Green Index Development for Government Programmes of Karnataka

Submitted to

Department of Forest, Ecology and Environment

Government of Karnataka

By

Indian Institute of Science *&*

Environment Management and Policy Research Institute

EMPRI
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Green Index Development for Government Programmes of Karnataka

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Executive Summary

Green Index is a composite measure of the environmental performance of a programme or a scheme or a project. Green Index is developed using a set of indicators and sub-indicators reflecting the environmental concerns such as: adoption of Energy Efficiency and Renewable Energy systems, Water Conservation and Recycling, Waste Treatment and Recycling, and air Pollution Control measures, Biodiversity Conservation, Carbon dioxide (CO_2) Emission Reduction or Sequestration, and Adaptation to Disasters and Climate Change.

Green Index has been developed for approved and ongoing programmes and schemes that are being implemented by Departments of the Government of Karnataka. Both central and state sponsored schemes that have implications for environment and natural resources have been considered for green indexing. Green Index has been developed for 198 programmes that have implications for environment, from 20 major departments of Government of Karnataka.

The scoring of indicators and sub-indicators is based only on the programme guidelines or components, Government Order (GO) and detailed project reports, and not on potential impacts of the programme or scheme.

Screening of the programmes is achieved by providing a value to each of the indicators and sub-indicators and using a colour scheme of Green (indicator value of 4), Light Green (3), Orange (2), and Red (1). Results and discussion for the Department of Energy and the Department of Forest Ecology and Environment are presented in the main report and for all the other departments, the green index values for the programmes are provided in the Annexure.

⇒ ***Department of Energy:*** Green Index has been developed for 14 major programmes of the Department of Energy, that are relevant to environmental concerns and indicators. The final classification of programmes on the basis of Green Index are as follows:
- Ranking Index: Moderately Green – 5 programmes
- Ranking Index: Orange – 5 programmes
- Ranking Index: Red - 4 programmes.

⇒ **Department of Forest Ecology and Environment:** Green Index has been developed for 15 major programmes of the Department of Forest Ecology and Environment, that are relevant to environmental concerns and indicators. The classification of programmes on the basis of Green Index development are as follows:
- Ranking Index: Green – 1 programme
- Ranking Index: Moderately Green – 3 programmes
- Ranking Index: Orange – 11 programmes

Findings of Green Index development, based on screening of the GO, programme guidelines and components, show the need and opportunity for enhancing the Greenness of programmes of the Department of Energy and Department of Forest, Ecology and Environment, by considering the critical environmental indicators such as mandatory deployment of energy efficiency measures and renewable energy technologies, and adaptation strategies for extreme weather or climatic hazards in the programme guidelines, to ensure adoption of such concerns at the implementation stage.

An approach to enhancing Greenness of developmental programmes is presented involving the following steps:

- **Step 1:** Identify the opportunities, technologies, interventions and regulatory standards to be incorporated, into the proposed programmes, to enable transition towards Green Index or green development.
- **Step 2:** Assess the cost of the technology or intervention or regulatory standard per unit or for the whole programme. Some interventions such as energy efficient systems may indeed save money.

- **Step 3:** Incorporate the identified green technology or regulatory standards into the components of the proposed programme or into the programme guidelines or Government Order or Work Plan or Detailed Project Report.
    - Some programmes may require mandatory provision for adopting, for example, energy efficiency standards or installation of renewable energy systems or water conservation measures or waste recycling or compensatory tree planting and CO_2 emission reduction.
- **Step 4:** Create budgetary provisions or incentives for adoption of the proposed green technologies, interventions and regulatory standards.

Strategies for greening of developmental and infrastructural programmes are as follows:

Energy efficiency and renewable energy systems

- All programmes that use energy directly or indirectly should have a mandatory requirement or regulation to incorporate most energy efficient systems, appliances and standards.
- All programmes where fossil fuel electricity is used should have a provision for adoption of renewable energy technologies and sources of renewable power.

Water conservation and recycling

- There is a need for regulation on use of ground water and all programmes which require water must have a mandatory requirement for adopting water conservation measures. Further, programmes where recycled water could be used, should be made mandatory by incorporating water recycling processes or technologies.

Waste treatment and recycling

- Identify or select programmes that have activities leading to generation of solid or liquid waste or pollute the air or water and recommend technologies and measures to address water or air pollution. Also, incorporate solid/liquid waste treatment measures into the programme guidelines.

CO_2 emission reduction and carbon sequestration

- All programmes requiring use of fossil fuel energy should have provision for adopting energy efficiency measures and shifting to renewable sources of energy, where feasible, to reduce CO_2 emission.
- Land-based programmes should have a provision for minimizing tree felling and promoting compensatory tree planting for carbon sequestration.
- Programmes using fossil fuel energy on a large-scale should have a provision for reporting CO_2 emissions.

Biodiversity conservation and ecosystem services

- Land and water based programmes should have a provision for banning or minimizing tree felling and to avoid loss of biodiversity of plants, fishes, etc. Biodiversity conservation should be made mandatory for all programmes that impact biodiversity and ecosystem services.

Adaptation to climate risks and disasters

- All infrastructure programmes should have a provision for considering climate change risks and disasters and incorporate adaptation measures in design of the structures.
- All Natural Resource Management programmes should have a provision for considering the impact of climate change and disasters and incorporate adaptation measures.

Green Index Development for Government Programmes of Karnataka

1. Introduction

Green development means development that is environmentally compliant. In other words, green development approach ensures that the development and infrastructure schemes, programmes and projects implemented by the government or other agencies do not lead to any degradation of environment and unsustainable use of natural resources, and indeed lead to conservation and regeneration of the environment and sustainable flow of benefits.

Green Index or Environment Performance Index is a composite measure of the relative environmental performances of developmental and infrastructure schemes, programmes and projects, using criteria and a set of indicators. Green index will be used for ranking of the different programmes using a score or an index, which reflects the implications of the programmes, schemes and projects on environment and sustainability. Environmental impact in the broader context includes impacts on air, water, ecosystems, biodiversity and climate.

Green or Environment Performance Index can be considered at various levels or scales such as:

- At the global level – comparing environmental performance across the countries
- At the national or state or district or city level – comparing the environmental performance across these geographical and administrative units
- At project/programme level – comparing environmental performance of projects and programmes
- Indices pertaining to environmental concerns
    - Climate change performance index
    - Climate risk index
    - Carbon footprint
    - Water quality index
    - Air quality index
- Sector-specific indices: Green indices could be considered even at sectoral level.
    - GRIHA - Environmental performance of buildings
    - Energy Star rating for heating or cooling appliances

In the following section, a few of the initiatives in environmental / green ranking are discussed.

1.1. Initiatives in Environmental/Green Ranking

Green Index has been varyingly called as Environment Performance Index and Environment Footprint Index. There are also specific indices linked to certain components of the environment such as climate change performance index, carbon footprint, ecological footprint, air quality index, green building index and water quality index. Many of the green or environment performance indices are in use at the global level and in many countries.

1.1.1. Global Indices

There are a few global scale or global level indices developed for ranking countries based on criteria such as environment or climate risk or human development or gender gap or poverty. Here three indices based on environment and climate are discussed as examples.

The Environmental Performance Index: The Environmental Performance Index (EPI) is a method of quantifying and numerically marking the environmental performance of a government's policies. The 2018 EPI ranks 180 countries on 24 performance indicators across 10 categories covering environmental protection, health and ecosystem vitality. These metrics provide a gauge at a national scale of how close countries are towards establishing environmental policy goals or indicate which countries are doing best against the environmental pressures that the nation faces. Indicators used belong broadly to the following categories:

- Environmental protection
- Environment health
- Environment vitality

Other leading indices like the Global Green Economy Index (GGEI) provide an integrated measure of the environmental, social and economic dynamics of national economies.

Climate Change Performance Index: The Climate Change Performance Index (CCPI) is an independent monitoring tool of countries' climate protection performance. It aims to enhance transparency in the international climate politics and enables the comparability of climate protection efforts and progress made by individual countries. The ranking results are defined by a country's aggregated performance across 14 indicators within the four categories:

- GHG Emissions
- Renewable Energy
- Energy Use
- Climate Policy

Global Climate Risk Index: The Global Climate Risk Index (CRI*)* is developed by German Watch. The index is used to analyze and quantify impacts of extreme weather events – both in terms of fatalities as well as economic losses based on data from the *Munich Re NatCatSERVIC*. It examines both the absolute and relative impacts to create an average ranking of countries in four indicator categories:

- Number of deaths
- Number of deaths per 100,000 inhabitants
- Sum of losses in US$ in purchasing power parity (PPP)
- Losses per unit of Gross Domestic Product (GDP).

1.1.2. National Indices

Indices are developed by some countries to rank development or policy environment for investment or life and well-being or governance. Some of the countries that have developed

such indices include Sweden, UK, India and others. In India, ranking has been done by independent agencies such as Niti Ayog, India Today, Finance Commission and the Centre for Good Governance. Table 1 presents a few examples of Indices developed at different scales around the world and provides information on the criteria and indicators considered for developing them.

