

Case Study

# Thailand's Community-Based Eco-Industrial Town Development

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This case study is intended to serve as an example of policies and practices relevant to pursuing a green growth model of development. It describes activities and programs performed by organizations other than GGGI, and GGGI itself had no direct role in their development, adoption, or implementation.

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# Contents

01 Summary .....	2
02 Context.....	5
03 Approach.....	7
04 Outcomes .....	12
05 Lessons .....	14

# 01 Summary

Thailand has been a pioneer in promoting special economic zones, and has achieved noteworthy success as a result of its unique approach of promoting inclusive but voluntary industry participation and by actively engaging local communities.

Map Ta Phut Industrial Estate (IE) is the most symbolic icon of Thailand's industrial development. Formulated in 1990 as part of the Eastern Seaboard Development program, a government-led industrial development program in Rayong province, Map Ta Phut IE has turned a small fishing town into one of the world's largest petrochemical production centers. The economic significance of Map Ta Phut IE has grown dramatically based on the number of jobs supported and annual revenues, which are equivalent to 11% of the national GDP. The Industrial Estate Authority of Thailand (IEAT) under the Ministry of Industry (MoI) is charged with developing and managing Thailand's 47 IEs.

Economic success of Map Ta Phut IE came with some costs. The surrounding areas became severely polluted as a result of industrial emissions and waste, causing various health problems for people in nearby communities. Multiple industrial accidents such as leaks of toxic gas and factory explosions amplified fear as well as distrust towards IE management authorities and resident factories among local communities. Tensions intensified between civil society and the industrial sector in the absence of effective government intervention. The situation was similar in other IE areas, which experienced growing pressure to be more responsible for environmental and social impacts of their operations.

A decision by the Thai Central Administrative court to suspend a large number of industrial development projects in Map Ta Phut IE in 2009 came at the height of tension between environmentalists and the industrial sector and eventually resulted in a turning point in Thailand's industrial policy. MoI and the IEAT had previously piloted the Eco Industrial Estate program in

cooperation with the German Technical Cooperation Agency (GIZ) in 2000 as an attempt to make highly polluting IEs more sustainable. Although that program was unsuccessful, it provided the model for a new Thai MoI initiative launched in 2010 which focused more comprehensively on developing sustainable industrial communities, under a program titled as Eco Industrial Town development (EIT).

EIT was implemented with a special focus on being more inclusive and engaging a large range of stakeholders on the ground. Local IEAT offices encouraged community residents, local experts and officials from relevant local government agencies to participate more proactively in the development of EIT implementation plans for their own region through Eco Networks. The IEAT also emphasized knowledge-sharing and capacity building activities for local stakeholders. The EIT program was firstly piloted in five regions, and then expanded to six other provinces in 2013. Frequent political instability in the central government affected the overall EIT implementation progress. However, its adoption in the national development agenda in 2012 ensured continuity of the program, and 19 IEs had completed their EIT development master plan as of 2015.

The design of the EIT program also facilitated its adoption by key stakeholders. The program integrated Thailand's Green Industry (GI) and the Eco-Industrial Estate (EIE) programs under the EIT umbrella, allowing green transition either within individual firms or across entire industrial estates, even when the macro level EIT implementation faced difficulty. Both GI and EIT programs offer different levels of certification, which made it possible for more applicants to participate. In the GI program, for example, companies can be certified for actions ranging from basic commitment to more comprehensive integration of green acts in their value chain. Detailed certification criteria provided clear guidance for the participation in those programs.

There are some potential lessons learned from Thailand's EIT program and opportunities for improvement. First, some have noted that the current management structure does not promote sufficient coordination among relevant government ministries and agencies. Roles and responsibilities among ministries are not clear without a designated supervisory authority, whereas EIT development requires orchestrated actions by multiple ministries dealing with not only industries and economy but also urban development,

environmental regulations, and so forth. Also, there are no apparent coordination and collaboration mechanisms between national and subnational government bodies. In addition, the EIT program lacks specific and measurable goals on environmental, social, and economic impacts, making monitoring and evaluation of the program challenging and ambiguous. Linkage with national climate change commitments can also be strengthened in the program output goals.

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## Sectors in Focus

Industry, Energy, Cities

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## Key Challenges

Industrial pollution causing environmental degradation and public health hazards; increasing public antagonism against the industrial sector; need to harmonize industrial growth with public well-being and environmental sustainability

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## Impacts

**Environmental:** Thailand's Eco Industrial Town (EIT) development programs intend to reduce pollution and other environmental hazards by improving energy and resource efficiency in all manufacturing bases by applying industrial symbiosis principles, and to promote clean and environmentally safe production processes.

