	Asian Development Bank
AIRS	Aerometric Information Retrieval System
BOD	biological oxygen demand
CM	Census of Manufacturers
HHED	Human Health and Ecotoxicity Database
GDP	gross domestic product
GIS	Geographic Information System
IPPS	Industrial Pollution Projection System
IFC	International Financial Corporation
ISIC	International Standard Industrial Classification
LRD	Longitudinal Research Database
MIH	Ministry of Industry and Handicraft
NSSF	National Social Security Fund
NO2	nitrogen dioxide
NPDES	National Pollutant Discharge Elimination System
PM10	particulate matters of size less than 10 microns
SEZs	Special Economic Zone
SO2	sulfur dioxide
TRI	Toxics Release Inventory
TSS	total suspended solids
UNIDO	United Nations Industrial Development Organization
USEPA	United States Environmental Protection Agency
VOC	volatile organic compounds

Introduction

For the Myanmar government to efficiently and effectively enforce industrial pollution regulations, it needs to identify problematic manufacturing sectors and facilities, and tailor appropriate interventions. This is particularly important in a situation where agencies with authority to control industrial pollution in Myanmar face significant resource constraints in manpower, budget, and technology. Plant level monitoring of air, water, and toxic emissions is best done periodically but monitoring protocols and methods may not be applied consistently and monitoring equipment is often obsolete. Data management and archiving procedures may not be strictly followed, and there is a lack of trained and empowered staff to actually perform site level inspections and data analysis for setting priority actions.

Such a situation is not unique to Myanmar. It is generally recognized that environmental regulators in developing countries often lack vital information on where the main pollution hotspots are found, and which manufacturing sectors and specific enterprises are the main emitters, which are necessary in setting priorities, strategies, and action plans for the purpose of controlling industrial pollution. As a result, planning at the strategic level lacks relevant information on pollution that could inform and support priority setting for industrial pollution control, development of strategies, and improvement of policies and law enforcement.

In response to insufficient or unreliable pollution information, particularly in developing countries, the former Infrastructure and Environment team of the World Bank's Development Research Group developed the Industrial Pollution Projection System (IPPS), an Excel-based tool that calculates industrial pollution by focusing on the scale of industrial activities and their sector composition. IPPS operates through sector estimates of pollution intensity (usually defined as pollution per unit of output or pollution per unit of employment).[1] Results from IPPS have been used in various countries where insufficient data on industrial pollution proved to be an impediment in setting up pollution control strategies and prioritization of activities.[2]

This data review and needs assessment report summarizes key trends in Myanmar's industrial development, reviews and analyzes available enterprise data, and discusses the suitability of these data with IPPS.

[1] See Hettige et al. (1994) for details.
[2] For example, IPPS has been used to estimate industrial pollution in Brazil and Mexico (Dasgupta et al. 2000), Latvia (Laplante and Smits 1998), Nigeria (Etim 2012, and Odesanya 2012), Thailand (Laplante and Meisner 2001), and Viet Nam (Dore et al. 2008).

The International Standard Industrial Classification

The main purpose of the International Standard Industrial Classification of All Economic Activities (ISIC) is to "provide a set of activity categories that can be utilized for the collection and reporting of statistics according to such activities." [3] It provides a comprehensive framework within which economic data can be collected and reported in a format that is designed for economic analysis, decision taking and policy making. The classification structure represents a standard format to organize detailed information about the state of an economy according to economic principles and perceptions. These economic activities are subdivided in a hierarchical, four-level structure of mutually exclusive categories, thus facilitating data collection, presentation, and analysis at detailed levels of the economy in an internationally comparable, standardized way.

ISIC was first adopted in 1948 and has been subjected to four significant revisions, with the most recent Revision 4 completed in 2008[4].

The ISIC is subdivided in a hierarchical, four-level structure. The categories at the highest level are called sections. The two-digit of the code identify the division, the third digit identifies the group, and the fourth digit identifies the class.

