

The Environmentally Sustainable City Index (ESCI)

The Environmentally Sustainable City Index (ESCI) has been developed keeping in view *the critical significance of the five elements of existence* from which life on this planet is deemed to have been created: air, water, energy, sky/space and earth. The ESCI is a holistic configuration and seeks to give equal importance to each of the five elements in the context of “*sustainable development*.” The ESCI consists of five distinct evaluative groups relating to air, water, energy, sky/space and earth. Each group, further, consists of two broad parameters and three indicators under each parameter. The emerging ten parameters are described below:

I. Air related Group of Parameters

1. Ambient air quality in the city

This parameter has been conceptualized in relation to the percentage of sulphur dioxide (SO₂), oxides of nitrogen (NO₂, NO₃) and carbon monoxide (CO) in the ambient air of the city in terms of time-weighted annual average with data to be provided for a four years period. The three indicators under this parameter are:

- i. Percentage of sulphur dioxide (SO₂) in the ambient air of the city in terms of time-weighted annual average.
- ii. Percentage of oxides of nitrogen (NO₂, NO₃) in the ambient air of the city in terms of time-weighted annual average.
- iii. Percentage of carbon monoxide (CO) in the ambient air of the city in terms of time-weighted annual average.

2. Intra-city transport modes and dedicated jogging/cycling tracks vis-à-vis roads/streets length in the context of impact on ambient air quality

The nature of intra-city modes of transport and ratio of dedicated jogging/cycling tracks to total road length have a vital impact on the ambient air quality of a city. The specific indicators selected under this parameter (with data to be provided for a four years period) are:

- i. Ratio of passenger kilometers covered by non-motorized transport (NMT) to passenger kilometers covered by motorized transport in terms of time-weighted annual average or ratio of NMT vehicles (cycle, cycle-rickshaws, etc.) to motorized vehicles (trucks, cars, motorcycles, scooters etc.).
- ii. Ratio of passenger kilometers covered by the public transport system to passenger kilometers covered by private transport system in terms of time-weighted annual average or ratio of kilometers covered by public transport to kilometers covered by private transport on an average working day in the year.
- iii. Percentage of dedicated jogging/cycling tracks to total road/street length for motorized transport in the city.

II. Water related Group of Parameters

3. Water supply, rain water harvesting & dual piping system for water recycling in buildings

This parameter is conceptualised in terms of water supply, rain water harvesting & dual piping system for water recycling in buildings in terms of data covering a four year period. The three indicators selected for this purpose are:

- i. Percentage of buildings within the municipal jurisdiction connected by piped water supply to total buildings in the city or, in case there is 100% coverage of piped water supply to buildings in the city, the availability of water per person in the city on an average day in the year.
- ii. Percentage of buildings having rain-water harvesting facility – capturing rain water/cleaning the water/recharging of aquifers – to total buildings in the city.
- iii. Percentage of buildings with dual piping system for recycling of bathing, toilet, kitchen and allied types of water for horticultural and gardening purposes to total buildings in the city.

4. Sewerage, industrial effluents & storm water drainage

This parameter is conceptualised in terms of coverage & capacity of sewerage treatment plants, storm water drainage network and effluent treatment plants in the city in terms of data covering a four years period. The three indicators selected for this purpose are:

- i. Percentage of the total city area covered by sewerage facilities and in case there is 100% coverage, the total installed capacity of sewerage treatment plants in the city translated into per capita terms (w.r.t. Residents of the city).
- ii. Total storm water drainage network (in kilometers) as a ratio of total roads and street length (in kilometers) in the city.
- iii. Total capacity of the effluent treatment plants in the city as a ratio of the total capacity for effluent treatment required by industrial units in the city as assessed by the concerned public authority (eg. Central State Pollution Control Boards in India).

III. Energy (or “fire” by mythological connotation) related Group of Parameters

5. Power generation & energy management

This parameter is conceptualized in terms of use of renewable energy sources, reduction of carbon emissions at conventional power generation plants through improved technology and efficient energy management in terms of data covering a four years period. The three indicators selected for this purpose are:

- i. Total energy generated from non-conventional, renewable energy sources in the city as a percentage of total energy used in the city.
- ii. Extent of reduction of carbon emissions from power generation plants using non-renewable energy sources through improved technology and better management.
- iii. Percentage of energy saved on account of energy saving devices (e.g. energy efficient lighting) to total energy used in a city.