**Social:** Heavy pollution from industrial zones has incurred considerable social costs in Thailand including impacts on public health, and increased conflict and tension between local communities and industrial zones. The EIT program is expected to resolve these issues by harmonizing industrial priorities with the well-being of local communities.

**Economic:** Poor environmental records and negative images of industrial zones have been a major barrier for the industrial sector in achieving continuous growth in Thailand. The EIT program helps to rebuild trust between communities and industries, and enables industrial growth that brings positive returns to local economies.

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## Keywords

Eco-industrial estate, Green industries, Eco-industrial town, Industrial ecology, Sustainable industrial zone development, Stakeholder engagement

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## Geographic Coverage Kingdom of Thailand



## 02 Context

After the discovery of natural gas in the Gulf of Thailand in 1973, the Royal Thai Government launched a development plan for the eastern seaboard region comprised of Chachoengsao, Chonburi, and Rayong provinces, in line with its new national development strategy for export-led industrialization. The government established the Industrial Estate Authority of Thailand (IEAT), a state enterprise under MoI, to manage development and operation of industrial parks around the country. The Map Ta Phut Industrial Estate (IE) in Rayong province was opened in 1990 as part of the Eastern Seaboard Development Program. Constructed to be the national hub of heavy industries, it currently hosts more than 60 factories mostly in petrochemicals, along with several coal-fired power plants and oil refineries (Map Ta Phut Industrial Estate 2014).

Being the nation's largest industrial park and also the world's eighth largest petrochemical production complex, Map Ta Phut has an important position in Thailand's economy. Its annual revenue is estimated to be around THB 1.1 trillion (approximately USD 31.6 billion), which is 11% of the national GDP, and more than 100,000 jobs rely on this state-owned industrial complex (Aruninta 2012). The economic performance of Map Ta Phut is the best among the 47 IEs which IEAT manages.

However, Map Ta Phut IE has also been ranked the top among industrial areas in terms of negative environmental impacts, which has brought fierce public criticism and scrutiny on its operations. Toxic chemicals used in most of resident factories contaminated air and water extensively in the region, and multiple environmental incidents gave Map Ta Phut IE the reputation of being the most polluted area in Thailand. Only seven years after opening, more than 1,000 local students and teachers had to be evacuated in a nearby community for symptoms of headaches, nausea, breathing difficulties, and other respiratory illnesses caused by toxic gas emissions from the industrial zone (Hassarungsee and Kiatiprajuk

Figure 1. Location of Map Ta Phut (Fuller 2009)



2010, Buakamsri, et al. 2005). Cancer rates were also found to be highest in the Map Ta Phut area compared to other regions in Thailand, and industrial pollution was pointed out to be as the main cause of all major health issues in the region including more than 2,000 deaths since the opening of Map Ta Phut IE (Hurights Osaka 2012, Fuller 2009, Changplayngam 2012).

Numerous fatal incidents occurred in Map Ta Phut IE year after year, and public sentiment only got worse, not only towards Map Ta Phut IE but also towards the industrial sector overall. As a consequence of a multi-year fight led by Map Ta Phut locals and environmental activists, the Thai Central Administrative Court ordered to suspend 76 industrial projects in Map Ta Phut IE in 2009

worth about USD 9 billion in total, for their failure to comply with national legal requirements for environmental impact assessment (The online source for Thailand's sustainable development 2016, Hassarungsee and Kiatiprajuk 2010, Fuller 2009). Map Ta Phut was also declared a "Pollution Control Zone", which obliged the provincial government to investigate water and soil contamination in the region and come up with solutions. Persistent environmental problems and damages caused to local well-being in the Map Ta Phut area necessitated more systematic and substantive intervention by the national government to tackle these issues. It had also become more difficult for the Thai government to find sites for heavy industries, which amplified the necessity to find a fundamental solution that could achieve both environmental sustainability and economic growth.



