



For a resource-efficient low-carbon economy:  
**Sustainable Industrial  
Areas (SIA)**

GIZ Expertise and Services

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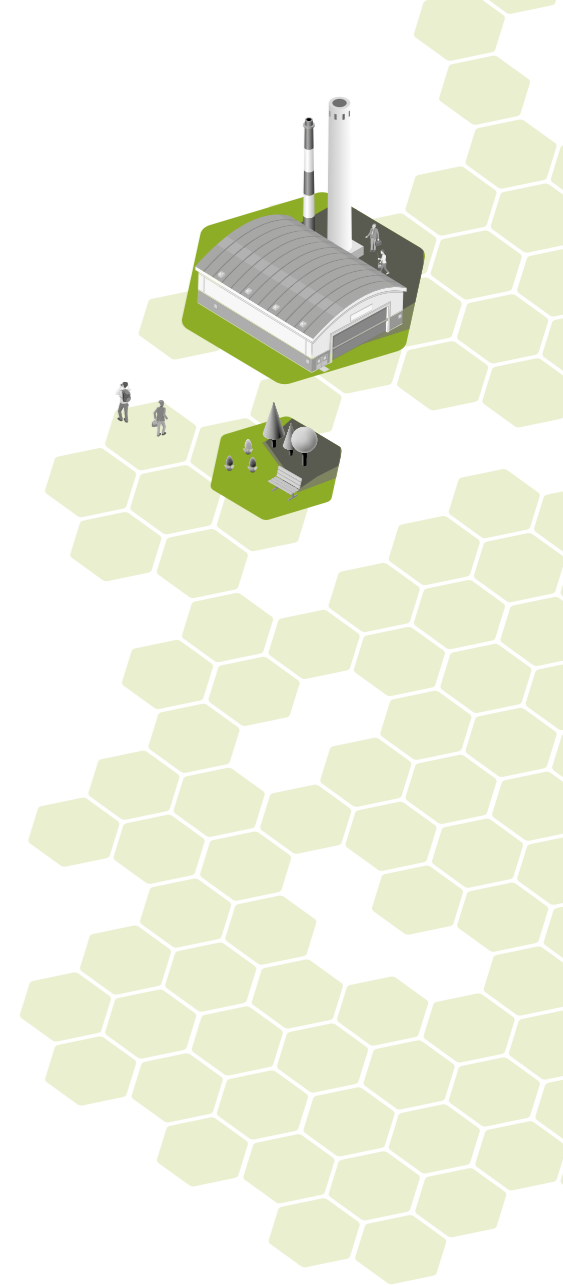
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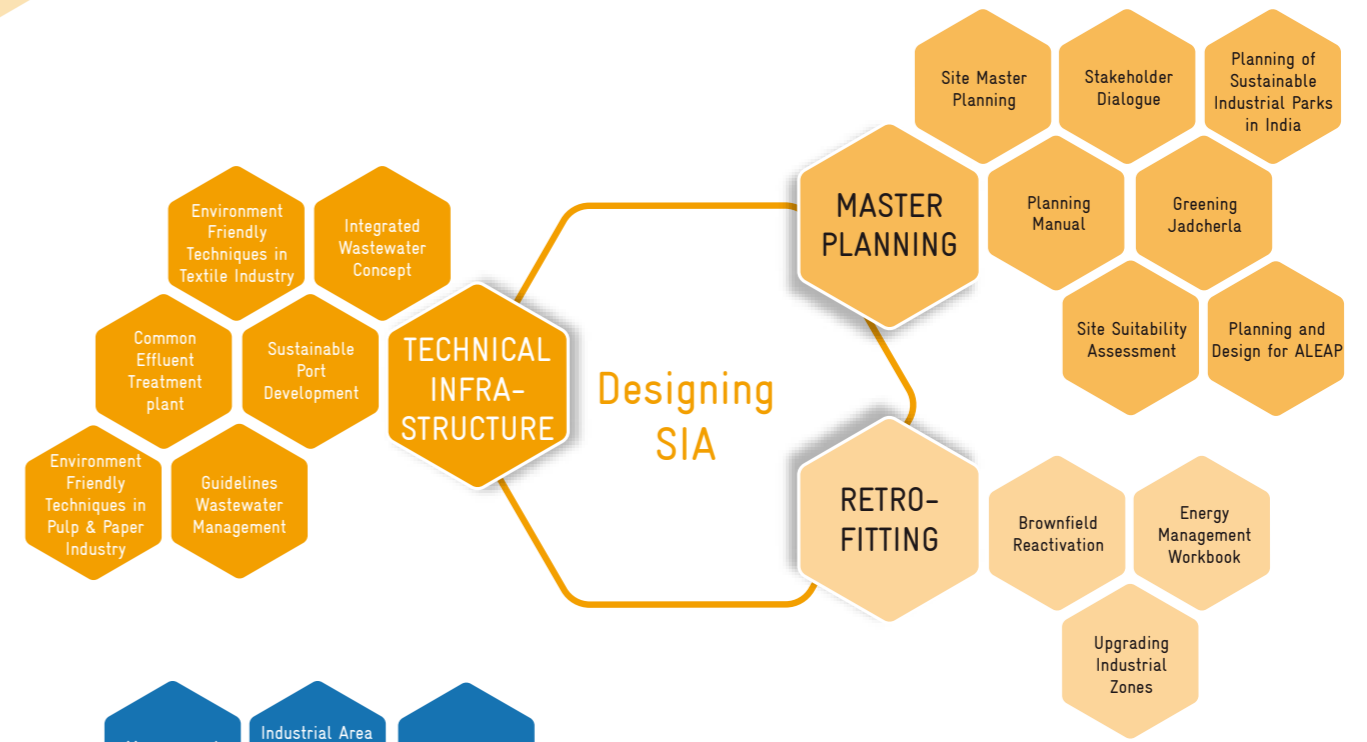
  
WORKING GROUP  
**SIA** Sustainable  
Industrial Areas



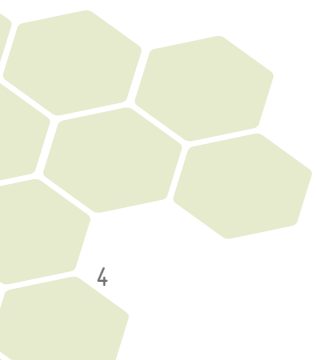
# Overview

The following figure shows the areas where GIZ is able to support and the available tools.

## Sustainable Industrial Areas | GIZ Service Offer



Introduction to Expertise
  Available Tools





# Introduction

Industrial areas are a motor of industrialisation and technology development worldwide. At the same time, they are often criticised as areas of extended resource consumption and environmental pollution.

The concept of “Sustainable Industrial Areas (SIA)” answers to this criticism by balancing economic, ecological and social aspects in industrial areas. This requires in particular management structures, which focus on resource and energy efficiency, environmental protection and social compatibility. While some governments and institutions primarily focus on Eco-Industrial Parks (EIP), GIZ regards the SIA approach to be more comprehensive, since it incorporates all three aspects of sustainability.

Already during the site selection process and master planning of the park it is important to create SIA friendly framework conditions. During operation guidance of the companies is necessary to meet the envisaged goals which are laid down in a common Sustainability Statement or Corporate Social Responsibility (CSR) Charter. This common code of conduct is developed for the entire park and should be compulsory for all companies. It demonstrates the high social responsibility and environmental consciousness of the park and its residential companies.

Ongoing environmental monitoring and risk management ensure smooth production processes and minimize possible negative impacts on environment and local communities. Additionally, an open flow of information and the creation of transparent structures lead to a high level of acceptance of the residents around the industrial area.

To address resource efficiency well-designed framework conditions and regulations have to be introduced to interlink companies inside the park and build up structures of a circular economy. The established networks for resource and energy efficiency form a symbiotic relationship with each other and ensure that materials (e.g. waste and by-products), waste heat and other types of energy as well as knowhow and technical innovations are exchanged. The joint use of service facilities for energy and water supply, waste and wastewater treatment, logistics and social care result in cost savings for the individual companies while securing a high level of service provision, site attractiveness and environmental standard.

The construction of industrial areas is one instrument of economic development strategies that enjoys great popularity in GIZ partner countries seeking for economic progress.

Thus, for the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH the concept of „Sustainable Industrial Areas“ represents an important element of its advice to partners in the industrial sector. For many years, projects addressing various aspects of sustainable industrial development and sustainable industrial areas have been carried out by GIZ in many countries and significant knowhow and experiences have been accumulated in the organisation. The representatives of SIA projects and experts involved have formed the GIZ SIA Working Group which, together with its partners worldwide, permanently works on further developing the SIA concept.

The present document intends to give an overview of GIZ’s expertise and service offer in the field of sustainable industrial areas and shall guide interested GIZ projects and their partner institutions in the use of the developed tools and materials.

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# 1. Introducing SIA



## 1.1. Analysis



### Outline

When starting to promote sustainable industrial development or to assist industrial parks in their various stages of development, it is important to understand the status quo of industrial areas in the country and the local political, economic, environmental and social framework conditions guiding SIA development. This requires an analysis/baseline study of the most important aspects. Ideally, this analysis has to be carried out in a participatory way involving all relevant stakeholders.

### Key elements

The following areas need to be investigated:

#### *Status quo of industrial areas:*

Depending on certain development parameter and respective policies, industrial areas are more or less similar in different countries. It is important to get an overview of the real situation before starting any activities. In this respect it is good to know how many industrial areas exist in the country, their location and regional distribution, their organisational and management structure and their thematic orientation. On national, provincial and local level it is important to understand the institutional and political responsibilities for industrial areas and the underlying development policies. Once, a general overview is achieved, an in-depth assessment of the political, economic, environmental and social framework conditions has to follow.

#### *Political framework conditions:*

As mentioned, industrial areas can either operate on national, provincial, municipal or in some case

cross-border level. Depending on their status it is therefore important to understand the national, provincial, municipal or transnational legislation for industrial development und industrial parks. This legislation will give information on the preferred setting of the park in respect to the addressed industry sector, the organisational setup and preferred management structure, the environmental and social limits and regulations to be observed. It also points out the fiscal and administrative support government institutions are willing to offer to develop the industrial area, and the instruments in place to monitor and supervise its operation. Relevant taxes, fees and incentives are important as well.

#### *Economic framework conditions:*

Industrial areas are established either to make use of an attractive business location (e.g. near important logistic hubs or markets, in an already existing industrial cluster) or in regions where the industrial zone shall initiate economic development in a still underdeveloped area. While in the first case the companies in the industrial area want to benefit from favourable business conditions, in the second case they may be attracted by interesting government incentives or tax exemptions. The availability of cheap and sufficient energy, water, raw materials and labour may be another reason to implement an industrial park. Moreover, some parks intend to attract foreign investors to stimulate local industry and technology development.