6. Motor vehicles

This parameter is conceptualised in terms of level of carbon emission efficiency of vehicles, percentage of alternate energy vehicles and alternate fuels used in the city in terms of data covering a four years period. The three indicators selected for this purpose are:

- i. Level of carbon emission efficiency (e.g. Euro II & III or Bharat II & III onwards) of motor vehicles in the city.
- ii. Ratio of alternate energy vehicles (e.g. Electric battery or hydraulic propelled vehicles as well as hybrid vehicles) to total vehicles in the city.

- iii. Ratio of alternate (e.g. CNG, agro diesel, etc.) to conventional fuels used by motor vehicles in the city.

IV. Space (or 'sky/space' or 'ether' by mythological connotation) related Group of Parameters

7. Green areas promoting photosynthesis in the city

This parameter is conceptualised in terms of the extent of green areas, large “breathing lungs” and playing fields in the city in the terms of data covering a four years period. The three indicators selected for this purpose are:

- i. Percentage of green areas within the municipal jurisdiction to the total area of the city.
- ii. Percentage of area covered by ‘breathing lungs’ (defined as green areas covering at least four hectares) within the municipal jurisdiction with reference to the total area of the city.
- iii. Percentage of area under “*grassy playfields for games and sports*” to total green areas in the municipal jurisdiction of the city.

8. Emissions into the sky/space

This parameter is conceptualised in terms of the smoke emitted into the sky/space in relation to suspended particulate matter (SPM), respirable suspended particulate matter (RSPM) and the percentage of ozone in the ambient air of the city in the context of data over a four years period. The three indicators selected for this purpose are:

- i. Percentage of suspended particulate matter (SPM) in the ambient air of the city in terms of time-weighted annual average.
- ii. Percentage of respirable suspended particulate matter (size less than 10 microns) in the ambient air of the city in terms of time-weighted annual average.
- iii. Percentage of ozone (O₃) in the ambient air of the city in terms of time-weighted annual average.

V. Earth related Group of Parameters

9. Built-up environment & solid waste management

This parameter is conceptualised in terms of the quality of built-up environment & effective solid waste management measures in terms of data covering a four years period. The three indicators selected for this purpose are:

- i. Percentage of ‘*green buildings*’ certified under any normative standard (eg. Leeds Standard, Teri Griha, Oxford Brookes, HQE etc.) with reference to total buildings in the city.
- ii. Percentage of segregated and recycled solid waste with reference to total solid waste generated on an average day in the city.
- iii. Percentage of persons living in slums or buildings having carpet area of up to 5 m² or more than up to 10 m² per person with reference to the total number of persons living in the city.

10. Regional planning & the urban-rural continuum

This parameter is conceptualised in terms of whether master planning of the city is done in the context of the region and whether the city and surrounding rural areas develop in a symbiotic manner with reference to data covering a four years period. The three indicators selected for this purpose are:

- i. Total area of rural hinterland (minus rural built-up area) surrounding a municipal jurisdiction as a ratio of the total area of the city.



The EuroIndia Centre

- ii. Total area of rural hinterland (minus rural built-up area) as a ratio of the total green area of the city.
- iii. Total built-up area in a ten kilometers radius around the municipal jurisdiction of the city as a ratio to the total built-up area in the municipal jurisdiction of the city.

Inter se weightage of parameters & process of assessment

The five evaluative groups of air, water, energy, sky/space and earth and the parameters there under constitute *the generic aspect of assessment* and the innovative project (to be submitted by each participating city) constitutes *the specialised aspect* of assessment for determining the city which wins the ESCA. The ratio of assessment marks allotted to the 'generic aspect' vis-à-vis the 'specialised aspect' will be 2:1. The 'specialised aspect' refers to a chosen project submitted by the city showcasing its resolves towards improving the environmental sustainability of the city. The environmentally sustainable city index (ESCI) is to be constructively applied to the successfully implemented project of each city participating in the competition at two points of time: before and after the successful implementation of the project. In order to make the index flexible, it is stipulated that in case a city does not have data on a given indicator of a parameter, it can give data for a comparable indicator. The entries for the ESCA will be evaluated by an independent international jury. The jury will analyse the trend over a four years trend while examining the data provided by each city on various parameters and indicators constituting the ESCI.