## 03 Approach

Based on a joint study by the Office of National Economic and Social Development Board (NESDB) and Department of Industrial Works (DIW) of MoIn, the IEAT launched the EIE program in 2000 in cooperation with the German Technical Cooperation Agency (GIZ). It was a model inspired by the concept of industrial ecology which promotes the “3R” principles of “reduce, reuse, and recycle” for industrial waste and by-products. The project was implemented in five selected pilot locations of Map Ta Phut IE, Bang-poo IE, Northern Region IE, Eastern Seaboard IE, and Amata Nakorn IE, focusing on developing by-products, recycling, and clean production facilities. Despite good efforts by the government, the project ended in 2004 with few visible results and no succession plan, mostly due to lack of interest in the industrial sector as well as low awareness among relevant government officials themselves. Moreover, community stakeholders had limited trust in the EIE program or

understanding about mutual benefits to support continued program implementation (Panyathanakun, et al. 2012).

It was only after the Central Administrative Court's decision in 2009 to halt investment projects in Map Ta Phut IE that the Thai government turned its attention to promote EIE again. Although the ban was lifted for most of the suspended projects only a year later, it was the first time in Thailand that environmental concerns superseded national economic priorities. Learned from the Map Ta Phut experience, MoIn suggested a relaunch of EIE program in early 2010 with the concept expanded to a broader network of Eco-Industrial Town (EIT) construction. It was also intended to restore investor confidence which had been depressed by the 2009 court ruling as well as a series of incidents of political unrest since 2006 (Hariraksapitak 2010, Bangkok Post 2009, Fernquest 2011).