Section	C	Manufacturing
Division	13	Manufacture of Textiles
Group	139	Manufacture of Other Textiles
Class	1393	Manufacture of Carpets and Rugs

ISIC categorization is a key requirement in manipulating IPPS. It provides the link between the activity-specific pollution coefficients of the IPPS and the type of activity of each enterprise captured in the national enterprise database that it is to be evaluated.

The Industrial Pollution Projection System (IPPS)

The Industrial Pollution Projection System (IPPS) combines data from industrial activities, such as production and employment, with data on pollution emissions to calculate pollution intensity factors, representing the level of pollution emissions per unit of industrial activity.[5] As illustrated in Figure 2, pollution intensities have been calculated with data available from the United States (US) Manufacturing Census (CM) and the US Environmental Protection Agency (USEPA). The CM maintains the Longitudinal Research Database (LRD), which contains information from the CM and the Annual Survey of Manufactures (ASM). While the CM contains information on all manufacturing establishments in the US, the ASM has more information on a subset of those companies. Once an establishment has been selected to be part of the ASM, information is collected from the chosen company annually for a period of five years. The LRD contains detailed information on approximately 200,000 plants.

[3] From https://unstats.un.org/unsd/publication/SeriesM/seriesm_4rev4e.pdf.
[4] Details about ISIC are provided at the following site: http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=27
[5] See Hettige et al. (1994) for details.

The USEPA maintains a number of databases on pollution emissions. These include the Toxics Release Inventory (TRI), the Aerometric Information Retrieval System (AIRS), the National Pollutant Discharge Elimination System (NPDES), and the Human Health and Ecotoxicity Database (HHED). These datasets have been used in the calculation of pollution intensities.[6] After combining the LRD and EPA databases, it becomes possible to calculate the pollution intensity factors for approximately 20,000 plants.

The USEPA contains emissions information for a number of pollutants and chemical substances known to be harmful to both human health and the environment. IPPS coefficients are available for selected air pollutants—including sulfur dioxide (SO_2), nitrogen dioxide (NO_2), volatile organic compounds (VOC), total suspended particulates (TSP), and particulate matter of 10 microns in diameter or smaller (PM10)—and selected water pollutants including biological oxygen demand (BOD) and total suspended solids (TSS). IPPS also includes pollution intensities for over 240 priority chemicals and metals generally known to be toxic to human health and metals known to be bio-accumulative.

For each of the air and water pollutants, and the 240 toxic chemicals and metals, IPPS provides a lower bound, interquartile, and upper bound mean value for their pollution intensity factors. In this study, estimates of pollution load are based on the lower bound value and more importance is given to the ranking of industrial sectors in terms of pollution discharges and the ranking of geographical areas. These rankings remain the same whether lower bound, interquartile, or upper bound values are used.