#### *Environmental framework conditions:*

A precondition for planning a sustainable industrial area is the exact analysis of the environmental situation. It starts with an analysis of the selected location considering amongst others issues of climate change risks. Its integration in the regional zoning and infrastructure, its former utilisation and envisaged consumption of arable land have to be studied. Moreover, its existing biodiversity and vulnerability to damage surface and groundwater resources and the existing risks for natural disasters need to be assessed. This data will give first

ideas about future impacts on the natural environment and the local community as well as required limits and preventive measures to minimise the risks. Analytical tools regulated by law need to be claimed and supported (e.g. Environmental Impact Assessment).

*Social framework conditions:*

Very often, industrial areas are surrounded by municipal areas where people are living and working. Implementing new industrial parks can have positive and negative impacts on the neighbourhood.

Positively, the park will generate jobs and income, offer education and training and may enhance also the cultural life. Negative impact such as traffic, noise, air and water pollution may increase due to the business and industrial activities of the park. When establishing a new industrial area, it is important to identify affected groups of stakeholders and organisations which represent them. Possibilities to enhance their participation in the planning, implementing and operating processes need to be offered.

**GIZ expertise**

GIZ and its partners developed several tools, guidelines and recommendations for investigating the framework conditions for establishing sustainable industrial areas.



• **Standard TOR**

For analysing the situation of industrial areas in a country and their political, economic, environmental and social framework conditions an assessment mission may be carried out. Respective TOR are needed to achieve a comprehensive view of the situation.



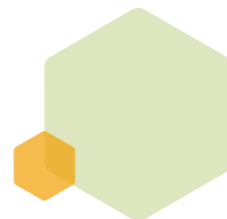
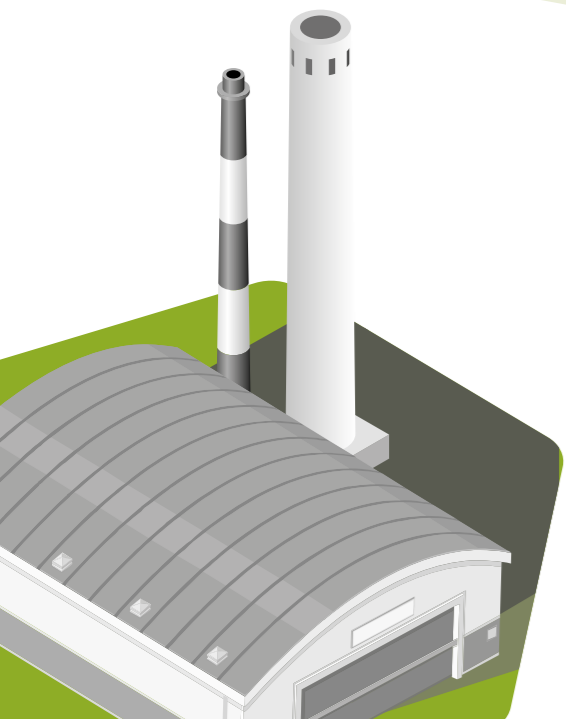
• **Baseline Analysis Tool**

A viable baseline of the given framework condition is an essential prerequisite for planning and implementing new or retrofitting old SIA. It helps to identify hot-spots for actions, permits to monitor the evolution of indicators and provides information for decision makers.



• **Guidelines for Regional Environmental Assessment**

The investigation of the environmental framework conditions are part of the analysis at the start of an industrial area project. The themes for developing State and District Environmental Atlases are listed for examples from India.



**1.2. Sensitisation**



**Outline**

In a conventional approach industrial areas and parks are regarded as a location where small and large industries accumulate. In providing land, basic utilities and sometimes incentives, industry is attracted to invest. The primary intention of the park's administration or developers is to sell or rent the available plots to interested companies. In the majority of cases, there is no plan or preferences regarding the type of company, industry sector or production process to be settled in the park.

Intending to establish sustainable industrial areas (SIA) the involved local administrations, park developers or park management units need to be sensitised regarding the new approach of the SIA concept which bases on a different management model. It requires the networking of companies to establish circular economy loops, the development of a common code of conduct in particular on environmental and social issues and a different mode of interaction with the local public.

**Key Elements**

*New management model:*

The administration or park management needs to develop a business like behaviour. When operating a sustainable industrial area a pro-active service orientation based on an intensive stakeholder dialogue and participation is required. In facilitating networks within the area, but also with neighbouring industry, energy and resource efficiency should increase. If conflicts evolve among the companies in the park or with the local municipality or population the management acts as moderator and mediator. The local community is permanently informed about the development of the park and community participation is enhanced. Strict monitoring of environmental, occupational health and safety issues as well as possible risks resulting from the industrial operations shall minimise negative impacts.

*Common Code of Conduct:*

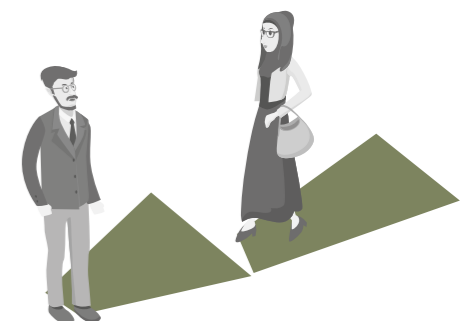
The industrial areas approach towards sustainability is laid down in a common Code of Conduct. This may be a "Sustainability Statement" or "Corporate Social Responsibility (CSR) Charter", which has to be monitored for example by Key Performance Indicators (KPI). In signing this document the companies of the park agree to comply with minimum requirements regarding cooperation of companies in the park, environmental protection, occupational health and safety standards, participation with local community and to obey given rules and regulations. Companies and management have to understand that this is not only a burden but also a convincing argument for marketing on a competitive market.

*Networking:*

Forming company networks inside and beyond the park premises result in symbiotic structures which have advantages for the individual company (access to knowhow, facilities, customers, raw material). This will also increase energy and resource efficiency of the entire park. New investors in the park are selected in a way that they fit into the existing supply or product chains or close gaps in circular economy loops. This requires a certain degree of transparency and trust among the companies for which they have to be sensitised.

*Transparency and community participation:*

Successful industrial areas need the acceptance of the local community, they are embedded in. This requires from the park management and the companies in the park to adopt certain transparency rules and the openness for community participation. The community in return needs to understand the benefits they receive from the industrial area and that its management does its best to minimise risks and negative impacts for the local population.



## GIZ expertise

To sensitise the various stakeholders for eco-(sustainable) industrial development and areas various instruments, tools and documents are available.

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• **EID-Toolbox**  
To give an overview about the various tools developed by GIZ and its partners in the field of eco (sustainable) industrial development, an EID-Toolbox was elaborated. An overview of selected EID Tools is available.
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• **Industropia – A Game about Sustainable Industrial Areas (SIA)**  
Industropia is a role game in which participants learn about sustainability aspects of industrial areas. The game simulates a situation in which different stakeholders of an industrial area come together to sketch a sustainability concept for retrofitting and enlargement of their site. The game is supplemented by the presence of investors which are looking for industrial areas to locate their businesses.
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• **Training: Eco-Industrial Parks (EIP) – Introducing Energy and Resource Efficiency to Industrial Production**  
The training was originally used to sensitise Chinese decision makers from governments and industrial parks for sustainable industrial development and energy and resource efficiency in industrial areas.
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• **Industrial Environmental Improvement Drive**  
The EID-tool Industrial Environmental Improvement Drive (IEID) shows how to raise environmental awareness amongst industries and their employees with different activities e.g. environmental rallies; expert talks and plantation drives etc. in a participatory way. One month long Industrial Environmental improvement drives have been carried out in India in the states of Telangana and Andhra Pradesh for a couple of years.
- 

• **Cleaner Production Clubs**  
Principles of cleaner production may be applied to processes, products and services with the objective to increase overall efficiency and reduce risks to humans and the environment. Cleaner Production Clubs (CPC) focus on the respective principles and are meant to sensitise participating companies for the basics of cleaner production. A manual for the implementation of cleaner production is available.
- 

• **Corporate Social Responsibility Toolkit**  
A sustainable industrial area needs a well-developed common Code of Conduct or CSR charter to develop a common understanding, enforce rules and regulations, enhance community relations, ease conflict potential, enable communal service providers or small businesses to meet industrial park requirements and supports the capacity building of local workforce.
- 

• **Pathway to Eco Industrial Development in India**  
Description and showcase how India sees its pathway to eco-industrial development
- 

• **Eco-Industrial Parks in Andhra Pradesh**  
The Government of Andhra Pradesh took a decision on its vision and objectives to transform the existing industrial parks into Eco-Industrial Parks and to ensure sustainable models for industrial growth in the state.

## 1.3. Standards



### Outline

Presently, in many parts of the world government institution and industry representatives are discussing standards for sustainable (eco-) industrial areas. While governments want to guide their national industrial development towards sustainability, park operators and company representatives regard the standardisation process as a good instrument to increase the efficiency of their production, to lower the costs and to enhance their reputation.

Guidelines and standards of sustainable industrial areas focus primarily on the management level of the park. They intend to guide the parks as a whole to become sustainable and are less dealing with the individual companies. The environmental friendliness or performance of companies in the park is assumed to be guided by the respective sector or company related guidelines or standards. Nevertheless, a sustainable framework on park level of course will initiate and promote positive changes on company level.

### Key Elements

#### *Good Practices for Sustainability Standards:*

There are various ways of increasing and measuring the sustainability performance of industrial areas. If a standard is taken into consideration, certain rules and aspects need to be followed. Otherwise the claim of the standard itself or of a possible certification is not credible. The organisation ISEAL Alliance is committed to sustainability standards and gives worldwide accepted guidance on the issue. ISEAL published for example a “Code of Good Practice for Setting Social and Environmental Standards” which defines effective standard-setting processes, thereby increasing the credibility of the resulting standard. Also, the ISEAL Credibility Principles set the framework for trustworthy standard practices.

#### *Sustainability Standards for Industrial Areas:*

A number of approaches have been made to define standards, guidelines and indicators for SIA or EIP in various parts of the world:

### Germany

- DGNB Standards for individual buildings and entire (industrial) quarters

The DGNB standards define quality levels for environmental, economic and technical performance. Amongst other the site suitability, socio-cultural factors and processes are assessed. Eco-friendly solutions like renewable energy sources, energy efficient material and uses, waste-water management, local food production, permaculture or symbiotic solutions are considered while planning.

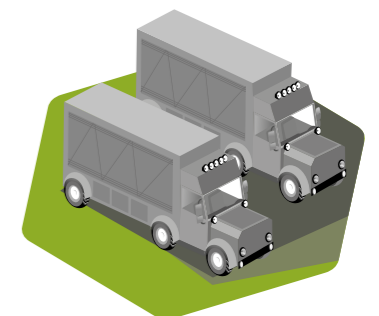
The DGNB offers a certification for “Industrial Locations” (Industrial Areas).