Figure 2. Three levels of Eco Industrial Transformation

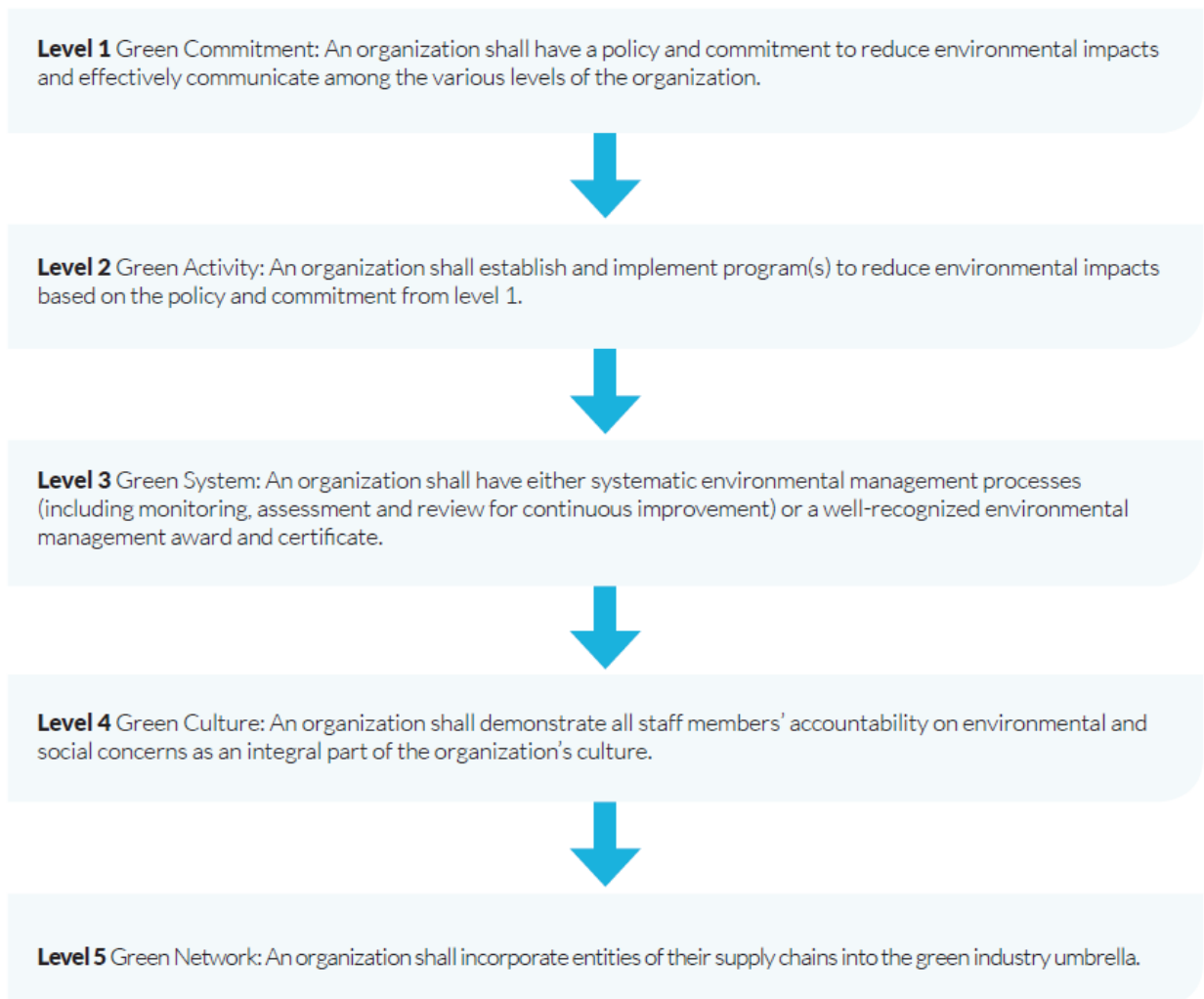


Source: (Pilouk 2015)

The new EIE program envisioned three levels of green industrial transformation: (1) Green Industry (GI) at a factory level; (2) Eco-Industrial Estate (EIE) at an IE level; and (3) ultimately, Eco-Industrial (EIT) at a community level. GI is an accreditation program for individual factories and companies which have shown commitment to or implemented green actions in their business operations, including their value chains. It was initially a separate program launched by MoIn in 2009 prior to the EIE program, aiming to promote environmentally sustainable and socially responsible activities by private businesses whether they are located within an IE or elsewhere (Ministry of Industry of Thailand 2013). The program has set five accreditation levels which companies can pursue to demonstrate the degree of sustainability of their

business (Figure 3). Some accreditation levels are linked to ISO certification managed by the Thai Management System Certification Institute, such as ISO 14001 (Environmental Management) and ISO 50001 (Energy Management) for level 3, and ISO 26000 for Corporate Social Responsibility (CSR) in level 4 (Ministry of Industry of Thailand 2013). Companies which pass certain criteria are granted the corresponding level of GI accreditation, and the government widely promotes these companies through various official channels. Accredited companies can also benefit from various financial support programs run by MoIn, as summarized in Table 1. MoIn published a manual for the GI program in 2011, specifying principles, accreditation criteria, and action guidelines for business applicants.

**Figure 3. Green Industry Certification Level**



Source: Green Industry information brochure (Ministry of Industry of Thailand n.d.)

**Table 1. Supporting programs for Green Industry certified companies**

Eligibility	Benefits	Responsible organization
<ul style="list-style-type: none"> <li>▪ Accredited for Environmental Management Standard (ISO 14001)</li> <li>▪ Accredited for Health and Safety Standard (OHSAS 18001)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Exemption of the annual fee for operational permit for 5 years</li> </ul>	<ul style="list-style-type: none"> <li>▪ Department of Industrial Works, Office of Permanent Secretary of Moln</li> </ul>
<ul style="list-style-type: none"> <li>▪ Reuse of industrial wastes to produce biogas</li> <li>▪ Use of waste heat for production</li> </ul>	<ul style="list-style-type: none"> <li>▪ Exemption of the annual operation permit fee for 5 years</li> </ul>	<ul style="list-style-type: none"> <li>▪ Department of Industrial Works of Moln</li> </ul>
<ul style="list-style-type: none"> <li>▪ Small and Medium Enterprises (SMEs)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Green Productivity Loan (soft loan)</li> </ul>	<ul style="list-style-type: none"> <li>▪ SMEs Bank</li> </ul>
<ul style="list-style-type: none"> <li>▪ Reduced number of audits for factories acquired Green industry certification for level 3 or above</li> </ul>	<ul style="list-style-type: none"> <li>▪ Relaxed auditing</li> </ul>	<ul style="list-style-type: none"> <li>▪ Department of Industrial Works, Office of Permanent Secretary of Moln</li> </ul>
<ul style="list-style-type: none"> <li>▪ Investment in an energy saving or a renewable energy business, or</li> <li>▪ Investment in a manufacturing business for environment friendly products</li> </ul>	<ul style="list-style-type: none"> <li>▪ Machine import duty exemption</li> <li>▪ Corporate income tax exemption for 8 years</li> <li>▪ Income tax exemption</li> </ul>	<ul style="list-style-type: none"> <li>▪ Board of Investment of Thailand</li> </ul>
<ul style="list-style-type: none"> <li>▪ Investment in energy saving facilities which utilizes an energy reduction technology or renewable energy, or minimizes environmental impacts</li> </ul>	<ul style="list-style-type: none"> <li>▪ Machine import duty exemption</li> <li>▪ Corporate income tax exemption for 3 years</li> <li>▪ Income tax exemption</li> </ul>	<ul style="list-style-type: none"> <li>▪ Board of Investment of Thailand</li> </ul>

