

**'16
ASIA
PETROCHEMICAL INDUSTRY
CONFERENCE**

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DELEGATION OF THAILAND

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I. Report on the Thai Petrochemical Industry

Thai Petrochemical Industry – Current State and Issues

I-1. Business Environment

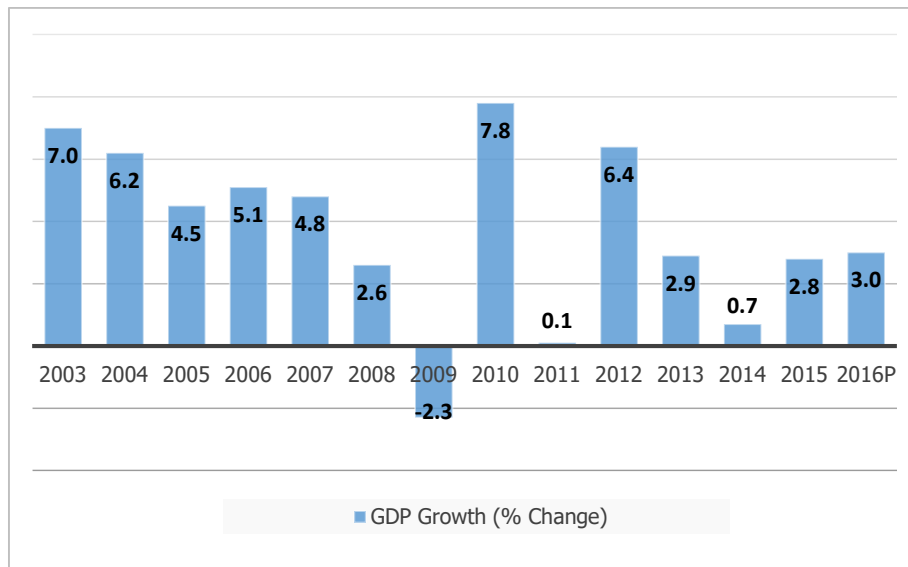
Global economic growth remain moderate in 2015, the IMF’s Statistics Department estimated the growth of the world economy at 3.1%. This number is nearly as growth rate which archived at 3.3% in 2014. In China some areas of the economy seem to be affected by global economic slowdown, particularly exports, Japan and the Euro-zone have been lowered. In addition, the global crude oil price which starts declining in the 4th quarter year leads to slowdown of various economic sector especially exploration and production sector.

I-2. Present Situation and Future Prospect of the Thai Economy

In 2015, The Office of the National Economic and Social Development Board (NESDB) of Thailand announced GDP growth of by 2.8% supported by higher government spending, which was dispersed to farmers, as well as an increase in household spending. Government construction expanded due to an accelerating disbursement in water resources management and road transportation system project. The lower export caused by a slowdown in Chinese economy together with a slightly recovery in global demand. Meanwhile, export to CLMV countries continually increased at high rate.

Thai economy in 2016, government has infrastructure projects under the Action Plan for Transport Infrastructure Development, start to disburse investment budget within 2016, and the water resource management and road transport system project.

Figure-1 Thailand’s GDP Growth 2003-2016



Source: NESDB, BOT

I-3. Present Situation and Future Prospect of the Thai Petrochemical Industry

The petrochemical industry in Thailand continued to expand from the previous year. As a result, the GDP growth in 2015 significantly increased from previous year at 0.7% to 2.8%. Automotive and real estate segment were two major segment which mainly affect by these factors. Strong expansion of construction sector, as well as favorable expansion of hotel and restaurants and other services sector. The expansion of consumption expenditure on non-durable goods. However, demand of petrochemical product used in packaging segment still relatively stagnated by strong demand in food industry.

The overall picture of petrochemical production and consumption are as follows:

- Ethylene production increased by 2.6% in 2015 as the all crackers already operate at approximately 99% utilization rate supported by demand in derivative market. The demand from the petrochemical end market also increased in line with ethylene production especially LDPE/EVA and HDPE that the average production increased. In addition, ethylene import in 2015 dropped from 46,000 tons to 23,000 tons while ethylene export increased from 66,000 tons to 70,000 tons
- The production of major polymer in 2015 increased by 4% from the previous year. The gain was the result of strong demand of both domestic and export market especially HDPE resin. Domestic demand of HDPE were increased by 4% a result of upward trend in packaging segment. On the other hand, domestic demand of PVC resin in relatively increased from the previous year from strong demand of construction segment.

Table-2 Production/ Consumption and Import/ Export Figures of Five Major Products 2011-2014

(Unit:'000 T/Y)

Products	2012	2013	2014	2015
Ethylene				
Production	4,093	4,116	4,345	4,458
Import	115	85	46	23
Export	59	17	66	70
Consumption by derivative product ⁽¹⁾	4,148	4,184	4,324	4,411
Propylene				
Production	2,226	2,220	2,410	2,367
Import	5	17	5	21
Export	139	208	225	181
Consumption by derivative product ⁽²⁾	2,092	2,029	2,190	2,207
PTA				
Production	2,469	2,167	2,084	2,020
Import	0	0	0	0
Export	1,242	996	892	854
Consumption by derivative product ⁽³⁾	1,227	1,171	1,192	1,166
PE (including EVA)				
Production	3,453	3,455	3,703	3,659
Import	437	418	321	413
Export	2,450	2,379	2,486	2,575
Consumption ⁽⁴⁾	1,441	1,495	1,538	1,497
PP				
Production	1,756	1,767	1,843	1,790
Import	242	229	212	240
Export	732	767	818	856
Consumption ⁽⁴⁾	1,266	1,229	1,237	1,174

Note: Data shown as " 0 " means less than 0.5 ton.

(1) Consumption netbacked from PE, VCM, EG and SM production.

(2) Consumption netbacked from PP, Cumene and PO production.

(3) Consumption netbacked from polyester polymer (PET) production.

(4) Consumption figure is different from calculation (Production + Import – Export) due to inventory change

Table-3 Capacity of Major Petrochemicals 2015 (as of March 2016)

(Unit: '000 T/Y)

Ethylene

Company	Capacity
IRPC	360
MOC	900
PTTGC	2,376
ROC	800
Total	4,436

Source: PTIT Industrial Survey, March 2016

Polyethylene

Company	Capacity				Total
	LDPE/EVA	LLDPE	LLDPE/MDPE	HDPE	
IRPC				140	140
PTTGC	300	400		800	1,500
Siam Polyethylene		650			650
SSLC (Specialty Elastomers)		220			220
TPE	100		120	960	1,180
TPI Polene	158				158
Total	558	1,270	120	1,900	3,848

Source: PTIT Industrial Survey, March 2016

Vinyl Chloride Monomer

Company	Capacity
TPC	590
VNT	400
Total	990

Source: PTIT Industrial Survey, March 2016

Polyvinyl Chloride

Company	Capacity
TPC	530
TPC Paste Resin	36
VNT	280
Total	846

Source: PTIT Industrial Survey, March 2016

Propylene

Company	Capacity
HMC	310
MOC	800
IRPC	720
PTTGC	487
ROC	400
SPRC	130
Total	2,847

Source: PTIT Industrial Survey, March 2016

Table-3 Capacity of Major Petrochemicals 2015 (as of March 2016)

(Unit: '000 T/Y)

Polypropylene

Company	Capacity
HMC	775
IRPC	475
TPP	720
Total	1,970

Source: PTIT Industrial Survey, March 2016

Styrene Monomer

Company	Capacity
IRPC	260
SSMC	280
Total	540

Source: PTIT Industrial Survey, March 2016

Polystyrene

Company	Capacity
Siam Polystyrene	100
Thai ABS	150
Thai Styrenics	90
Total	340

Source: PTIT Industrial Survey, March 2016

Butadiene

Company	Capacity
BST	140
IRPC	50
PTTGC	75
Total	265

Source: PTIT Industrial Survey, March 2016

Synthetic Rubber

Company	Capacity	
	ESBR	BR
BST Elastomer	72	
Thai Synthetic Rubber		72
Total	144	

Source: PTIT Industrial Survey, March 2016

II. Committee Meetings

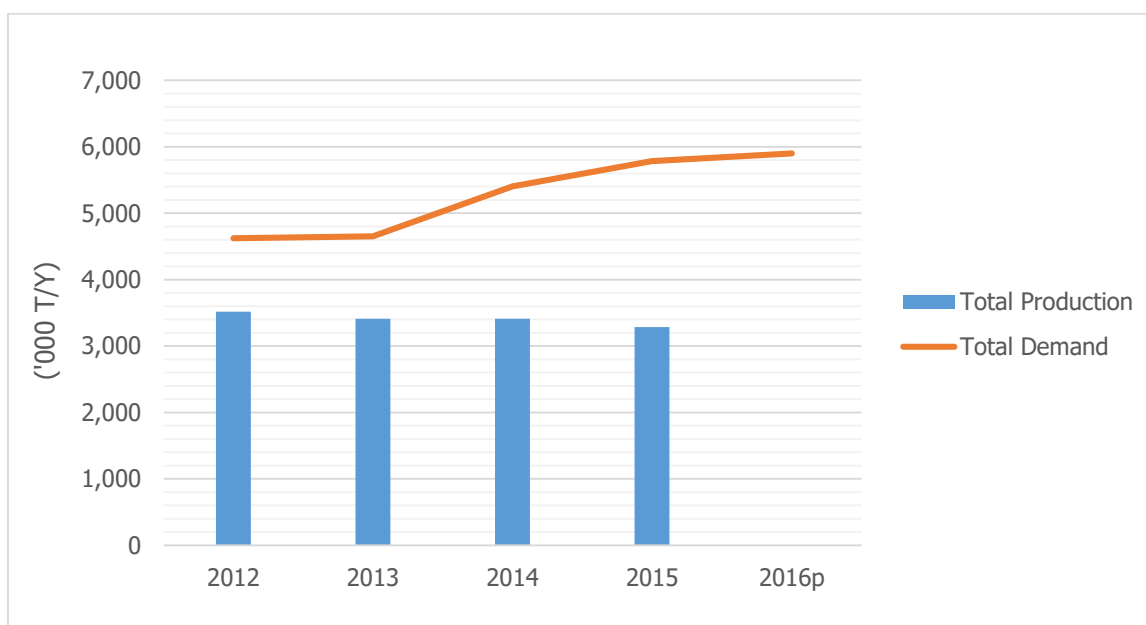
General Matters & Raw Materials Committee

II-1. General Matters & Raw Materials Committee

Capacity, Production and Demand of Light Naphtha

(Unit: '000 T/Y)

	Historical				Estimated
	2012	2013	2014	2015	2016
Total Production	3,515	3,412	3,411	3,287	
Feedstock	4,539	4,536	5,330	5,690	
Solvents	84	115	76	93	
Total Demand	4,623	4,651	5,406	5,783	5,898



1. Review of 2015

Thailand's light naphtha production in 2015 relatively stagnated from the previous year. Meanwhile, domestic demand for light naphtha increased by 7% follow strong demand of derivative product especially ethylene and propylene.

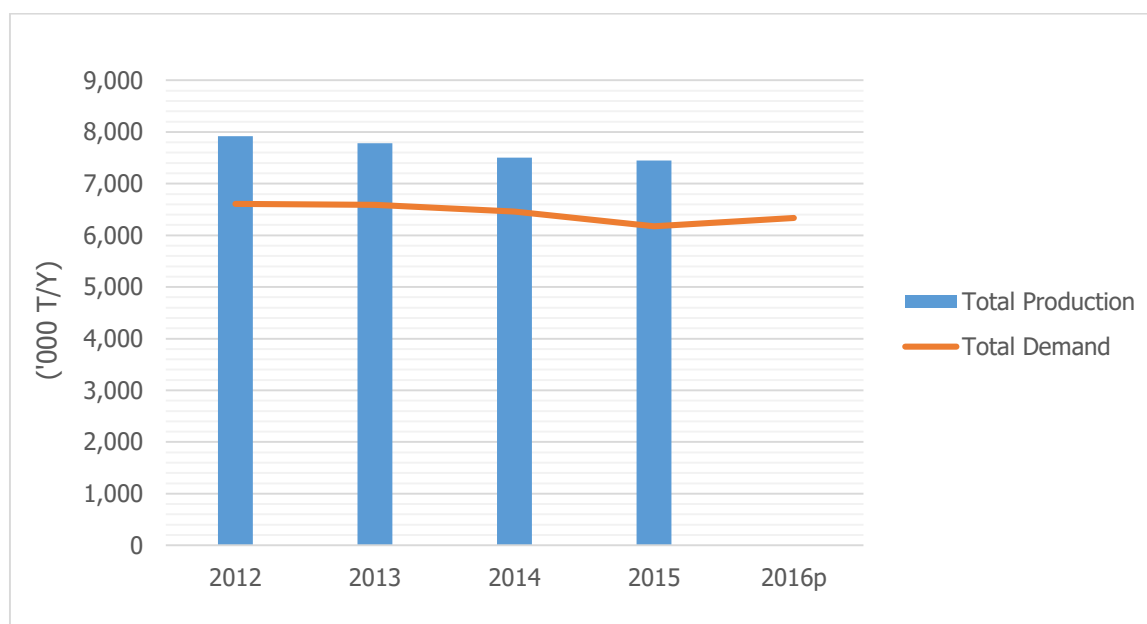
2. Outlook for 2016

Domestic production and consumption for light naphtha in Thailand in 2016 is expected to be stagnate supported by strong demand of derivative products.

Capacity, Production and Demand of Heavy Naphtha

(Unit: '000 T/Y)

	Historical				Estimated
	2012	2013	2014	2015	2016
Total Production	7,917	7,780	7,501	7,446	
Feedstock	6,609	6,589	6,462	6,174	
Total Demand	6,609	6,589	6,462	6,174	6,334



1. Review of 2015

Domestic production and consumption for heavy naphtha slightly dropped follow soft demand of domestic end-user market demand for aromatic-based polymers.

2. Outlook for 2016

Thailand's production for heavy naphtha is projected to remain steady similarly as in 2015 while demand for heavy naphtha is expected continue decreasing.

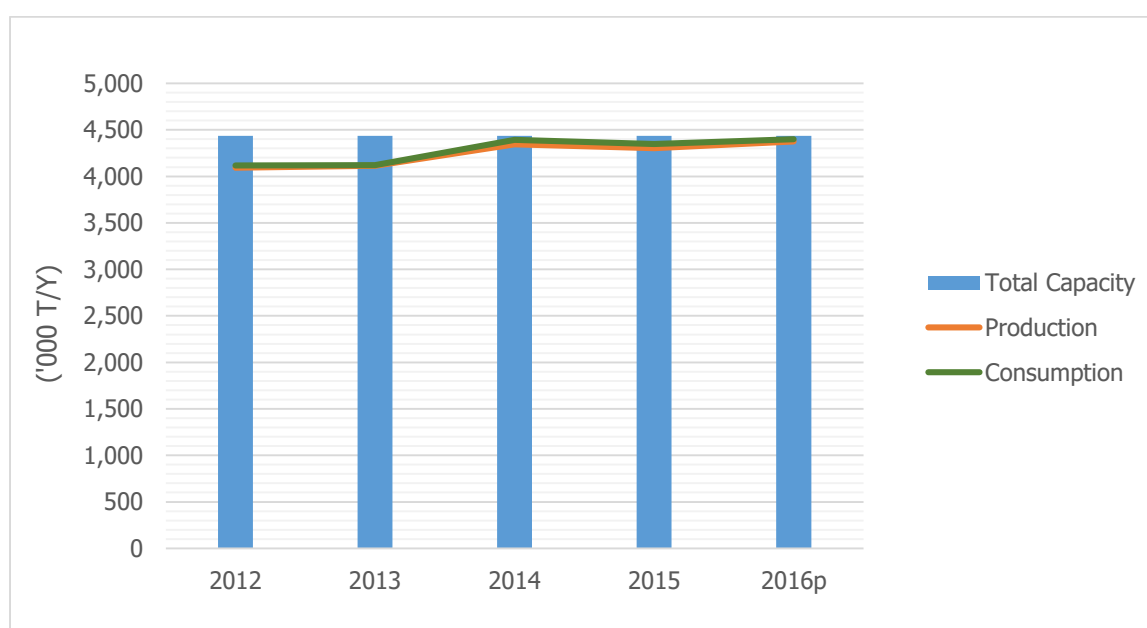
Capacity, Production and Consumption of Olefins: Ethylene

(Unit:'000 T/Y)

	Historical				Estimated
	2012	2013	2014	2015	2016
Total Capacity	4,436	4,436	4,436	4,436	4,436
Production	4,093	4,115	4,344	4,458	4,374
Consumption by Derivative Prod.	4,118	4,121	4,392	4,349	4,399*
Export	59	17	66	70	
Import	115	85	46	23	

Source: PTIT Industrial Survey, The Customs Department

Note: * Consumption netbacked from PE, EDC/VCM, EG and SM production which is projected by assuming a 90% operating rate except EG which is projected by assuming a 97% operating rate.