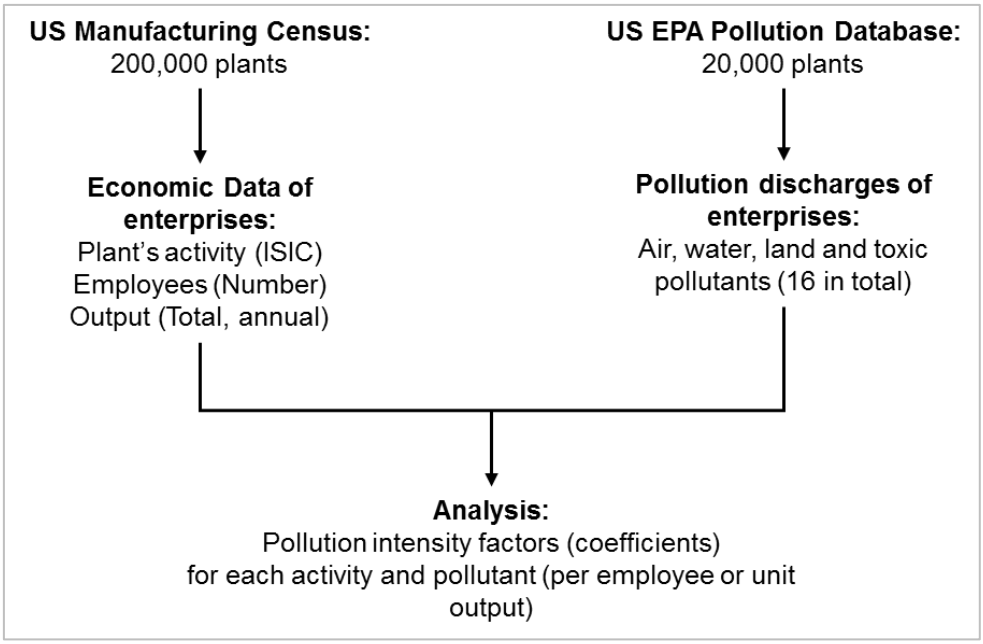

Figure 2: The Industrial Pollution Project System

[6]The TRI contains information on annual emissions for more than 300 chemicals that are toxic to the environment. Manufacturing establishments that (i) employ 10 full-time employees or more, and (ii) produce, import or process 25,000 pounds or more of any listed chemical must report the nature and quantity of the chemical produced, imported, or processed. In 1987, approximately 20,000 enterprises reported their release of such chemicals. The AIRS is the US national database for ambient air quality, air emissions and compliance with the US Clean Air Act. The NPDES contains self-reported data of plants facing standards for water emissions. Finally, the HHED contains various indices of toxicological potency.

Pollution intensity factors are calculated as the total amount of pollution discharge for a given pollutant divided by the manufacturing indicator—whether output value, value-added or employment. In the case of an employment-based indicator, the denominator is the number of kilograms of pollutant per unit of employment.

One difficulty in the calculation of pollution intensity factors is the variable used to capture the extent of manufacturing activity. While physical volume of output would be the ideal unit of measurement, industries and even establishments within an industry often use different units to report their volume of production. This does not allow for comparison across industries. However, the values of output and plant-level employment do offer such common units of measurement—the ranking of industrial sectors is almost identical whether the value of output or employment is used.[7] In the United States, the choice of unit of measurement does not appear to impact the ranking of industrial sectors by pollution load. For the purpose of policy making, it is this ranking that is most relevant.

The income elasticity of pollution per unit of output and the income elasticity of labor per unit of output are both negative, and not significantly different from one another. This suggests that while developing economies generate more pollution per unit of output than developed economies, they employ more labor per unit of output in the same proportion. Therefore, in developing countries it can be considered more accurate to use pollution discharge per unit of labor as the pollution intensity factor.

Industrial Development in Myanmar

Since 2011, the Government of Myanmar has gradually transitioned the country to a civilian rule as manifested in the 2015 parliamentary election. Parallel to this process, the government established several policies that facilitated investments. Two of these are the Myanmar Foreign Investment Law in 2012 and the Special Economic Zone Law or the SEZ Law in 2014.

Relaxing import and export regulations, and adjusting the exchange rate system—as part of the Myanmar Industrial Development Vision promoted by the Ministry of Economy, Trade and Industry—has led to a significant increase in investments in the country. The statistics on approved foreign direct investments (FDIs) by sector (see Appendix Table 1) as published by the Myanmar Directorate of Investment and Company Administration,[8] document the following interesting trends:

1) In the period 2011–2016, FDI has been *regularly* above US$1 billion a year while it was *generally* well below the mark in the period 2004–2010. The years 2006 and 2010 were exceptions to this trend due to a few but large power/oil and energy investments.
2) After power/oil and gas, the transport and communication, and manufacturing sectors rank second and third, respectively, in terms of FDI volume.

[7] Hettige et al (1994). For the US study, the rank correlation coefficient between intensity factors using the value of output and employment is 0.98, thus indicating an almost identical ranking.
[8] DICA, http://www.dica.gov.mm/en/topic/foreign-investment-sector

3) Compared to power/oil and gas, the FDI in the manufacturing sector shows a distinct, sharp increase from US$32 million in 2010 to US$400 million in 2011, and has been rapidly and steadily growing up to more than US$1 billion in 2015.
4) Investments in the manufacturing sector are more diversified than any other sector, with 46 approved investments in 2016 compared to eight in the transport and communication sector, and two in the power/oil and gas sector in the same period.