Source: Translated from the Green Industry official website ([www.greenindustry.got.th](http://www.greenindustry.got.th))

The Thai Moln took up the GI program as a bottom-line strategy for ecological industrial transition at the relaunch of the EIE, with the ultimate goal of environmentally and economically sustainable town or city development, the EIT. Under this new arrangement, the EIT development was first tested in three pilot sites of the Bang Poo IE, the Northern Region IE, and the Eastern Seaboard IE for the initial phase of 2010-2014 (The Industrial Estate Authority of Thailand (IEAT) 2015). The first phase aimed to enlarge the number of EIT pilot sites to 15 by the end of 2014, with all of them having finalized their master plan and three of them completing implementation. Soon after the relaunch, the Thai Moln released a set of standards and evaluation criteria to guide EIT master plan development. The guidelines specified five categories—physical, economic, environmental, social, and managerial—for EIT certification, which were further segregated into

22 sub-categories and 45 indicators (Figure 3). The guidelines also set three different levels of EIT accreditation which are Eco Champion, Eco Excellency and World Class, depending on the degree of EIT development (Ministry of Industry of Thailand 2013).

In 2012, the EIT program gained a stronger impetus for implementation under the 11th National Economic and Social Development Plan (NESDP) of Thailand which announced 'Green Society' as a major national goal for the next five-year term (The Public Relations Department, Office of the Prime Minister of Thailand 2015). In the following year, the Thai Cabinet selected Samut Prakan, Samut Sakorn, Rayong, Prachinburi, Chachoengsao, and six other provinces as new pilot sites for EIT construction based on economic importance and potential indicated as Gross Provincial Product (GPP), and a budget of THB 60

million (UDS 1.7 million) was assigned for the first five provinces (Wongsamuth 2013).

Two other ministries were also brought in to support the EIT program: the Ministry of Natural Resources and Environment to refine environmental standards and the Ministry of Interior to support urban planning and waste management parts of EIT development.

The implementation of EIT on the ground usually starts with drafting a master plan for EIT

development in each location. Led by IEAT regional offices, brainstorming and consultation sessions are held among local community and government stakeholders to discuss the focus and the path of the EIT development in the respective region, and a draft EIT master plan is submitted to the Cabinet for final approval. In order to institutionalize public participation and stakeholder engagement in the program, IEAT made it compulsory to establish an Eco Team, a project

**Figure 3. EIE standards and evaluation criteria (Fuller 2009)**

**Goal: Pleasant and sustainable co-existence of industry and communities**

**Physical Aspect: Green use of land & development of environmentally safe and efficient public facilities and infrastructure**

- Green land-use planning for IE areas
- Eco-design for public facilities and green infrastructure development
- Green industrial buildings

**Economic Aspect: Facilitating growth of local and national economy**

- Economic growth of the industrial sector (Economic efficiency)
- Growth of local economies (Economic stability)
- Balanced economic growth of communities (Economic equity)

**Environmental Aspect: Efficient use of resources and energy in industrial production and in waste management systems & promotion of environmentally-friendly products**

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>• Resource &amp; material management</li> <li>• Energy management</li> <li>• Production process &amp; products</li> <li>• Water pollution</li> <li>• Air pollution</li> </ul> | <ul style="list-style-type: none"> <li>• Waste management</li> <li>• Complaints resolution</li> <li>• Safety &amp; health</li> <li>• Industrial symbiosis networks</li> </ul> |
|--|---|

**Management Aspect: Effective management of IEs focusing on collaboration and good governance for the benefits of all relevant stakeholders**

- Management by cooperation
- Enhancing audit of individual factories
- Promotion of international management standards (ISO series)
- Promotion of new technologies, systems and industrial innovation
- Public disclosure & reporting

Source: modified from (Pilouk 2015)

management working group in the local EIT agency, and stakeholders' consultation mechanisms such as Eco Network and Eco Forum for EIT accreditation. When it comes to financing the EIT program, approved master plans are primarily funded by both central and local government budgets. However, the EIT program itself does not offer any specific monetary

incentives or subsidies to participating companies, thus participation primarily relies on the companies' good will as well as social pressure for environmental and social performance. The Thai government is currently examining options for financial incentives and privileges, especially for SMEs.