1. Review of 2015

Ethylene production increased by 2.6% in 2015 supported by demand in derivative market. In addition, ethylene import dramatically dropped by 50% while ethylene export surged up by 6%

2. Outlook for 2016

Assuming 97% operating rate, ethylene production in 2016 is expected to be 4,374,000-ton/year. Ethylene consumption is expected to slightly decrease following demand from downstream market especially export market which tends to decrease from high market competition especially PE resin.

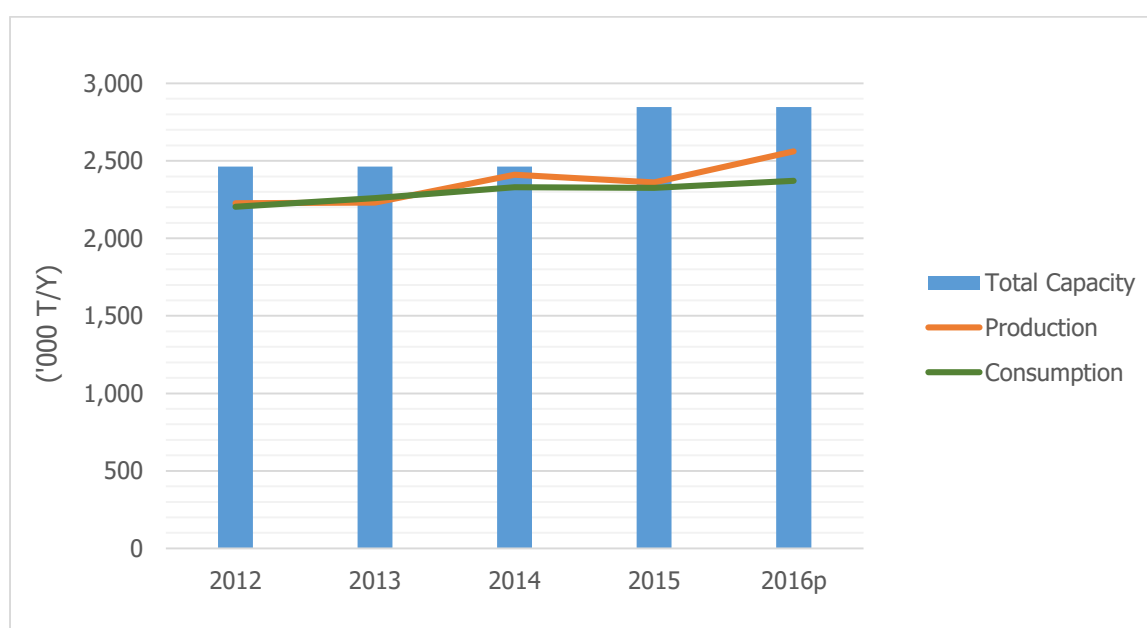
Capacity, Production and Consumption of Olefins: Propylene

(Unit: '000 T/Y)

	Historical				Estimated
	2012	2013	2014	2015	2016
Total Capacity	2,464	2,464	2,464	2,847	2,847
Production	2,226	2,231	2,411	2,361	2,562
Consumption by Derivative Prod.	2,204	2,259	2,330	2,326	2,371*
Export	139	208	225	181	
Import	5	17	5	21	

Source: PTIT Industrial Survey, The Customs Department

Note: *Consumption netbacked from PP, Cumene and PO production which is projected by assuming a 90% operating rate.



1. Review of 2015

Propylene production decreased from the previous year by 2% and consumption and 0.1% respectively supported by low demand and import volume.

2. Outlook for 2016

Assuming a 90% operating rate, propylene production in 2015 is expected to be 2,562,000 tons supported by new propylene plant ran at full production capacity of 320,000 ton/year propylene of IRPC Plc. has start up in Q4 2015.

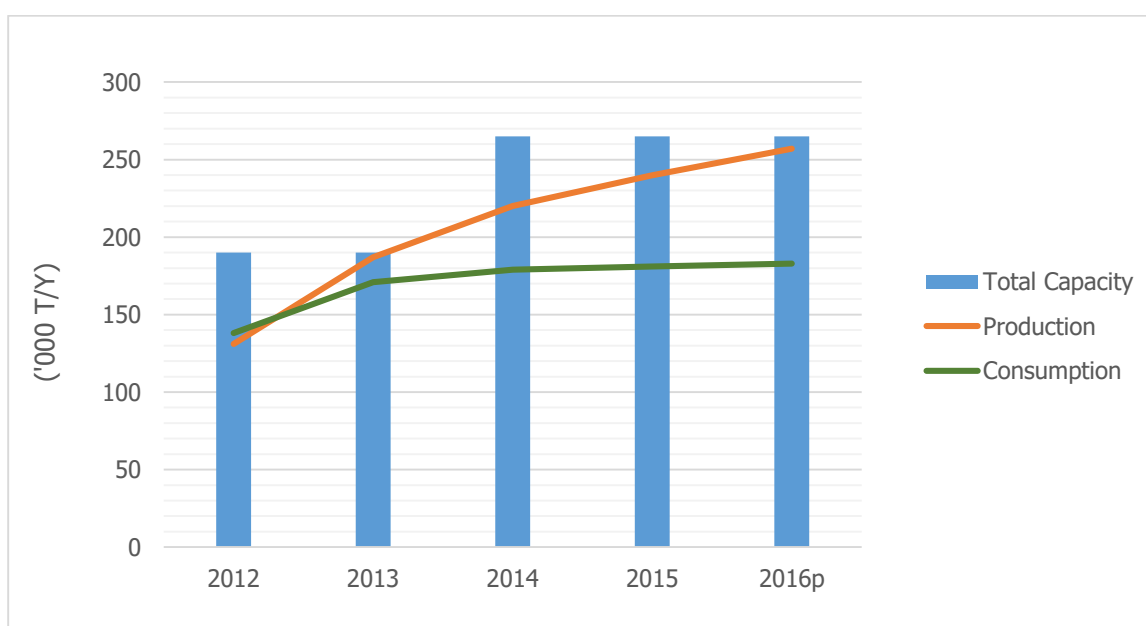
Capacity, Production and Consumption of Olefins: Butadiene

(Unit:'000 T/Y)

	Historical				Estimated
	2012	2013	2014	2015	2016
Total Capacity	190	190	265	265	265
Production	131	187	220	240	257
Consumption by Derivative Prod.	138	171	179	181	183*
Export	47	71	51	80	
Import	26	30	18	13	

Source: PTIT Industrial Survey, The Customs Department

Note: *Consumption netbacked from SBL, SBR, BR, NBL and ABS/SAN (assumed 100% ABS) production, which is projected by assuming a 90%, 90%, 90%, 90% and 85% operating rate, respectively.



1. Review of 2015

Butadiene production surged by 9% from the year 2014 supported by new production of butadiene from PTTGC with nameplate capacity at 75,000 T/Y, meanwhile, butadiene consumption remain stagnated from strong demand of derivatives products and export market.

2. Outlook for 2016

Butadiene production is projected to significantly increase as new 75,000 tons/year butadiene plant of PTTGC which start production in 2014 should be able to operate at maximum production rate.

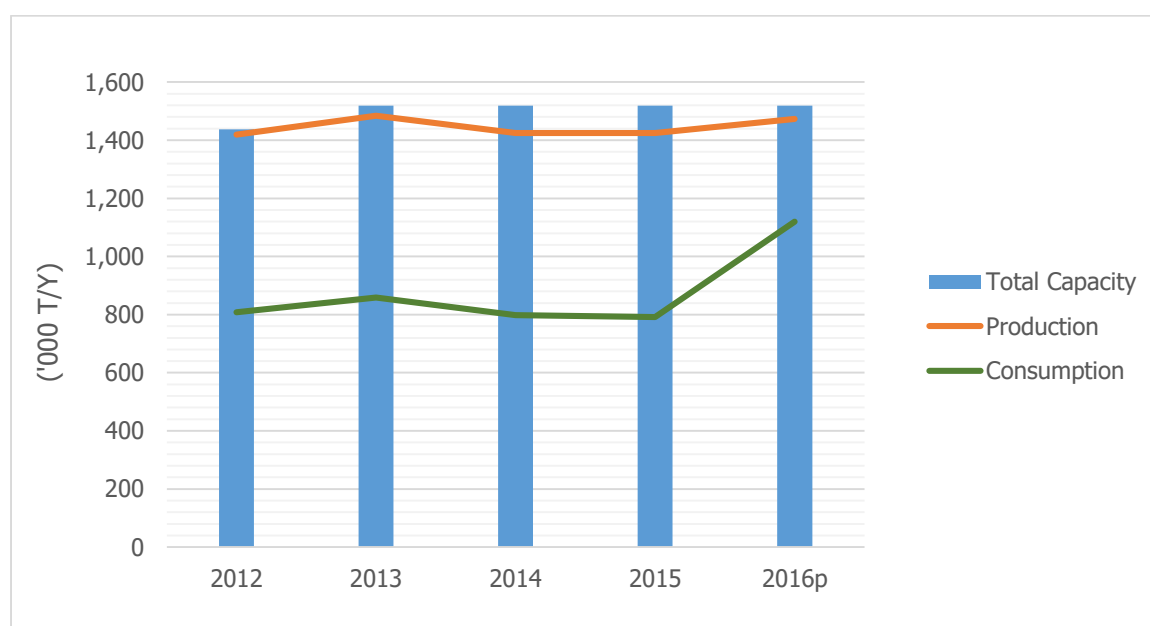
Capacity, Production and Consumption of Aromatics: Benzene

(Unit: '000 T/Y)

	Historical				Estimated
	2012	2013	2014	2015	2016
Total Capacity	1,437	1,519	1,519	1,519	1,519
Production	1,419	1,484	1,425	1,425	1,473
Consumption by Derivative Prod.	808	859	798	792	1,120
Export	650	766	672	592	
Import	0	0	0	0	

Source: PTIT Industrial Survey, The Customs Department

Note: *Consumption netbacked from SM, cumene and cyclohexane production, which is projected by assuming 97%, 90% and 90% operating rate, respectively.
'0' means below 500T/Y



1. Review of 2015

Benzene production at 1,425,000 T/Y same in 2014 supported by soft demand in both domestic and export market. Domestic consumption inch up by 1% from the previous year on the back of low demand from domestic derivative petrochemical including Styrene monomer, Cyclohexane and Cumene.

2. Outlook for 2016

Benzene production and consumption in 2016 is expected to dramatically increase supported by bullish demand from Cumene production as new expansion plan of PTT Phenol with nameplate capacity at 332,000 T/Y will start production in Q2 2015.

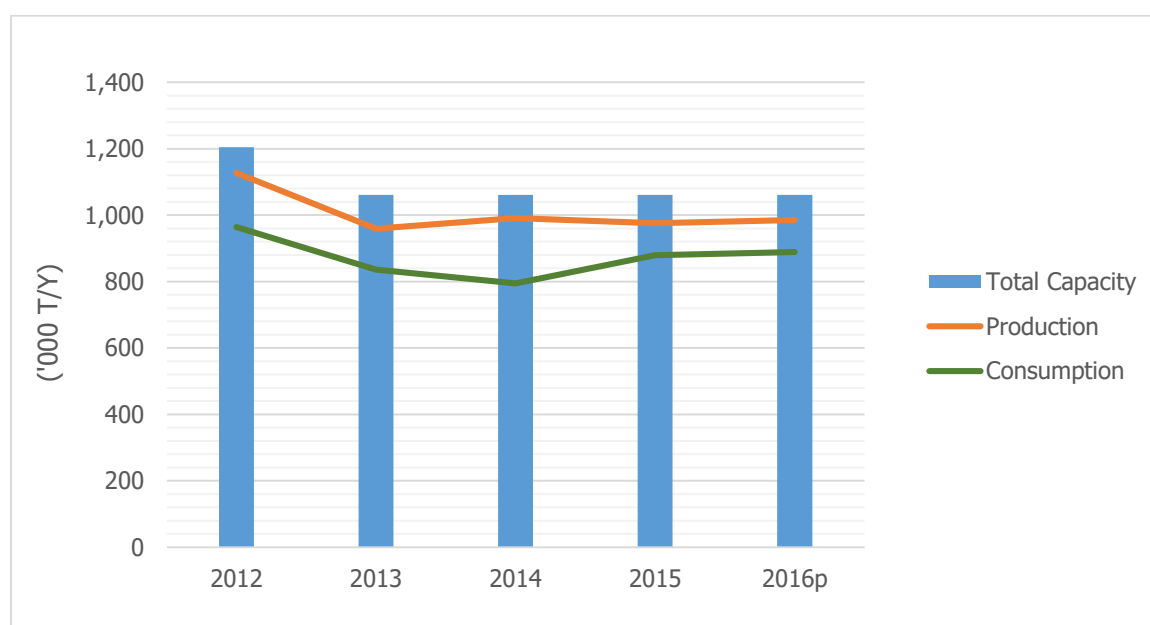
Capacity, Production and Consumption of Aromatics: Toluene

(Unit: '000 T/Y)

	Historical				Estimated
	2012	2013	2014	2015	2016
Total Capacity	1,205	1,061	1,061	1,061	1,061
Production	1,127	959	991	976	985
Consumption by Derivative Prod.	964	836	795	739	889
Export	162	135	196	237	
Import	0	12	0	0	

Source: PTIT Industrial Survey, The Customs Department

Note: *Including consumption netbacked from benzene/xylene production, solvents, etc, which is projected by assuming a 90% operating rate
'0' means below 500T/Y



1. Review of 2015

Toluene production in 2015 slightly decreased around 1.5% meanwhile, consumption dropped by 11% supported by weak demand of domestic derivative products. Thailand's toluene production figures also included toluene volume which PTT Global Chemical (PTTGC) used in its Benzene and P-Xylene production process.

2. Outlook for 2016

Toluene production in 2016 is expected to increase by assuming a 90% operating rate while demand of domestic consumption especially p-xylene, benzene and mixed xylenes is expected to recover.

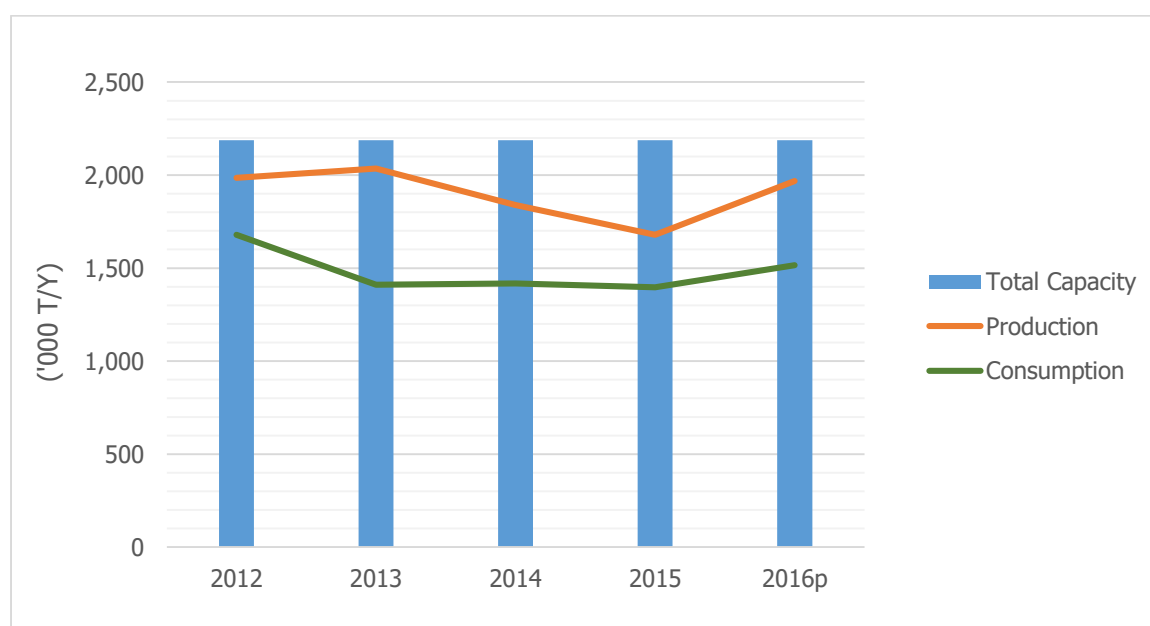
Capacity, Production and Consumption of Aromatics: P-Xylene

(Unit: '000 T/Y)

	Historical				Estimated
	2012	2013	2014	2015	2016
Total Capacity	2,187	2,187	2,187	2,187	2,187
Production	1,985	2,035	1,839	1,680	1,968
Consumption by Derivative Prod.	1,679	1,410	1,417	1,397	1,516*
Export	478	708	549	443	
Import	156	83	151	142	

Source: PTIT Industrial Survey, The Customs Department

Note: *Consumption netbacked from PTA production, which is projected by assuming a 80% operating rate



1. Review of 2015

Thailand p-xylene production in 2015 dropped by 9% compared to the previous year. In the meantime, domestic p-xylene consumption slightly decreased supported by low demand of derivative PTA product.