Table 1: Examples of Development, Governance and Environment ranking Indices at the global and national level in India

Index	Ranking criteria / Indicators
Environment Performance Index	i) Environmental protection ii) Environment health • Air Quality, Water and Sanitation, Heavy Metals iii) Environment vitality • Biodiversity & Habitat, Forests, Fisheries, Climate and Energy, Air Pollution, Water Resources, Agriculture
India Today Ranking of states	i) 12 categories and overall • Economy, infrastructure, agriculture, education, health, law and order, inclusive development, governance, entrepreneurship, environment, cleanliness and tourism
Good Governance Index	i) Change in Forest Cover ii) State Action Plan on Climate Change (SAPCC)
Global Climate Risk Index	i) Number of deaths ii) Number of deaths per 100,000 inhabitants iii) Sum of losses in US$ in purchasing power parity (PPP) iv) Losses per unit of Gross Domestic Product (GDP)
Climate Change Performance Index	i) GHG Emissions ii) Renewable Energy iii) Energy Use iv) Climate Policy
Human Development Index	i) Life expectancy at birth, expected years of schooling, mean years of schooling, Gross national per capita income
Human Poverty Index	i) Poverty levels
Life and Well-Being Index	i) Housing, income, health, education, environment, jobs, community, civic engagement, life satisfaction, safety, etc.

However, there are very few or no examples of ranking of developmental and infrastructural schemes, programmes and projects at any country or state level.

1.2. Objectives of the Study

This study aims to develop the concept of Green Index and implement it for ranking and Green Indexing of the programmes being implemented by the Government of Karnataka. The specific objectives of the study are to:

- Develop criteria for Green Indexing of the ongoing and proposed schemes/projects/programmes in Karnataka.
- Identify indicators for green indexing of schemes/programmes/projects at different stages of approval and/or implementation, including ongoing schemes.
- Develop Green Index ranking for various schemes/programmes/projects implemented across various departments of the Government of Karnataka.

2. Approach and Methodology

Green Index development for various programmes and schemes being implemented in Karnataka by the different government departments involves multiple steps. Figure 1 presents the approach and steps adopted for Green Index development.

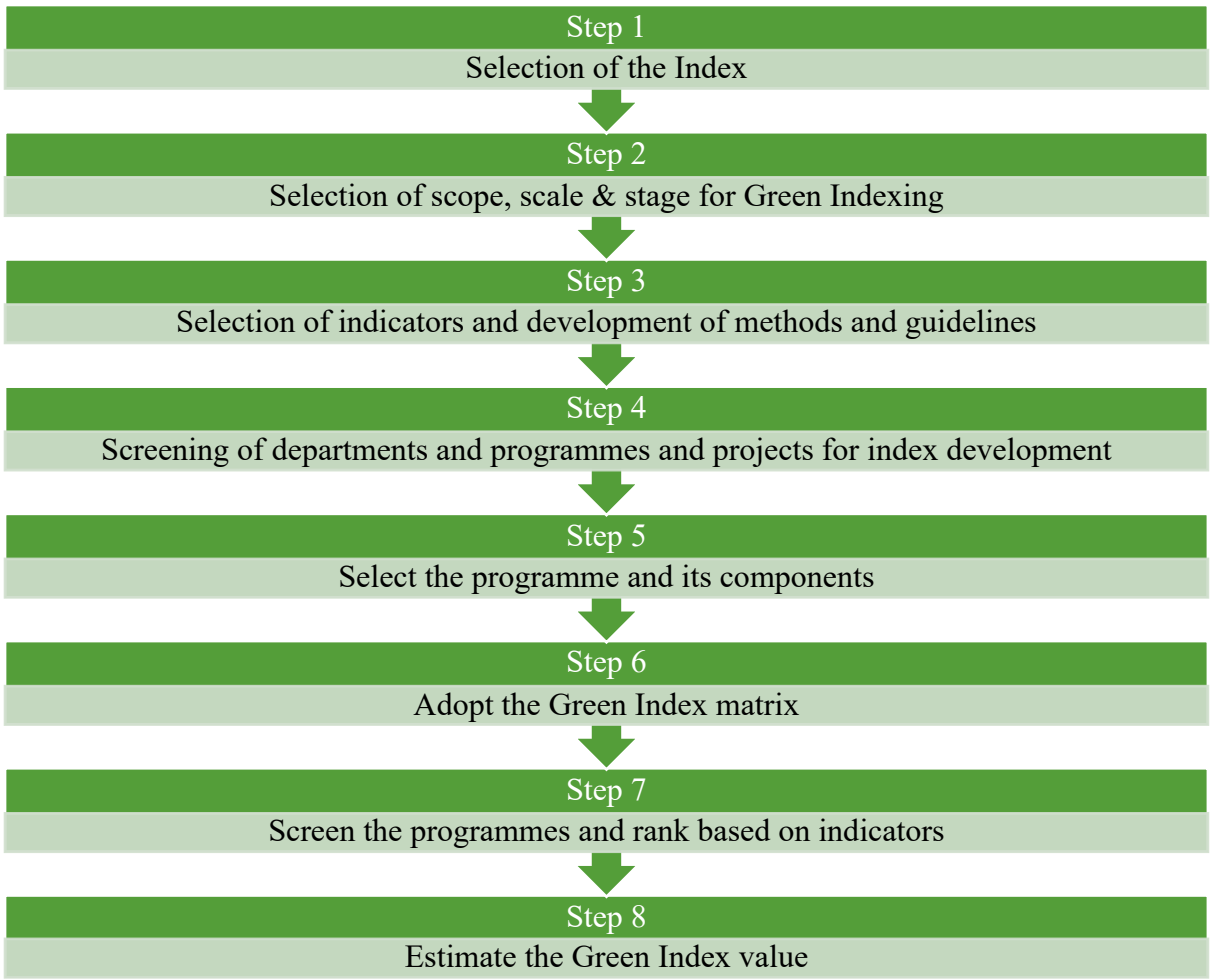

Figure 1: Approach and steps adopted for development of Green Index for Karnataka

2.1. Selection of Index – Step 1

There are multiple indices developed at different scales and for different purposes as discussed in Section 1.1. For the purpose of this study, Green Index concept has been adopted. Green Index provides information on the environmental performance of developmental and infrastructural schemes, programmes and projects.

2.2. Selection of Scope, Scale and Stage of Index Development – Step 2

Green Index is developed for ranking schemes, programmes and projects of the Government of Karnataka.

The green indexing of programmes, schemes and projects could be done at three stages.

i) ***Pre-Approval stage***: *Ex ante* ranking and Green indexing of new developmental and infrastructural schemes, projects and programmes prior to approval by the Government.

ii) ***Post-Approval stage:*** Green indexing of developmental and infrastructural schemes, projects and programmes that have been approved and ongoing.

iii) ***Implementation stage:*** Green indexing of developmental and infrastructural schemes, projects and programmes based on the assessment of the environmental impacts using on a set of indicators during or post-implementation.

In this phase, Green Index has been developed for approved and ongoing programmes and schemes that are being implemented by selected Departments of the Government of Karnataka. Both central and state sponsored schemes that have implications for environment and natural resources have been considered for green indexing.

2.3. Selection of Indicators for Index Development – Step 3

A set of main indicators and sub-indicators were identified based on discussions and stakeholder consultations. It is always desirable to have fewer and a common set of indicators. The rationale for selecting a common set of indicators is as follows:

- Comparison across sectors on environmental performance is possible
- Standardization and large-scale application for all sectors and departments is feasible
- Easy for reporting by all departments
- Easy for public, media and policy makers to understand and appreciate.

2.3.1. Indicators and sub-Indicators for Green Index Development

Six major indicators have been selected during this phase of development of Green Index for ranking of the developmental and infrastructural programmes of Karnataka. The indicators include:

- Energy Use; Promotion of Renewable Energy and Energy Efficiency
- Water use; Conservation and Recycling
- Waste or air pollution management
- Land and biodiversity; Tree planting, Biodiversity conservation
- Carbon emissions; Emission Reduction and C-Sequestration
- Addressing climate risks – enhancing Resilience to Disasters

For each main indicator, there are 1 to 3 sub-indicators, broadly assessing the guidelines for provisions or regulations of enforcement across the six main indicators.

2.3.2. Criteria and rationale for selecting indicators

It is important to consider representativeness and robustness of an indicator at the time of selection. Further, in efforts such as this at the state level, applicability of an indicator to a wide range of schemes and programmes across various departments or sectors and its quantification is important. The selected indicators are provided in Table 2, along with the rationale for their inclusion in development of Green Index.