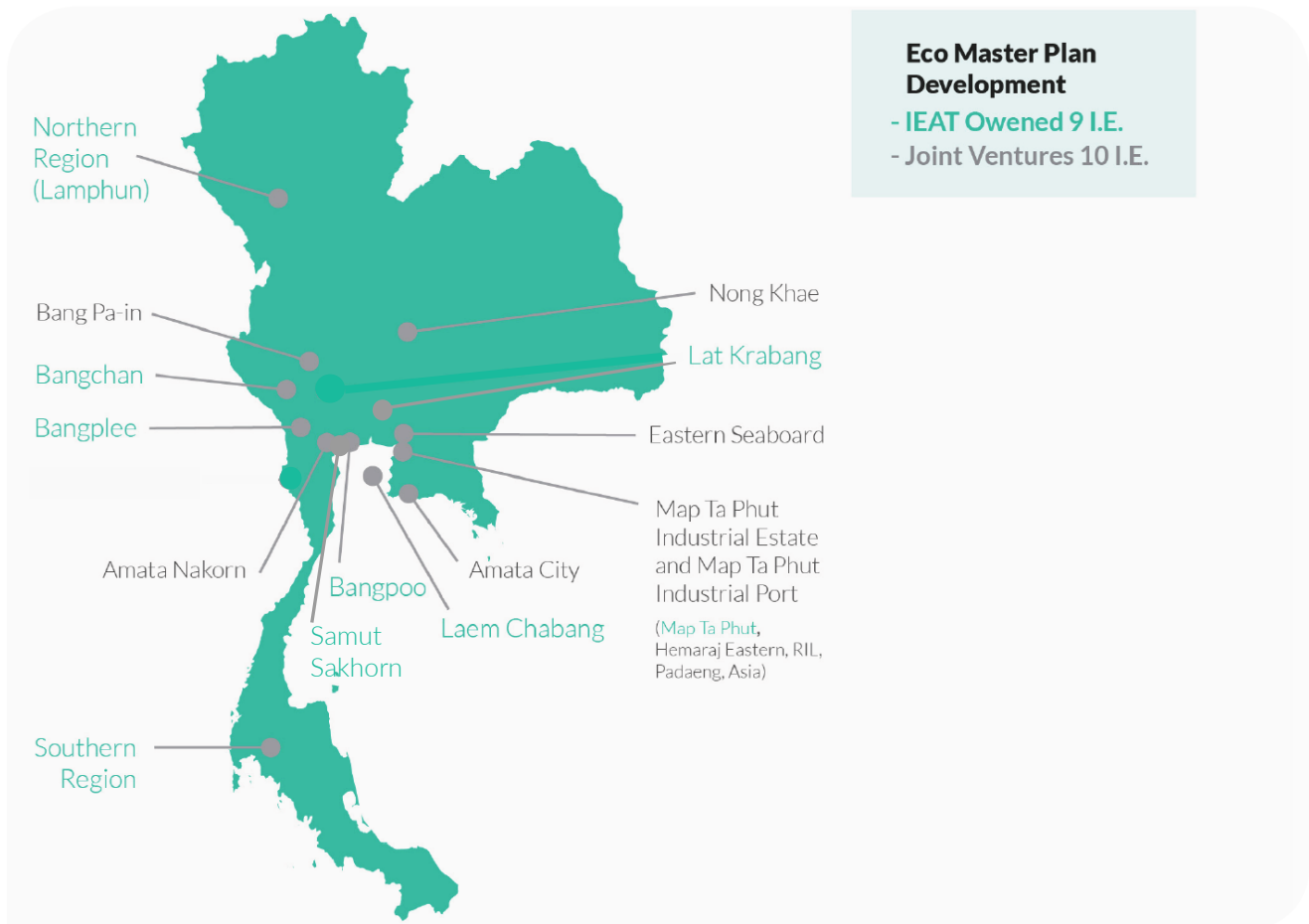
# 04 Outcomes

The EIT program is now in its second phase, starting in 2015. Phase II aims to transform all IEs into EITs by the end of 2019. However, political turmoil in the Thai government during 2013 and 2014 caused major delays in the program, affecting development or approval of EIT master plans for most of pilot IEs.

The implementation process resumed in early 2015, and it is now moving at a faster pace, buttressed by the Thai government’s strong commitment to green growth. As a result, EIT implementation master plans were completed in 19 IEs, and the Cabinet approved 16 of them as Eco Champion as of September 2015 (Pilouk 2015).