2. Outlook for 2016

Thailand p-xylene production is expected to increase; meanwhile, domestic consumption is also forecasted to recover supported by strong growth in packaging industry.

Polyolefins Committee

II-2. Polyolefins Committee

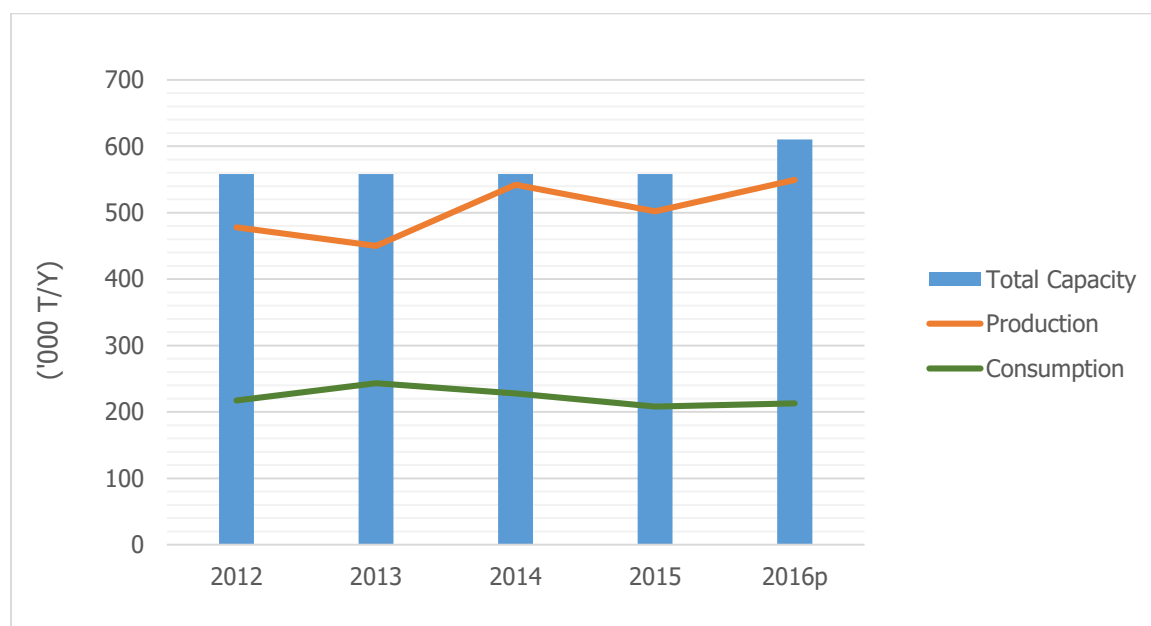
Capacity, Production and Consumption of LDPE/EVA

(Unit: '000 T/Y)

	Historical				Estimated
	2012	2013	2014	2015	2016
Total Capacity	558	558	558	558	610
Production	478	450	542	559	549
Consumption by Derivative Prod.	217	243	228	208	213
Export	378	271	415	450	
Import	116	64	100	99	

Source: PTIT Industrial Survey, The Customs Department

Note: *Projected production figures : assume 90% operating rate. Some consumption figures are deviated from normal calculation (Production + Import – Export) because of its inventory change



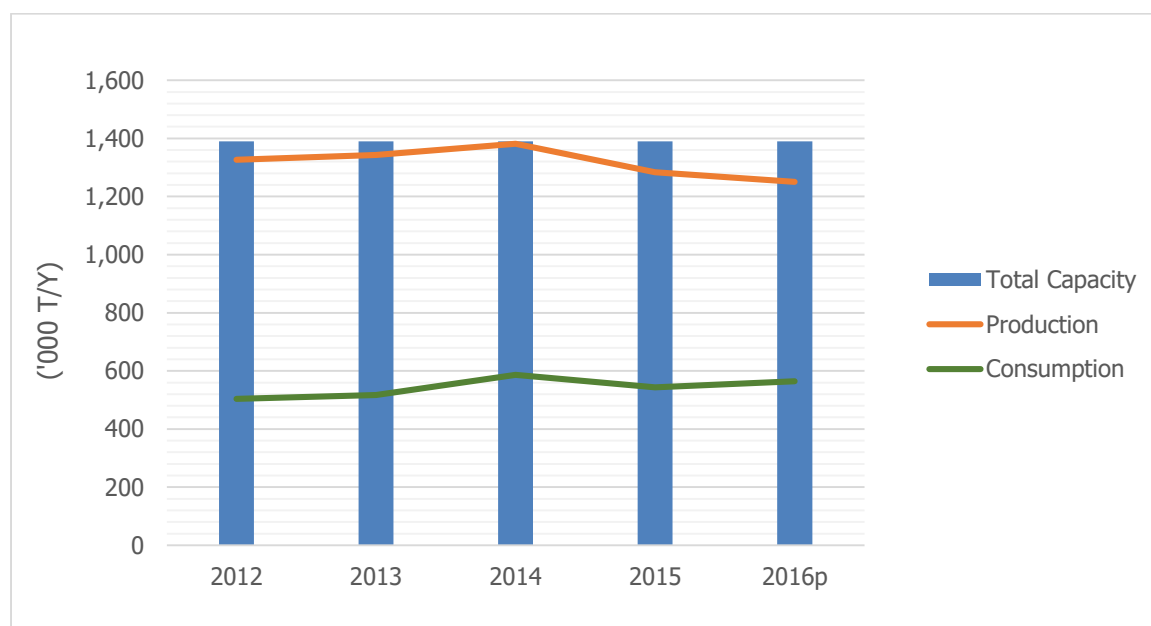
Capacity, Production and Consumption of LLDPE

(Unit: '000 T/Y)

	Historical				Estimated
	2012	2013	2014	2015	2016
Total Capacity	1,390	1,390	1,390	1,390	1,390
Production	1,327	1,343	1,382	1,284	1,251
Consumption by Derivative Prod.	504	517	587	543	564*
Export	993	966	954	920	
Import	170	210	159	179	

Source: PTIT Industrial Survey, The Customs Department

Note: *Projected production figures : assume 90% operating rate. Some consumption figures are deviated from normal calculation (Production + Import – Export) because of its inventory change



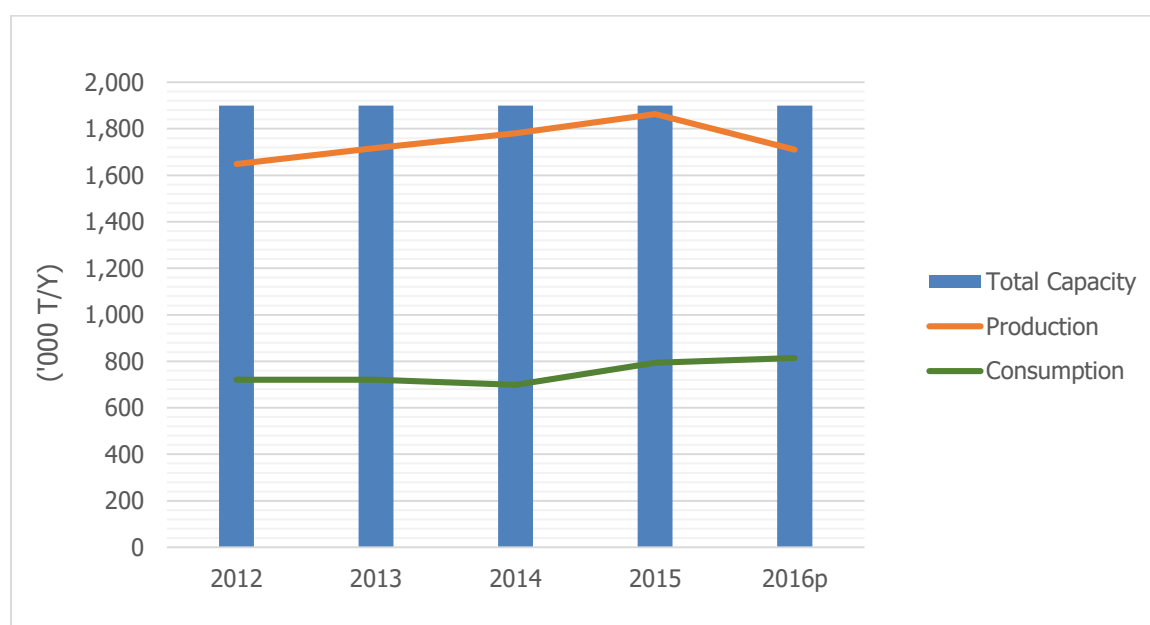
Capacity, Production and Consumption of HDPE

(Unit:'000 T/Y)

	Historical				Estimated
	2012	2013	2014	2015	2016
Total Capacity	1,900	1,900	1,900	1,900	1,900
Production	1,648	1,718	1,781	1,863	1,710
Consumption by Derivative Prod.	720	721	699	793	814*
Export	1,079	1,142	1,206	1,205	
Import	151	145	124	135	

Source: PTIT Industrial Survey, The Customs Department

Note: *Projected production figures : assume 90% operating rate. Some consumption figures are deviated from normal calculation (Production + Import – Export) because of its inventory change



1. Review of 2015

In 2014, domestic production for LDPE/EVA surged up around 3% supported by the new PTTPE plant (300,000-ton/year) operated at maximum production capacity while production of LLDPE and HDPE slightly decreased about 7% and 5% respectively. Domestic consumption of LDPE decreased by 8% and LLDPE increased and 8% respectively in 2015 while HDPE consumption increased by 13%. Export volume of LLDPE slightly dropped from high market competition in the region.

2. Outlook for 2016

Thailand PE production is expected to remain stagnated The overall domestic demand of PE resin tends to increase supported by growth in packaging segment.

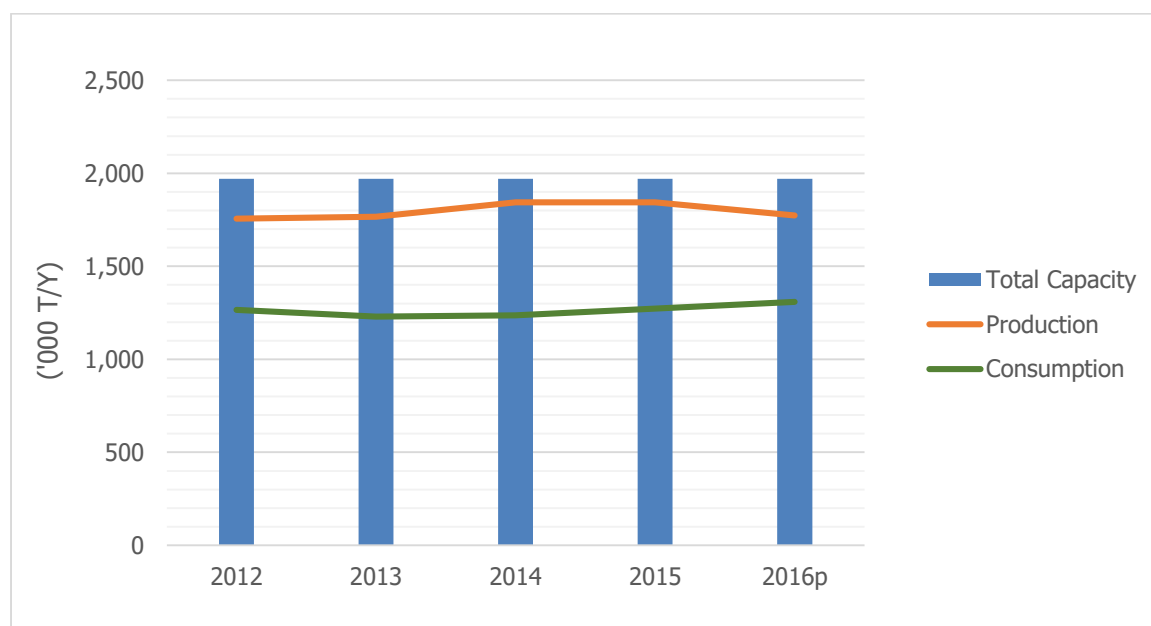
Capacity, Production and Consumption of PP

(Unit: '000 T/Y)

	Historical				Estimated
	2012	2013	2014	2015	2016
Total Capacity	1,970	1,970	1,970	1,970	1,970
Production	1,756	1,767	1,843	1,843	1,773
Consumption by Derivative Prod.	1,266	1,229	1,237	1,272	1,309*
Export	732	767	818	856	
Import	242	229	212	240	

Source: PTIT Industrial Survey, The Customs Department

Note: *Projected production figures : assume 90% operating rate. Some consumption figures are deviated from normal calculation (Production + Import – Export) because of its inventory change



1. Review of 2015

Domestic polypropylene (PP) production in 2014 same the previous year. PP domestic consumption slightly increased from strong demand in downstream packaging segment. In addition, export market of PP increased by 5% compared with 2014.

2. Outlook for 2016

PP production is projected to decrease from 2015 from weak demand of automotive segment. On the other hand, the internal end-user market demands tend to increase supported by recovered in packaging segment.

Styrenics Committee

II-3. Styrenics Committee

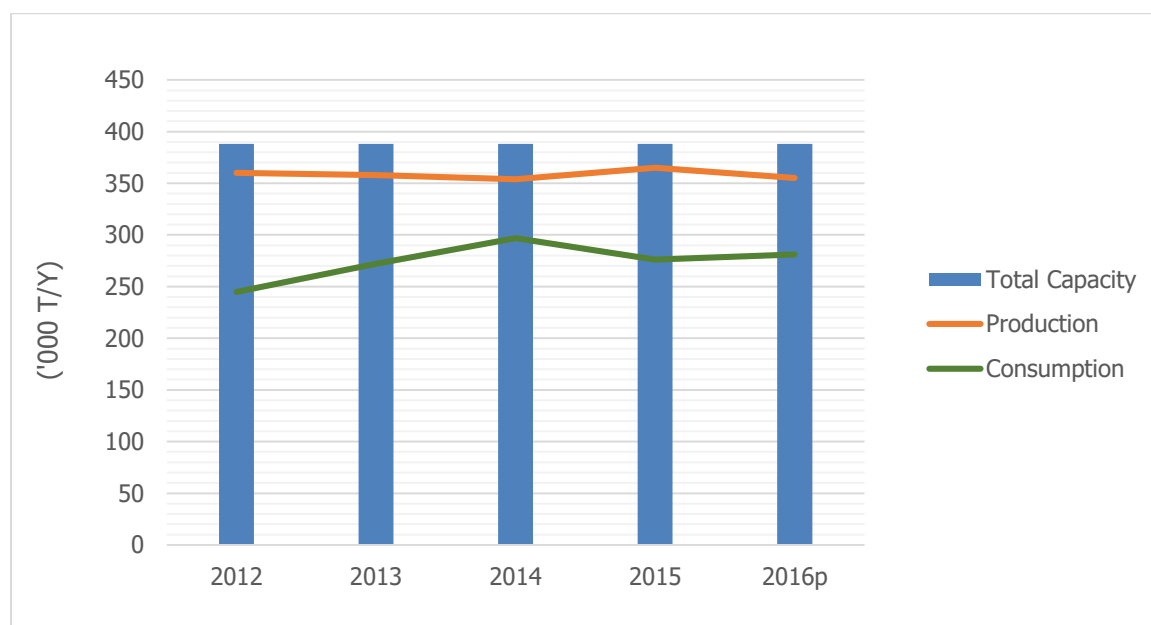
Capacity, Production and Consumption of PS/EPS

(Unit: '000 T/Y)

	Historical				Estimated
	2012	2013	2014	2015	2016
Total Capacity	388	388	388	388	388
Production	360	358	354	365	301
Consumption by Derivative Prod.	245	272	297	276	281*
Export	163	132	98	162	
Import	48	46	41	72	

Source: PTIT Industrial Survey, The Customs Department

Note: *Projected production figures: assume 85% operating rate



1. Review of 2015

Domestic production of PS/EPS in 2015 slightly increased while domestic consumption of these resin increased around 3% following a surging in demand from end-user markets.

2. Outlook for 2016

PS/EPS production is expected to slightly increased while domestic consumption is projected to decrease from weak demand in electrical appliances.