Table 2: Indicators and rationale for inclusion in development of Green Index

Indicators		Rationale
1	Energy Efficiency (EE) and Renewable Energy (RE)	• Most activities require energy • Energy efficiency opportunity exists for all activities and may lead to cost savings • Need to shift to RE as opportunities exist for shifting to RE and may be cost effective • Adoption of low efficient systems and use of fossil fuel-based energy leads to air pollution, land degradation and GHG / CO_2 emissions
2	Water Conservation and Recycling	• Most programmes or activities require use of water • Water crisis and depleting ground water are major environmental concerns • Technologies exist for water conservation, harvesting and recycling
3	Waste Treatment and Recycling and Pollution Control	• Most processes and activities using natural resources, energy and materials lead to waste generation or pollution • Waste minimization, waste recycling and reduction of air pollution are critical environment and health concerns
4	CO_2 Emission Reduction and Carbon Sequestration	• CO_2 or GHG emissions is a national and global environmental concern • Paris Agreement and NDC require reduction of GHG emissions, estimation and reporting of GHG emissions and mitigation actions • Need to avoid tree felling and promote tree planting and soil conservation leading to carbon sequestration
5	Biodiversity Conservation	• Biodiversity conservation opportunities exist and must be adopted for sustained flow of ecosystem services
6	Adaptation to Disasters and Climate Change	• Impact of climate change on infrastructure, agriculture, forest, water, health, and disasters needs to be addressed in the long-term • Opportunities and technologies exist for climate proofing or adaptation to climate risks and disasters

2.4. Selection of Departments and Programmes – Step 4

The categories of schemes, programmes and projects to be included and potentially excluded for Green Index development are as follows:

i) Schemes, programmes and projects to be included for Green Index development are those that have implications for the environment and natural resources. These could be both central and state sponsored schemes.

ii) Schemes or programmes which do not have any implications for environment are excluded from Green Index development. For example programmes of the Department of Kannada and Culture, DPAR, Law, Parliament Affairs, etc., which do not include activities that impact the environment.

Table 3 presents the departments considered for development of Green Index.

Table 3: Departments considered for Green Index development

Departments Selected *NRM related*	Departments Selected *Infrastructure and Development related*
1. Agriculture	9. Energy
2. Forest Ecology and Environment	10. Infrastructure Development
3. Water Resources	11. Urban
4. Rural Development and Panchayat Raj Department	12. Public Works
5. Animal Husbandry	13. Transport
6. Fisheries	14. Housing
7. Horticulture	15. Food and Civil Services
8. Watershed Development	16. Health & Family Welfare
	17. Tourism
	18. Commerce and Industries
	19. Education
	20. Mines and Geology

2.5. Selection of Programme and Components – Step 5

Programmes that have implications for the environment were selected and the programme objectives, Government Order, components and guidelines or procedures for implementation were procured for screening the programmes using criteria and a set of indicators for development of Green Index.

2.6. Adoption of Green Index Matrix – Step 6

The Green Matrix developed as presented in the '***Toolkit for Green Index Development: for Government Programmes***' is adopted for screening the programmes. This matrix would enable Green Index development utilizing the criteria and six indicators and sub-indicators (Table 4), related to:

- Energy Conservation (and Renewable Energy); Water Conservation and Recycling; Waste Treatment and Recycling, and Pollution Control; Biodiversity Conservation; CO_2 Emission Reduction and Sequestration; and Adaptation to Disasters and Climate Change.

Table 4: Green Matrix with indicators and sub-indicators and indicator scoring for development of Green Index for the proposed programmes

Green Indicators	Green Sub-indicators	Indicator Score			
		1	2	3	4
1. Energy Conservation (and Renewable Energy)	1. Mandatory provision or requirement for adopting Energy Efficiency standards or measures or appliances				
	2. Mandatory provision or requirement for adopting Renewable Energy technologies or measures				
2. Water Conservation and Recycling	1. Mandatory provision or requirement for water conservation or water harvesting or water recycling measures				
3. Waste Treatment and Recycling and Pollution Control	1. Mandatory provision for wastewater treatment				
	2. Mandatory provision for solid waste treatment and recycling measures				
	3. Mandatory provision for air pollution control				
4. Biodiversity Conservation	1. Mandatory provision for regulating tree felling and conservation of biodiversity (trees/fishes/wildlife/others)				
	2. Mandatory provision for promoting tree planting and conservation measures				
5. CO_2 Emission Reduction and Carbon Sequestration	1. Mandatory provision for CO_2 or GHG emission reduction measures or tree planting for carbon sequestration				
6. Adaptation to Disasters and Climate Change	1. Mandatory provision for adaptation activities to minimize damage or cope with any climate change or weather related impacts and disasters				

2.7. Screening of Programmes and Ranking Indicators – Step 7

Screening of the programmes is achieved by providing an index value to each of the indicators and sub-indicators and using a colour scheme of Green (indicator value of 4), Light Green (3), Orange (2), and Red (1). Detailed explanation for scoring of indicators and colour scheme is provided in Table 5.

If an indicator or sub-indicator has no relevance for the proposed programme and its components, a score of '0 - Zero' is assigned.

Table 5: Scoring criteria for Indicators and Sub-Indicators using colour codes

Green Indicators	Green Sub-Indicators	Green Score = 4	Light Green Score = 3	Orange Score = 2	Red Score = 1
1. Energy Efficiency (EE) and Renewable Energy (RE)	Is there a mandatory provision or requirement for adopting Energy Efficiency standards or measures or appliances?	Mandatory provision or requirement for adopting Energy Efficiency standards or measures exists in the program	No mandatory provision or requirement but includes some EE measures or equipment or appliances	Marginal or limited inclusion of Energy Efficiency technologies or measures which are incidental to the program	Energy Efficiency standards or measures required but not included
	Is there a mandatory provision or requirement for adopting Renewable Energy technologies or measures?	Mandatory provision or requirement for adopting Renewable Energy technologies or measures exists in the program	No mandatory provision or requirement but incudes some RE technologies or measures	Marginal or limited inclusion of Renewable Energy technologies or measures which are incidental to the program	Renewable Energy technologies or measures required but not included
2. Water Conservation and Recycling	Is there a mandatory provision requirement for adoption of water conservation or water harvesting or water recycling measures?	Mandatory provision or regulation for adoption of water conservation or harvesting or recycling measures exists in the program	No mandatory provision or requirement but includes some water conservation or harvesting o recycling measures	Marginal or limited inclusion of water conservation or harvesting and recycling measures which are incidental to the program	Water conservation, water harvesting and water harvesting measures required but not included
3. Waste Treatment and Recycling and Pollution Control	Is there a mandatory provision or requirement for wastewater or polluted water treatment?	Mandatory provision or regulation for treatment of wastewater or polluted water exists in the program	No mandatory provision or requirement but includes some measures for treatment of waste or polluted water	Marginal or limited inclusion of measures for treatment of wastewater which are incidental to the program	Wastewater treatment measures required but not included
	Is there a mandatory provision or requirement for adoption of solid waste treatment and recycling measures?	Mandatory provision or regulation for adoption of solid waste treatment and recycling measures exists in the program	No mandatory provision or requirement but includes some measures for solid waste treatment and recycling	Marginal or limited inclusion of measures for solid waste treatment and recycling which are incidental to the program	Solid waste management and recycling measures required but not included
	Is there a mandatory provision or requirement for adoption of air pollution control measures?	Mandatory provision or requirement for adoption of air pollution control measures exists in the program	No mandatory provision or requirement but includes some measures for air pollution control	Marginal or limited inclusion of measures for pollution control which are incidental to the program	Air pollution control measures required but not included

Green Indicators	Green Sub-Indicators	Green Score = 4	Light Green Score = 3	Orange Score = 2	Red Score = 1
4. Biodiversity Conservation	Is there a mandatory provision or requirement for regulating tree felling and conservation of biodiversity (trees /fishes /wildlife / others)	Mandatory provision or requirement for regulating tree felling and conservation of biodiversity (trees /fishes / wildlife /others) exists in the program	No mandatory provision or guidelines but includes measures for regulating tree felling or conservation of biodiversity (trees /fishes / wildlife /others)	Marginal or limited inclusion of measures for regulating tree felling or conservation of biodiversity (trees /fishes / wildlife /others), which are incidental to the program	Regulations on tree felling and conservation of biodiversity (trees / fishes /wildlife /others) required but not included
	Is there a mandatory provision or requirement for promoting tree planting and conservation measures?	Mandatory provision or requirement for promoting tree planting and conservation measures exists in the program	No mandatory provision or requirement but includes some measures for promoting tree planting	Marginal or limited inclusion of measures for promoting tree planting which are incidental to the program	Promotion of tree planting and conservation required but not included
5. CO_2 Emission Reduction and Carbon Sequestration	Is there a mandatory requirement for CO_2 and other GHG emission reduction measures and tree planting for carbon sequestration	Mandatory provision or requirement for reducing GHG emissions or promoting tree planting measures exists in the program	No mandatory provision or requirement but includes some GHG reduction or tree planting measures	Marginal or limited measures for GHG emission reduction or tree planting for carbon sequestration which are incidental to the program	GHG emission reduction or tree planting for carbon sequestration required but not included
6. Adaptation to Disasters and Climate Change	Is there a mandatory requirement to include actions to minimize damage or cope with loss from climate change or weather related disasters (floods, droughts, cyclones, hurricanes)?	Mandatory provision or requirement for adaptation to climate change and disaster management exists in the program	No mandatory provision or requirement but includes measures for adaptation to disasters and climate change	Marginal or limited measures for adaptation to disasters and climate change which are incidental to the program	Adaptation to disaster and climate change required but not included

2.8. Estimation of Green Index Value – Step 8

This step involves estimation of the Green Index value for the programmes, based on the scores assigned for the relevant indicators and sub-indicators provided in Table 4.

- ***Indicator Count:*** Count the number of sub-indicators relevant to the programme, which have been assigned a score of 1 to 4 and obtain the '*Indicator Count*'. Do not include sub-indicators that are not relevant and have been assigned a score of '0 - Zero'.