- Kaiserslautern University Pilot Project

The Kaiserslautern University of Technology conducted a pilot project to identify the potential for a sustainable development of industrial areas in Rhineland-Palatinate in 2011. During this study, requirements which need to be fulfilled by the parks, as well as indicators to evaluate the progress in the different sectors have been identified. Different aspects of sustainability stated in international, national and regional policies were aggregated and characterized according to their relevance to the three dimensions of Sustainable Development (SD). The recommendations have the character of a pilot project.

- GIZ SIA Guidelines

GIZ and its SIA Working Group are very active in developing guidelines for sustainable industrial areas and intend to stimulate a worldwide standards setting process. The GIZ SIA Guidelines shall give orientation when establishing sustainable industrial parks or developing a legal framework for sustainable industrial area development. The structure of the GIZ Guidelines for sustainable industrial areas is based on the following four features – organisational features, economic and infrastructure features, environmental features and social features.



## Europe

- ECOSIND: Rating system based on the principles of EID

The EU-funded ECOSIND project has developed an elaborated approach towards a rating system for industrial parks. The initiative is implemented by the Ministry of Environment and Housing of the Catalan government. It also includes two regional Italian governments, i.e. Abruzzo and ARPAT (Agenzia Regionale per la protezione ambientale della Toscana) as well as the regional Peloponnese government in Greece. ECOSIND intended to lay the foundations of a new strategy fostering sustainable industrial development in Southern Europe. Industrial symbiosis and industrial ecology are key concepts in its attempt to surpass economic, social and environmental limits that impact the overall industrial production.

- HQE (High Quality Environmental standard)

The Haute Qualité Environnementale or HQE (High Quality Environmental standard) is a standard for green building in France, based on the principles of sustainable development. The standard is controlled by the Paris-based Association pour la Haute Qualité Environnementale (ASSOHQE). The certification is awarded to building construction and management as well as urban planning projects. The standard is a process quality standard similar to ISO 9000 or 14000 series. The standard specifies criteria for managing the impacts on the outdoor environment (e.g. minimizing energy use, water use and waste) and creating a pleasant indoor environment (different control mechanisms). HQE certifies buildings of different utilisations and urban areas, but is not specialised in industrial areas.

## Asia

- Chinese Standard for EIPs

In 2006 the Chinese Environmental State Agency (SEPA) developed a comprehensive guidance, which describes the concept of EIP as well as criteria and indicators for successful EIP projects. It was the first national standard to guide EIPs in the world. SEPA's programme's general objective is to encourage, manage, and monitor EIP projects by setting up criteria and indicators. According to its definition, the difference between an EIP and a traditional industrial park is the emphasis on establishing a park-wide

network of industrial symbiosis composed of varied industries. Characteristics of these networks are by-products exchange, water and energy cascading, and information sharing among firms. This is supposed to promote the principles of cleaner production, industrial ecology and a circular economy.

- Indian Green Building Council (IGBC)

For Indian industrial parks a Green Rating System has been developed by the Indian Green Building Council (IGBC). The IGBC Green SEZ Rating System is an extension of the Green SEZ guidelines, which were prepared in cooperation with the Ministry of Commerce and Industry. It encourages projects to exceed the requirements of well-established codes and standards. In addition, appropriate international benchmarks have been considered wherever local or national standards were not available.

## Latin America

Presently, only few attempts have been made to develop and test standards in Latin America in particular in Brazil<sup>1</sup>, Colombia and Puerto Rico<sup>2</sup>.

In Mexico, the Mexican Federal Attorney for Environmental Protection (PROFEPA) is responsible, that the industry and production in Mexico comply with the current environmental regulations and laws. The program of the PROFEPA<sup>3</sup> aims to identify, assess and control industrial processes which may cause pollution to the environment. The programme consists of a systematic and comprehensive review of the company's procedures and practices. The goal is to detect potential risk and to give necessary preventive and corrective recommendations. All industrial parks are formally incorporated into the National Environmental Audit Programme through a Collaboration Agreement signed in 2009 between PROFEPA and the Mexican Association of Industrial Parks (AMPIP). They also created a "Clean Park Label" to be awarded to industrial estates, offering two types of certifications: the "Certificate of Environmental Quality" and the "Clean Company Certificate".

<sup>1</sup> Elabras Veiga, L. B. & Magrini, A. (2009): *Eco-industrial park development in Rio de Janeiro, Brazil: a tool for sustainable development*. *Journal of Cleaner Production*, vol. 17, pp. 653-661

<sup>2</sup> Monroy, N. & Ramirez, D. (2004): *¿Parques Industriales Ecoeficientes en Bogotá: Luna Alternativa Ambiental, Económica y Social?* *Revista de Ingeniería*, Issue 19

<sup>3</sup> [http://www.profepe.gob.mx/innovaportal/v/26/1/mx/programa\\_nacional\\_de\\_auditoria\\_ambiental.html](http://www.profepe.gob.mx/innovaportal/v/26/1/mx/programa_nacional_de_auditoria_ambiental.html)

## Worldwide

An excellent overview of eco-(innovation) parks of the world was gained by a study carried out by Guillaume Massard et.al. from SOFIES, Switzerland on behalf of the European Research Area Network on Eco-innovation (ERA-NET ECO-

INNOVERA) and the Swiss Federal Office for the Environment (FOEN) in 2013/14. This study shows the guidelines and indicators which govern the various parks.

### GIZ expertise



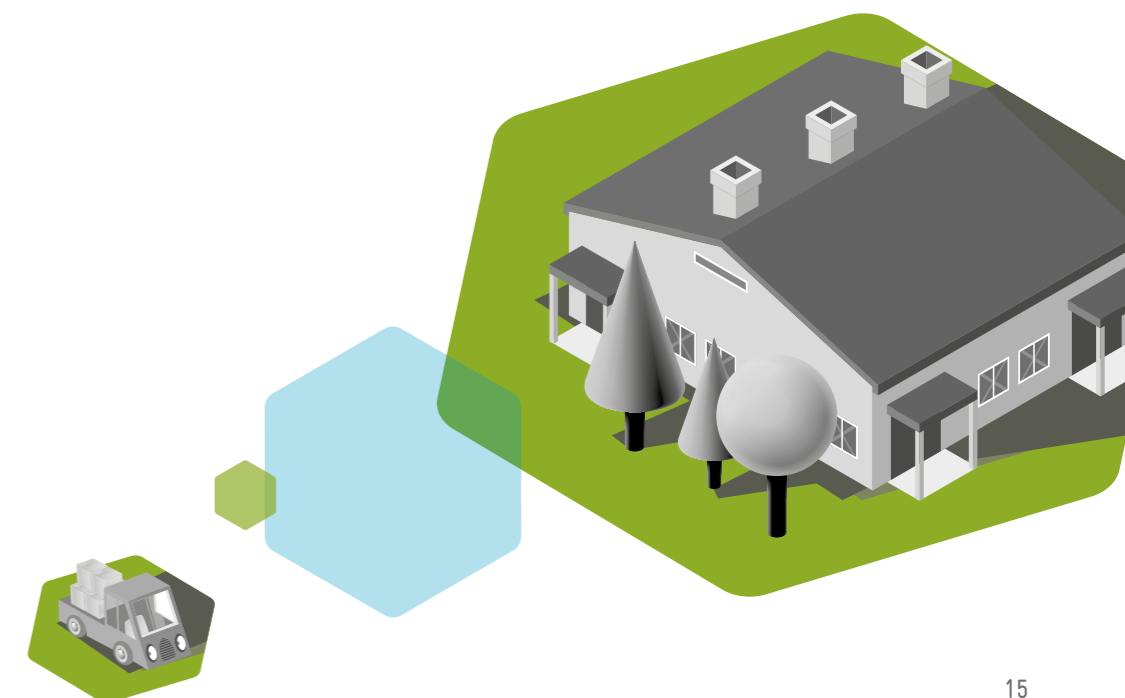
#### • GIZ SIA Guidelines

Trying to coordinate the worldwide effort to develop standards for SIA, GIZ in particular gained significant experiences in formulating SIA Guidelines covering organisational, economic and infrastructural, environmental and social elements of sustainable industrial areas.



#### • CSR Toolkit

A well-developed CSR charter sets standards for working together of all stakeholders in the parks on the basis of common understanding, rules and regulations.





## 2. Designing Sustainable Industrial Areas



### 2.1. Master Planning

#### Outline

A good planning process is one cornerstone of a sustainable industrial area. This applies equally to both, new-planned industrial parks and old ones that need to be retrofitted. Ideally, sustainability criteria are included right from the start during the site master planning and of course during all following planning steps. Not only the situation at the moment of initiating the planning process of a new park needs to be considered, but also the potential future development of the park. This needs a clear park concept from the beginning. Besides considering economic and environmental aspects, social participation within the park and between the park and the local community is crucial for an industrial park to be successful. Therefore, stakeholder participation needs to be included already during the planning steps.

#### Key elements

Based on a clear development concept (size and type of the industrial area, type of industry sector, envisaged mix of companies, service facilities needed, needs for environmental protection, required social facilities, etc.) master planning needs to address the following issues:

##### *Integration of park in surrounding infrastructure:*

Since a park has to be supplied with raw materials and the produced goods need to be transported to the customers, accessibility of the area and its connection to surrounding infrastructure is essential. Good access is also important for the commuting employees and workers. Master planning must therefore secure a good connection to the local goods and passenger transport systems as well as the energy supply and communication system.

##### *Efficient land use planning:*

During master planning the existing land use planning of the region needs to be considered and interlinked with land use planning inside the industrial area. While using the available space in a sensible manner (minimising needs for extensive levelling), the relation between buildings and green open spaces is important. To cater for the needs of the industry but also reserve contiguous space for the improvement of microclimate, the protection of biodiversity and the recreation of

people working onsite, it is important that land is used efficiently.

##### *Planning of park infrastructure:*

The infrastructure of a park comprises of roads capable to accommodate the foreseeable development of traffic as well as bicycle and pedestrian infrastructure, access points and parking areas to manage the stationary traffic. Apart from the general road transport system, the entire logistics of goods entering or leaving the park has to be planned. This needs also entry points like harbours, train terminals, warehouses or other types of logistic hubs, transport facilities like pipelines for gases and liquids, conveyor belts for bulk material and respective storage, loading and pumping facilities. The provision of the telecommunication infrastructure (telephone, internet, high speed telecommunication cables, etc.) must also be included into master planning as well as the social infrastructure.

##### *Planning of energy supply:*

Energy supply and distribution needs to be based on an integrated system of incoming energy from outside the park and energy generation including utilisation of waste energy and renewable energies in the park. This requires an integrated electricity, gas and steam distribution network and respective energy generation, conversion and distribution facilities.

##### *Planning of water supply, waste and wastewater treatment facilities:*

Responding to the different demands for drinking and process water needed by the companies in the industrial area, several water qualities must be offered, ideally in a cascading way based on re-use concepts to save water. During master planning the required infrastructure and facilities to provide drinking and process water, and to collect and treat wastewater must be taken into account. Possibilities for rainwater harvesting could also be part of the water provision and distribution planning. Infrastructure and facilities for waste collection, transport and treatment as well as waste-to-energy plants are part of master planning too.