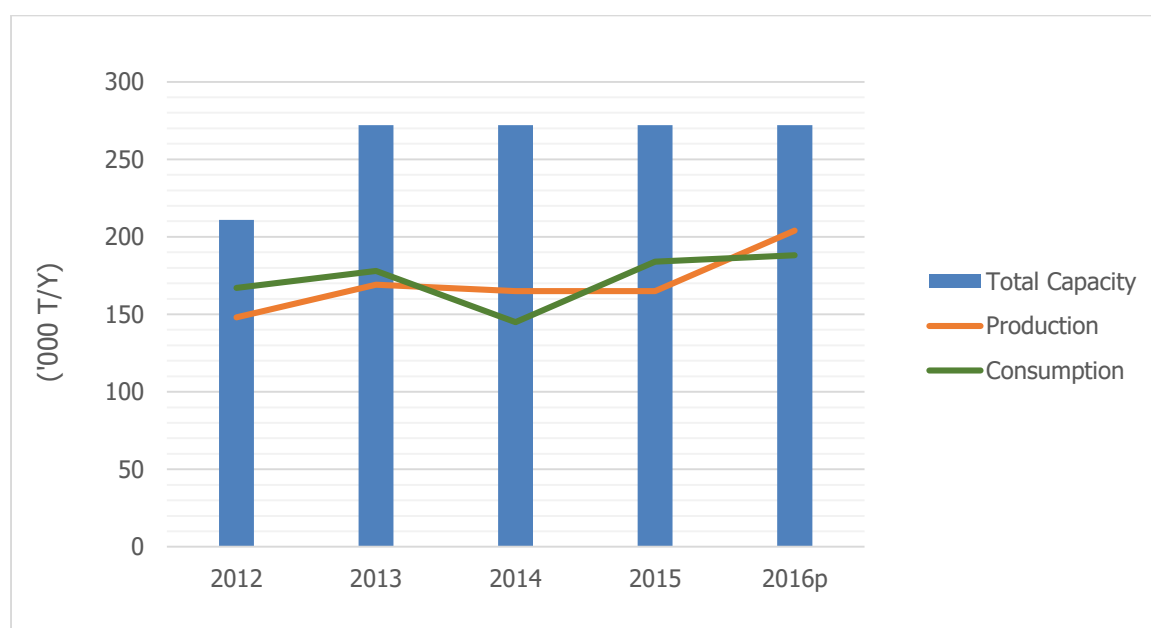
Capacity, Production and Consumption of ABS/SAN

(Unit: '000 T/Y)

	Historical				Estimated
	2012	2013	2014	2015	2016
Total Capacity	211	272	272	272	272
Production	148	169	165	165	204
Consumption	167	178	145	184	188*
Export	103	116	146	135	
Import	122	124	126	154	

Source: PTIT Industrial Survey, The Customs Department

Note: *Projected production figures: assume 75% operating rate



1. Review of 2015

Domestic production ABS/SAN stable same the previous year. Meanwhile, import market slightly increased from domestic demand in automotive part.

2. Outlook for 2016

Domestic production and consumption of ABS/SAN is expected to be stable due to automotive sector slightly increased demand of domestic and export auto part.

Capacity, Production and Consumption of SM

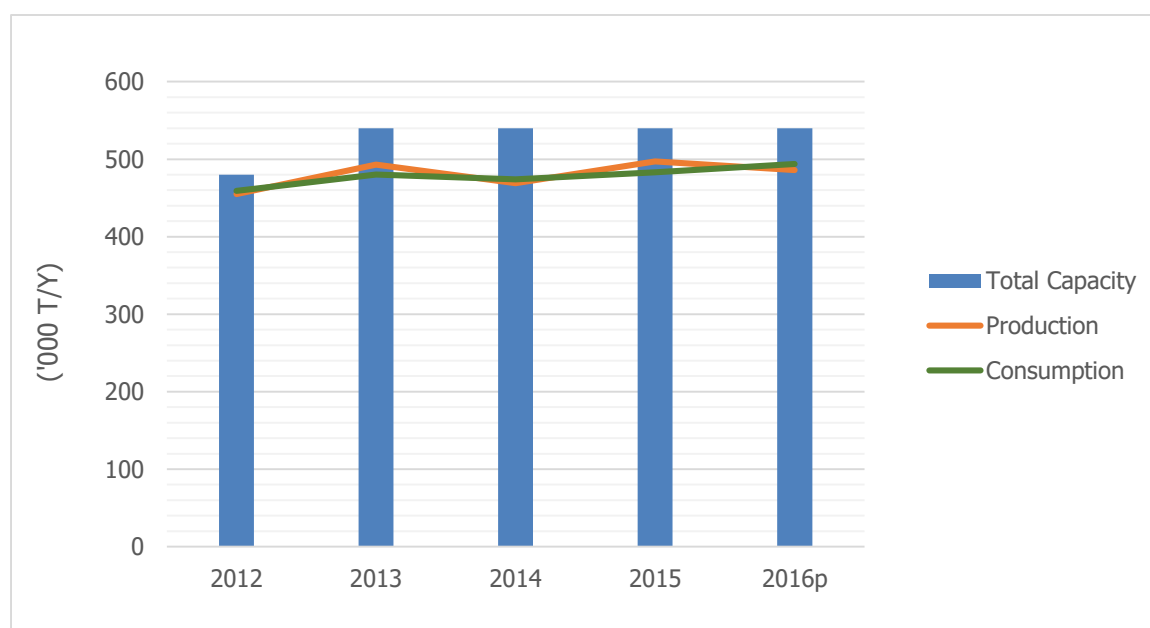
(Unit:'000 T/Y)

	Historical				Estimated
	2012	2013	2014	2015	2016
Total Capacity	480	540	540	540	540
Production	455	493	469	497	486
Consumption by Derivative Prod.	459	480	474	483	494*
Export	27	39	21	53	
Import	55	77	47	81	

Source: PTIT Industrial Survey, The Customs Department

Note: *Consumption netbacked from PS+EPS, ABS/SAN, SBL and SBR (assumed ABS 100%) production, which is projected by assuming a 85%, 85%, 90%, 90% operating rate respectively.

'0' means below 500 T/Y



1. Review of 2015

SM production slightly increased from last year. However, consumption slightly up from soft demand of the key derivatives products, especially PS/EPS which are widely used to produce packaging product and food containers.

2. Outlook for 2016

Assuming a 90% operating rate, SM production is expected to increase. Consumption is forecasted to rise on the back of growing trend in domestic and export of automotive markets.

PVC Committee

II-4. PVC Committee

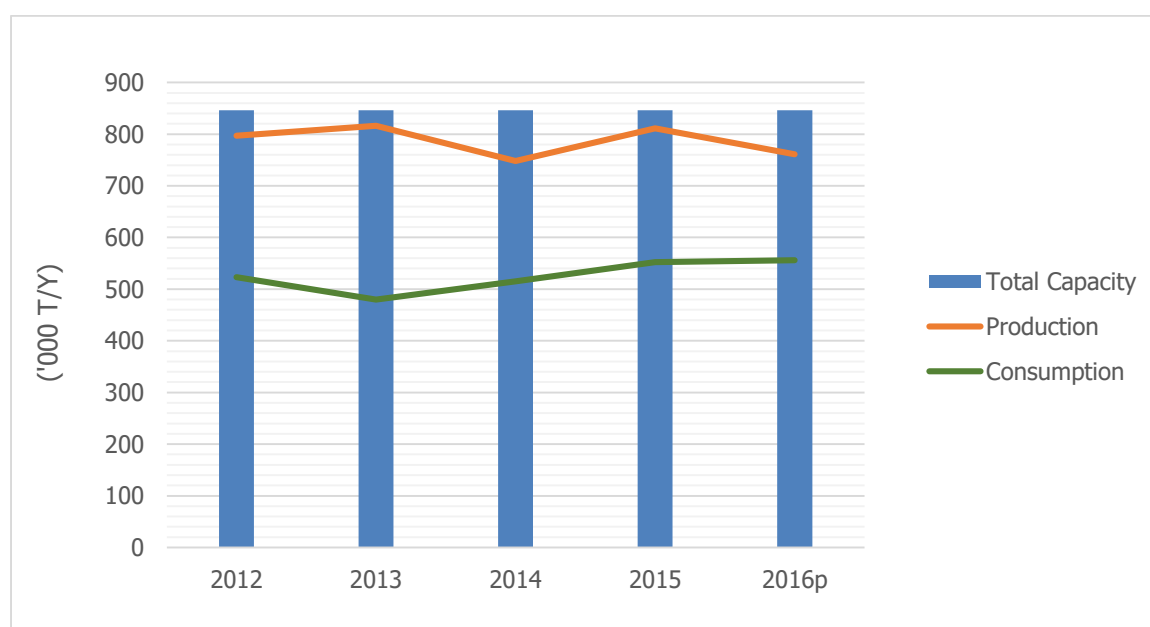
Capacity, Production and Consumption of PVC

(Unit: '000 T/Y)

	Historical				Estimated
	2012	2013	2014	2015	2016
Total Capacity	846	846	846	846	846
Production	797	816	748	811	761
Consumption	523	480	515	552	556*
Export	367	422	334	313	
Import	94	86	101	113	

Source: PTIT Industrial Survey, The Customs Department

Note: *Projected production figures: assume 90% operating rate



1. Review of 2015

Thailand's PVC production in 2015 increased by 8% from 2014 from soft demand of exported market. However, Thailand's PVC consumption recovered as a result of strong demand of real estate sector.

2. Outlook for 2016

Thailand's domestic PVC consumption in 2016 is forecasted to slightly increase from policy of real estate.

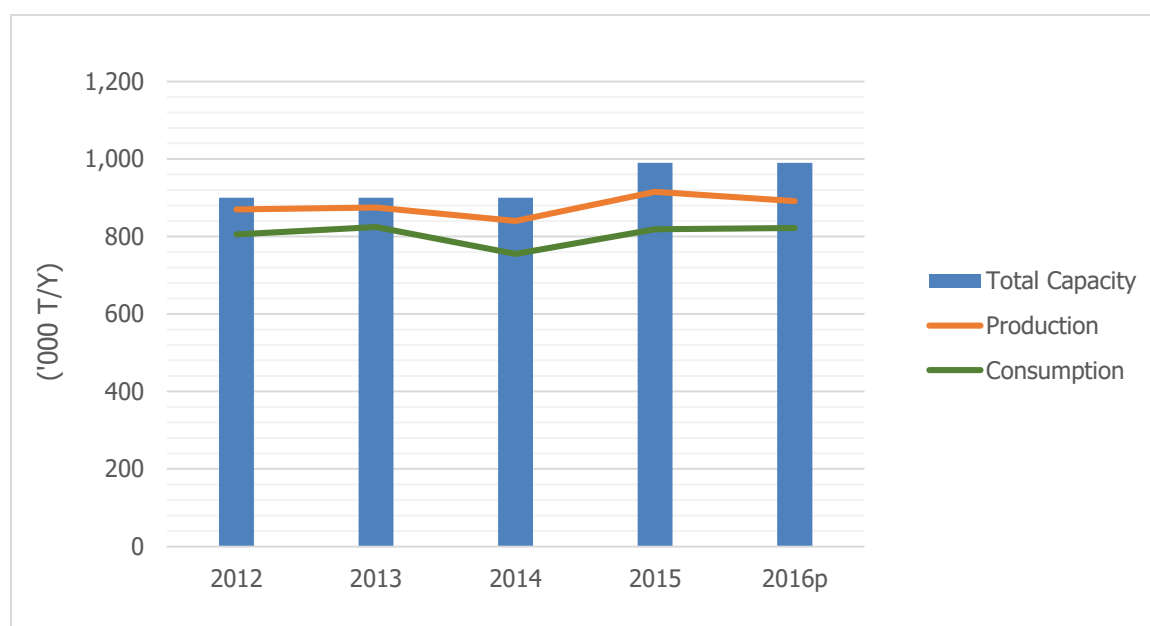
Capacity, Production and Consumption of VCM

(Unit: '000 T/Y)

	Historical				Estimated
	2012	2013	2014	2015	2016
Total Capacity	900	900	900	990	990
Production	870	875	840	915	891
Consumption by Derivative Prod.	805	824	755	819	822*
Export	78	111	72	86	
Import	0	0	1	50	

Source: PTIT Industrial Survey, The Customs Department

Note: *Consumption by derivative netbacked from PVC production, which is projected by assuming a 90% operating rate.



1. Review of 2015

Thailand's VCM production in 2014 increased by 8% due to TPC expand production capacity with nameplate capacity of 90,000 T/Y

2. Outlook for 2016

Assuming a 90% operating rate, supply for VCM in 2016 is expected to decreased compare with 2015. In addition, Domestic demand is forecasted to increase supported by strong demand of derivative market.

Synthetic Rubber Committee

II-5. Synthetic Rubber Committee

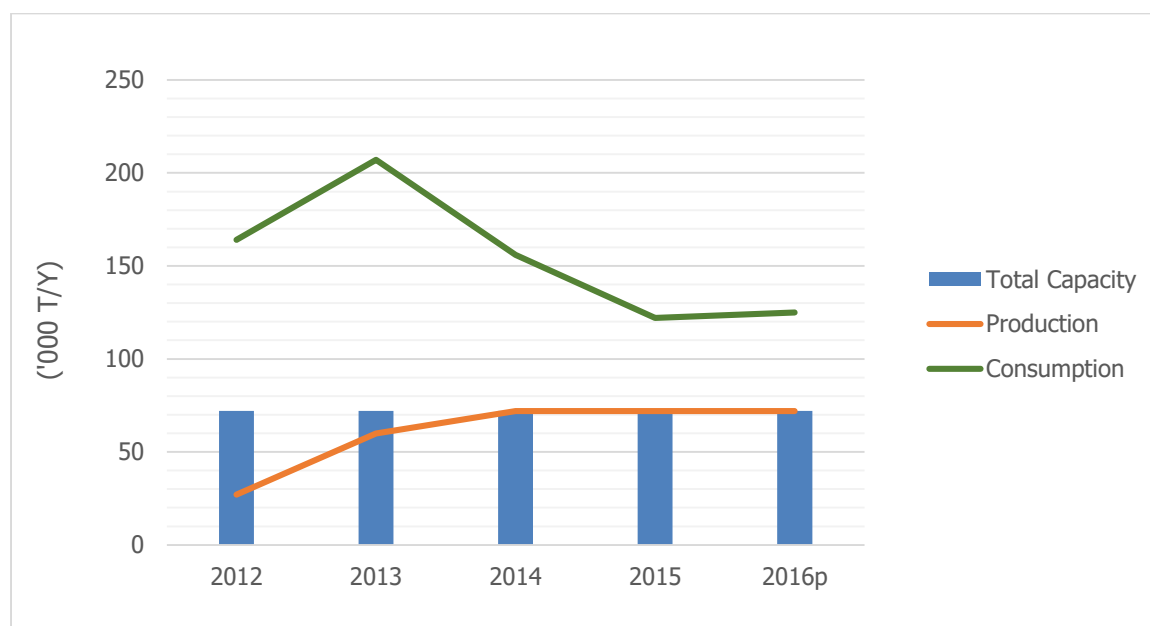
Capacity, Production and Consumption of ESBR

(Unit: '000 T/Y)

	Historical				Estimated
	2012	2013	2014	2015	2016
Total Capacity	72	72	72	72	72
Production	27	60	72	72	72
Consumption	164	207	156	122	125*
Export	26	39	61	86	
Import	163	174	145	136	

Source: PTIT Industrial Survey, The Customs Department

Note: *Some consumption figure is different from calculation (Production + Import – Export) due to inventory change.



1. Review of 2015

ESBR production remained stable while domestic consumption was affected by slowdown in automotive industry in line with economic situation.

2. Outlook for 2016

ESBR domestic consumption is expected to improve compared to 2015, especially in the second half of 2016.