- ***Aggregate Index Score:*** Sum the scores of sub-indicators for which a score of 1 to 4 has been assigned and obtain the '*Aggregate Index Score*' value.

- ***Green Index:*** Divide the '*Aggregate Index Score'* value by the '*Indicator Count*' to obtain the Green Index for the proposed programme.

2.8.1. Demonstration of Green Index development

Two examples – one from development and infrastructure sector – Energy and one from NRM related sector – Forest is presented here to demonstrate development of Green Index using the criteria, indicators, sub-indicators and ranks assigned.

Example 1 - Off-grid Solar PV Programmes of the Energy Department

Scoring or Ranking of Indicators

Indicator	Sub-Indicators	Score
1. Energy Conservation (and Renewable Energy)	1. Mandatory provision or requirement for adopting Energy Efficiency standards or measures or appliances	**1**
	2. Mandatory provision or requirement for adopting Renewable Energy technologies or measures	**4**
2. Water Conservation and Recycling	1. Mandatory provision or requirement for water conservation or water harvesting or water recycling measures	**0**
3. Waste Treatment and Recycling and Pollution Control	1. Mandatory provision for wastewater treatment	**0**
	2. Mandatory provision for solid waste treatment and recycling measures	**0**
	3. Mandatory provision for air pollution control	**0**
4. Biodiversity Conservation	1. Mandatory provision for regulating tree felling and conservation of biodiversity (trees/fishes/wildlife/others)	**0**
	2. Mandatory provision for promoting tree planting measures	**0**
5. CO_2 Emission Reduction and Carbon Sequestration	1. Mandatory provision for CO_2 or GHG emission reduction measures or tree planting for carbon sequestration	**3**
6. Adaptation to Disasters and Climate Change	1. Mandatory provision for adaptation to minimize damage or cope with any climate or weather related impacts and disasters	**0**

Indicator Count

For the Off-grid Solar PV programmes, 3 of the 10 sub-indicators are relevant and have a score of 1 to 4. Therefore, the Indicator Count for the programmes is 3.

Aggregate Index Score

3 of the 10 sub-indicators have a score of 1 to 4 and the sum of these 3 sub-indicators is 8.

Energy Conservation (and Renewable Energy) [1+4] + CO_2 Emission Reduction and Carbon Sequestration [3] = 8

$$\textbf{Green Index} = \frac{\textbf{Aggregate Indicator Score}}{\textbf{Indicator Count}} = \frac{8}{3} = \textbf{2.6 approximately} = \textbf{3}$$

This means the "the off-grid solar PV" programmes is *Light Green*, with a potential to become *Green*.

Example 2 - Social Forestry Programmes of the Forest Department

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Scoring or Ranking of Indicators

Indicator	Sub-Indicators	Score
1. Energy Conservation (and Renewable Energy)	1. Mandatory provision or requirement for adopting Energy Efficiency standards or measures or appliances	**0**
	2. Mandatory provision or requirement for adopting Renewable Energy technologies or measures	**1**
2. Water Conservation and Recycling	1. Mandatory provision or requirement for water conservation or water harvesting or water recycling measures	**3**
3. Waste Treatment and Recycling and Pollution Control	1. Mandatory provision for wastewater treatment	**0**
	2. Mandatory provision for solid waste treatment and recycling measures	**1**
	3. Mandatory provision for air pollution control	**0**
4. Biodiversity Conservation	1. Mandatory provision for regulating tree felling and conservation of biodiversity (trees/fishes/wildlife/others)	
	2. Mandatory provision for promoting tree planting measures	**4**
5. CO_2 Emission Reduction and Carbon Sequestration	1. Mandatory provision for CO_2 or GHG emission reduction measures or tree planting for carbon sequestration	**3**
6. Adaptation to Disasters and Climate Change	1. Mandatory provision for adaptation to minimize damage or cope with any climate or weather related impacts and disasters	**0**

Indicator Count

For the Social Forestry programmes, 5 of the 10 sub-indicators have a score of 1 to 4. Therefore, the Indicator Count for the programmes is 5.

Aggregate Index Score

5 of the 10 sub-indicators have a score of 1 to 4 and the sum of these 5 indicators is 12.

`Energy Conservation (and Renewable Energy) [1] + Water Conservation and Recycling [3] + Waste Treatment and Recycling and Pollution Control [1] Biodiversity Conservation [4] + CO_2 Emission Reduction and Carbon Sequestration [3] = 12

$$\textbf{Green Index} = \frac{\textbf{\textit{Aggregate Indicator Score}}}{\textbf{\textit{Indicator Count}}} = \frac{\mathbf{12}}{\mathbf{5}} = \mathbf{2.4\ approximately = 2}$$

This means the 'Social Forestry' programmes is Orange with a potential to become Light Green.

3. Green Ranking of Programmes and Schemes

In this study, 20 major departments of the Government of Karnataka, which have direct relevance or impact on environmental concerns and indicators are selected and screened. The results are available in the following manner.

1. Scoring of the programmes according to 6 indicators and 10 sub-indicators for programmes of 20 departments
2. Green Index ranking of the programmes of 20 departments.
3. Green Index estimated along with key factors contributing to index ranking.

In 20 departments, 198 programmes have been screened for Green Index development. Since many of the departments have 10 to 20 programmes, presenting all the above tables in this report is less useful, making the report very long. Therefore, in the main report, only programmes of the Department of Energy and Department of Forest, Ecology and Environment are presented as examples, highlighting the details of the findings. The Green Index tables for the programmes of remaining departments are provided as Annexures.

3.1. Department of Energy

Energy is one of the largest departments of Government of Karnataka. Karnataka has always given high priority to the development of the power sector. All segments of the electricity supply chain: generation, transmission and distribution are important. GoK is developing the power sector through programmes such as: i) expansion of power generation capacity in the State by Karnataka Power Corporation, Government of India Undertakings and other Private Power Producers, ii) bring down transmission and distribution losses by technical improvements and prevention of theft of electricity, iii) improving the quality of power supply with system improvements works, iv) expanding the transmission and distribution network to cover every corner of the State, v) electrifying every hamlet and every household in the State

in a phased manner, vi) improving the efficiency of the electricity companies, vii) encouraging the development of renewable energy, and viii) promoting energy conservation measures.

Table 6 provides example of ranking of indicators and sub-indicators for three selected programmes of Department of Energy. The scores are provided in the range of 1 to 4, based on scoring criteria provided in Table 5.

Table 6: Illustration of scoring of indicators and sub-indicators for selected three programmes of the Department of Energy

Green Indicator	Green Sub-Indicator	Deendayal Upadhyaya Gram Jyoti Yojana	Solar Irrigation Pumpset Scheme for Irrigation	Off Grid Solar PV
1. Energy Conservation (& Renewable Energy)	1. Mandatory provision or requirement for adopting Energy Efficiency standards or measures or appliances	1	1	1
	2. Mandatory provision or requirement for adopting renewable energy technologies or measures	1	4	4
2. Water Conservation and Recycling	1. Mandatory provision or requirement for water conservation or water harvesting or water recycling measures	0	1	0
3. Waste Treatment and Recycling and Pollution Control	1. Mandatory provision for wastewater treatment	0	1	0
	2. Mandatory provision for solid waste treatment and recycling measures	0	0	0
	3. Mandatory provision for air pollution control	0	0	0
4. Biodiversity Conservation	1. Mandatory provision for regulating tree felling and conservation of biodiversity	1	0	1
	2. Mandatory provision for promoting tree planting and conservation measures	1	0	1
5. CO_2 Emission Reduction and Carbon Sequestration	1. Mandatory provision for CO_2 or GHG emission reduction measures or tree planting for carbon sequestration	1	2	3
6. Adaptation to Disasters and Climate Change	1. Mandatory provision for adaptation to minimize damage or cope with any climate or weather related impacts and disasters	1	1	1

Green Index has been developed for 14 major programmes of the Department of Energy, that are relevant to environmental concerns and indicators. The results of Green Index development are provided in Table 7. The results are as follows:

- Ranking Index: Moderately Green – 5 programmes
- Ranking Index: Orange – 5 programmes
- Ranking Index: Red - 4 programmes

Table 7 provides the Green Index ranking and the explanation for the programmes being ranked as Moderately Green, Orange or Red. No programmes qualified as Green – Index Score of 4. Even though energy efficiency and renewable energy standards are prescribed by KREDL, many of the programmes do not incorporate the mandatory requirement for energy efficiency or adoption of renewable energy technologies in the programme guidelines. Further, many of the programmes do not consider indicators relevant to water conservation and recycling, CO_2 emission reduction or compensatory tree planting.

Thus, the findings of Green Index development show the need for, and opportunity for enhancing the Greenness of the programmes of the Department of Energy, by considering critical environmental indicators such as mandatory deployment of energy efficiency measures and renewable energy technologies, CO_2 emission reduction, and adaptation strategies for extreme weather or climatic hazards in the programme guidelines, to ensure adoption of these concerns during implementation.