Despite Myanmar's economy being heavily dependent on the extraction and export of its natural resources—in particular, oil and gas, mineral resource, and timber—the above numbers indicate the growing importance of the manufacturing sector to the national economy.

As part of its work on preparing the Myanmar Environmental Quality Emission Guidelines (EQEG), the GMS Environment Operations Center (EOC) collected information on Myanmar's manufacturing sector from the Ministry of Industry (MoI). The 2014 data include International Finance Corporation (IFC) categories for industrial activities, the number of enterprises in each category, and location (region). The data only captures 10 of the 15 regions of Myanmar (excluded are Bago, Chin, Magway, Shan, and Naypyitaw). The data doesn't disaggregate down to the enterprise level (name of enterprise or specific activity) nor does it capture data related to the size and productivity of the enterprises (employee numbers or units of output per enterprise).

Nevertheless, as other datasets were not reported existing or available at the time of writing, the MoI 2014 data were used for a rapid analysis of the type and distribution of manufacturing industries in Myanmar.

The ISIC lists 32 different categories at the division level under manufacturing. Almost 70% of these industries, 24 out of 32 categories, are present in the MoI dataset (see Appendix Table 2).

The MoI dataset records a total of 30,851 manufacturing enterprises or facilities that are categorized by industry group (equivalent to division in the ISIC system) and activity (somewhere between group and class in the ISIC system). Neither the categorization of the industry groups nor activities is compatible with the ISIC system, but based on activity description, it is generally possible to manually match the MoI database with that of ISIC.

So far, the most important manufacturing sector in Myanmar is the **manufacture of food products**. About 61% of Myanmar's manufacturing sector or 18,766 out of 30,593 enterprises in the MoI database belong under this category (Appendix table 2). The next most important sectors are significantly smaller: **manufacture of machinery and equipment** with 2,711 enterprises (8.9%) and **manufacture of wood and of products of wood and cork** with 1,800 enterprises (5.9%). Together, these three sectors account for over 75% of Myanmar's manufacturing sector. Of the remaining quarter, there are four sectors with more than 2% share each: 1) manufacture of fabricated metal products; 2) manufacture of motor vehicles, trailers and semi-trailers; 3) manufacture of textiles; and 4) manufacture of rubber and plastics products.

Looking at the regions individually shows slight variations to this list. The **manufacture of furniture** is among the top seven sectors in Mon (second), Kayin (second), Ayeyarwady (third), Tanintharyi and Rakhine. In Mon and Kayin, it ranks second right after food products and is therefore one of the most important manufacturing sectors in these regions. Another

important sector in some regions is **repair and installation of machinery and equipment** (among the top seven in Rakhine, Bago, and Kayin). In Mandalay, the **manufacture of basic metals** is among the top seven industries with almost as many facilities in Yangon (142 facilities compared to 148 facilities in Mandalay). These regions are the only hubs in Myanmar with a significant number of related enterprises.

In terms of regional distribution of industries, results show a fairly clear picture in Appendix Table 3. In all regions, Yangon has by far the highest concentration of enterprises in almost all manufacturing activities listed. Particularly high—and not surprising—is the concentration of activities that require higher investment in terms of financial and human capital, and technology; namely, pharmacy (100% of related enterprises in Yangon); wearing apparel (87%); reproduction of recorded media (83%); rubber and plastic products (79%); and electrical equipment (75%). However, most of these activities are among the lesser important ones in terms of number of enterprises. Only the rubber and plastic products sector is included among the top 10 and Yangon is leading in the regional distribution of enterprises in the top 10 activities, but more diversification may be observed here. Some of the most dominant manufacturing sectors in Myanmar (food products and machinery) actually have the highest concentration of enterprises—not in Yangon—but in the Ayeyarwady and Mandalay regions. Bago, Sagaing and Mon also have high concentrations in some activities while Tanintharyi, Rakhine, Kachin and Kayin score overall low across all activities, suggesting that these regions are lagging behind with regard to industrialization.

