



## Industrial estates siting study

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THE GOVERNMENT OF Sri Lanka (GoSL) has adopted a clean industrialization policy, consisting of a set of measures to ensure that both existing and new industries discharge their environmental obligations. Among these is a policy adopted by the cabinet in 1994 requiring that all new industries that are classified as medium and high polluting by the Central Environmental Authority (CEA) be located in industrial estates. This policy is intended to ensure that industries with significant pollution potential have appropriate environmental controls and are located in areas most suitable with respect to their environmental and resource attributes.

One of the first industrial development programs to be affected by this policy is a program recently initiated by the Ministry of Industrial Development (M/ID) to foster the development of industrial estates at numerous locations throughout the country. Under this program, M/ID will be offering a package of incentives including the provision of infrastructure up to the periphery of the estate, to encourage private investors to develop industrial estates on designated sites.

Historically, industrial estate development planning in Sri Lanka has been carried out by numerous agencies such as M/ID, Industrial Development Board (IDB), Board of Investment (BOI), Urban Development Authority (UDA), National Development Bank (NDB), and Development Finance Corporation of Ceylon (DFCC) with little co-ordination and in an ad-hoc site by site and industry by industry basis. Recognizing the need for a rational and systematic process of site selection that could be adopted in a standardized manner by the above mentioned agencies, M/ID requested a multi-disciplinary team of environmental professionals to conduct initial environmental examination of eleven of M/ID's candidate sites and provide a comparative analysis of the environmental and resource characteristics of each of the sites, and using the lessons learned from the site analysis, to derive a more general criteria regarding measures that should be taken to improve the industrial siting process. This study (NAREPP, 1995) was supported by the Natural Resources and Environmental Policy Project (NAREPP) of GoSL and U.S. Agency for International Development (USAID).

### Objectives

This study is intended to assist M/ID in implementing key elements of the clean industrialization policy that relate to the siting and managing industrial estates. The two major specific objectives are:

- To assist M/ID and other relevant agencies in screening their candidate sites in order to determine the most suitable sites to locate the industrial estates in terms of their environmental and resource characteristics, keeping in mind the relevant cabinet directive to site all medium and high polluting industries within an industrial estate.
- Based on the lessons learned from the individual site analysis, develop a general evaluation procedure in order to improve the overall industrial estate siting and development program and its related environmental and resource attributes.

### Methodology

This study was conducted by a multi-disciplinary team of environmental professionals with expertise in hydrology and water resource, water quality and environmental engineering, ecology, industrial waste management, chemical and process engineering, sociology, economics, and environmental impact assessment.

The team initiated the study by conducting two preliminary site visits and conducting a scoping sessions involving agencies and institutions (public and private) in Sri Lanka in order to obtain relevant issues and information that had already been identified or collected.

Thereafter, the team conducted individual site visits pertaining to eleven of M/ID's candidate sites. These sites are listed in Table 1. During each visit, the team made detailed visual observations of the site and surrounding areas and conducted interviews with the M/ID regional director, local administrative officials, community leaders and residents. Additionally, the team's hydrologist and water quality specialist collected water and soil samples, conducted infiltrometer tests within the site, and took flow measurements at water bodies on or near the site.

Upon completion of all eleven site visits, the team evaluated the data collected for each site and collectively derived conclusions regarding the environmental suitability and resource availability at these 11 proposed sites for establishment of industrial estates. In addition to evaluating each site individually, the team developed a comparative rating of the sites in accordance with the parameters provided below. The assessment is primarily qualitative, but supported by quantitative and visual observations as well as through discussions with relevant officials and residents.

**Table 1. Proposed sites for industrial estates**

Site name	Province	District	Area (Acres)
Bata-Atha	Southern	Hambantota	107
Uragasmanhandiya	Southern	Galle	50
Waljapala watta	Western	Gampaha	15
Karanawan watta	North Western	Puttalam	58
Manaweriya	North Western	Puttalam	52
Tammanakele	North Western	Puttalam	67
Senapura	North Central	Anuradhapura	15
Tambuttegama	North Central	Anuradhapura	40
Buttala	Sabragamuwa	Moneragala	35
Mapakada	Uva	Badulla	11
Gemmunupura	Uva	Badulla	85

\*1 ha = 2.47 ac

### Assessment indicators

Assessing and comparing the suitability of a number of different sites as potential industrial estates requires the use of a systematic methodology for independently rating two principal components:

- Relative compatibility of potential sites for industrial uses.
- Relative impacts of various types of industries.