Table 7: Green Index ranking of programmes being implemented by Energy Department

Name of the schemes	Moderately Green Schemes with moderate environmental considerations	Orange Schemes with low environmental considerations	Red Schemes with no environmental considerations	Explanation
Deendayal Upadhyaya Gram Jyoti Yojana (DDUGJY)				• Energy efficient measures are not included • Measures for tree biodiversity conservation are not included while laying transmission lines
Karnataka Renewable Energy Policy 2014				• Scheme encourages use of renewable energy • Promotes utilization of solar, wind and biomass energy
Off-grid Solar PV				• Provides solar energy access (street light, power plants, study lamps) solutions in the rural and remote areas • No compensatory afforestation for tree loss during implementation
Pradhan Mantri Urja Suraksha Evam Utthaan Mahabhiyaan (KUSUM)				• There is a provision for use of renewable energy • Solar pumps are used for micro irrigation
Solar Rooftop PV Systems				• It is a Solar PV-based programme • Reduces carbon dioxide emissions by using solar energy
Solar Irrigation Pumpset Scheme/ Solar Pumping Programme for Irrigation				• No water conservation measures • No provision for CO_2 reduction
Surya Raitha Scheme				• Provides solar pump sets to farmers for agriculture • Energy efficient pumps not included • Water conservation measures not included
Pradhan Mantri Sahaj Bijli Har Ghar Yojana (Saubhagya)				• Provide solar energy in remote areas, inaccessible to villages or habitation • Reduces carbon dioxide by using solar energy • Energy efficient lighting systems not included
Energy Efficient Fans Programme (PAVAN) Scheme				• Provides energy efficient fans • Distribution of BEE five star celling fans

Name of the schemes	Moderately Green Schemes with moderate environmental considerations	Orange Schemes with low environmental considerations	Red Schemes with no environmental considerations	Explanation
Mukhya Mantri Anila Bhagya Yojane				• Provides free LPG connection to poor and backward community and LPG helps to reduce carbon dioxide emissions • Reducing air pollution in kitchens
IPDS				• Provision for solar panels • Energy efficient systems not included • There is no compensatory afforestation for tree loss during implementation
Ganga Kalyan				• Energy efficiency component is not included • Water conservation measures are not considered • Biodiversity conservation measures are not considered

3.2. Department of Forest, Ecology and Environment

The Forest, Ecology and Environment department has a vision of conservation, management and development of forests and tree growth, on a sustainable basis, for present and future generations. Its mission is to plan, execute, coordinate and monitor the implementation of Forestry and Wildlife programmes to meet people needs and to ensure ecological security and environmental balance, by sustainable management of forests, and enhancing the forest and tree cover through peoples' participation for meeting community needs and better realization of ecological goods and services.

Table 8 provides examples of ranking of indicators and sub-indicators for three selected programmes of Department of Forest, Ecology and Environment. The scores are provided in the range of 1 to 4, based on scoring criteria provided in Table 5.

Table 8: Illustration of scoring of indicators and sub-indicators for selected three programmes of the Department of Forest, Ecology and Environment

Green Indicator	Green Sub-Indicator	Development or preservation of Devarakadu	Special Component Plan	Social Forestry Scheme
1. Energy Conservation (and Renewable Energy)	1. Mandatory provision or requirement for adopting Energy Efficiency standards or measures or appliances	0	4	0
	2. Mandatory provision or requirement for adopting Renewable Energy technologies or measures	1	4	1
2. Water Conservation and Recycling	1. Mandatory provision or requirement for water conservation or water harvesting or water recycling measures	2	1	3
3. Waste Treatment and Recycling and Pollution Control	1. Mandatory provision for wastewater treatment	0	0	0
	2. Mandatory provision for solid waste treatment and recycling measures	1	1	1
	3. Mandatory provision for air pollution control	0	0	0
4. Biodiversity Conservation	1. Mandatory provision for regulating tree felling and conservation of biodiversity (trees/fishes/wildlife/others)	4	3	3
	2. Mandatory provision for promoting tree planting and conservation measures	4	3	3
5. CO_2 Emission Reduction and Carbon Sequestration	1. Mandatory provision for CO_2 or GHG emission reduction measures or tree planting for carbon sequestration	3	4	4
6. Adaptation to Disasters and Climate Change	1. Mandatory provision for adaptation to minimize damage or cope with any climate or weather related impacts and disasters	4	0	1

Green Index is developed for 15 major programmes of the Department of Forest, Ecology and Environment, that are relevant to environmental concerns and indicators. The results of Green Index development (Table 9) are as follows for the Department of Forest, Ecology and Environment:

- Ranking Index: Green – 1 programme
- Ranking Index: Moderately Green – 3 programmes
- Ranking Index: Orange – 11 programmes

Table 9 provides the Green Index ranking and the explanation for programmes being ranked as Green, Moderately Green and Orange. No programmes qualified as Red in the Department of Forest, Ecology and Environment. However, many of the programmes still have opportunities for incorporating the mandatory requirement for energy efficiency or adoption of renewable energy technologies in the programme guidelines. Further, many of the programmes do not consider indicators relevant to waste management, water conservation and recycling.

Thus, the findings of Green Index development show the need for, and opportunity for enhancing the Greenness of the programmes of the Department of Forest, Ecology and Environment, by considering critical environmental indicators such as mandatory deployment of energy efficiency measures and renewable energy technologies, and adaptation strategies for extreme weather or climatic hazards in the programme guidelines, to ensure adoption of these concerns at the implementation stage.

Table 9: Green Index ranking of programmes being implemented by Department of Forest, Ecology and Environment

Name of the Scheme	Green Schemes with high environmental considerations	Moderately Green Schemes with moderate environmental considerations	Orange Schemes with low environmental considerations	Explanation
Development/Preservation of Devarakadu				• Conservation measures for maintenance of biodiversity • There is a reduction of CO_2 through conservation
Social Forestry Scheme				• Positive impact on biodiversity. • No provision for EE and RE. • Nursery waste management measures not included
Tribal Sub Plan				• Reduction of CO_2 due to growing of avenue plantations • No provision for water conservation. • Provision to use renewable energy source (solar lamps, heaters) of energy
Greening of Urban Areas				• Provision for water conservation • No provision for EE and RE. • Nursery waste management measures not included
Raising of Seedlings for Public Distribution				• Provision for water conservation. • No provision for EE and RE. • Nursery waste management measures not included
Tree Parks				• Provision for water conservation. • No provision for EE and RE.
Development of Degraded forest				• Provision for water conservation • Positive impact on biodiversity • No provision for EE and RE.
Talukigondu Hasiru Grama Yojanae				• Positive impact on biodiversity • No provision for EE and RE • Nursery waste management measures not included
National Agroforest and Bamboo Mission				• Positive impact on biodiversity • Provision for water conservation • No provision for EE and RE • Nursery waste management measures not included
Special Component Plan				• Provision for renewable energy (solar lamps & water heaters) • Positive impact on biodiversity.

Roadside plantation				• No provision for water conservation • No provision for EE and RE
Maguvigondu Mara Shalegondu Vana				• Provision for water conservation. • No provision for EE and RE. • Nursery waste management measures not included
Sirichandanavana				• Provision for chain link mesh and watch guards which conserves biodiversity. • No provision for EE and RE • Nursery waste management measures not included
Samrudha Hasiru Grama Yojanae				• Positive impact on biodiversity. • No provision for EE and RE.
Krishi Aranya Protsaha Yojanae				• Positive impact on biodiversity • There is no provision for EE and RE in nurseries. • Nursery waste management measures not included

4. Strategy for Incorporating Environmental Concerns or Greenness in Government Programmes of Government of Karnataka

The main goal of Green Index concept is to make development green and sustainable. This could be achieved by incorporating guidelines and measures to address the identified environmental concerns in all the developmental and infrastructural programmes/schemes/ projects.

4.1. Approach and Steps for Greening of Government Programmes

Here is the summary of the steps involved in promoting Greenness of programmes are presented.

1. ***Identify the drivers of Green Index:*** Identify all the indicators and sub-indicators which have an index score value of 1 (Red), 2 (Orange), and 3 (Light Green). These scores and colour scheme indicate opportunities for enhancing the Greenness of the proposed programmes in a gradual manner as given below:

    - Directly transition from Red to Green
    - Transition from Red to Orange or Orange to Light Green – since some programmes may not have cost-effective and feasible technologies or measures to directly transition to Green.
    - Transition from Red to Orange or Orange to Light Green is the first step and further transition to Green gradually during the project period.

2. ***Enhance the Greenness of the proposed programmes***: Enhance the Greenness of the programmes by adopting the following procedure:

    - Identify the opportunities, technologies, interventions and regulatory standards to be incorporated, into the proposed programmes to enable transition towards Green Index or development.
    - Assess the cost of the technology or intervention or regulatory standard per unit or for the whole programme. Some interventions such as energy efficient systems may indeed save money.
    - Incorporate the identified green technology or regulatory standards into the components of the proposed programmes or into the programmes guidelines or Government Order or Work Plan or Detailed Project Report.
        - Some programmes may require mandatory provisions for adopting, for example, energy efficiency standards or installation of renewable energy systems or water conservation measures, or waste recycling or compensatory tree planting and CO_2 emission reduction.
    - Create budgetary provision or incentives for adoption of the proposed green technologies, interventions and regulatory standards.