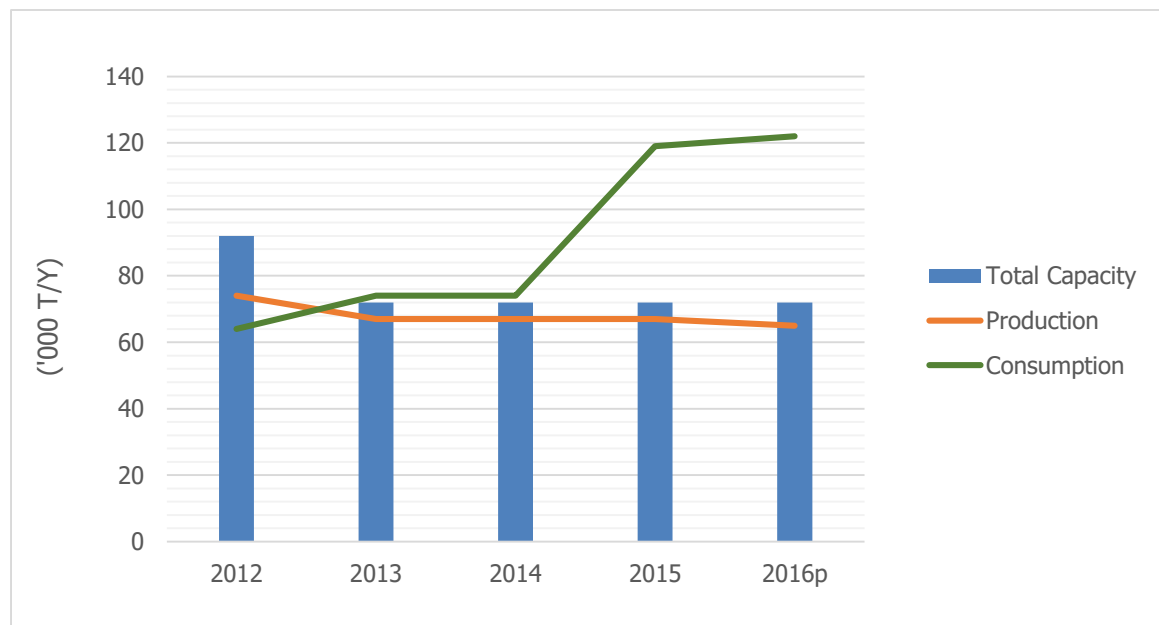
Capacity, Production and Consumption of BR

(Unit: '000 T/Y)

	Historical				Estimated
	2012	2013	2014	2015	2016
Total Capacity	92	72	72	72	72
Production	74	67	67	67	65
Consumption	64	74	74	119	122*
Export	59	42	44	40	
Import	49	49	20	92	

Source: PTIT Industrial Survey, The Customs Department

Note: Projected production figures: assume 90% operating rate



1. Review of 2015

The production and domestic consumption of BR in 2015 increased compared with the previous year as a result high domestic demand.

2. Outlook for 2016

Domestic BR consumption is expected to slightly increase with the strong demand from automotive industry especially export market following Thailand's next target for the automotive industry for supplying the Asia- Pacific and global markets.

Synthetic Fiber Raw Materials Committee

II-6. Synthetic Fiber Raw Materials Committee

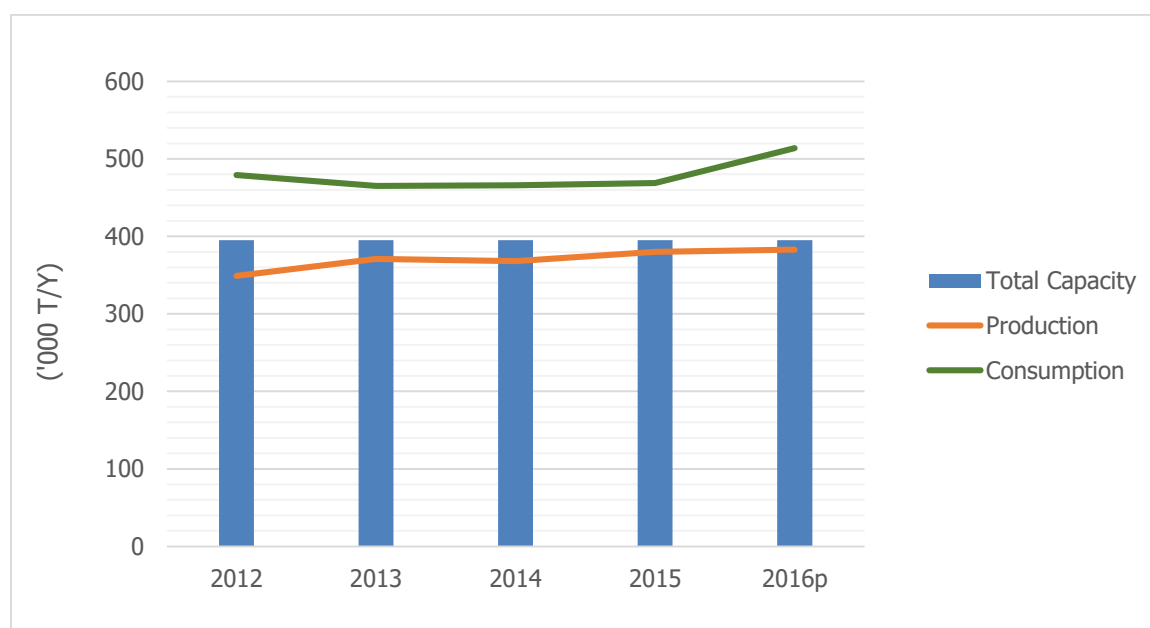
Capacity, Production and Consumption of Ethylene Glycol

(Unit: '000 T/Y)

	Historical				Estimated
	2012	2013	2014	2015	2016
Total Capacity	395	395	395	395	395
Production	349	371	368	380	383
Consumption	479	465	466	469	514*
Export	76	34	48	0	
Import	155	157	169	1	

Source: PTIT Industrial Survey, The Customs Department

Note: *Consumption netbacked from polyester polymer production, which is projected by assuming a 88% operating rate.



1. Review of 2015

The production and domestic consumption in 2015 remain stagnate compared with the previous year. Domestic demand of PET in downstream market still weak supported by downward trend of of textiles production in domestic.

2. Outlook for 2016

In 2015, MEG production and consumption is forecasted to recover supported by higher demand of downstream segment in this region.

Capacity, Production and Consumption of Acrylonitrile

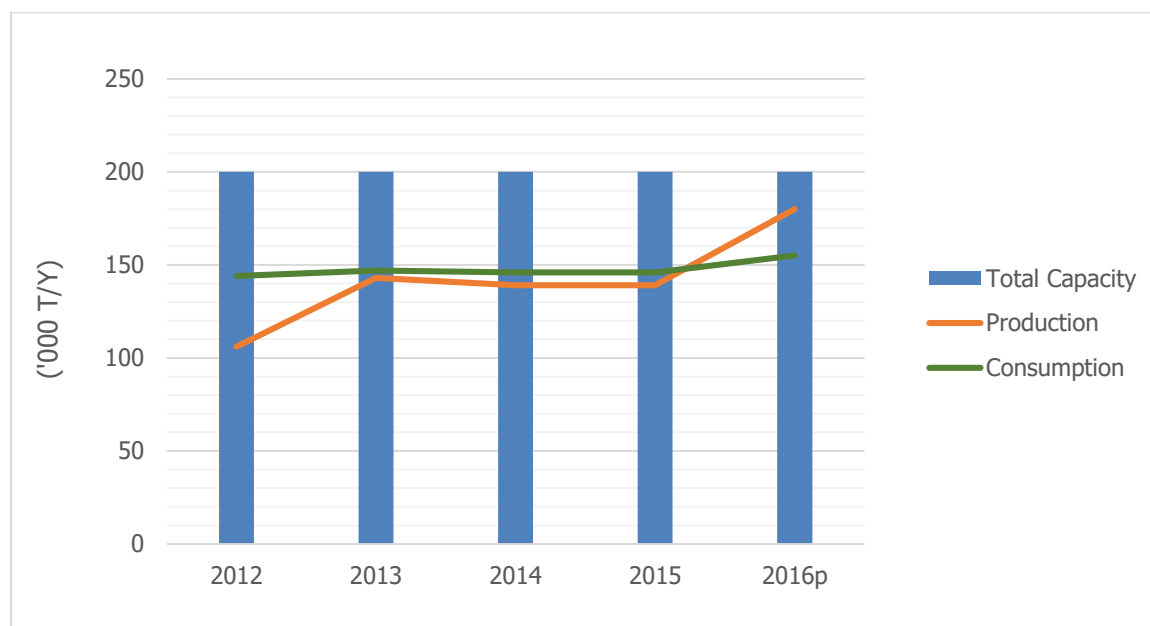
(Unit: '000 T/Y)

	Historical				Estimated
	2012	2013	2014	2015	2016
Total Capacity	200	200	200	200	200
Production	106	143	139	139	180
Consumption by Derivative Prod.	144	147	146	146	155*
Export	30	46	55	56	
Import	70	68	62	34	

Source: PTIT Industrial Survey, The Customs Department

Note: *Consumption netbacked from ABS/ SAN and acrylic fibre production with an assumed operating rate of 87%.

'0' means below 500T/Y



1. Review of 2015

Thailand's ACN production in 2015 remain stagnate compared with the previous year. Meanwhile, domestic consumption slightly increased demand of ABS/SAN which mainly used in automotive segment.

2. Outlook for 2016

Production and domestic consumption of ACN are expected to increase as in automobile industries. ACN is used as feedstock to produce ABS/SAN resins which is widely used in various parts and components of electrical and electronic, automobile parts products.

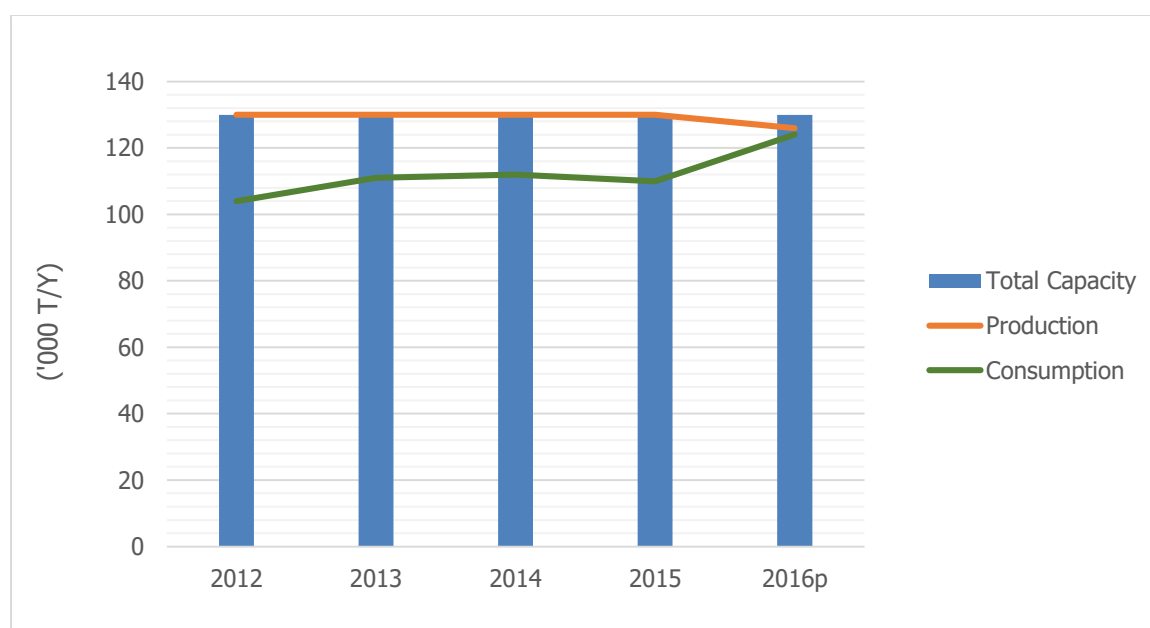
Capacity, Production and Consumption of Caprolactam

(Unit: '000 T/Y)

	Historical				Estimated
	2012	2013	2014	2015	2016
Total Capacity	130	130	130	130	130
Production	130	130	130	130	126
Consumption by Derivative Prod.	104	111	112	110	124*
Export	33	28	27	27	
Import	8	9	9	7	

Source: PTIT Industrial Survey, The Customs Department

Note: *Consumption is netbacked from Nylon 6 production, which is projected by assuming a 75% operating rate.



1. Review of 2015

Domestic production and consumption of caprolactam in 2015 remain stagnant at maximum production capacity at 130,000 ton/year supported by strong demand of Nylon 6 production in domestic market and export market.

2. Outlook for 2016

Caprolactam production and consumption is projected to relatively stagnate in line with the demand from downstream derivative Nylon 6 which is the key market for caprolactam.

Capacity, Production and Consumption of Terephthalic Acid

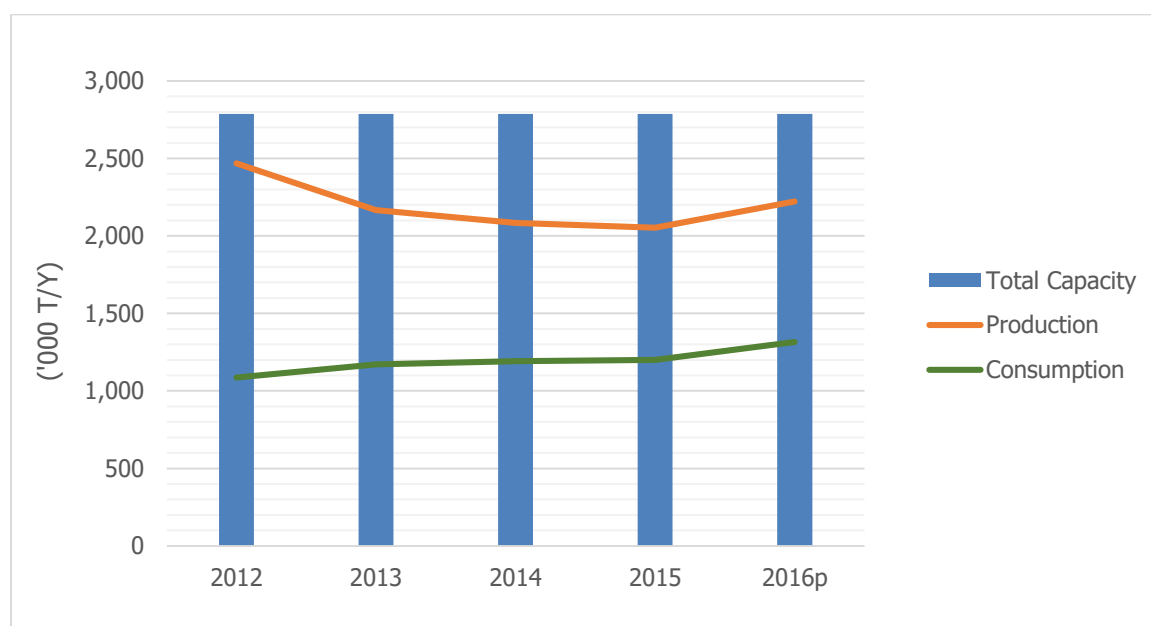
(Unit:'000 T/Y)

	Historical				Estimated
	2012	2013	2014	2015	2016
Total Capacity	2,787	2,787	2,787	2,787	2,787
Production	2,469	2,167	2,084	2,054	2,223
Consumption by Derivative Prod.	1,086	1,171	1,192	1,200	1,315*
Export	1,381	996	892	854	
Import	0	0	0	0	

Source: PTIT Industrial Survey, The Customs Department

Note: *Consumption netbacked from polyester polymer production, which is projected by assuming a 88% operating rate.

'0' means below 500T/Y



1. Review of 2015

Thailand's PTA production remain stagnant from previous year from weak demand of regional markets especially China. Domestic PTA consumption slightly increased supported stable demand in polyester product.

2. Outlook for 2016

In 2016, domestic PTA production and consumption are expected to increase supported by projection of economic recovery in domestic market.

Chemicals Committee

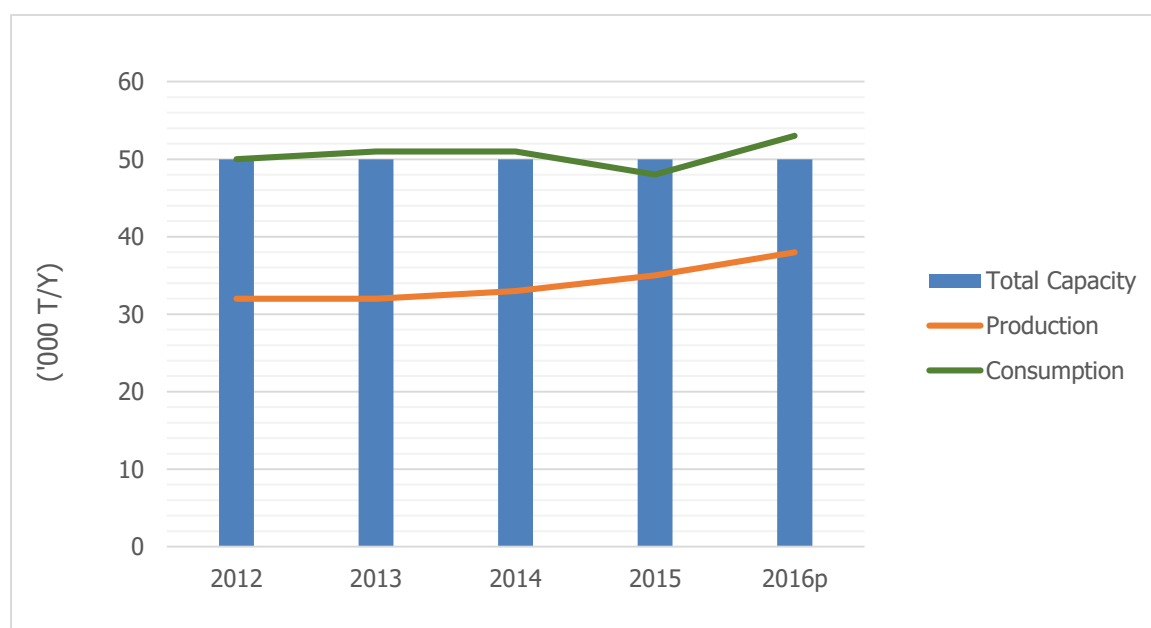
II-7. Chemicals Committee Capacity, Production and Consumption of Phthalic Anhydride (PA)

(Unit: '000 T/Y)

	Historical				Estimated
	2012	2013	2014	2015	2016
Total Capacity	50	50	50	50	50
Production	32	32	33	35	38
Consumption by Derivative Prod.	50	51	51	48	53*
Export	2	6	9	19	
Import	17	18	24	24	

Source: PTIT Industrial Survey, The Customs Department

Note: *Consumption by derivative netbacked from plasticizer, UPR and alkyd resins production, which is projected by assuming 50%, 60%, 65% operating rate, respectively.