In order to evaluate and inter-relate both components - the potential sites and the types of industries they may accommodate - a systematic methodology employing a set of parameters to assess both sites and industries with respect to two general indicators is proposed. The team used the proposed set of parameters in order to assess both the proposed estate sites and industries as explained below.

For classifying potential sites, the following two indicators were used:

- Pollution assimilative capacity
- Local resource availability.

The above two indicators provide a logical way of assessing the important characteristics of the site in terms of their capability to accommodate industrial activity.

Industrial activities interact with the surrounding environment in two principal ways: pollution generation and resource consumption. Thus for classifying industries, the two indicators selected were:

- Pollution potential.
- Resource consumption.

The above two industry rating indicators are to an extent, the inverse of the indicators used for rating the sites.

### Environmental parameters

In order to assess a site's compatibility with industrial development, the team made use of the following environmental parameters.

- Surface drainage and soil stability
- Water availability
- Wastewater disposal capacity
- Air quality
- Noise
- Solid waste disposal capacity
- Cultural/religious sensitivities
- Important ecosystems
- Transportation facilities
- Public utilities
- Local labour availability
- Community infrastructure facilities
- Site expandability.

The team evaluated each site on the basis of the above 13 parameters. The sites were rated for each parameter at one of three levels: High, Medium, and Low. The rating given is the estimated compatibility of the site for each parameter with regard to compatibility with typical industrial activities. This rating system is more qualitative than quantitative, but is backed by the best professional judgement of the team members.

The 13 parameters were sorted into two groups based on the indicators (i.e., for sites, pollution assimilative capacity or resource availability) that each most closely represents as shown in Table 2.

Once all the parameters for a site were rated, an aggregate ranking for each indicators was determined, assuming equal weightage for all parameters. The aggregate rating is determined for each site by adding up and comparing the number of H,M,L rankings separately for each of the two indicators. A simple averaging method was used, where any single 'H' was matched up against any single 'L', resulting in 2 'M'. This exercise produces a composite or aggregate rating for each proposed estate site with regard to the two overall indicators.

A similar procedure was adopted to classify industries (among broad industry types) with the proviso that these industries are evaluated on 'as typically practiced' (ATP) basis with regard to their resource demands and their pollution generation potential. The indicators used to classify industries are in a sense the inverse of those used in classifying industrial estates. The 'pollution assimilative capacity' is replaced with 'pollution potential' and 'resource availability' is replaced with 'resource consumption'. The drainage, cultural/religious sensitivities, and ecosystems are not used in classifying an industry primarily because these parameters are heavily site-specific, whereas the industry ratings are derived independent of any specific locations. In this way a person can look for the best site, specifically matching a selected industrial type.

The site evaluation methodology proposed can determine the most suitable sites for particular type and level of industrial development. It should be noted here that the method proposed compares similar types of information from different sites and does not make an absolute judgement about the suitability of individual sites for industrial development. A more specific environmental impact assessment (EIA) may be required for any site being seriously considered for locating a mix of medium and high polluting industries before a final determination is made.

## Analyses

### Industrial estates

Using the qualitative ranking system described in chapter 3, the study team conducted a comparative analysis of the 11 sites. A major objective of this exercise was to identify environmental and resource constraints that tended to occur in multiple sites. Several of these constraints can be alleviated by including specific measures, such as provision of infrastructure, treatment plant etc., into the project design. However, this step would increase the development cost making them less attractive compared to other sites that do not have these constraints.

It should be noted that no attempt was made to weight the score for one parameter more heavily than another, as these 'weights' are site specific and is not conducive for the development of a general site assessment methodology. However, four of the parameters listed below were viewed by the team as posing the most serious constraints on the establishment of industrial estates.

- *Surface water availability* is a constraint or limiting factor at the majority of sites. This constraint indicates that development of these sites may have to be restricted to industries with very low water use.
- *Wastewater assimilative capacity* is a constraint at the majority of the sites.
- *Solid waste disposal capacity* is a significant constraint at each and every site. This constraint can be alleviated to some extent by requiring certain facilities such as constructed sanitary land-fill, incinerators etc. to be provided, which would add to the estate development cost.
- *Limited space* was a major constraint at most of the sites. Physical barriers on many of these lands (such as existing structures, natural barriers such as streams, lagoons etc.) would make future expansion of the sites infeasible.