##### *Planning of environmental, emergency and social facilities:*


To protect the environment and to prepare for production related risks and natural disasters the parks needs respective automated monitoring systems, online reporting and supervision centres and emergency response units like fire brigades and rescue facilities. For employees and residents in the park master planning should foresee the provision of housing, shopping, education, health, sports and other recreational facilities.


## GIZ expertise

There are various experiences, tools and documents on site master planning available which have been developed by GIZ and its partners.


- 


• **Site Suitability Assessment**  
Industries, and especially industrial parks, have an impact on the environment. For siting of industries, both the economic factors, such as availability of raw materials, market for finished products, transportation networks, water supply, electricity, labour availability etc., and the environmental factors need to be considered. Guidelines for siting industrial areas are available.
- 


• **Planning of Sustainable Industrial Parks in India**  
The GIZ project Indo-German Environment Partnership Programme has far-reaching know-how of planning sustainable industrial areas. A compendium brings together the expertise on planning industrial areas in India and improving their sustainability. Detailed information is provided about the criteria that were used to increase environmental, technical, economic and social quality.
- 

• **Planning and Design for ALEAP**  
Under IGEP Programme, GIZ provided technical support to the Association of Lady Entrepreneurs of Andhra Pradesh (ALEAP) for site master planning of the Green Industrial Park (GRIP) project at Nandigama catering to women entrepreneurs. Several aspects of environment sustainability, entrepreneurship opportunities and gender aspects were integrated into the planning of the industrial park using the benchmarks set by the German Sustainable Building Council (DGNB). The site master plan achieved potential 'Gold' rating in preliminary assessment from DGNB Auditors.
- 

• **Greening Jadcherla**  
Under IGEP Programme, GIZ provided technical support to the Telangana State Industrial Infrastructure Corporation (TSIIC) for site master planning of the Green Industrial Park (GRIP) project at Jadcherla. This encompassed an in-depth study of partially developed GIP Jadcherla and strategy to make it 'Green; through replanning and provision of necessary infrastructure. Various thematic maps were generated pragmatically for showcasing the zoning, optimal land use, hierarchical circulation pattern, environmental infrastructure, technical infrastructure as well as social infrastructure. The site master plan achieved potential 'Silver' rating in preliminary assessment from DGNB Auditors.
- 

• **Site Master Planning**  
Site master planning is an important step to secure sustainability at a later stage. It includes site suitability assessment, zoning / plotting of the site based on the pollution potential of industries, restrictions on certain types of polluting industries, planning of common environmental infrastructure and utilities for recycling / reuse of waste water, solar energy usage, plantation / green buffers etc. An overview of international approaches in master planning of industrial parks is available.
- 

• **Manual for Planning New Industrial Parks and Retrofitting Existing Ones (French)**  
This manual is highlighting the Tunisian experiences with regard to developing industrial areas.
- 

• **Industrial Area Information Management System (IAIMS)**  
Already during master planning, an industrial area information management system needs to be implemented. The technical data is stored in a database (Industrial Area Information Management System) which is related to a Geographical Information System (GIS).
- 

• **Stakeholder Dialogue**  
Information gathering for master planning should be carried out in a participatory way. A suitable instrument is the stakeholder dialogue. Stakeholder dialogues (SD) are used to moderate a discussion between relevant public and private stakeholders (examples from Indonesia, Tunisia are available).

## 2.2. Technical Infrastructure

### Outline

Operators (management companies) of industrial sites often tend to restrict themselves to the building of roads and the provision of energy and water. To foster sustainability a wider approach is necessary which comprises all aspects of infrastructure and logistics, supply of energy, water and goods, collection and treatment of effluents and waste as well as provision of communication networks and social services. Depending on the local framework conditions and the business concept of the park management, individual services can be tendered to sub-contractors supervised and monitored by the park management.

### Key elements

#### *Infrastructure for passenger and goods transport:*

A sustainable infrastructure provision is based on a well-designed site master plan, which includes roads capable to accommodate the foreseeable development of traffic as well as bicycle and pedestrian infrastructure, access points and parking areas to manage the stationary traffic. Apart from the general road transport, the entire logistic of goods entering or leaving the park has to be taken care of. This includes the management of entry points like harbours, train terminals, warehouses or other types of logistic hubs, transport facilities like pipelines for gases and liquids, conveyor belts for bulk material and respective storage, loading and pumping facilities. To assure reliable, safe, comfortable and affordable commuting towards and within the industrial area an efficient passenger transport system is required. It should consider all means of transport (pedestrian, bicycle, scooter, car, bus, tram, metro), but from the ecological point of view, it should give priority to public mass transport systems (bus, tram, metro).

#### *Provision of energy:*

Energy supply and distribution needs to be based on an integrated system of incoming energy from outside the park and energy generation including utilisation of waste energy in the park. The management company has various options to supply energy to its customers at favourable prizes. It may buy energy in large quantities from external suppliers or generate energy internally from conventional fuels, renewable energy sources and waste or

utilise waste energy, heat and steam coming from the resident companies. This requires of course an integrated electricity, gas and steam distribution network operated by a single entity, ideally the management unit itself.

#### *Provision of water:*

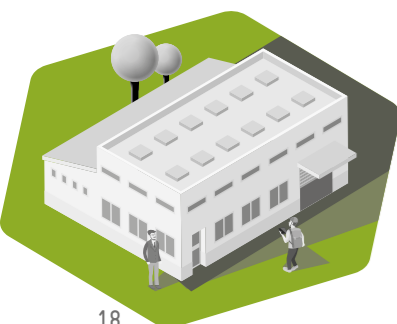
The scarce resource "water" should be addressed in a holistic water and wastewater management approach. Responding to the different demands for drinking and process water needed by the companies in the industrial area, several water qualities must be offered, ideally in a cascading way based on re-use concepts to save water. An analysis of the water distribution system forms the basis for identifying the requirements of the industry and existing water saving potentials. Advice and support to reduce water consumption and reuse wastewater is given to companies to raise awareness in the industry. Rainwater harvesting should be practiced on park facilities, and the collected water should be made available (after conditioning) to the companies for production purposes.

#### *Surface and wastewater management:*

Generally, measures have to be introduced to prevent wastewater generation and to reuse wastewater (after treatment) as best as possible before disposal options are considered. Due to the different levels of contamination wastewater treatment needs to be accommodated to the releasing industries as well as to the requirements of the companies reusing wastewater. Companies that generate intensively polluted wastewater need to install a pre-treatment facility before they are allowed to discharge their wastewater into the common sewer. Wastewater of the common sewer is treated in common effluent plants. A good functioning wastewater and surface water system needs clean and proper designed drains. Depending on the magnitude of expected rainfalls it might be advisable to separate the surface water from the industrial wastewater to not overload the effluent plants.

#### *Waste collection, treatment and disposal:*

Waste management in sustainable industrial areas should follow the principles of the waste management hierarchy which gives avoidance of waste, reuse, recycling and conversion into energy priority to incineration and disposal. In order to set up such a system, the park management needs to offer advice on how to prevent, minimise and separate the waste within the companies. Furthermore, it provides joint service facilities at park level for the collection, treatment, recycling and disposal of the different types of waste including those which are



hazardous. To design an appropriate waste management system the waste flows in the park have to be analysed. For those waste components which are considered a resource ecological and economic sound solutions have to be offered to use these resources within the area (e.g. within networks of industrial symbiosis or loops of circular economy) or to market them as secondary raw material.

#### *Social infrastructure:*

Basic social infrastructure should cover catering, small shops or kiosks and communication facilities. Especially for risky work conditions adequate medical services are necessary. Educational and

training institutions specialised to train apprentices and employees of the industry sectors settled in the park are very important and may be one key success factor. If many workers live with their families close to or on the premises of the park, the question of schools for children needs to be addressed. Adequate child care facilities are required, in particular to enable mothers to work. If the park is regarded a development zone, the basic facilities need to be complemented by further shopping and banking facilities as well as recreational and sports facilities. In providing a cultural infrastructure (e.g. cinema, cultural events, and congregation space) the areas can play an important societal role.

### GIZ expertise

GIZ expertise on technical installations of sustainable industrial areas is based on the following documents.

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• **Integrated Wastewater Concept for Industrial Parks (German)**  
For the industrial area Tra Noc in the City of Can Tho in the Mekong-Delta, Vietnam an integrated waste water management concept was developed.
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• **Guidelines for Wastewater Management**  
This guideline intends to assist industrial estates and locations in managing wastewater. It also provides the laws that govern wastewater generation and presents the regulatory requirements that should be undertaken to ensure compliance with the Philippine Clean Water Act.
- 

• **Common Effluent Treatment Plants**  
Common effluent collection and treatment systems in industrial parks are often either not existing, dysfunctional or not functioning properly in many developing countries. The causes are diverse and have to be thoroughly examined from case to case. This tool kit comprises a collection of tools and common weak points compiled, developed and employed in the Philippines. Experiences from India regarding the construction of a common effluent treatment plant in the industrial areas of Mallapur and Nacharam is also available.
- 

• **Sustainable Port Development**  
The sustainable port development programme in the ASEAN region assists to shift the emphasis from mere reactive complying with minimum standards to a pro-active approach to achieve quality and sustainability in safety, health and environmental (SHE) management.
- 

• **Environment Friendly Techniques in Textile Industry**  
Textile manufacturing processes are resource intensive from the preparation of fibre, dying to the fabrication of the end product. In a pilot work in the Indian state of Gujarat the textile sector was assessed regarding potential to reduce resource consumption and negative impact from the sector to the environment. A report summarising the approach and illustration case examples from the pilot implementation is available.
- 

• **Environment Friendly Techniques in Pulp and Paper Industry**  
The pulp and paper industry has a big potential to reduce resource consumption and thus to contribute to a more sustainable way of production. In the frame of the Indo-German Environment Partnership Programme (IGEP) studies were conducted in the state of Gujarat that analysed the potential to reduce resource consumption through environmental friendly techniques. A report with a technical part and case examples from the pilots is available.

## 2.3. Retrofitting



### Outline

Many existing industrial areas which have been established years ago were planned and implemented without any sustainability considerations. Some of them developed organically without a proper planning at all. Old industrial areas are often too densely constructed without an adequate infrastructure and sufficient open green spaces. They have no proper or only an inappropriate sewage and waste collection system, and no facilities for wastewater treatment. The electricity lines are too weak to cater for more, and more workshops and production sites and public transport in the area are insufficient for a growing number of workers and employees. The results are environmental pollution, bad working and living conditions and growing conflicts with neighbouring communities.

### Key elements

To introduce sustainability issues properly planned retrofitting measures have to be implemented which address the following areas:

#### *Improving infrastructure:*

Improving the infrastructure can make already a great difference to the previous situation. Traffic ways should be refurbished and small pathways paved. Open sewage drains which are often filled with waste need to be cleaned, repaired and covered. Regular maintenance and a gradual implementation of an underground sewage system should make sure that surface and wastewater is managed properly. The sewage of the park should either be fed into the communal sewage system or treated in a central wastewater treatment plant at the periphery of the industrial area. Scattered waste and informal waste dumps need to be removed and a reliable waste collection system introduced.