1. Review of 2015

Domestic PA production and consumption in 2015 relatively stagnated, supporting by strong exported market especially construction industries in ASEAN.

2. Outlook for 2016

Assuming 50%, 60%, 65% operating rate for plasticizer, UPR and alkyd resins respectively, Thailand PA production is expected to increase follow strong demand of export market. In addition, domestic consumption is expected to increase supported by strong demand of construction industry.

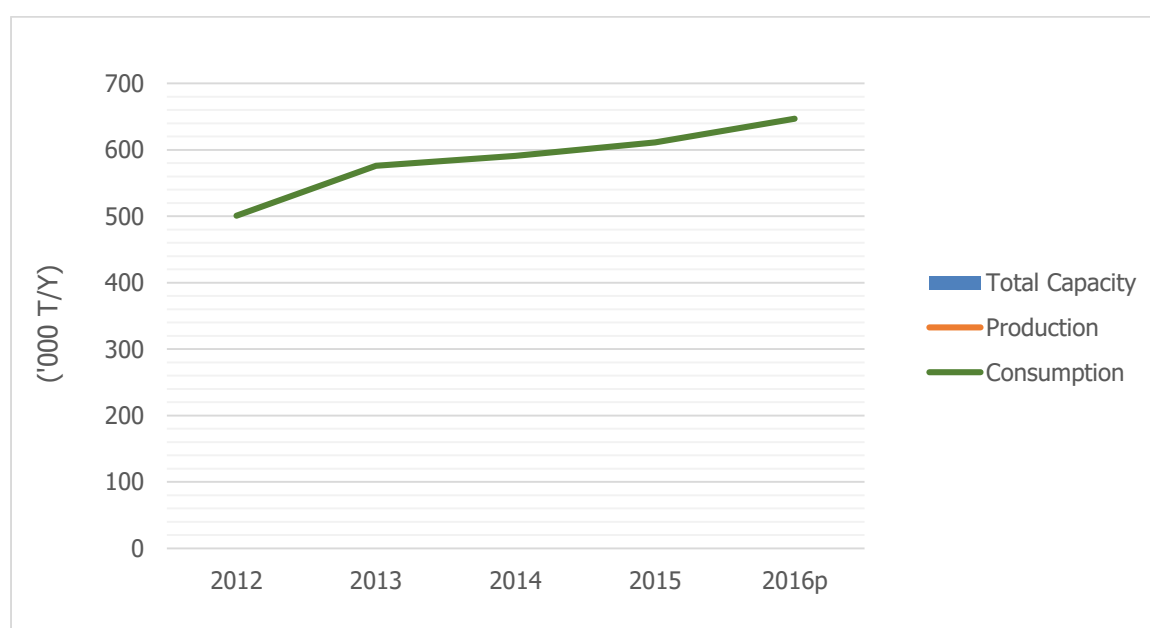
Capacity, Production and Consumption of Methanol

(Unit: '000 T/Y)

	Historical				Estimated
	2012	2013	2014	2015	2016
Total Capacity					
Production					
Consumption by Derivative Prod.	501	576	591	611	647*
Export	85	0	0	0	
Import	554	596	2,557	664	

Source: PTIT Industrial Survey, The Customs Department

Note: *Consumption netbacked from MTBE, MMA, POM and formaldehyde production, which is projected by assuming 90% operating rate.



1. Review of 2015

Domestic consumption of methanol increased in demand from derivative products especially demand from biodiesel production.

Thailand has no methanol production facility. All methanol usage is imported.

2. Outlook for 2016

Methanol consumption in Thailand is expected to relatively increase assuming a 90% operating rate for MMA, POM, formaldehyde, MTBE including expansion plan of biodiesel production plant in Thailand.

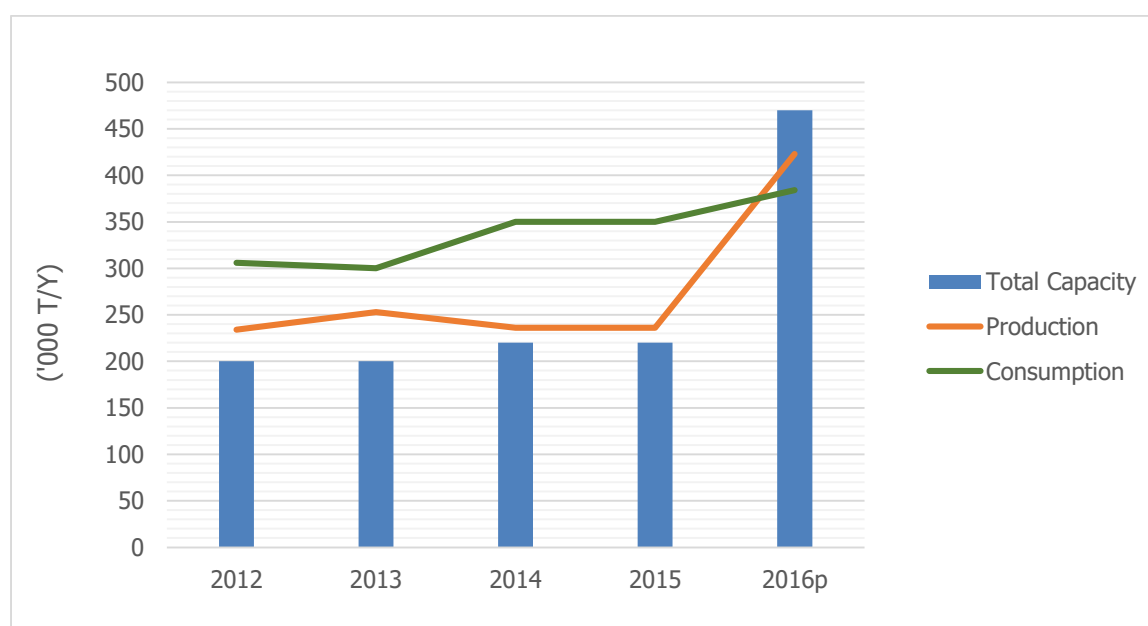
Capacity, Production and Consumption of Phenol

(Unit: '000 T/Y)

	Historical				Estimated
	2012	2013	2014	2015	2016
Total Capacity	200	200	220	220	470
Production	234	253	236	236	423
Consumption by Derivative Prod.	306	300	350	350	384*
Export	113	103	53	49	
Import	185	149	166	138	

Source: PTIT Industrial Survey, The Customs Department

Note: *Consumption netbacked from bisphenol A and phenolic resin production, which is projected by assuming a 97% operating rate

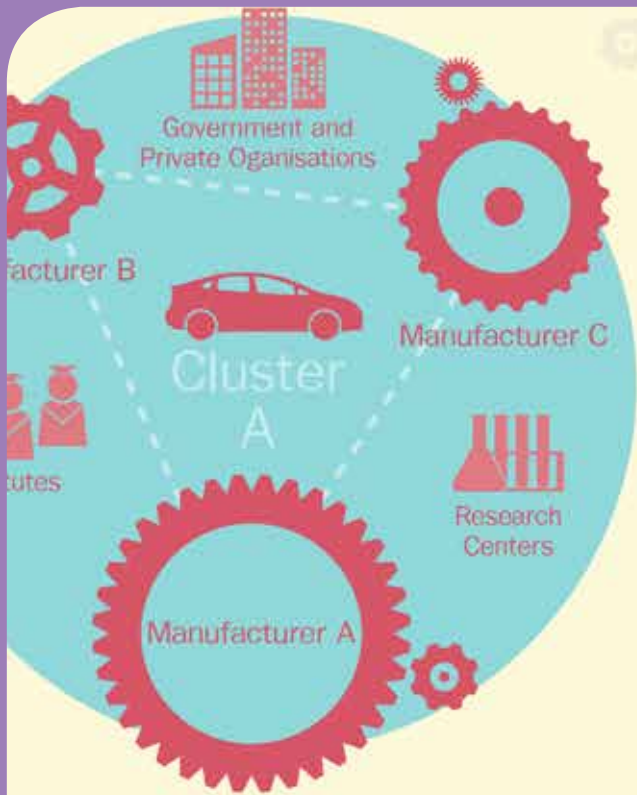


1. Review of 2015

Domestic phenol production remain stagnant support by low demand in domestic.

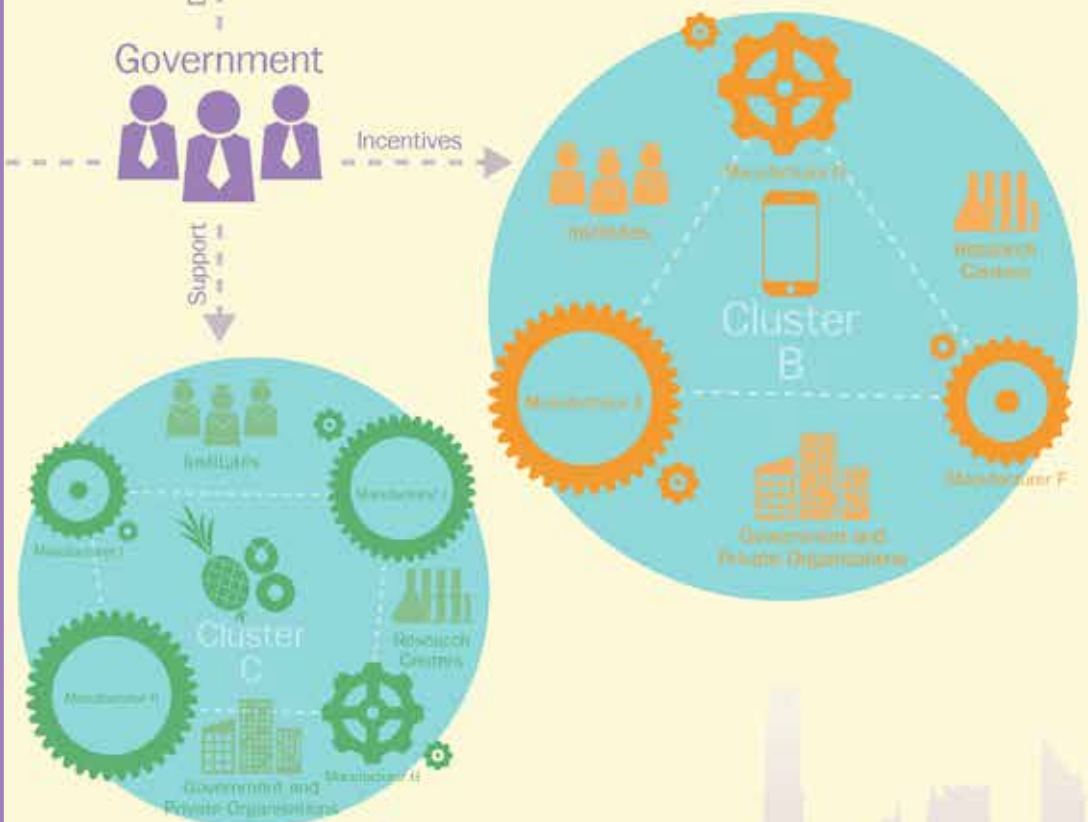
2. Outlook for 2016

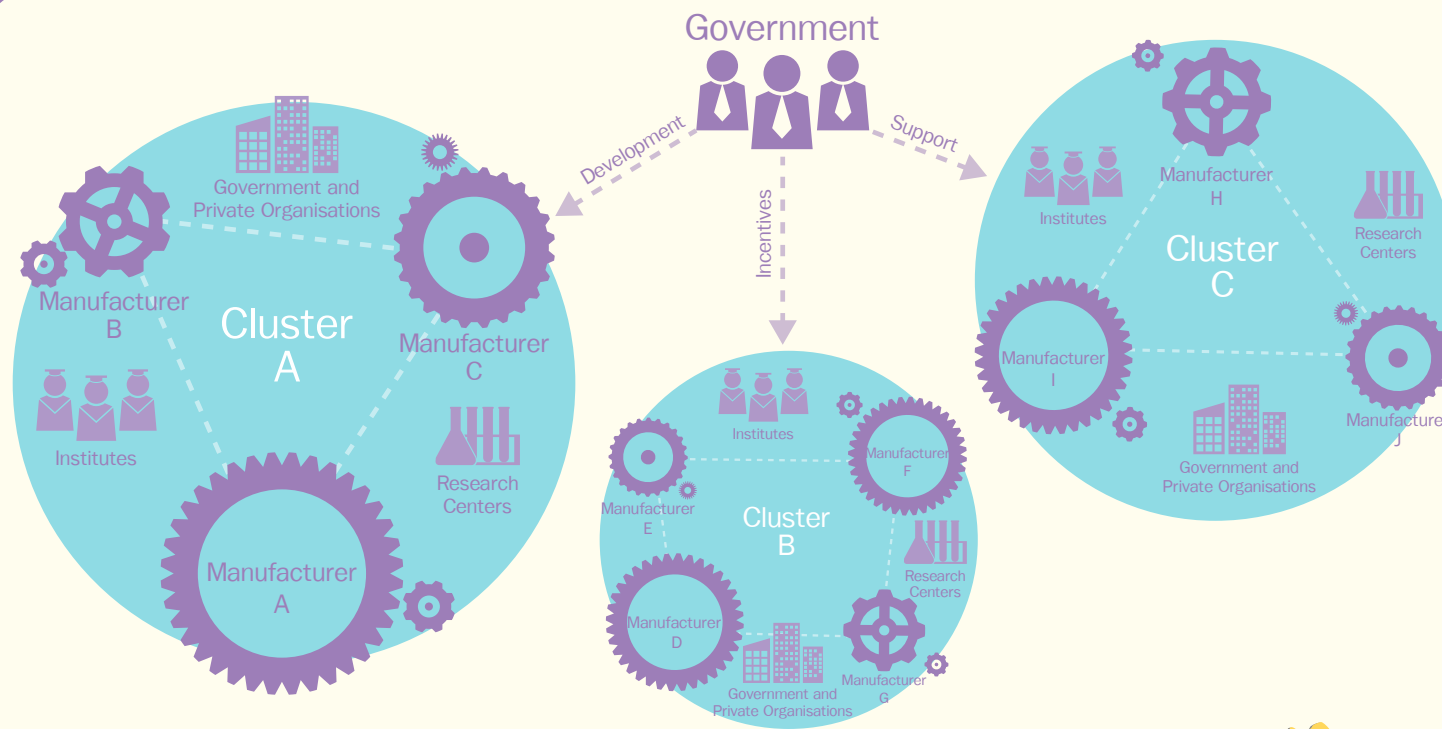
Phenol production in Thailand is expected to continue increase as an expansion plan of 250,000-ton/year phenol of PTT Phenol Co., Ltd will start production in Q2 2016. Consequently, the consumption is forecasted to increase from demand of derivatives products.



Thailand Board of Investment
www.boi.go.th

Thailand Moving Ahead with Cluster Development





Targeted Clusters in the Initial Stage

In the initial stage of the Cluster Policy, the government has targeted to develop 2 types of clusters: Super Cluster and other targeted clusters.

1. **Super Cluster** includes clusters of businesses using advanced technology, and future industry, e.g. Automotive and Parts Cluster, Electrical Appliances, Electronics and Telecommunication Equipment Cluster, Eco-friendly Petrochemicals and Chemicals Cluster, Digital-based Cluster, Food Innopolis and Medical Hub.
2. **Other targeted clusters**, e.g. Agro-processing Products Cluster, Textiles and Garment Cluster.

What is the Cluster Policy?

A cluster is concentration of interconnected businesses and related institutions that operate within the same geographic areas. The aim of promoting business clusters is to boost the level of support and cooperation in all facets of the business, both vertical and horizontal, in order to strengthen the industrial value chain, enhancing Thailand's investment potentials and competitiveness, and expand socioeconomic development to regional and local levels.