Regarding the level of sector diversification within each region, data show at first glance a fairly even picture (Appendix Table 4). Food production is by far the most important sector in all regions, with at least 23 (Yangon) to 82 percentage points (Rakhine) lead over the next manufacturing activity in terms of number of enterprises. However, while Yangon shows a wide distribution of enterprises from the manufacturing sector in Myanmar—including those not within the top 10 enterprises—other regions have a well-distributed manufacturing industry (aside from food production) spanning within the top 10 activities, without significant differences from one another. Therefore, in terms of diversification, only Yangon can claim to have a reasonably diversified manufacturing sector although food production is by far the most important activity even in Yangon.

To sum up:

1) In terms of the number of enterprises, Myanmar's manufacturing industry is still heavily concentrated on food production (61%) with two other activities (manufacture of machinery and equipment, and manufacture of wood and related products) following at a distance,
2) While Yangon does not rank highest in terms of enterprises in food production (only fourth after Ayeyarwady, Bago, and Sagaing), it has almost always the highest concentration of enterprises from other manufacturing sectors, making it the region with the most manufacturing enterprises.
3) The dominance of food production is also reflected in the lack of diversification in the manufacturing industry. Only Yangon shows diversification across most of the manufacturing sectors found in Myanmar, with almost all non-top 10 sectors only found within. All other regions only show diversification among the top 10 industries and almost no presence of enterprises beyond that.

While it is not the task of this paper to interpret the above findings, it may be concluded that the heavy focus on a few sectors, and the lack of diversification in the manufacturing sector outside Yangon, make the sector and economy vulnerable to market shocks.

Data Readiness for IPPS

IPPS relies on matching an industrial facility to a specific industrial sector for which pollution intensity factors are available. The standard approach of classifying economic activities is known as the ISIC (Box 1). While most countries use ISIC codes to classify economic activities, it is common to observe in developing countries the use of hybrid systems combining ISIC with a national system of classification.

Reviewing the EQEC data for applicability with IPPS exposes three key challenges.

First, the EQEC data available does not contain an ISIC code or compatible national industrial classification. The only related two-tier information in the dataset is the MoI classification by industry groups (equivalent to ISIC division) and factory type (positioned somewhere between ISIC groups and class). The dataset also contains IFC guideline categories and types of investment as per environmental impact assessment (EIA) categorization. While the IFC and EIA can be used to verify MoI categorization for selected cases, they also feature several inconsistencies and errors (e.g. inclusion of nonmanufacture categories, unclassified or unknown entries, etc.) which makes them unsuitable for use instead of the MoI classification. In any case, the lack of a numerical coding compatible with ISIC and the ambiguity and lack of clear description of the manufacturing activities or product requires decision makers to manually translate the MoI data into ISIC codes, and perform cumbersome cross-verification with IFC and EIA categories.

Second, the EQEC dataset is a summary dataset which aggregates individual enterprises to region level, and ISIC divisions and groups. With this aggregation, important detail is lost, particularly: 1) names of the individual enterprises, which could serve as a critical information to identify their ISIC activities; 2) detailed location (village, township), which could help analyze the pattern of distribution; and 3) date of establishment of enterprise, which could help in analyzing trends. The aggregation unnecessarily limits the government's options to analyze the data and draw valuable conclusions with regard to geographic distribution and trends.

Third, and the most important limitation, is the lack of information required to run the IPPS equation. The missing information from the ISIC codes can be compensated by manually translating the MoI categories, thus the aggregation level is only limiting the depth of analysis but not the IPPS application itself. However, the lack of data on gross output or the number of employees—both of which are essential components of the IPPS equation—is making the application of the IPPS with the EQEC data impossible. Either of these two data, preferably the number of employees, is an elementary requirement to calculate the emission estimates using IPPS pollution coefficients. Without these, the EQEC dataset can only be used to categorize and broadly describe the manufacturing sector in Myanmar, as done above, but not its performance with regard to air, water and toxic pollution. In this context, the dataset becomes a secondary source that holds data for 10 of Myanmar's 15 regions and excludes Bago, Chin, Magway, Shan, and Naypyitaw.