The team arrived at two aggregate scores for each site, one that would give an indication of a site's overall capacity to assimilate pollutants and the other that would indicate the site's relative capability to provide physical and socio-economic resources considered important for industrial development. The results are displayed in Table 2.

### Industries

To provide some basis for matching industries to site, the team selected 10 general types of industries found in Sri Lanka and assessed them with reference to a similar set of parameters. These assessments were used to produce aggregate rating of a specific industry on their 'pollution potential' and 'resource consumption'. These results are shown in Table 3. Tables 2 and 3 taken together provide a systematic way to look for possible 'matches' or 'fits' between a given site and a range of industries. Where a site's natural resources are limited, industry types with lower resource consumption may be more appropriate. This system could be used in the initial stage of site development to identify among others: which industry types to be encouraged vis-a-vis available sites and what sort of development is required (such as transport facilities) for a particular site in order to attract a particular kind of industry etc. Final siting decision may be based on a comprehensive Environmental Impact Analysis (EIA) pertaining to the specific site with the proposed industrial mix. The strength of the rating system is that it considers environmental impact to be a combination of pollution generation and resource consumption.

Some of the pertinent observations arrived at from the 'matching' analysis are:

- None of the sites were found ideally suited for high polluting industries.
- A number of sites were found suitable for medium scale industrial development.
- Most sites are served by relatively good transportation and public utility infrastructure.
- There is a good base of unskilled labour in all of the sites, and Sri Lanka's high literacy level implies that skilled labour can readily be trained.
- With one exception, ecological factors do not pose severe constraints to on-site development.

### Proposed siting guidelines

The following guidelines apply to the industrial estate development procedure of M/ID. Other agencies involved in developing industrial estates are encouraged to adopt a similar procedure in order to standardize the process of industrial estate development.

- Initial identification of sites for potential industrial estate is the responsibility of the Regional Industrial Service Committees (RISCs). RISC personnel may use the "Preliminary Industrial Estate Identification Checklist" at each potential site.
- Several potential sites may be identified by a specific RISC. The RISC director can conduct an initial screening to identify the best possible sites from that region. Screening is based on the "Preliminary Industrial Estate Screening Worksheet".
- RISC directors will submit the screened, potential industrial estate sites to M/ID.

- M/ID will conduct surveys to assess: (i) the demand for industrial sites by specific industry types, and (ii) availability of local resources such as raw materials, labour, and infrastructure facilities.
- The sectoral committee on industrial estates of the M/ID will appoint a panel of experts to synthesize information from the surveys and the list of potential industrial estate sites received from the RISCs.
- The panel will use the “industry-site matching procedure” as well as information generated from the surveys to initially match industries with the potential sites. The panel of experts should visit the proposed sites at least once before ‘matching’ the industries with respective sites.
- The proposed industrial estates (together with a list of potential industries) may be subjected to an EIA. The terms of reference for the EIA would be provided by the panel of experts.
- The team conducting the EIA will assess the environmental impacts of establishing an industrial estate with the proposed mix of industries as suggested by the panel. The team working in close collaboration with the panel may arrive at a different and appropriate industrial mix, if it was found that the originally

proposed mix of industries is inappropriate for the particular site.

- The final list of industrial estates and their respective mix of industries will be submitted by the panel to the committee. Concurrence of the CEA would be required before finalizing the list
- Approval of the minister in charge of M/ID and thereafter, the cabinet of ministers would be sought.

### References

NAREPP, ‘Sri Lanka Industrial Estates Siting Study’, Volume 1, Draft Report Prepared for the Ministry of Industrial Development, Natural Resources & Environmental Policy Project, Colombo, 1995.

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Note: “Preliminary Industrial Estate Identification Checklist” and “Preliminary Industrial Estate Screening Worksheets” were developed on the basis of the rating procedure adopted for the sites as illustrated above and in Table 2. These documents which are still being fine-tuned are not presented here due to their bulkiness.

Tables 2 and 3 are available from the author.