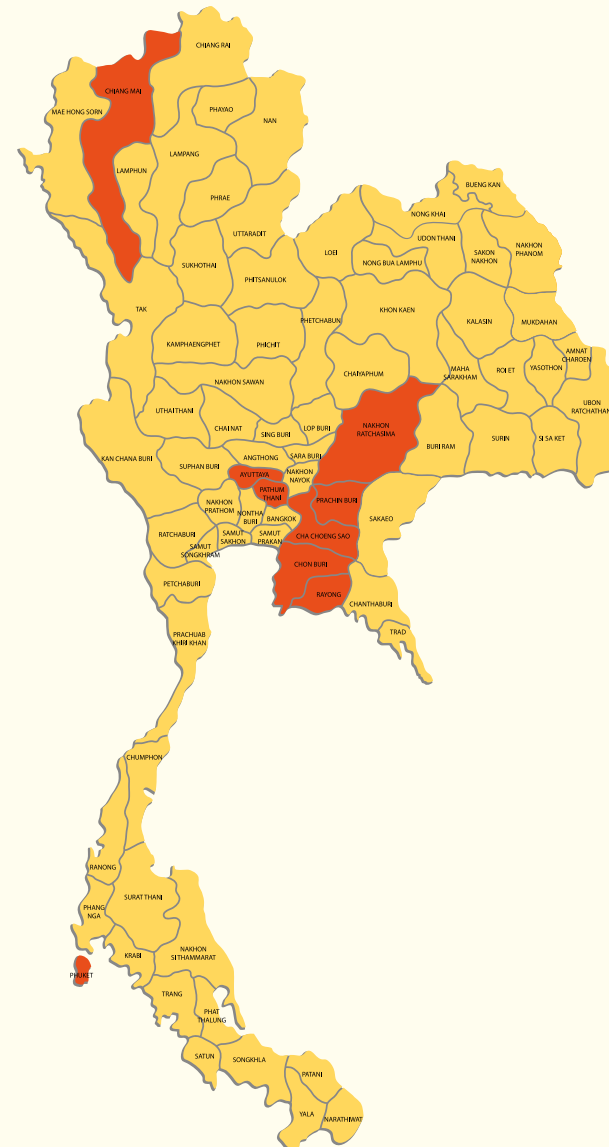
The government of Thailand has perceived the significance of cluster in the development of the nation's economy. The cabinet and the Thailand Board of Investment, therefore, proposed the Cluster-based Special Economic Development Zones Policy, or the Cluster Policy in short, which came into effect on September 16, 2015.

How the Cluster Policy Support the Investor?

The cluster development policy aims at increasing industrial competitiveness in areas with high potentials for targeted manufacture bases using advanced technology

Clusters are crucial in linking manufacturers, suppliers, supporting industries, research and academic institutions, and public and private organizations within the cluster areas. Strategic development is supported by government agencies in wide-ranging aspects, including human resources and technological developments, infrastructure development and logistics system, tax incentives and non-tax incentives, financial support, and amendments of rules and regulations to facilitate investment.

These measures not only support the cluster development and its competency in the international arena, but also give strategic advantage to investment projects in the cluster areas.



Super Cluster

Cluster for activities using advance technology and future industry e.g.

- **Automotive and Parts Cluster** (7 Provinces: Ayutthaya, Pathum Thani, Chonburi, Rayong, Chachoengsao, Prachinburi, Nakhon Ratchasima)
- **Electrical Appliances, Electronics and Telecommunication Equipment Cluster** (7 Provinces: Ayutthaya, Pathum Thani, Chonburi, Rayong, Chachoengsao, Prachinburi, Nakhon Ratchasima)
- **Eco-friendly Petrochemicals and Chemicals** (2 Provinces: Chonburi and Rayong)
- **Digital-based Cluster** (2 Provinces: Chiang Mai and Phuket)
- **Food Innopolis** (Details are to be announced)
- **Medical Hub** (Details are to be announced)

Other Targeted Clusters

Other industrial clusters with competencies e.g.

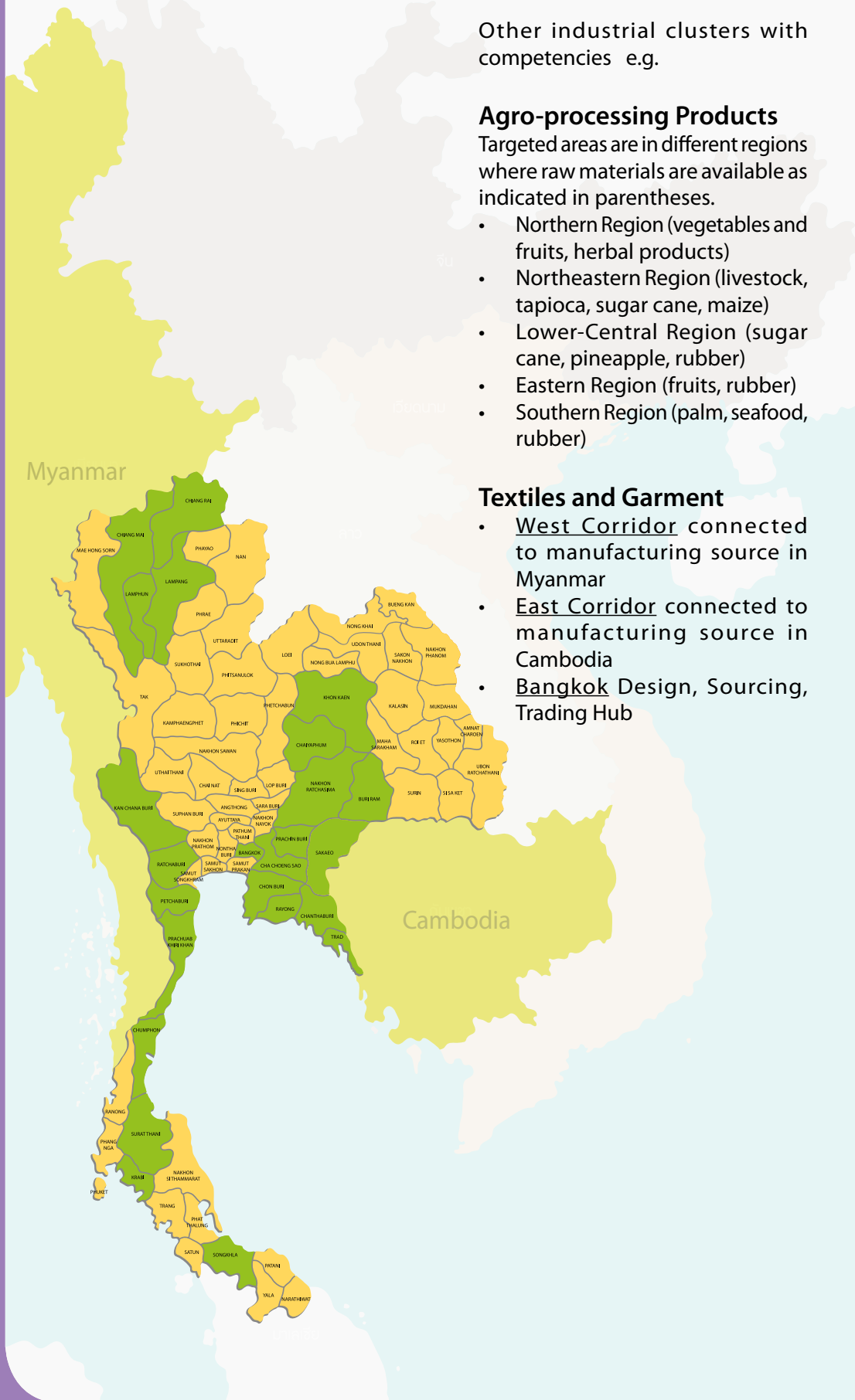
Agro-processing Products

Targeted areas are in different regions where raw materials are available as indicated in parentheses.

- Northern Region (vegetables and fruits, herbal products)
- Northeastern Region (livestock, tapioca, sugar cane, maize)
- Lower-Central Region (sugar cane, pineapple, rubber)
- Eastern Region (fruits, rubber)
- Southern Region (palm, seafood, rubber)

Textiles and Garment

- West Corridor connected to manufacturing source in Myanmar
- East Corridor connected to manufacturing source in Cambodia
- Bangkok Design, Sourcing, Trading Hub



Investment Incentives for Cluster-based SEZs

Incentives	Super Cluster	Other Clusters
Tax	BOI <ul style="list-style-type: none"> • 8-year corporate income tax exemption and an additional 5-year 50% reduction • Import duty exemption on machinery 	<ul style="list-style-type: none"> • 3–8 year corporate income tax exemption and an additional 5-year 50% reduction • Import duty exemption on machinery
	Ministry of Finance (Details are to be announced) <ul style="list-style-type: none"> • For Future industries with significant importance, the Ministry of Finance will consider granting 10-15 years corporate income tax exemption • Personal income tax exemption for international specialists to work in the specified area, both Thai and foreign 	
Non-Tax	<ul style="list-style-type: none"> • Consideration of granting Permanent Residence to the leading specialist • Permission for foreigners to own land to implement the promoted activities 	Same as Super Cluster

Approval Criteria for BOI Cluster Incentive Package

- Activity classified under eligible BOI categories
- Located in the designated provinces for each relevant cluster
- Have cooperation with academic institutions / research institutions / centers of excellence in the designated areas e.g.
 - » Talent Mobility / Work-integrated Learning / Co-operative Education / Dual systems
 - » Cooperation in development of human resource or technology as approved by the Board of Investment
- Applications to be submitted by end of 2016 and production to be started by end of 2017 (Extension may be possible if deemed appropriate.)

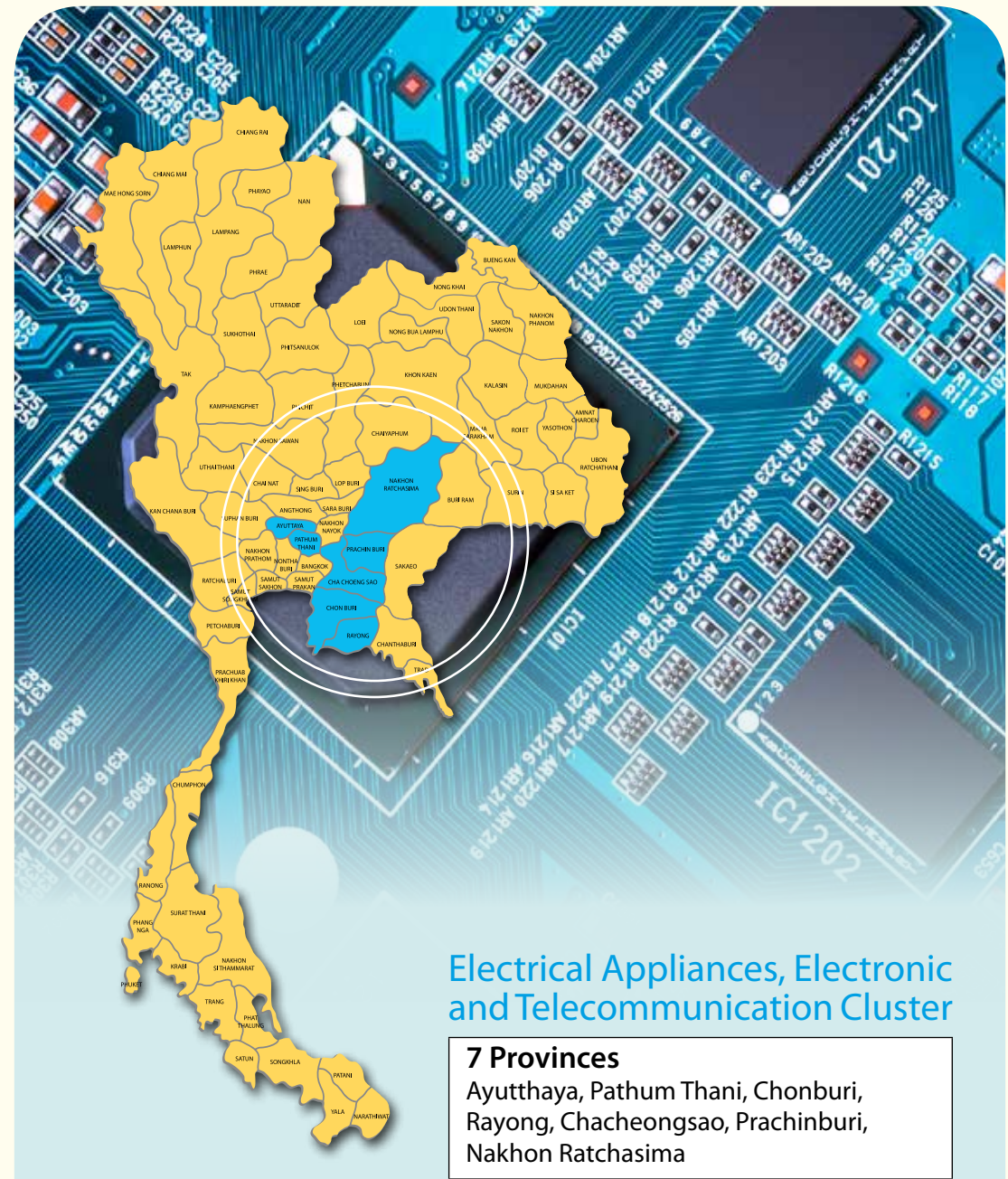
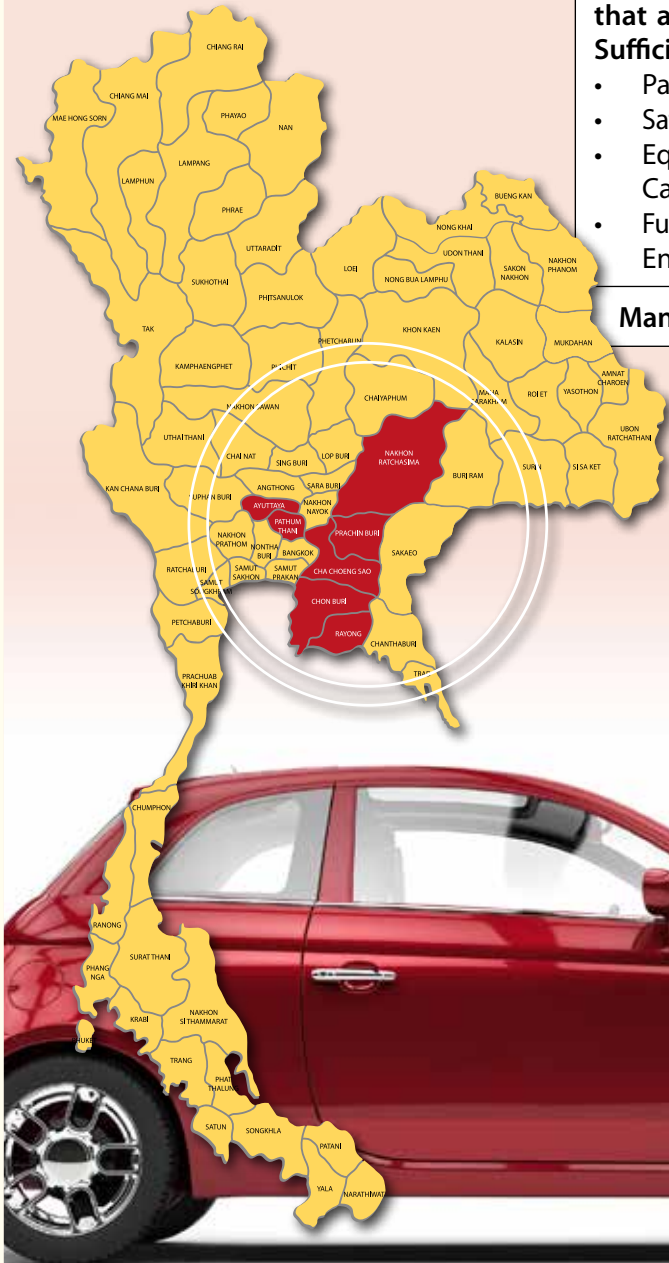
Areas and Targeted Activities in Each Cluster

Automotive and Parts Cluster

7 Provinces

Ayutthaya, Pathum Thani, Chonburi, Rayong, Chacheongsao, Prachinburi, Nakhon Ratchasima

Eligible Activities
Manufacture of Motorcycle with Engine Size \geq 248 CC. (only for projects with forming of engine parts)
Manufacture of Automobile Engines
Manufacture of Important Parts that are not Locally Produced or Sufficiently Produced i.e. <ul style="list-style-type: none"> • Parts using Advance Technology • Safety and Energy Efficient System • Equipment for Hybrid, EV, PHEV Cars • Fuel Injection Parts/ Transmission/ Engine System
Manufacture of Automobile Tires