Conclusions and Recommendations

Environmental regulators in numerous developing economies including Myanmar, find themselves with insufficient capacity, manpower, and resources to adequately address industrial pollution. In particular, the lack of monitoring resources—staff, budget, and technology—often prevents the accounting of plant-specific industrial discharges. This presents an obstacle to the enforcement of national pollution control regulations and standards.

Models such as the Industrial Pollution Projection System (IPPS) can help bridge the gap between considerable resource constraints and the mounting pollution pressure from industrial growth and development. This data review and needs assessment presents available enterprise data for Myanmar and discusses the suitability and limitations of the IPPS application.

While the IPPS is neither a data heavy nor arithmetically complex model, it requires some basic and reliable data inputs; namely, 1) location of enterprise (as coordinates or administrative code); 2) type of activity (as ISIC code); and 3) number of employees. Additional information such as date of establishment, gross output, classification of workers (male or female, management or manufacturing worker, etc.) can deepen the analysis but are not critically required to run the IPPS equation.

In the case of Myanmar, only the EQEC dataset was available to the EOC team for use in the review using the IPPS application. While the dataset can provide basic characterization of the manufacturing sector in Myanmar, it does not include employment data, which is essential in running the IPPS equation. Also, the use of a non-ISIC compliant activity categorization and the aggregation to the highest administrative level limits the usefulness of the dataset for both economic analysis and pollution control.

The most important recommendations of this review and analysis for Myanmar are 1) to identify if, elsewhere in the country, enterprise data exist that do not struggle with the limitations identified in this paper for the EQEC data; or 2) to invest in the establishment or upgrade of available data to include ISIC codes and basic enterprise information (date of establishment, outputs produced, number of employees, exact location).

It should be highlighted that the IPPS is an emissions model, not a pollution model. In order to better judge how emissions could translate into pollution and how pollution affects social and environmental assets, the enterprise data needs a higher geographic resolution (at least from the village level) than currently available. If that information is available, geographic context could be established between emission at source, environmental conditions in the area, and population exposed to the emission and pollution.

While the IPPS could not be run on the EQEC data, the dominance of the manufacturing of food products, and the geographic accumulation of food producing enterprises in Aweyarwady, Bago, Sagaing, and Yangon (in this order) suggests that investing and focusing in controlling pollution of food producing enterprises in these four regions could lead to a significant reduction in related absolute pollution. However, this does not imply that other regions have no relevant pollution issues to be addressed because other manufacturing industries may have severe pollution impacts and lesser concentration of enterprises may have significant impact on the population in a concerned area.

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Appendix Tables

Table 1: Yearly Approved Amount of Foreign Direct Investment (by sector, US$ in million)

(US $ in million)

Sr No	Sector	Foreign Capital to be brought in	1988-89 to 2003-2004	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-2017 (end of 31/10/2016)	
1	Agriculture	249.866	34.351							138.750		9.650	20.269	39.666	7.180		
2	Livestock & Fisheries	546.698	312.358				12.000					5.6	96.016	26.861	8.250	2	85.613 *
3	Mining	2897.606	528.190	6.000	0.700		5.000	855.996	2.500	1396.077	19.897	15.334	32.730	6.259	28.923		
4	Manufacturing	7311.140	1608.084	3.520			18.720	(-) 0.232	33.230	66.321	32.254	400.716	1826.980	1502.013	1064.998	46	725.435 *
5	Power	20290.314	0.000		6030.000	281.222	0.000			8218.520	4343.978	364.201	46.511	40.110	360.100	2	605.672
6	Oil and Gas	22410.368	2457.473	142.550	34.975	438.480	170.000	114.000	278.600	10179.297	247.697	309.200		3220.306	4817.790		
7	Construction	37.767	37.767														
8	Transport & Communication	6701.229	313.272								0.634		1190.232	1679.304	1930.996	8	1615.892
9	Hotel and Tourism	2541.091	1031.061	3.500				15.000	15.250			300.000	435.210	357.949	288.395	2	94.726
10	Real Estate	3111.451	1053.740	2.713									440.573	780.745	728.680	1	105.000
11	Industrial Estate	203.113	193.113												10.000		
12	Other Services	696.158	23.686									14.766	18.534	357.320	235.963	5	45.889 *
	Total	66996.801	7593.095	158.283	6065.675	719.702	205.720	984.764	329.580	19998.965	4644.460	1419.467	4107.055	8010.533	9481.275	66	3278.227