#### *“Greening” of park:*

The planting of trees and other native plants as well as measures to re-naturalise vacant plots, unused areas and road sites are able to improve microclimate, air quality, biodiversity and the general appearance of the industrial area. If space is available, small parks or leisure areas should be implemented for recreational purposes. If companies leave the park their plots may be used to create green spaces, while other companies are asked to improve their own plots accordingly. If the climate allows, roof gardens or roof greening could be established on large factory buildings.

#### *Introduction of renewable energy and waste energy use:*

Wherever possible renewable energy generation and use should be promoted, e.g. for street lighting, lighting of public and recreational places and other public facilities. Companies in the industrial area should be encouraged to use their roofs for solar energy generation. This needs energy storage facilities or an electricity grid that is able to accept and reward energy from solar panels. The possibilities of using waste energy should be examined as well as in particular the exchange of heat or steam if the park is able to interlink energy generators and users.



*Improving security in the park:*

Security in industrial areas is often a problem, in particular during night. Good street lighting, the installation of a camera observation network and security personnel patrolling through the industrial area can improve the situation. In addition it makes sense to have entry and exit point with access control. It helps to prevent burglary and reduce further security threats to the park. A safe and reliable public transport system is also an important safety element. If travelling outside of the industrial area during night is not safe, possibility to stay overnight, in particular for female employees, should be made available.

*Improving the park management:*

Retrofitting of existing industrial areas is not only a technical but also a management issue and needs the change of the management's attitude. A management that becomes pro-active and service oriented is needed. The required retrofitting plans have to be developed in a participatory way, involving all relevant stakeholders. After implementation permanent monitoring of the gained

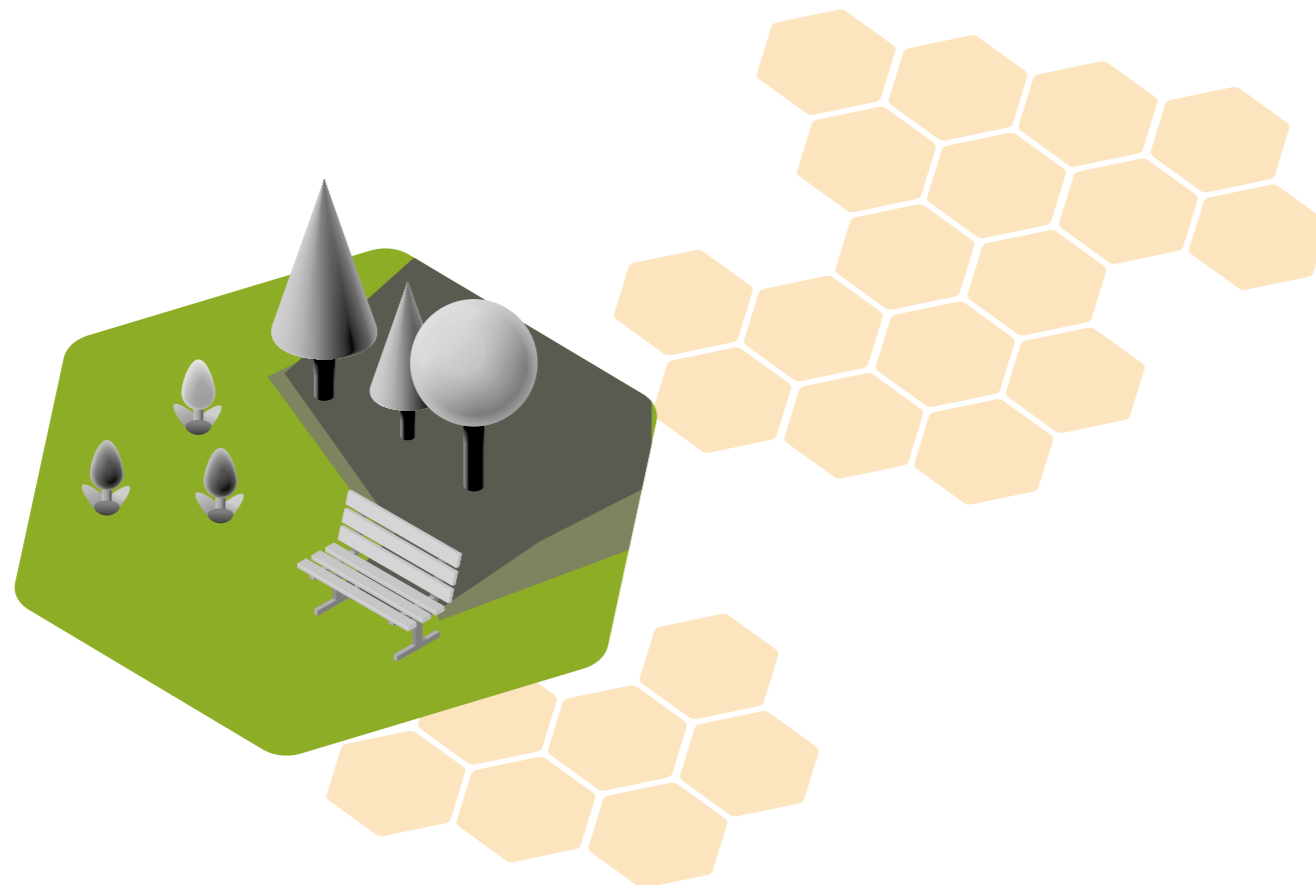
achievements is required to make them lasting and to identify possibilities of further improvement.

*Changing the attitude of the companies in the park:*

Retrofitting of existing industrial areas needs the mobilisation of the majority of resident companies. The companies have to agree on certain standards they want to achieve and a common Code of Conduct (e.g. CSR Charter) needs to be formulated. The charter will set rules for networking and cooperation in the park, energy and resource efficiency, environmental protection, occupational health and safety as well as park security. Management shall be given the permission to monitor and enforce the set rules.

*Participation of local community:*

To increase acceptance of the industrial area among the local community, transparency measures have to be introduced. While information is provided on the planned and implemented retrofitting measures, an ongoing participation of the population is secured for any further development of the industrial area.



**GIZ expertise**

Experiences of GIZ for retrofitting industrial areas or reactivating former industrial land are given in the following documents:

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• **Reactivation of Derelict Industrial Sites**  
The tool refers to methodology/guidelines to reactivate Brownfields for industrial development. Investors looking for real estate should benefit from a shorter process for planning and locating their businesses compared to setting up on Greenfields.
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• **Upgrading of Industrial Zones (French)**  
In Tunisia, GIZ assisted industrial zones to improve management and infrastructure of the zones. A triad approach has been chosen in Tunisia. A manual for planning new industrial parks and retrofitting existing ones has been developed, giving guidance in the planning process to consider and integrate as many elements of sustainability as possible. A second action field was the creation of management units in industrial areas. In a third step the staff of the management units was trained in up to 4 one-week workshops per year over a period of three years in order to build capacities for sustainable management of industrial areas (refer to SMIA).
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• **Energy Management Workbook**  
The introduction of energy efficiency measures is an important element of retrofitting of industrial areas towards sustainability. The workbook can be used to provide the key steps for organizing, planning and implementing an Energy Management (EM) Programme in an industrial park
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• **Common Effluent Plants**  
Common effluent collection and treatment systems in industrial areas are often either not existing, dysfunctional or not functioning properly in many developing countries. The causes are diverse and thoroughly have to be examined case by case. This tool kit comprises a collection of tools and common weak points compiled, developed and employed in the Philippines.
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• **Industrial Environmental Improvement Drive**  
The EID-tool Industrial Environmental Improvement Drive (IEID) shows how to raise environmental awareness amongst industries and their employees with different activities e.g. environmental rallies; expert talks and plantation drives etc. in a participatory way. One month long Industrial Environmental improvement drives have been carried out in India in the states of Telangana and Andhra Pradesh for a couple of years.
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• **Stakeholder Dialogue**  
For retrofitting it is important to involve all stakeholders. A suitable instrument is the stakeholder dialogue. Stakeholder dialogues are used to moderate a discussion between relevant public and private stakeholders (example from Indonesia, Tunisia).
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• **Cleaner Production Clubs**  
To improve the environmental situation in an industrial area Cleaner Production Clubs can be founded to promote the idea. The principles of cleaner production may then be applied to processes, products and services with the objective to increase overall efficiency and reduce risks to humans and the environment.
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• **Corporate Social Responsibility Toolkit**  
To change the attitude of a business community a well-developed CSR charter is needed, which shall develop a common understanding, enforce rules and regulations, enhance community relations, ease conflict potential, enable communal service providers/communal small businesses to meet industrial park requirements and support the capacity building of local workforce.

## 3. Operating Sustainable Industrial Areas



### 3.1. Management



#### Outline

For an industrial area considered to be well managed, well organised and prepared to implement sustainability measures, a management structure is generally required. This structure needs to be endowed with clear mandates, an adequate budget line and should be in the position to define by-laws compulsory inside the industrial park (e.g. park charter, corporate social responsibility charter, environmental, occupational health and safety, social standards, etc.). Enforcement of such rules must be monitored (e.g. by Key Performance Indicators). All companies operating in the park have to agree to these given rules and sign respective documents.

#### Key elements

##### *Organisational structure:*

The management units of industrial areas act as administrator and service provider responsible for all organisational and management features. The legal and organisational setup of these management units can differ considerably from each other. Depending on the existing context and policy framework management models may be: Public administration unit, private association, state-run company or private company.

##### *Management style:*

Management units of sustainable industrial parks should regard themselves as service providers rather than administrative units. This needs a clear understanding of the needs of the customers which are first of all the resident companies but also the municipal and state-level administration and the surrounding industry and population. In a pro-active approach, needs and demands are

identified and solutions offered. This requires a permanent investigation of the political and economic framework conditions as well as the needs of the market and the companies.

##### *Service offers:*

Infrastructure and service provision is the most prominent role of a park management. In a holistic approach the management provides all types of infrastructure and logistics, supplies energy, water and goods, collects and treats effluents and waste and provides communication networks and social facilities. It acts as facilitator and moderator of networks of companies inside and outside of the park, and mediates in case of conflicts between resident companies, companies and government authorities and with the neighbourhood.

##### *Supervision duties:*

The park management monitors the performance of the resident companies regarding their environmental performance (noise, air pollution, waste and waste generation, energy and resource efficiency, protection of biodiversity), their occupational and health standards and their disaster risk management. It ensures that companies regard legal rules and regulations and enforces compliance in case of misbehaviour.

##### *Business behaviour:*

The management of the park needs to develop a business like behaviour. This requires a business plan bringing expenditures and revenues into balance. Revenues are expected from selling and renting the plots, from monthly operating/service fees paid by companies and governmental funds for providing housing, education, health or other services to the community. To become economically successful it is important that the overall park concept is attractive for investors and the business community, that high-level services are offered at reasonable prices and that a lean and efficient management structure minimises the administrative overhead costs.