The GI program has also generated some meaningful outcomes despite the instability in the government. The accumulated number of GI accredited companies reached 25,510 in 2006, a significant jump from 1,080 companies in 2011 (Sibunruang 2016). Although the majority were still at level 1 and 2 certification, the number of companies accredited at level 3 and above also noticeably increased from 537 in 2011 to 3,979 in 2016 (Table 2). According to IEAT statistics (The Industrial Estate Authority of Thailand (IEAT 2015), only 2.6% of the total GI certified companies are located within IEs, and the rest are individual firms and factories outside IE areas.

**Figure 4. Status of EIT master plan development**



**Table 2. Number of Green Industry accredited firms**

Level	2011	2012	2013	2014	2015	2016	Total
1	316	1,172	4,407	5,637	4,328	809	16,669
2	227	705	1,733	764	986	447	4,862
3	507	603	882	659	730	384	3,765
4	30	20	1	42	7	100	30
5	-	-	-	5	8	1	14
<b>Total</b>	<b>1,050</b>	<b>2,510</b>	<b>7,042</b>	<b>7,066</b>	<b>6,094</b>	<b>1,648</b>	<b>25,410</b>

Source: Sibunruang (2016)

This outcome is actually considerably less than IEAT's original goal of 70,000 GI accredited companies by the end of 2014, which would cover 50% of the entire firms registered in Thailand. Nevertheless, it is worth noting that most of the companies are participating voluntarily without large-scale government subsidies. It demonstrates that being officially recognized as 'green' is starting to matter more to private companies as social and regulatory pressure for corporate responsibility grows.

Another important outcome of the EIT Phase I is enhanced involvement of local stakeholders in program development and implementation. As the EIT program implementation agency, IEAT carried out a number of activities to bring in not only local government authorities but also local communities and experts to the program starting at the planning phase, and numerous consultation meetings, workshops, and seminars were organized at the main EIT pilot sites. An example of this effort was the development of Eco Networks in IEs and industrial ports, whereby IEAT officials, industrial zone management authorities, private businesses, and community representatives have been brought together for information-sharing and capacity-building activities. According to IEA (The Industrial Estate Authority of Thailand (IEAT) 2015), more than 2,000 people participated in Eco Networks in 2015 alone, comprising 357 IEAT staff and 1,928 other non-governmental

stakeholders. It is particularly important that community and private stakeholder participation almost tripled in that year compared to the prior year. IEAT also established the first Eco Center in the Map Ta Phut IE in 2015, after conducting a study on the management of similar systems and support models in other countries. The Eco Center is designed to function as an on-site information-sharing and coordination vehicle of the IEAT for the EIT program. EIT development is incorporated in the current policy of the Prime Minister which forms the overarching national strategy of Thailand together with NESDP. The 12th NESDP released in 2016 also re-endorsed development of environmentally and socially sustainable economic zones as one of the main mid-term strategies for 2017-2021, demonstrating strong and sustainable backing for EIT implementation (Foreign Affairs Publisher 2016).

## 05 Lessons

One of the core strengths of Thailand's EIT program is the bottom-up and inclusive approach that MoIn promoted throughout the implementation process. MoIn placed a strong emphasis on engaging local governments as well as community and business stakeholders in both the planning and execution stages, based largely on lessons learned from the Map Ta Phut experience and the first EIE program outcomes. MoIn made a deliberate effort to enhance awareness about the program and its benefits among these local stakeholders, and involved them more substantively to increase their accountability for the program delivery in their own regions. Regular communication with various local actors through Eco Networks and other on-site consultation sessions succeeded in generating interests among these groups in the EIT program, and their participation consequently strengthened the legitimacy as well as the effectiveness of the program. Unlike before, public opinions were given priority consideration in proceeding EIT implementation on the ground, especially in shaping EIT master plans in participating regions.

Moreover, local governments were strongly encouraged to take more ownership over the EIT transition in their own region. They were requested to lead the development of an EIT implementation plan and the central government facilitated it by sponsoring the hiring of an expert for various field analyses. Guided by MoIn's EIT application instructions, provincial governments examined their social, economic, and environmental conditions and designed customized EIT implementation plans in line with their own needs, potential, and longer-term development strategies. Conferences, seminars, and workshops were

utilized to disseminate up-to-date information on the progress of the program at different locations as well as best practice examples from inside and outside the country, so as to enhance understanding and capacity of local participants, both from government and non-government sides in managing and delivering better results. Thanks to all these efforts, the EIT program obtained stronger buy-in from a broader range of stakeholders on the ground than any previous similar efforts by the Thai government. The program has become a platform where communities, industries, and government meet and work together towards mutual benefits, and it laid the groundwork for restoring trust among these parties.