Source: Myanmar Directorate of Investment and Company Administration

Table 2: Number of Enterprises / Facilities by Activity (based on ISIC Revision 4) and by Region

Activity (ISIC Rev4)	State / Region										Total
	Yangon	Ayeyarwady	Mandalay	Bago	Sagaing	Tanintharyi	Mon	Rakhine	Kachin	Kayin	
Manufacture of food products	2,037	4,883	610	3,464	2,803	862	1,123	1,725	854	405	**18,766**
Manufacture of machinery and equipment n.e.c.	350	540	686	230	460	187	160		71	27	**2,711**
Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	488	96	100	338	281	108	112	58	137	82	**1,800**
Manufacture of fabricated metal products, except machinery and equipment	417	30	190	111	56	43	268	3	38	133	**1,289**
Manufacture of motor vehicles, trailers and semi-trailers	238	15	214	31	71	39	98	1	76	76	**859**
Manufacture of textiles	435	2	161	39	159		3		12	11	**822**
Manufacture of rubber and plastics products	531	3	39	13	14	4	50		2	19	**675**
Repair and installation of machinery and equipment	146			172	79		14	122	1	77	**611**
Manufacture of furniture	52	152	6	16	2	34	169	25	14	60	**530**
Manufacture of basic metals	148	4	142	36	54	13	27		1	4	**429**
Manufacture of beverages	174	41	34	44	37	10	23	19	21	16	**419**
Manufacture of chemicals and chemical products	213	5	93	14	29	2	9	2	2	1	**370**
Printing and reproduction of recorded media	232	5	7	12	12		9	2			**279**
Manufacture of other non-metallic mineral products	91	4	20	12	22	5	82	-	27	13	**276**
Manufacture of paper and paper products	170	5	34	12	14		4	1			**240**
Other manufacturing	77	12	13	14	5	1	10		1	2	**135**
Manufacture of tobacco products	7	4	49	22	6		1		1	1	**91**
Manufacture of electrical equipment	66		17	1	2		1			1	**88**
Manufacture of wearing apparel	69	1	4	3	1					1	**79**
Manufacture of other transport equipment	29	24	3	6	3	8	4			1	**78**
Manufacture of coke and refined petroleum products	21	1	7		3	1	1	1	1		**36**
Manufacture of basic pharmaceutical products and pharmaceutical preparations	4										**4**
Manufacture of leather and related products			3	1							**4**
Manufacture of computer, electronic and optical products	2										**2**
Total	**5,997**	**5,827**	**2,432**	**4,591**	**4,113**	**1,317**	**2,168**	**1,959**	**1,259**	**930**	**30,593**

Source data: Ministry of Industry, 2014

Table 3: Distribution of Enterprises / Facilities Among the 10 Regions, in Percent