*Communication and PR:*


Social participation within the industrial area and with the local community is crucial for a smooth and successful operation. During master planning, participation of the public is important to make sure that the existing different points of view and concerns are considered. Starting from the agreed park vision, participation is needed during developing urban infrastructure concepts, business and marketing concepts, measures to achieve sustainability standards and for mitigating environ-


mental risks. Once, the industrial area has been commissioned, stakeholder involvement which now includes also the residential companies, remains important for all expansions, adaptations and retrofitting measures. As elements of an optimised participatory process the park management should offer public consultation-hours, grievance forums on its webpage and make relevant park information available to the public to create transparency on all issues.


**GIZ expertise**

When managing industrial areas general management skills have to be interlinked with those skills related to the technical and administrative demands of industrial areas. GIZ through its various projects on industrial development has gained substantial experiences on the following topics:

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• **Sustainable Management of Industrial Areas (SMIA)**  
Sustainable Management of Industrial Areas (SMIA) is an innovative concept combining three well established and widely used methods and cost-effective tools (PREMA APELL and Eco-mapping). It is suited to individual companies of any size, and also suitable for managers and managing bodies of industrial areas. With these instruments park managers can be trained to adopt a business-like behaviour to develop new innovative cost-covering services.
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• **Good Housekeeping Manual**  
In particular for individual companies the approach of “Good Housekeeping” intends to increase the eco efficiency and viability of companies.
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• **Management models of industrial parks in China**  
In China, the differentiation between development zones and industrial parks is difficult or often impossible. Therefore, development zones are referred to as industrial parks which are defined as geographically restricted areas under a park management that focus on industrial production and manufacturing in single or multiple sectors. The management modes of the various parks differ considerably from each other.
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• **Industrial Area Information Management System (IAIMS)**  
The implementation of the Sustainable Industrial Development approach in industrial areas requires comprehensive information. This includes technical data to be stored in a database (Industrial Area Information Management System) as well as geographical information to be stored and handled in a Geographical Information System (GIS).



- **Corporate Social Responsibility Toolkit**  
Corporate Social Responsibility (CSR) is the commitment of the private sector to social concerns beyond legal requirements. This can be either company-internal commitment (employees’ welfare and employees’ obligations) or in the social environment of the enterprise (community relations). Sustainable development in Industrial Areas requires an integrated approach towards stimulating economic growth, embedding environmental protection and economic development in a stable and prosperous social environment.



- **Training on Managing Industrial Areas (French)**  
The GEDZI training (Sustainable Management of Industrial Zones) aims to help managers of Industrial Area Management Units to better manage and develop innovative services, to become effective institutional partners, and to manage the change in their areas. Park managers learn how to develop industrial areas in a sustainable manner.



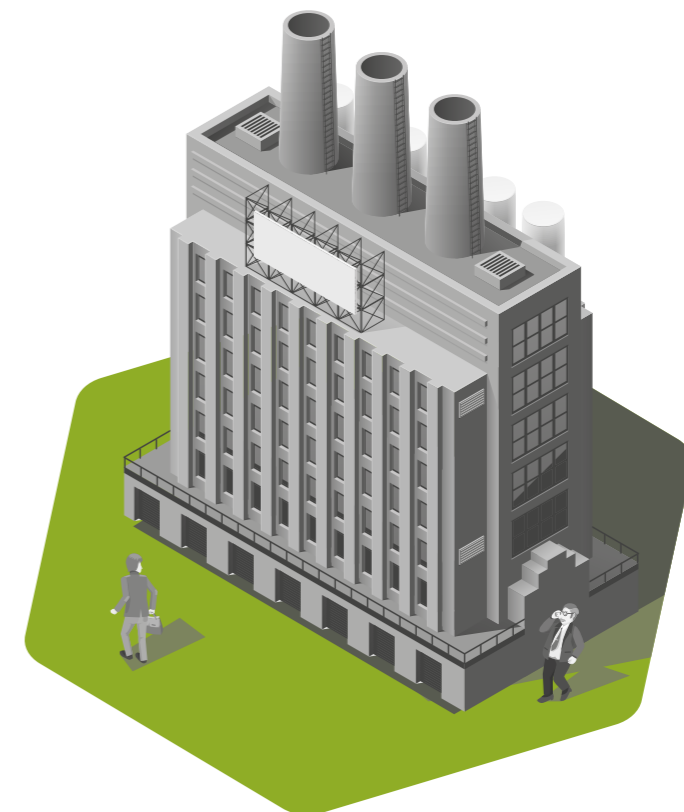
- **Development of a Service Platform for the Chengdu Economic and Technical Development Zone (German)**  
As part of a PPP with the Chengdu Economic and Technical Development Zone a service platform was developed and implemented assisting the park management to improve its service for the companies in the park.



- **Monitoring Instruments**  
Monitoring of various aspects (ambient pollution, risk management and disaster preparedness, occupational health and safety, energy and resource efficiency, etc.) is an important task of any park management. Multi stakeholder monitoring teams have the advantage to create transparency and put the findings and resulting consequences on a multi-stakeholder base.



- **Stakeholder Dialogue**  
Stakeholder dialogues are important to develop adequate solutions for analysed shortcomings in industrial areas. In Tunisia the foundation of a “National Association of Industrial Park Management Units” was assisted in order to exchange on similar problems and help each other solving them.



## 3.2. Resource Efficiency

### Outline

A growing population and an increased industrialisation are the reasons for worldwide accelerated resource consumption. In many countries, in particular in emerging economies, industrial areas are the motor of industrialisation and contribute significantly to the consumption of resources. Knowing that the natural resources of the world are limited solutions, have to be found to decouple economic growth from resource consumption. Measures of resource efficiency in industrial areas are an important step to lower resource consumption.

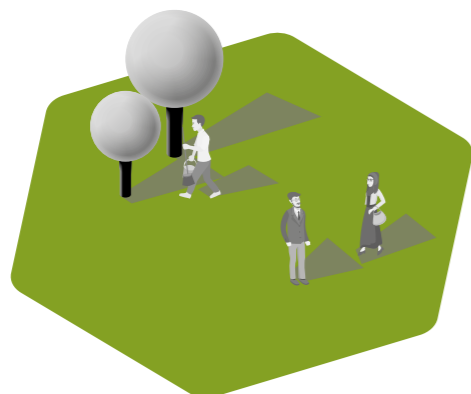
### Key elements

The following measures are able to increase resource efficiency in industrial areas:

#### *Renewable energy, energy efficiency and waste energy utilisation:*

To save energy the normal public energy provision system needs to be upgraded with elements of renewable energy generation, energy efficiency measures and mechanism to reuse waste energy. While on company level the introduction of modern state-of-the-art production technologies will increase the energy efficiency of individual processes, on park level an efficient and resource saving energy generation and distribution system is needed.

Energy generation in the park should be based wherever possible on a mix of conventional fuels, renewable energy sources and waste-to-energy



plants. It should be supplemented by utilising waste energy, heat and steam coming from the park companies. Also it should include co-generation and trigeneration, if economically viable. This requires of course an integrated electricity, gas and steam distribution network operated by a single entity, ideally the park management company.

To encourage energy saving and energy efficiency on company level, energy efficiency networks (EEN) can be formed. In exchanging their experiences companies are motivated and assisted to implement energy savings and efficiency measures.

#### *Industrial symbiosis and circular economy:*

The management unit of an SIA assists the efforts of companies to increase their resource efficiency by giving advice and support on resource efficient technologies and process optimisation. If possibilities to increase resource efficiency within a company are exploited, major additional gains are achieved by networking with other companies in the industrial area and beyond. Therefore, networks for industrial symbiosis need to be introduced to establish circular economy in the park.

For that purpose, it is necessary to channel information about the material flows in the park, identify possibilities of sharing products, by-products, water, waste or energy as well as services or utilities. A database is needed on park level giving the in- and outputs of the companies and the goods, by-products, energy, water and waste which could be exchanged. During network meetings organised by the park management the companies are encouraged and advised on exchange opportunities. On park level, the entire investment and marketing policy of the park should promote industrial symbiosis and resource efficiency in attracting relevant sectors or companies who could close supply chains or circular economy loops.

### GIZ expertise

GIZ gained various experiences in fostering energy and resource efficiency and developed respective tools.



#### • Resource Efficiency in Developing Countries

Responding to the needs to increase resource efficiency development cooperation should address this topic within the development cooperation. The document attempts to give an overview of current approaches and instruments to promote resource efficiency in the production sector (especially in manufacturing industries) and to demonstrate through examples how they can be put into practice.



#### • Resource Efficiency Training (French)

The training gives an introduction to policy makers and administration staff on resource efficiency and respective policy and tool development. The training was first piloted in 2015 in Morocco.

Training modules:

- 1) Concepts of resource efficiency and application methods,
- 2) BAT (Best Available Technology) examples for industrial sectors,
- 3) Waste value chains and their establishment,
- 4) Objectives and tools for the development of a national resource efficiency program,
- 5) Development process of a national resource efficiency programme and
- 6) Practical resource efficiency in the industry.



#### • Energy Management Workbook

The introduction of energy efficiency measures are an important element of resource efficiency in an industrial area. The workbook can be used to provide the key steps for organizing, planning and implementing of an Energy Management (EM) Programme in an Industrial Park



#### • Towards Industrial Symbiosis in Jiangsu, China

In order to position an Industrial Symbiosis programme in Jiangsu, within the context of Circular Economy (CE) and the development of EIPs in the province, the following aspects are investigated: the history of CE in China, highlighting the seven pillars of current implementation; how the concept of extending the industrial chain can lead to increased resource efficiency; how a facilitated programme could impact EIPs in China and what risks may be associated with introducing such a programme.



#### • Clean and Resource Efficient Production (India)

The document describes clean and resource-efficient production as including all measures aimed at improving the input-output relation of material, water and energy-consuming processes and at mitigating the adverse environmental impacts resulting from these processes. Measures of this kind are economically beneficial to companies, making them more profitable and boosting their competitiveness, especially under the current trend of rising raw material and energy prices.



#### • Energy Efficiency Networks in Chinese Industrial Development Zones (German)

As part of a PPP with three industrial development zones energy efficiency networks were formed which resulted in significant energy savings in the park.



#### • Development of an Industrial Symbiosis Network

As part of a PPP with the Chengdu Economic and Technical Development Zone a network for industrial symbiosis was formed identifying immediately possibilities to exchange materials and by-products.

### 3.3. Social Aspects



#### Outline

Considering social aspects is an important element of the sustainability concept. This means for sustainable industrial areas that the parks, apart from providing social infrastructure like housing, shopping, education, health, sports and other recreational facilities, should promote community participation, occupational health and safety, gender issues, and civil society institutions like NGOs, trade unions, clubs, etc. as well.