4.2. Strategies for Addressing Environmental Concerns towards Greenness of Government Programmes

Greening strategies for addressing the six environmental concerns and indicators are summarised in Table 10. In this Table, the current status of the consideration of environmental concerns and indicators in infrastructure and developmental programmes is presented. Currently, majority of the programmes do not adequately address the six environmental concerns, considered in Green Index development. Table 10 also provides a broad strategy to address the environmental concerns such as energy conservation, promotion of renewable energy, water conservation and recycling, waste and air pollution management, GHG emission reduction, and adaptation to climate risks.

Table 10: Summary of 'Greening Strategies' to address the environmental concerns and indicators in government programmes

Environmental concerns	Indicators	Current status of ongoing programmes	Strategies for proposed and ongoing programmes
Energy	Energy Efficiency (EE)	Majority of the programmes directly or indirectly use energy. However, these have no provision for ensuring and promoting EE.	1. All programmes that use energy directly or indirectly should have a mandatory requirement or regulation to incorporate most efficient energy systems, appliances and measures.
	Renewable Energy (RE)	Majority of the programmes, excluding solar energy related programmes, do not have any or limited provision for use of RE.	1. All programmes where fossil fuel electricity is used should have a provision for adoption of RE technologies and sources of renewable power.
Water	Conservation	Majority of the programmes require water but do not have any regulation on use of ground water and water conservation or water use efficiency.	1. There is a need for regulation on use of ground water. 2. All programmes which require water must have mandatory requirement for adopting water conservation measures.
	Recycling	Many programmes could use recycled water. But currently, there is no provision that mandates recycling of water.	1. Identify programmes where recycled water could be used. 2. Recommend water recycling processes or technologies.
Waste	Waste reduction and management	Many programmes lead to pollution of water or air or generate waste (solid or liquid). Currently, there is no provision for addressing pollution or waste management in a majority of the programmes.	1. Identify or select programmes that have activities leading to generation of solid or liquid waste or pollute the air or water. 2. Recommend technologies and measures to address water or air pollution. 3. Incorporate solid/liquid waste treatment measures into the programme guidelines.

GHG emissions and Carbon sequestration	CO_2 emission reduction or sequestration	Majority of the programmes use fossil fuel energy and some programmes lead to tree felling, both leading to CO_2 emissions. Currently there is no consideration of CO_2 emissions or carbon sequestration.	1. All programmes requiring use of fossil fuel energy should have provision for adopting energy efficiency measures and shifting to renewable sources of energy, where feasible, to reduce CO_2 emission. 2. Land-based programmes should have a provision for minimizing tree felling and promoting compensatory planting for carbon sequestration 3. Programmes using fossil fuel energy on a large-scale should have a provision for reporting CO_2 emissions.
Biodiversity (BD) and Ecosystem Services (ES)	Conservation of BD and ES	Land and water based programmes could potentially lead to loss of BD and ES. Currently, there is very limited consideration of BD and ES.	1. Land and water based programmes should have a provision for minimizing tree felling, loss of BD – plants, fishes, etc., and compensatory tree planting. 2. Biodiversity conservation should be made mandatory for all programmes that impact biodiversity.
Adaptation to climate change	Adaptation to weather disasters and climate change	All large infrastructure programmes and all natural resource management programmes will be impacted by climate change and weather extremes. Currently climate risks and disasters are not considered.	1. All infrastructure programmes should have a provision for considering the climate change risks and disasters and incorporate adaptation measures in design of structures. 2. All Natural Resource Management programmes should have a provision for considering impact of climate change and disasters and incorporate adaptation measures.

4.3. Application of Green Index

Development of Green Index creates multiple opportunities to promote Green Development at the state level. Some of the potential applications of the Green Index are as follows:

1. Enable policy makers or government departments and agencies to design programmes and projects to ensure no adverse environmental impacts occur. Green Index would enable them to identify opportunities to minimize the damage to environment and promote conservation and sustainable use of resources. Green Index would assist in enhancing the greenness of developmental programmes by identifying the critical environmental concerns that need to be addressed in designing the programmes such as;
    - Water conservation and recycling measures are incorporated in the programmes guidelines

    - Energy efficiency and renewable energy technologies are incorporated in the guidelines
    - Solid or liquid waste generation is minimized and are treated, or managed by incorporating adoption of relevant pollution abatement technologies in the guidelines
    - GHG or carbon emissions are reduced by adoption of mitigation technologies.
2. Create awareness within the government departments and among different stakeholders such as NGOs, communities and mass media about environmental considerations in design and implementation of government programmes or schemes.
3. Facilitate enhanced financial allocations and rewards to green and environmentally friendly programmes and projects.
4. Empower the government, in a phased manner, to enforce use of renewable resources, conservation of resources, minimization of pollution, treatment of wastes, and regeneration of environment.
5. Meet the Nationally Determined Contributions (NDC) goals and targets relevant to climate change and SDGs (Sustainable Developmental Goals), and also facilitate implementation of State Action Plan on Climate Change.

Green Index adoption would enable government programmes or scheme developers to design programmes or schemes to transform from being an environment damaging programmes or scheme → to a reduced environment damaging programmes or scheme → to a green (environmentally sound) programme or scheme.

Annexures

Department of Agriculture

Name of the scheme	Green Schemes with high environmental considerations	Moderately Green Schemes with moderate environmental considerations	Orange Schemes with low environmental considerations	Red Schemes with no environmental considerations	Justification
National Mission on Sustainable Agriculture					• Encourages water conservation • No provision for RE and water recycling.
CM's Sookshma Neeravari Yojanae - National Mission on Sustainable Agriculture					• Provision for water conservation • No provision for EE and RE use
Organic Farming					• Provision for EE devices, water conservation – mulching & green manuring • Provision for plantation
National Food Security Mission					• Encourages water conservation through irrigation • No provision for renewable energy and water recycling.
National Mission on Oilseed and Oil Palm					• It encourages water conservation through drip irrigation • No provision for energy efficient management strategies
Agricultural Inputs and Quality Control					• There is no provision for energy efficiency measures
Agriculture Infrastructure					• There is no provision for energy efficiency measures
Krishi Bhagya					• No provision for energy efficient management strategies • There is provision for water conservation through rainwater harvesting • No provision for GHG emission reduction • There is provision for horticultural crop cultivation

Department of Horticulture

Name of the scheme	Green Schemes with high environmental considerations	Moderately Green Schemes with moderate environmental considerations	Orange Schemes with low environmental considerations	Red Schemes with no environmental considerations	Justification
National Horticulture Mission					• Provision for water conservation through rain water harvesting • No provision for RE and EE mechanisms
National Mission on Oil seeds and Oil Palm(NMOOP)					• No provision for RE and EE mechanisms
Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)					• Provision for water conservation by adopting micro irrigation • No provision for RE and EE mechanisms
Rashtriya Krishi Vikas Yojane					• No provision for RE and EE mechanisms • Provision for water conservation by adopting drip irrigation
Comprehensive Horticulture Development					• Provision for water conservation by adopting drip irrigation • No provision for RE and EE mechanisms
Karnataka State Spices Development Board					• No provision for RE systems
Apiculture Development Program					• No provision for RE systems.
Krishi Bhagya Yojane (KBY)					• Provision for water conservation through rain water harvesting. • Provision for renewable energy by using solar motors • Provision for horticultural crop cultivation.

Department of Fisheries

Name of the scheme	Green Schemes with high environmental considerations	Moderately Green Schemes with moderate environmental considerations	Orange Schemes with low environmental considerations	Red Schemes with no environmental considerations	Justifications
Reimbursement of Sales Tax on Diesel used by Fishing Boats					• Subsidy given for purchase of diesel which is a fossil fuel and CO_2 emitting fuel
Matsya Ashraya Scheme					• No provision for energy efficiency, water conservation, waste management, and conservation of biodiversity
NABARD assistance under RIDF					• The water conservation measures are undertaken • There is biodiversity conservation
Blue Revolution - Integrated Development and management of Fisheries					• Provision for energy efficient, renewable energy for aquaculture activity
Unspent SCSP-TSP Amount as per the SCSP-TSP Act 2013					• There is biodiversity conservation – hatcheries, fish ponds • No provision for RE and EE • No Water recycling measures incorporated
Dredging of fishing harbours-Centrally Sponsored Scheme					• There is provision for waste management
Subsidy on electricity used by Ice plants					• There can be a provision for use of biofuels
Maintenance of costal link roads					• Energy efficient measures can be undertaken
Assistance for Development of Inland Fisheries (ZP)					• There can be provision for RE and EE
Construction and maintenance of fisheries buildings and facilities					• There can be provision for adopting renewable source of energy • There is biodiversity conservation – seed production

Department of Animal Husbandry

Name of the scheme	Green Schemes with high environmental considerations	Moderately Green Schemes with moderate environmental considerations	Orange Schemes with low environmental considerations	Red Schemes with no environmental considerations	Justifications
Incentives to Milk Producers					• There is no provision for energy efficiency, water conservation, waste management and conservation of biodiversity.
Opening of Rural Veterinary Dispensaries & their upgradation as Taluk level Dispensaries					• There is provision for use of EE mechanisms and RE
Conservation and Management of Indigenous Varieties of Livestock (Cattle and Sheep) in the wake of Climate Change in Karnataka					• There is provision for biodiversity conservation • There is provision for use of solar energy and biogas plants • There is conservation of ground and surface water resources • Project has mitigation co-benefit of reducing methane emission
Establishment of Veterinary and Animal Sciences University.					• There can be use of EE mechanisms and RE • Can promote biodiversity conservation mechanisms • Water conservation measures can be adopted
Construction of Dispensaries under RIDF					• There can be use of EE mechanisms and RE • Water conservation measures can be adopted
Institute of Animal Health and Veterinary Biologicals, Bangalore					• There can be use of EE mechanisms and RE • Water conservation measures can be adopted
Karnataka Sheep and Wool Development Corporation Limited					• There is provision for biodiversity conservation
Livestock Farms and Training					• There is provision for biodiversity conservation
Livestock Development Farms					• There can be use of EE mechanisms and RE - Solar lights installation