Activity (ISIC Rev4)	State / Region										Total
	Yangon	Ayeyarwady	Mandalay	Bago	Sagaing	Tanintharyi	Mon	Rakhine	Kachin	Kayin	
Manufacture of food products	11	26	3	18	15	5	6	9	5	2	100
Manufacture of machinery and equipment n.e.c.	13	20	25	8	17	7	6	-	3	1	100
Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	27	5	6	19	16	6	6	3	8	5	100
Manufacture of fabricated metal products, except machinery and equipment	32	2	15	9	4	3	21	0	3	10	100
Manufacture of motor vehicles, trailers and semi-trailers	28	2	25	4	8	5	11	0	9	9	100
Manufacture of textiles	53	0	20	5	19	-	0	-	1	1	100
Manufacture of rubber and plastics products	79	0	6	2	2	1	7	-	0	3	100
Repair and installation of machinery and equipment	24	-	-	28	13	-	2	20	0	13	100
Manufacture of furniture	10	29	1	3	0	6	32	5	3	11	100
Manufacture of basic metals	34	1	33	8	13	3	6	-	0	1	100
Manufacture of beverages	42	10	8	11	9	2	5	5	5	4	100
Manufacture of chemicals and chemical products	58	1	25	4	8	1	2	1	1	0	100
Printing and reproduction of recorded media	83	2	3	4	4	-	3	1	-	-	100
Manufacture of other non-metallic mineral products	33	1	7	4	8	2	30	-	10	5	100
Manufacture of paper and paper products	71	2	14	5	6	-	2	0	-	-	100
Other manufacturing	57	9	10	10	4	1	7	-	1	1	100
Manufacture of tobacco products	8	4	54	24	7	-	1	-	1	1	100
Manufacture of electrical equipment	75	-	19	1	2	-	1	-	-	1	100
Manufacture of wearing apparel	87	1	5	4	1	-	-	-	-	1	100
Manufacture of other transport equipment	37	31	4	8	4	10	5	-	-	1	100
Manufacture of coke and refined petroleum products	58	3	19	-	8	3	3	3	3	-	100
Manufacture of basic pharmaceutical products and pharmaceutical preparations	100	-	-	-	-	-	-	-	-	-	100
Manufacture of leather and related products	-	-	75	25	-	-	-	-	-	-	100
Manufacture of computer, electronic and optical products	100	-	-	-	-	-	-	-	-	-	100

Source data: Ministry of Industry, 2014

Table 4: Distribution of Activities Within Region

Activity (ISIC Rev4)	State / Region									
	Yangon	Ayeyarwady	Mandalay	Bago	Sagaing	Tanintharyi	Mon	Rakhine	Kachin	Kayin
Manufacture of food products	34	84	25	75	68	65	52	88	68	44
Manufacture of machinery and equipment n.e.c.	6	9	28	5	11	14	7	-	6	3
Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	8	2	4	7	7	8	5	3	11	9
Manufacture of fabricated metal products, except machinery and equipment	7	1	8	2	1	3	12	0	3	14
Manufacture of motor vehicles, trailers and semi-trailers	4	0	9	1	2	3	5	0	6	8
Manufacture of textiles	7	0	7	1	4	-	0	-	1	1
Manufacture of rubber and plastics products	9	0	2	0	0	0	2	-	0	2
Repair and installation of machinery and equipment	2	-	-	4	2	-	1	6	0	8
Manufacture of furniture	1	3	0	0	0	3	8	1	1	6
Manufacture of basic metals	2	0	6	1	1	1	1	-	0	0
Manufacture of beverages	3	1	1	1	1	1	1	1	2	2
Manufacture of chemicals and chemical products	4	0	4	0	1	0	0	0	0	0
Printing and reproduction of recorded media	4	0	0	0	0	-	0	0	-	-
Manufacture of other non-metallic mineral products	2	0	1	0	1	0	4	-	2	1
Manufacture of paper and paper products	3	0	1	0	0	-	0	0	-	-
Other manufacturing	1	0	1	0	0	0	0	-	0	0
Manufacture of tobacco products	0	0	2	0	0	-	0	-	0	0
Manufacture of electrical equipment	1	-	1	0	0	-	0	-	-	0
Manufacture of wearing apparel	1	0	0	0	0	-	-	-	-	0
Manufacture of other transport equipment	0	0	0	0	0	1	0	-	-	0
Manufacture of coke and refined petroleum products	0	0	0	-	0	0	0	0	0	-
Manufacture of basic pharmaceutical products and pharmaceutical preparations	0	-	-	-	-	-	-	-	-	-
Manufacture of leather and related products	-	-	0	0	-	-	-	-	-	-
Manufacture of computer, electronic and optical products	0	-	-	-	-	-	-	-	-	-
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source data: Ministry of Industry, 2014