#### Key elements

##### *Social infrastructure:*

Basic social infrastructure should cover catering, small shops or kiosks and communication facilities. Especially for risky work conditions adequate medical services are necessary. Educational and training institutions specialised to train apprentices and employees of the industry sectors settled in the park are very important and may be one key success factor. If many workers live with their families close to or on the premises of the park, the question of schools for children needs to be addressed. Adequate child care facilities are required. If the park is regarded a development zone the basic facilities needs to be complemented by further shopping and banking facilities as well as recreational and sports facilities. In providing a cultural infrastructure (e.g. cinema, cultural events and congregation space) the areas can play an important societal role.

##### *Occupational health and safety:*

The promotion of working and occupational health standards in the industrial area addresses health and safety at the workplace itself. It comprises aspects such as workplace comfort regarding air quality, visual comfort, noise protection and an appropriate work-rest balance. Regular medical check-ups of workers and employees, provision of safety gear (protective goggles, gloves, safety shoes, filter masks, etc.), monitoring of exposure limits and safety trainings are important measures to increase occupational health and safety.

##### *Gender issues:*

In many countries women are still underprivileged. Although they often represent a large part of the workforce of an industrial area, the parks do not care sufficiently about the specific needs of women. Ignorance exists regarding their needs for separate toilets and washing facilities, their combined role as worker, housewife and mother, their vulnerability in respect to security issues or their special needs as business women or entrepreneur.

##### *Civil society institutions:*

Transparency is an important attribute of a sustainable industrial area. It includes not only the information of everybody inside and outside the industrial area regarding the future development of the park or possible environmental risks but also intends to promote civil society and the activities of its institutions in the industrial area. While trade unions in particular take care of the workers' rights and are an important factor for better working conditions, NGOs and other civil society organisations will address more general environmental, social and even political issues.

#### GIZ expertise

For GIZ, social aspects of development always play a central role. This is also considered when developing and implementing concepts for sustainable industrial areas.



- **Association of Lady Entrepreneurs of Andhra Pradesh (ALEAP)**

An industrial area specially reserved for women entrepreneurs intends to meet the specific needs of women as business women, housewife and mother. The model became so successful that it is going to be duplicated in other parts of India.



- **Stakeholder Dialog**

Social aspects can only be addressed if all stakeholders are involved in a participatory way. A suitable instrument is the stakeholder dialogue. Stakeholder dialogues (SD) are used to moderate a discussion between relevant public and private stakeholders (example from Indonesia, Tunisia).

### 3.4. Climate Change



#### Outline

Climate change is already showing its adverse effects in many parts of the world. Storms, flooding and extreme weather events in general are expected to occur more frequently in the future. Remedies to climate change are distinguished into mitigation and adaptation actions which are equally important. While climate mitigation actions focus on measures to reduce the emission of climate-damaging greenhouse gas (GHG) emissions at company or industrial park level, climate adaptation actions aim to better cope with the consequences of climate change. Through adaptation actions industrial parks can increase their resilience against the consequences of climate changes, e.g. droughts, water scarcity, storms, floodings.

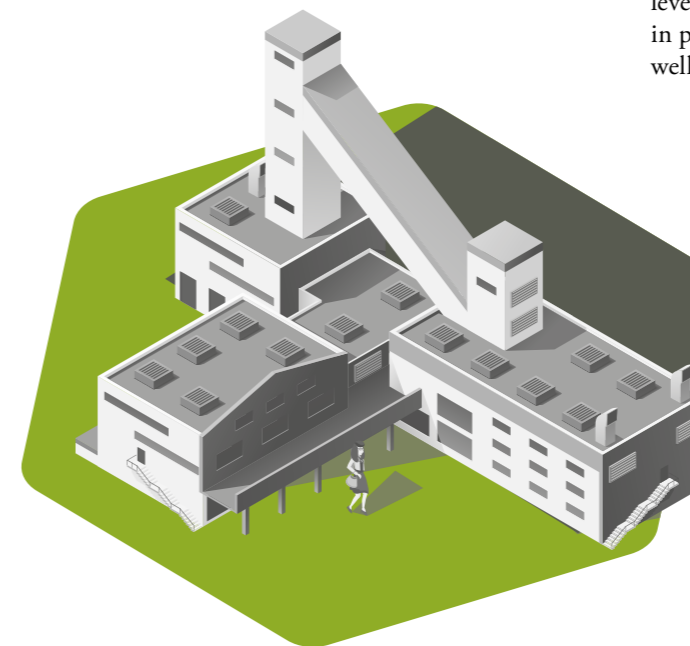
#### Key elements

##### *Mitigation of climate change:*

Mitigation of climate change requires the introduction of measures to reduce GHG emissions. For that purpose the park management in dialogue with the companies on site needs to develop a strategy to reduce greenhouse gas emissions from energy provision, operation of industries, transport of goods and people, waste generation and treatment. Starting with an assessment of the status quo measures should be developed introducing best available technologies. Decision makers need to be informed about available technical and financing options.

##### *Adaptation to climate change:*


For the adaptation to climate change, capacity development is required to introduce climate resilient planning and policy development. This planning has to deal with shrinking water resources and extreme weather conditions which could result in natural disasters. The possible consequences of climate change should therefore be incorporated into the risk management plans of companies and the entire park. Based on a risk analysis, sensitisation and capacity development needs to take place to mainstream awareness on all levels and to actively consider adaptation measures in planning and implementation of new parks as well as in retrofitting of existing industrial areas.








## GIZ services


GIZ has experiences in both, climate change mitigation and adaptation actions from projects around the world. There are several tools available dealing in particular with climate change mitigation and adaptation.


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• **Corporate Climate Change Strategies Training Toolkit**  
The Corporate Climate Change Strategies Training Toolkit is aimed at developing the capacities of management within industrial parks and companies regarding climate change related issues. Its objective is to enable the development of a corporate strategy for addressing climate change related challenges and opportunities.
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• **Baseline Assessment**  
To investigate the possibilities for climate change mitigation and the vulnerability and needs for adaptation to climate change a baseline analysis has to be carried out. Examples from Andhra Pradesh show the procedures applied.
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• **Baseline Analysis Tool**  
To carry out a baseline study on climate change mitigation and adaption respective instruments are required. This tool intends to assist.
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• **Project Outline Supporting the Management of Climate Risks and Opportunities**  
The project intends to develop a decision-support-system (DSS) which is available online to support the management of climate change risks and opportunities for organisations in various sectors.
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• **Climate Change Adaptation in Industries and Industrial Areas**  
Climate variability with extreme weather conditions and climate change, directly or indirectly impacts the resource extraction industry, heavy industry and manufacturing sector alike. It is therefore important to understand the points of vulnerability to these impacts in relation to materials, products, value chains, and even business cases and stakeholders, so that appropriate strategies can be developed.
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• **Climate Change Vulnerability Assessment and Adaptation Plan**  
The tool intends to help companies to identify possible risks for their businesses caused by climate change and offers guidelines on how to create an adaption plan in order to mitigate consequences for the business.

# List of available tools

## Introducing SIA

### Analysis

**Standard TOR** for analyzing the situation of industrial areas in a country available at [eid@giz.de](mailto:eid@giz.de)

### Baseline analysis tool:

<http://www2.giz.de/network/eid-toolbox/tools/baseline-analysis-toolkit.asp>

### Regional environmental assessment:

[http://www2.giz.de/network/eid-toolbox/document/Attachment3-Guideline\\_for\\_Regional\\_Assessments.pdf](http://www2.giz.de/network/eid-toolbox/document/Attachment3-Guideline_for_Regional_Assessments.pdf)

[http://www2.giz.de/network/eid-toolbox/document/Attachment1-Themes\\_for\\_State.pdf](http://www2.giz.de/network/eid-toolbox/document/Attachment1-Themes_for_State.pdf)

[http://www2.giz.de/network/eid-toolbox/document/Attachment2-Themes\\_for\\_District.pdf](http://www2.giz.de/network/eid-toolbox/document/Attachment2-Themes_for_District.pdf)

### Sensitisation

#### EID-Toolbox:

[http://www2.giz.de/network/eid-toolbox/document/EID-Toolbox-flyer\\_web.pdf](http://www2.giz.de/network/eid-toolbox/document/EID-Toolbox-flyer_web.pdf)

[http://www2.giz.de/network/eid-toolbox/document/SIA\\_WG\\_EID\\_Folder.pdf](http://www2.giz.de/network/eid-toolbox/document/SIA_WG_EID_Folder.pdf)

**Industropia** – A game about Sustainable Industrial Areas (SIA)

Industropia Instructions for Facilitation available at [eid@giz.de](mailto:eid@giz.de)

**Training Eco-Industrial Parks (EIP)** – Introducing Energy and Resource Efficiency to Industrial Production

Material on the EIP Training China available at [eid@giz.de](mailto:eid@giz.de)

#### Industrial environmental improvement drive

Tool “Participatory Approach EID” available at [eid@giz.de](mailto:eid@giz.de)

Documentation of the “Industrial Environmental Improvement Drive 2013” available at [eid@giz.de](mailto:eid@giz.de)

Highlights of the APIIC Industrial Environmental Improvement Drive

<http://www.igep.in/live/hrdpmp/hrdpmaster/igep/content/e48745/e49028/e56114/e56208/VCMDAPIICinternationalConference-final.pdf>

#### Cleaner Production Clubs

<http://www2.giz.de/network/eid-toolbox/tools/cleaner-production-clubs.asp>

<http://www2.giz.de/network/eid-toolbox/document/08-Cleaner-Production-Manual.pdf>

#### Pathway to Eco Industrial Development in India

[http://www2.giz.de/network/eid-toolbox/document/121004\\_Pathway\\_EID\\_ISO3uncoated-1.pdf](http://www2.giz.de/network/eid-toolbox/document/121004_Pathway_EID_ISO3uncoated-1.pdf)

#### Eco-industrial parks in Andhra Pradesh

[http://www2.giz.de/network/eid-toolbox/document/APIIC\\_GTZ\\_Brochure.pdf](http://www2.giz.de/network/eid-toolbox/document/APIIC_GTZ_Brochure.pdf)

### Standards

#### Good Practices for Sustainability Standards

Cf. [www.isealalliance.org](http://www.isealalliance.org)

*Germany* DGNB Standards for individual buildings and entire (industrial) quarters:

<http://www.dgnb-system.de/de/system/kriterien/>

*Europe* ECOSIND: Rating system based on the principles of EID:

<http://www.genocat.cat/mediamb/sosten/ecosind/fr/inici.html>

*Latin America*

[http://www.profepa.gob.mx/innovaportal/v/26/1/mx/programa\\_nacional\\_de\\_auditoria\\_ambiental.html](http://www.profepa.gob.mx/innovaportal/v/26/1/mx/programa_nacional_de_auditoria_ambiental.html)