Department of Watershed

Name of the scheme	Green Schemes with high environmental considerations	Moderately Green Schemes with moderate environmental considerations	Orange Schemes with low environmental considerations	Red Schemes with no environmental considerations	Justification
Karnataka watershed Development Project-II Sujala- III					• Provision for water conservation • Provision for carbon sequestration
Pradhan Mantri Krishi Sinchaye Yojane (PMKSY)-Watershed Development					• Provision for recharge of ground water, water recycling • Provision for afforestation

Department of Transport

Name of the scheme	Green Schemes with high environmental considerations	Moderately Green Schemes with moderate environmental considerations	Orange Schemes with low environmental considerations	Red Schemes with no environmental considerations	Justification
Implementation of LPG Kits					• Distribution of LPG kits to reduce air and noise pollution • There is provision for renewable energy and energy efficient mechanisms
Public Bus transportation services					• Provision for procuring EE buses • Provision for water conservation measures • Tree planting at bus stations undertaken
Regional and inter-state transportation services					• Rainwater harvesting is undertaken • Emission checks conducted regularly • Tree planting is undertaken in and around the vicinity of bus stations
Comprehensive Mobility Plan (CMP)					• Provision to estimate CO_2 emissions and air quality

Name of the scheme	Green Schemes with high environmental considerations	Moderately Green Schemes with moderate environmental considerations	Orange Schemes with low environmental considerations	Red Schemes with no environmental considerations	Justification
					• Use of biofuel and natural gas as alternatives • No provision for water and biodiversity conservation
Electric Vehicle policy					• Provision for renewable energy and energy efficient mechanisms • Provision for controlling air pollution
Public Bicycle Sharing					• Promotes non-motorised transport, reduces CO_2 emission
BRTS Hubbali- Dharwad					• Provision for energy efficiency buses • Water conservation measures adopted • Tree planting is undertaken in and around the vicinity of bus stations.
E-rickshaws Scheme					• Scheme suggests for adopting energy efficiency measures • E-waste management strategies are implemented.
National Urban Transport Policy					• Provision reducing emission of GHGs • No provision for energy efficiency measures
SDP/SCP/TSP/KGID/JnNURM (UIDSSMT) & Infrastructural Works					• Provision for recycling/reuse of wastewater
Infrastructure Development					• No provision for RE and EE systems

Department of Housing

Name of the scheme	Green Schemes with high environmental considerations	Moderately Green Schemes with moderate environmental considerations	Orange Schemes with low environmental considerations	Red Schemes with no environmental considerations	Justification
Rajeev Awas Yojane (RAY)					• There is no provision for energy efficiency, water conservation, waste management and conservation of biodiversity
53 Housing Schemes					• There is no provision for energy efficiency, water conservation, waste management, and conservation of biodiversity
225 Housing Schemes					• There is no provision for energy efficiency, water conservation, waste management and conservation of biodiversity.
Suvarna Karnataka					• There is no provision for energy efficiency, water conservation, waste management and conservation of biodiversity

Name of the scheme	Green Schemes with high environmental considerations	Moderately Green Schemes with moderate environmental considerations	Orange Schemes with low environmental considerations	Red Schemes with no environmental considerations	Justification
Multi Village Scheme Project					• There is provision for water conservation – water harvesting and its quality treatment • There is no provision for energy efficiency, measures.
Swachha Bharat Mission(SBM)					• There is provision for solid and water waste management strategies • No provision for energy efficiency
Pradhana Manthri Gram Sadakyojana (PMGSY) (CMGSY is included)					• There is no provision for utilizing energy efficient vehicles for transportations. • There is provision for compensatory afforestation of plants
Mahatma Gandhi National Rural Employment Guaranteed Scheme (MNREGA)					• There is provision for water conservation for rain water harvesting, bund formation, water tank etc. • There is provision for tree plantation. • There is no provision for energy efficiency measures.
Social Housing Schemes under Rajiv Gandhi Rural Housing Corporation Limited (RGRHCL)					• There is no provision for energy efficiency, water conservation, waste management, and conservation of biodiversity.
Pradhan Mantri Awas Yojana Housing for All (PMAY-HFA)					• There is no provision for energy efficiency, water conservation, waste management, and conservation of biodiversity.
Grama Vikasa Scheme / Suvarna Gramodhaya/ Chief Minister Grama Vikasa Yojane (as per Annual Report 2017-18)					• There is no provision for energy efficiency, water conservation, solid waste management, and conservation of biodiversity measures.
Bharat Nirman/National Rural Drinking Water Programme (NRDWP)					• There is no provision for water conservation and water quality and its efficiency. • There is no provision for energy efficiency measures.

Name of the scheme	Green Schemes with high environmental considerations	Moderately Green Schemes with moderate environmental considerations	Orange Schemes with low environmental considerations	Red Schemes with no environmental considerations	Justification
Grama Swaraj Yojane					• There is no provision for energy efficiency, water conservation, waste management, and conservation of biodiversity.
Desert Development Programme (DDP)					• There is provision for water conservation mainly for drought prone areas. • There is no provision for energy efficiency measures.
National Biogas Manure and Management Programme (NBMMP)					• There is provision for renewable energy efficiency measures. • Solid waste management measures are implemented towards biogas production.
Western Ghats Development Programme (till 2015-16 it was central scheme)					• Measures for biodiversity conservation are undertaken • There is provision for water conservation. • There is no provision for energy efficiency use and waste management.
Soura Belaku – Installation of Solar Street Lights at Grama Panchayats					• Measures for implementation of renewable energy efficient activities programmes through installation of solar lights are carried out.

Department of Urban Development

Name of the Scheme	Green Schemes with high environmental considerations	Moderately Green Schemes with moderate environmental considerations	Orange Schemes with low environmental considerations	Red Schemes with no environmental considerations	Justification
Smart cities					• There is promotion of green buildings • Provision for energy efficiency and renewable energy • Waste water recycling is undertaken • Waste management strategies are adopted • There is conservation of biodiversity
KIUWMIP					• There is provision for waste water treatment • There is provision for compensatory afforestation
KUWSMP					• There is provision for usage of energy efficiency devices • There is adoption of water conservation measures as per policy on Safe System of Work • Adoption of solid waste management and handling rules, 2016 • There is conservation of biodiversity
Atal Mission for Rejuvenation and Urban Transformation(AMRUT)					• There is provision for water conservation and sewage treatment facility • There is provision for tree planting • and creating green spaces
Nagarothana					• There is provision for usage of energy efficiency devices • There is adoption of water conservation measures as per policy on Safe System of Work • Adoption of solid waste management and handling rules, 2016 • There is conservation of biodiversity
Swacch Bharat Mission					• There is provision for construction of landfill – solid waste management • There is provision for tree planting • Energy efficiency measures are adopted
State Finance Commission					• There is provision for solid waste management • Installation of sewage treatment plants
14th Finance					• There is provision for solid waste management

Name of the Scheme	Green Schemes with high environmental considerations	Moderately Green Schemes with moderate environmental considerations	Orange Schemes with low environmental considerations	Red Schemes with no environmental considerations	Justification
					• There is provision for usage of renewable energy sources • Adoption of water conservation and recycling measures
MukyaMantrigala Nava Nagarothana Yojane - Road Infrastructure					• No provision for renewable energy usage • Provision for usage of C&D waste
Shubra Bangalore					• There is provision for usage of renewable energy sources • There is provision for solid waste management • There is provision for usage of renewable energy sources • Adoption of water conservation and recycling measures • Provision of sweeping machines to control air pollution
MukyaMantrigala Nava Nagarothana Yojane - Solid Waste Management					• There is provision for usage of renewable energy sources • There is provision for solid waste management • There is provision for solid waste management • There is provision for biodiversity conservation
MukyaMantrigala Nava Nagarothana Yojane - Lake Development					• Provision of recharge of ground water • Provision of STPs • Provision of solid waste management system • Provision of conservation of trees, wildlife, birds etc
BMRCL -Phase II					• Usage of energy efficient mechanisms • There is reduction in GHG emission • There is provision for compensatory afforestation
Urban Water Supply Schemes					• No provision for renewable energy • No water conservation measures
Under Ground Drainage Schemes					• No provision for adopting energy efficiency standards. • No provision for adoption of water conservation measures. • Adoption of water recycling measures • Sludge separated from sewage is used as manure