Another strength of the Thai EIT program has been its pragmatic approach to EIT development. Countries like Japan, Korea, or Germany which have pioneered similar concepts for green industrial development usually emphasized macro-level construction of eco-towns or eco-industrial networks, involving large-scale infrastructure development. This kind of approach typically requires strong financial and human capacity in the national government for planning and execution, as well as active participation of the private sector to leverage financing. The Thai government, however, adopted a different approach which was more viable in their own context. There, the Ministry of Industry built on the previously existing GI and EIE programs to allow green industrial transition not only for entire industries but also for individual firms and industrial zones. This was particularly effective in the case of Thailand since private companies and some IEs could still pursue green transition in their business models even when government-led



macro-level EIT development was suspended due to political instabilities. It consequently enabled the continuity of Thailand's eco-industrial programs despite several gaps in the overall implementation processes.

In addition, the design of green certification systems made entry into each program by target groups relatively easy, thus facilitating uptake of the programs on the ground. The GI program, for example, offers five levels of certification for businesses implementing green activities, from more basic and easily implementable actions such as adoption of green policies to more sophisticated and integrated ones like greening the supply chain. Likewise, EIT also offers three levels of accreditation so that participating provinces and IEs can easily step into the program and progress towards more integrated EIT levels. By lowering barriers to entry, Thailand's green industrial certification programs could attract a large volume of voluntary participants, particularly private companies without much financial incentive.

On the other hand, there are a couple of weaknesses or challenges that the program needs to overcome to fully materialize its intended impact. Firstly, coordination and collaboration among relevant ministries and government agencies needs to be strengthened. EIT establishment requires extensive cooperation industrial development as well as environmental affairs, not only at the national level but also between national and sub-national governments. MoIn, with strong support from the Prime minister, has led the efforts to tighten inter-ministrial collaboration for EIT development (Royal Thai Government 2015).

However, a more integrated and systemized approach is required such as institutionalization of consultative mechanisms among relevant ministries and streamlining of supervision and decision-making systems. Division of roles and responsibilities among involved ministries also needs to be consolidated to ensure efficient and effective operation of the program.

Another area to improve for enhanced impact is monitoring and evaluation. Particularly, specific goals need to be developed for each area of environmental, social, and economic impact of the program, based on measurable and verifiable indicators. Currently, the goals are expressed only in terms of the number of IEs or provinces adopting the EIT program, which is insufficient to monitor and assess various impacts the EIT program brings about. The program also needs to develop both short and long term goals (outputs and impacts) to ensure consistency and sustainability in implementation actions especially in connection with national climate change and green growth targets, including Nationally Determined Contributions (NDCs) goals. Subsequently, more investment needs to be made in capacity-building of program management officials and developing relevant financial and regulatory infrastructure.

## Success Factors

- A strong emphasis by the Thai Ministry of Industry, the program management body, on engaging local communities and other stakeholders in the program planning and implementation
- The Central government's efforts to strengthen the ownership of local governments in Eco-Industrial Town development and promote community participation.
- Application of eco-transition at three different layers of an industrial community (Green Industry program for individual firms, Eco-Industrial Estate for industrial zones, and Eco-Industrial Town for communities) which facilitated uptake of each program as well as participation of business actors.
- Multiple levels of certification in Green Industry and Eco-Industrial Town accreditation program from basic to more integrated status, which lowers the access barrier to the programs.

## Impact

- Improved public sentiment towards the industrial sector and enhanced cooperation between communities and industrial zones for a shared goal of Eco-Industrial Town development.
- More companies adopting environmentally and socially responsible business operation mechanism as indicated in the increase in the Green Industry accredited firms

## Limitations and Challenges

- Lack of institutionalized coordination and cooperation among relevant ministries within the Thai government as well as unclear division of roles and responsibilities.
- Absence of specific and measurable goals on environmental, social, and economic impacts, especially in linkage with national climate change goals including NDCs.

# Further Information

Information on Eco Industrial Town, Department of Industrial Work of the Thai Ministry of Industry (in Thai): <http://ecocenter.diw.go.th/th/>.

Green Industry accreditation criteria and selection procedures: [http://www.greenindustry.go.th/documents/Brochure\\_Green\\_EN.pdf](http://www.greenindustry.go.th/documents/Brochure_Green_EN.pdf).

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