*Worldwide*

<http://www.bafu.admin.ch/publikationen/publikation/01756/index.html?lang=en>

## Designing Sustainable Industrial Areas

### Master Planning

#### Site suitability assessment

<http://www2.giz.de/network/eid-toolbox/tools/site-suitability-assessment.asp>

[http://www2.giz.de/network/eid-toolbox/document/Attachment4-Guideline\\_for\\_Industrial.pdf](http://www2.giz.de/network/eid-toolbox/document/Attachment4-Guideline_for_Industrial.pdf)

#### Planning of Sustainable Industrial Parks in India

[http://www.igep.in/live/hrdpmp/hrdpmaster/igep/content/e54413/e54441/e62975/20150629\\_PlanningofSustainableIndustrialParksa.pdf](http://www.igep.in/live/hrdpmp/hrdpmaster/igep/content/e54413/e54441/e62975/20150629_PlanningofSustainableIndustrialParksa.pdf)

#### Planning and Design for ALEAP

[http://www.igep.in/live/hrdpmp/hrdpmaster/igep/content/e54413/e54441/e62974/20150630\\_ALEAPCaseExamplea.pdf](http://www.igep.in/live/hrdpmp/hrdpmaster/igep/content/e54413/e54441/e62974/20150630_ALEAPCaseExamplea.pdf)

#### Greening Jadcherla

[http://www.igep.in/live/hrdpmp/hrdpmaster/igep/content/e54413/e54441/e62973/20150630\\_GIPJadcherlacaseexample.pdf](http://www.igep.in/live/hrdpmp/hrdpmaster/igep/content/e54413/e54441/e62973/20150630_GIPJadcherlacaseexample.pdf)

**Site master planning**

<http://www2.giz.de/network/eid-toolbox/tools/site-master-planning.asp>  
[http://www2.giz.de/network/eid-toolbox/document/Int\\_Appr\\_Master\\_pl.pdf](http://www2.giz.de/network/eid-toolbox/document/Int_Appr_Master_pl.pdf)

**Manual for planning new industrial parks and retrofitting existing ones**

GIZ (2014): Manuel pour la requalification et la création de zones industrielles en Tunisie available at [eid@giz.de](mailto:eid@giz.de)

**Industrial Area Information Management System (IAIMS)**

<http://www2.giz.de/network/eid-toolbox/document/EID%20ToolBox%20Quick%20User%20Guide%20-%20Industrial%20Area%20Information.pdf>  
<http://www2.giz.de/network/eid-toolbox/info/abfrage.asp>  
<http://www2.giz.de/network/eid-toolbox/tools/gis-industrial-areas.asp>

**Stakeholder dialogue**

<http://www2.giz.de/network/eid-toolbox/tools/stakeholder-dialogues.asp>

**Technical Infrastructure****Integrated wastewater concept for industrial park**

[http://www2.giz.de/network/eid-toolbox/document/AKIZ-Kurzbeschreibung\\_2009-11.pdf](http://www2.giz.de/network/eid-toolbox/document/AKIZ-Kurzbeschreibung_2009-11.pdf)

**Guidelines for wastewater management**

[http://www2.giz.de/network/eid-toolbox/document/WW\\_Mgt\\_GUIDELINE\\_OF\\_PEZA\\_final\\_061709.pdf](http://www2.giz.de/network/eid-toolbox/document/WW_Mgt_GUIDELINE_OF_PEZA_final_061709.pdf)

**Common effluent plants**

<http://www2.giz.de/network/eid-toolbox/tools/common-effluent-treatment.asp>

**Sustainable port development**

[http://www2.giz.de/network/eid-toolbox/document/Sustainable\\_Port\\_Development\\_Flyer.pdf](http://www2.giz.de/network/eid-toolbox/document/Sustainable_Port_Development_Flyer.pdf)

**Retrofitting****Reactivation of derelict industrial sites**

<http://www2.giz.de/network/eid-toolbox/tools/reactivation-derelict-industrial-sites.asp>

**Upgrading of industrial zones**

GIZ (2013): Nouvelle approche, nouvelles zones industrielles. Manuel pour la requalification et la création de zones industrielles en Tunisie. available at [eid@giz.de](mailto:eid@giz.de)

Material on the training “Gestion Durable de Zones Industrielles – GEDZI” available at [eid@giz.de](mailto:eid@giz.de)

Material on the tool “Creation of Management Units” available at [eid@giz.de](mailto:eid@giz.de)

**Energy management workbook**

<http://www2.giz.de/network/eid-toolbox/tools/energy-management-workbook.asp>  
<http://www2.giz.de/network/eid-toolbox/document/EID%20ToolBox%20Quick%20User%20Guide%20-%20Energy%20Management%20Workbook.pdf>

**Common effluent plants**

<http://www2.giz.de/network/eid-toolbox/tools/common-effluent-treatment.asp>

**Industrial environmental improvement drive**

Tool “Participatory Approach EID” available at [eid@giz.de](mailto:eid@giz.de)

Documentation of the “Industrial Environmental Improvement Drive 2013” available at [eid@giz.de](mailto:eid@giz.de)

Highlights of the APIIC Industrial Environmental Improvement Drive <http://www.igep.in/live/hrdpmp/hrdpmaster/igep/content/e48745/e49028/e56114/e56208/VCMDAPIICInternationalConference-final.pdf>

**Stakeholder dialogue**

<http://www2.giz.de/network/eid-toolbox/tools/stakeholder-dialogues.asp>

**Cleaner Production Clubs**

<http://www2.giz.de/network/eid-toolbox/tools/cleaner-production-clubs.asp>

**CSR Toolkit**

<http://www2.giz.de/network/eid-toolbox/tools/csr-toolkit.asp>

**Operating Sustainable Industrial Areas Management****Sustainable Management of Industrial Areas (SMIA)**

<http://www2.giz.de/network/eid-toolbox/tools/smia.asp>  
<http://www2.giz.de/network/eid-toolbox/document/EID%20ToolBox%20Quick%20User%20Guide%20-%20SMIA.pdf>  
<http://www2.giz.de/network/eid-toolbox/document/EID%20ToolBox%20Quick%20User%20Guide%20-%20EoCM%20for%20Companies.pdf>  
<http://www2.giz.de/network/eid-toolbox/document/EID%20ToolBox%20Quick%20User%20Guide%20-%20PREMA%20for%20Companies.pdf>

**Good Housekeeping Manual**

[http://www2.giz.de/network/eid-toolbox/document/7\\_Good\\_Housekeeping\\_GHK\\_Manual\\_Sept\\_2006.pdf](http://www2.giz.de/network/eid-toolbox/document/7_Good_Housekeeping_GHK_Manual_Sept_2006.pdf)  
 Industrial Area Information Management System  
<http://www2.giz.de/network/eid-toolbox/document/EID%20ToolBox%20Quick%20User%20Guide%20-%20Industrial%20Area%20Information.pdf>  
<http://www2.giz.de/network/eid-toolbox/tools/ia-information-management-system.asp>  
<http://www2.giz.de/network/eid-toolbox/tools/gis-industrial-areas.asp>

**CSR Toolkit**

<http://www2.giz.de/network/eid-toolbox/tools/csr-toolkit.asp>

**Training on managing industrial areas**

Material on the training “Gestion Durable de Zones Industrielles – GEDZI” available at [eid@giz.de](mailto:eid@giz.de)

Weber, Michael (2013): Entwicklung einer Serviceplattform in der CETDZ Chengdu, Missionsbericht. available at [eid@giz.de](mailto:eid@giz.de)

**Monitoring instruments**

<http://www2.giz.de/network/eid-toolbox/tools/multipartite-monitoring-team.asp>

**Stakeholder dialogue**

<http://www2.giz.de/network/eid-toolbox/tools/stakeholder-dialogues.asp>

**Resource Efficiency****Resource efficiency in developing countries**

<http://www2.giz.de/network/eid-toolbox/document/giz2012-en-resource-efficiency-in-development-cooperation.pdf>

**Energy management workbook**

<http://www2.giz.de/network/eid-toolbox/tools/energy-management-workbook.asp>  
<http://www2.giz.de/network/eid-toolbox/document/EID%20ToolBox%20Quick%20User%20Guide%20-%20Energy%20Management%20Workbook.pdf>

**Towards industrial symbiosis in Jiangsu, China**

[http://www2.giz.de/network/eid-toolbox/document/Introducing\\_IS\\_to\\_Jiangsu\\_China\\_report.pdf](http://www2.giz.de/network/eid-toolbox/document/Introducing_IS_to_Jiangsu_China_report.pdf)

**Clean and resource efficient production**

[http://www2.giz.de/network/eid-toolbox/document/Clean\\_and\\_resource\\_efficient\\_production.pdf](http://www2.giz.de/network/eid-toolbox/document/Clean_and_resource_efficient_production.pdf)

**Energy efficiency networks in Chinese industrial development zones**

ARQUM (2013): Abschlussbericht einer Maßnahme mit chinesischen Industrieparks zur Bildung von Energieeffizienznetzwerken. available at [eid@giz.de](mailto:eid@giz.de)

**Development of an industrial symbiosis network**

SOFIES (2013): Synthesis note - Development of an industrial symbiosis network available at [eid@giz.de](mailto:eid@giz.de)

**Resource Efficiency Training (French)**

Material on Resource Efficiency Training (French) available at [eid@giz.de](mailto:eid@giz.de)

**Social Aspects****India's industrial park for women entrepreneurs (ALEAP)**

ALEAP, <http://www.aleap.org/>

**Stakeholder dialog**

<http://www2.giz.de/network/eid-toolbox/tools/stakeholder-dialogues.asp>

**Climate Change****Corporate Climate Change Strategies Training Toolkit**

<http://www2.giz.de/network/eid-toolbox/document/EID%20ToolBox%20Quick%20User%20Guide%20-%20Corporate%20Climate%20Change%20Str.pdf>  
<http://www2.giz.de/network/eid-toolbox/tools/corporate-climate-change-Toolkit.asp>

**Baseline assessment**

[http://www2.giz.de/network/eid-toolbox/document/poster\\_baseline\\_assess\\_09-7-1\\_final2.pdf](http://www2.giz.de/network/eid-toolbox/document/poster_baseline_assess_09-7-1_final2.pdf)

**Baseline analysis tool**

<http://www2.giz.de/network/eid-toolbox/tools/baseline-analysis-toolkit.asp>

**Project outline supporting the management of climate risks and opportunities**

[http://www2.giz.de/network/eid-toolbox/document/dss\\_CC\\_Adelphi.pdf](http://www2.giz.de/network/eid-toolbox/document/dss_CC_Adelphi.pdf)

**Climate change adaptation in industries and industrial areas**

[http://www2.giz.de/network/eid-toolbox/document/CCA\\_for\\_Industries\\_Industrial\\_Areas.pdf](http://www2.giz.de/network/eid-toolbox/document/CCA_for_Industries_Industrial_Areas.pdf)

**Climate Change Vulnerability Assessment and Adaptation Plan**

Material on Climate Change Vulnerability Assessment and Adaptation Plan available at [eid@giz.de](mailto:eid@giz.de)

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