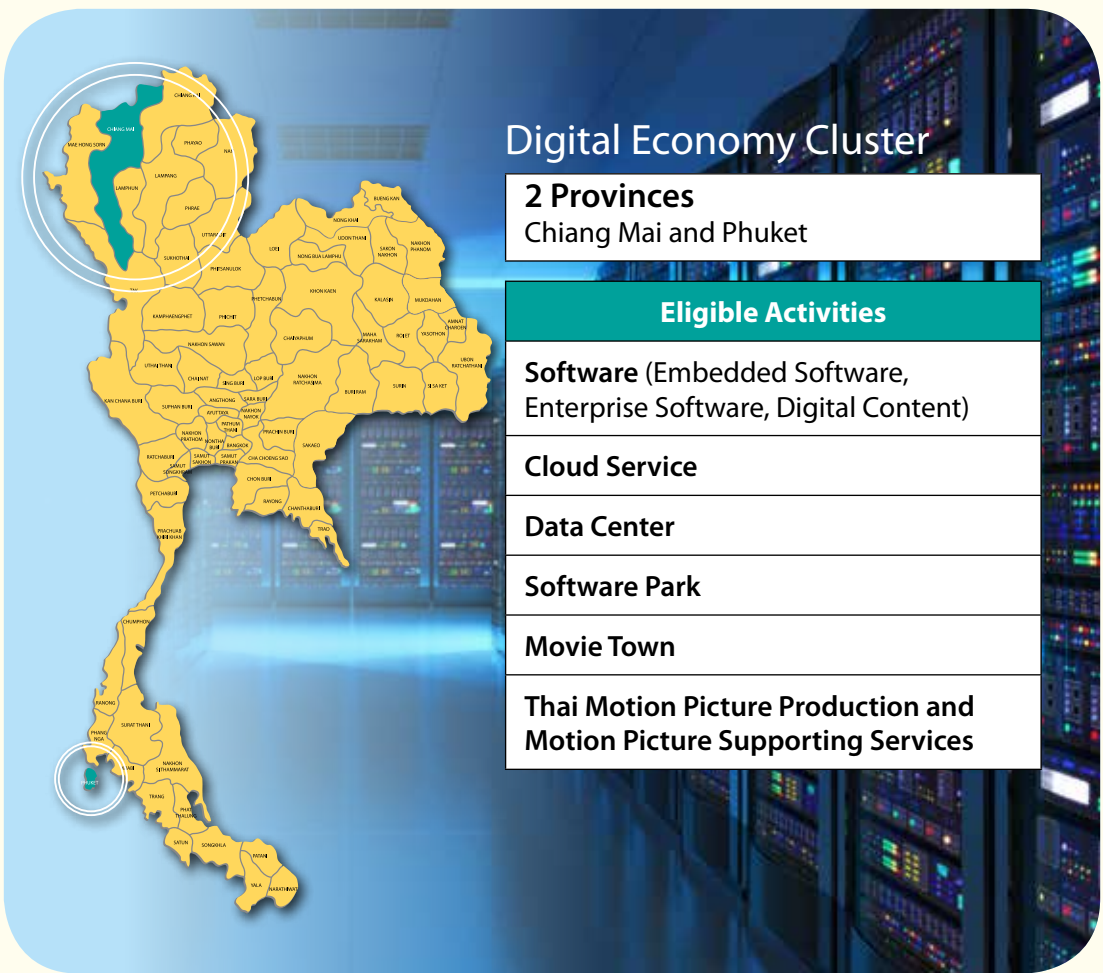


Electrical Appliances, Electronic and Telecommunication Cluster

7 Provinces

Ayutthaya, Pathum Thani, Chonburi, Rayong, Chacheongsao, Prachinburi, Nakhon Ratchasima

Eligible Activities
Electronic Design e.g. Microelectronics Design and Embedded System Design
Electronic Products and Parts using Advance technology e.g. Telecommunication Equipment, Electronic Parts for Medical Devices / Automotive / Industrial Works, Hard Disk Drive, Solid State Drive
Materials for Microelectronics e.g. Wafers, Materials Based on Thin-film Technology
Advanced Technology Electrical Appliances e.g. Internet of Things



Digital Economy Cluster

2 Provinces
Chiang Mai and Phuket

Eligible Activities

- Software (Embedded Software, Enterprise Software, Digital Content)
- Cloud Service
- Data Center
- Software Park
- Movie Town
- Thai Motion Picture Production and Motion Picture Supporting Services

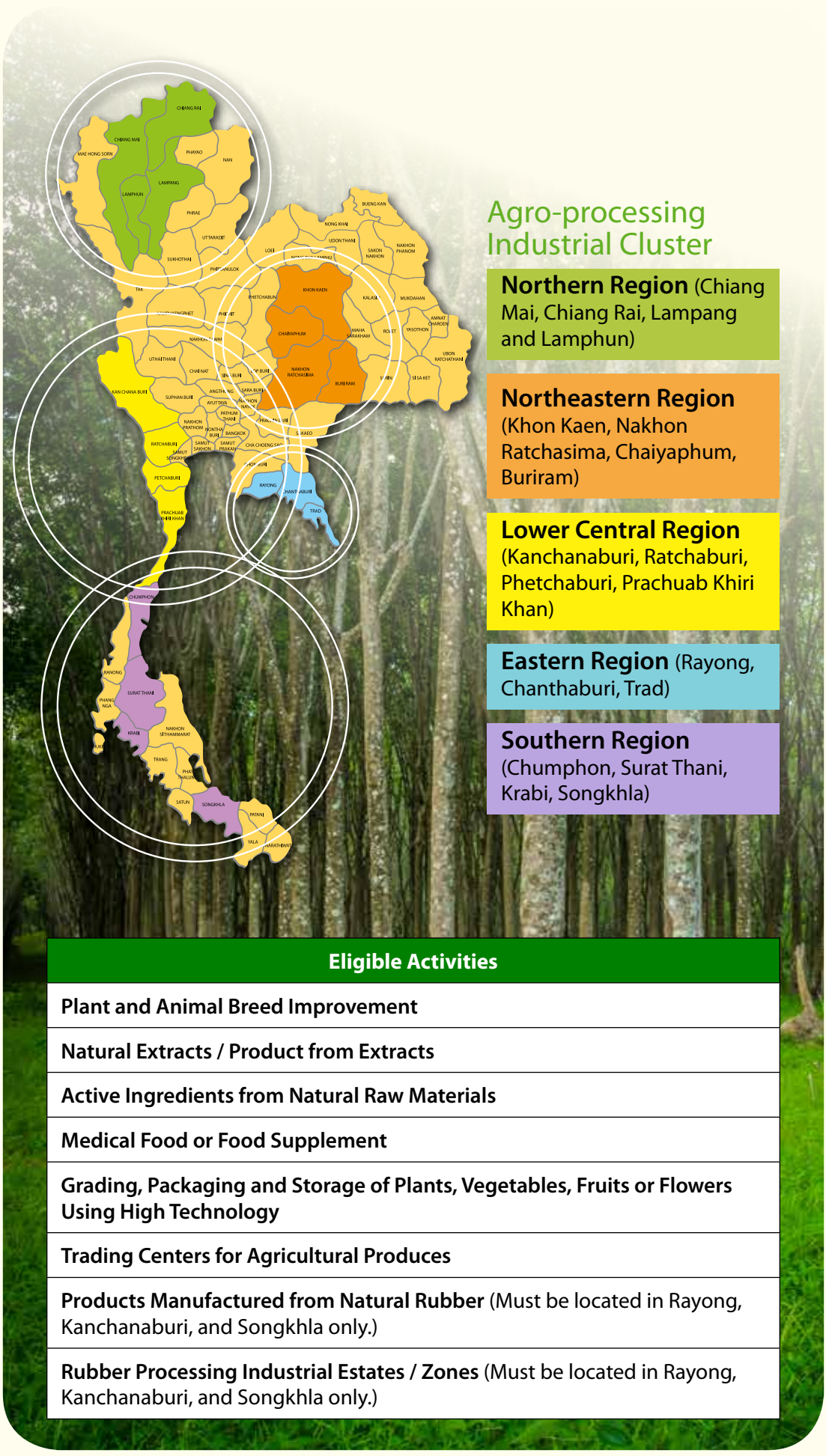


Eco-friendly Petrochemicals and Chemical Product Cluster

2 Provinces
Chonburi and Rayong

Eligible Activities

- Eco-friendly Chemicals or Polymers; or Products Made from Eco-friendly Polymers
- Specialty Polymers or Specialty Chemicals
- Bioplastic-coated Paper Packaging



Agro-processing Industrial Cluster

Northern Region (Chiang Mai, Chiang Rai, Lamphun and Lamphun)

Northeastern Region (Khon Kaen, Nakhon Ratchasima, Chaiyaphum, Buriram)

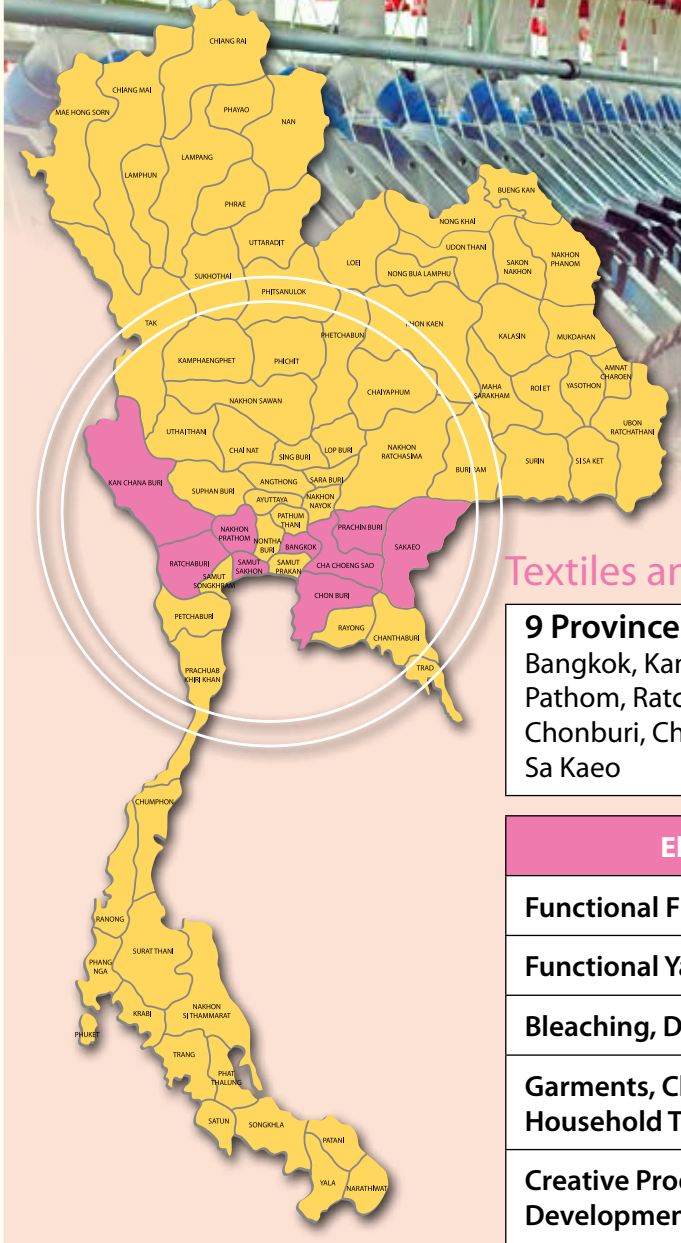
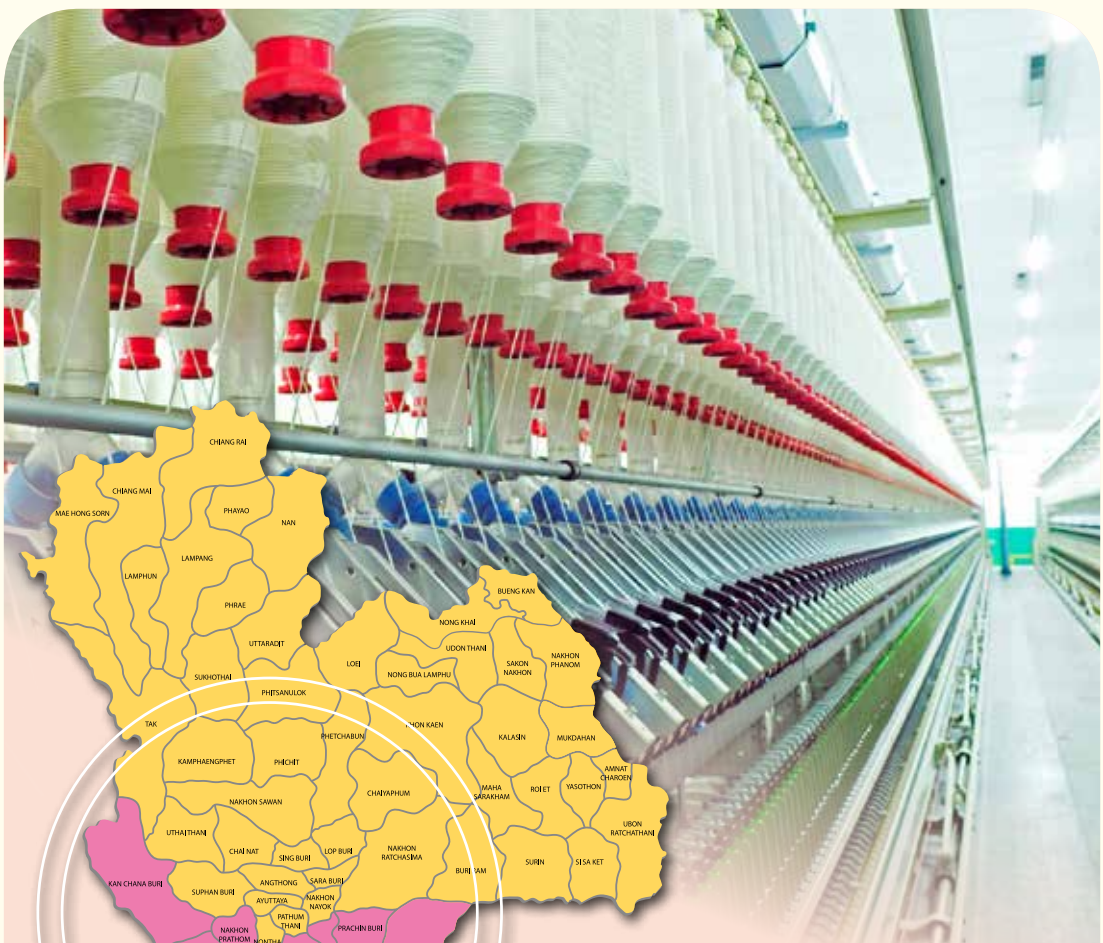
Lower Central Region (Kanchanaburi, Ratchaburi, Phetchaburi, Prachuab Khiri Khan)

Eastern Region (Rayong, Chanthaburi, Trad)

Southern Region (Chumphon, Surat Thani, Krabi, Songkhla)

Eligible Activities

- Plant and Animal Breed Improvement
- Natural Extracts / Product from Extracts
- Active Ingredients from Natural Raw Materials
- Medical Food or Food Supplement
- Grading, Packaging and Storage of Plants, Vegetables, Fruits or Flowers Using High Technology
- Trading Centers for Agricultural Produces
- Products Manufactured from Natural Rubber (Must be located in Rayong, Kanchanaburi, and Songkhla only.)
- Rubber Processing Industrial Estates / Zones (Must be located in Rayong, Kanchanaburi, and Songkhla only.)



Textiles and Garment Cluster

9 Provinces
 Bangkok, Kanchanaburi, Nakhon Pathom, Ratchaburi, Samut Sakhon, Chonburi, Chachoengsao, Prachinburi, Sa Kaeo

Eligible Activities
Functional Fiber / Recycled Fiber
Functional Yarn or Fabric
Bleaching, Dyeing and Finishing
Garments, Clothing Accessories, and Household Textiles
Creative Product Design & Development Center

Infrastructures to Support Cluster Development

Regions and areas, in which the government has selected as cluster areas, are developed and fully equipped with public utility and infrastructures crucial for investment projects. These include industrial estates, electricity, water supply, transportation and educational institutions of all levels. All of which significantly contributes to the increase in an investment competitive advantage in cluster areas, in addition to tax incentives.

Infrastructures in Cluster Areas	Quantity
Ports	3
Deep Seaports	5
Domestic Airports	7
International Airports	6
Industrial Estates	14
Electricity Generation Capacity	Approximately 37,000 MW

Support in Raw Materials	Maximum Annual Production Capacity
Plastic Resin Pallets (e.g. PP, PE, PET, PVC)	10.6 million tons
Bio-plastic Resin Pallets (e.g. PBS, PLA) *	135,000 tons
Iron	4.6 million tons

Support in human resources	Quantity
Higher Education Institutions	129
Vocational Education Institutions	215

Remarks
 * The total production capacity planned is 135,000 ton. By early 2016, the estimated maximum production capacity will be 20,000 tons.



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