Name of the Scheme	Green Schemes with high environmental considerations	Moderately Green Schemes with moderate environmental considerations	Orange Schemes with low environmental considerations	Red Schemes with no environmental considerations	Justification
Cauvery Water Supply - Stage V					• Provision for STPs • Provision for ground level reservoirs • There is no provision for energy efficiency standards • There is provision for compensatory afforestation
Providing Water Supply to 100 villages					• There is provision for compensatory afforestation • No provision for adoption of water conservation measures.
Support for BWSSB STP Project					• There is power generated through sludge waste • Provision for water conservation measures

Department of Food and Civil Supplies

Name of the Scheme	Green Schemes with high environmental considerations	Moderately Green Schemes with moderate environmental considerations	Orange Schemes with low environmental considerations	Red Schemes with no environmental considerations	Justification
Provision of food through Public Distribution System					• No provision for renewable energy use • No provision for energy efficient devices
National Food Security Act - 2013					• No provision for renewable energy • No provision for energy efficient devices
DASOHA Scheme					• Use of firewood leads to emissions
Punarbelaku Yojane					• Provision of renewable energy such as rechargeable bulbs • There is provision for usage of energy efficient devices

Department of Infrastructure Development

Name of the Scheme	Green Schemes with high environmental considerations	Moderately Green Schemes with moderate environmental considerations	Orange Schemes with low environmental considerations	Red Schemes with no environmental considerations	Justification
Railways(Railroad over/under bridge) (ROB/RUB)					• There is no provision for energy efficiency or renewable energy • There is no provision for biodiversity conservation • There is no provision for waste management
Tadadi port					• There is provision for wastewater treatment
City Gas Distribution (GAIL)					• There is no provision for energy efficiency or renewable energy • There is no provision for biodiversity conservation • There is no provision for waste management
Bengaluru Signature Business Parks					• Provision for water conservation measures
Airport/Airstrips					• Provision for adoption of EE standards

Department of Tourism

Name of the scheme	Green Schemes with high environmental considerations	Moderately Green Schemes with moderate environmental considerations	Orange Schemes with low environmental considerations	Red Schemes with no environmental considerations	
Swadesh Darshan					• Use of renewable energy shall be promoted • Implementation of Solid waste Management & Handing rules 2016 is being considered • Water conservation measures are considered • Tree planting is promoted

Name of the scheme	Green Schemes with high environmental considerations	Moderately Green Schemes with moderate environmental considerations	Orange Schemes with low environmental considerations	Red Schemes with no environmental considerations	
Eco Tourism Policy					• Promote green buildings concept for infrastructure development • Eco-friendly transportation for forest visits • Encourages waste recycling and proper sewage disposal
Karnataka Tourism Policy					• It encourages use of environmental friendly vehicles - Promote Zero pollution mode of transport
Prasad Scheme					• Use of renewable energy in tourism related infrastructure • Eco friendly mode of transportation • Clean energy source for street lighting • Eco-friendly transportation for tourists
Mega Tourism Projects					• Eco-friendly mode of transportation • Provides improvement in solid waste and sewage management • Development of parks, landscape activities at tourist places
RIDF-XII/NABARD					• Waste management measures to be incorporated • Biodiversity Conservation measures can be considered
Tagore Cultural Complex Scheme					• Use of renewable energy for infrastructure • Biodiversity conservation measures to be considered • Waste management and water conservation measures must be implemented
JNNURM					• Provision of solar lights at the heritage paths
Establishment of Tourism Plaza at Karwar and Mysuru					• Promote green buildings concept for infrastructure development
Establishment of Cauvery Art Gallery at Mysuru					• Promote green buildings concept for infrastructure development
Mega Coastal Circuit Project					• Development of parks, landscape activities at tourist places • Eco-friendly mode of transportation • Provide improvement in solid waste management

Name of the scheme	Green Schemes with high environmental considerations	Moderately Green Schemes with moderate environmental considerations	Orange Schemes with low environmental considerations	Red Schemes with no environmental considerations	Justification
Maintenance of School Facilities (Panchasoulabya)					• There is provision for biodiversity conservation • There is no provision for energy efficiency or renewable energy • There are no wastewater and solid waste management measures
RMSA-Primary School Infrastructure					• Water conservation measures are not considered • Biodiversity conservation measures not considered • Use of renewable energy not incorporated
Akshaya Pathra (Midday meal programme)					• No provision for energy efficiency, water conservation & waste management
Sarva Shiksha Abhiyan Society					• No provision for energy efficiency, water conservation & waste management
Maintenance of Secondary School Building					• No provision for energy efficiency, water conservation & waste management

Name of the scheme	Green Schemes with high environmental considerations	Moderately Green Schemes with moderate environmental considerations	Orange Schemes with low environmental considerations	Red Schemes with no environmental considerations	Justification
Industrial Infrastructure for Institutions					• There is provision for sewage treatment plant • There are conservation measures for ground water • Biodiversity conservation measures are adopted • There is no provision for energy efficiency or renewable energy
Critical Infrastructure Scheme					• There is provision for common effluent treatment plant • Solid waste management is undertaken • There is no provision for energy efficiency, renewable energy
Rebate and Assistance to Khadi small industries products					• There is no provision for energy efficiency or renewable energy • There is no provision for biodiversity conservation measures
Establishment and improvement of Industrial Clusters					• There is provision for common effluent treatment plant • The scheme suggest for creation of green space • There is provision for wastewater treatment plant • There is no provision for energy efficiency or renewable energy
Kaigarika Vikasa Yojane					• No provision for EE & RE • No provision for biodiversity conservation • No provision for waste management
Aerospace Common Facility Centre at Devanahalli, Bengaluru District					• There is provision for renewable energy, effluent treatment plant, water conservation measures such as rainwater harvesting and water recycling. • There is provision for recycling of electronic and plastic waste. • No provision for biodiversity conservation measures
Special Development Plan					• There is provision for wastewater treatment plant • No provision for EE & RE

Name of the scheme	Green Schemes with high environmental considerations	Moderately Green Schemes with moderate environmental considerations	Orange Schemes with low environmental considerations	Red Schemes with no environmental considerations	Justification
					• There is provision for waste management • There is no provision for biodiversity conservation
Artisan Housing Cluster					• No provision for EE & RE • There is no provision for biodiversity conservation • There is no provision for waste management
Assistance to Coir Sector-Tengu Bhagya					• No provision for EE & RE • There is no provision for biodiversity conservation • There is no provision for waste management
Suvarna Kayaka Koushalya Abhivrudhi Yojane					• No provision for EE & RE • There is no provision for biodiversity conservation • There is no provision for waste management

Department of Mines and Geology

	Green Schemes with high environmental considerations	Moderately Green Schemes with moderate environmental considerations	Orange Schemes with low environmental considerations	Red Schemes with no environmental considerations	Explanation
Mineral Conservation Cell					• There is no provision for EE and RE. • There is no provision for water conservation. • There is negative impact on biodiversity
Modernization					• There is no provision for EE and RE. • There is no provision for water conservation. • There is negative impact on bio-diversity.
Filling up of Stone Quarry Pits					• There is no provision for EE and RE. • There is no provision for water conservation. • There is negative impact on biodiversity.
Karnataka State Mineral Policy					• There is no provision for EE and RE. • There is no provision for water conservation. • There is negative impact on biodiversity.

	Green Schemes with high environmental considerations	Moderately Green Schemes with moderate environmental considerations	Orange Schemes with low environmental considerations	Red Schemes with no environmental considerations	Explanation
Karnataka State Highway Improvement Project (KSHIP)					• There is debris reuse for reconstruction • Dust control measures are undertaken. • There is a provision for compensatory afforestation. • There is a positive impact on biodiversity through tree planting. • There is no provision for EE and RE.
District and Other Roads					• Waste disposal is done through compaction and turfing • Dust control measures are undertaken. • There is a provision for compensatory afforestation. • There is a positive impact on bio diversity through tree planting. • There is no provision for EE and RE.
Central Road Fund(NH)					• Air pollution control norms are enforced • There is provision for compensatory afforestation • Construction and demolition waste is reused in reconstruction of roads
State highway Development Project (SHDP)					• There is a provision for compensatory afforestation • They use C & D waste for reconstruction • There is no provision for EE and RE
Karnataka Road Development Corporation (KRDCL)					• Water conservation measures are effectively used • There is provision for recharge of ground water pits, silt traps, silt fence and borrow area • Solar lamps are used in some villages for street lighting • They use C & D waste for reconstruction of roads • There is a provision for compensatory afforestation
District and Other Roads-Special Development Plan					• Waste disposal is done through compaction and turfing • Dust control measures are undertaken. • There is a provision for compensatory afforestation. • There is a positive impact on bio diversity through tree planting. • There is no provision for EE and RE.

	Green Schemes with high environmental considerations	Moderately Green Schemes with moderate environmental considerations	Orange Schemes with low environmental considerations	Red Schemes with no environmental considerations	Explanation
Chief Minister Grameena Road Development Yojane (CMGRAY)					• Waste disposal is done through compaction and turfing • Dust control measures are undertaken. • There is a provision for compensatory afforestation. • There is a positive impact on bio diversity through tree planting. • There is no provision for EE and RE.
State Highway Road Works					• Waste disposal is done through compaction and turfing • Dust control measures are undertaken. • There is a provision for compensatory afforestation. • There is a positive impact on bio diversity through tree planting. • There is no provision for EE and RE.
MDR works Financed from NABARD					• Waste disposal is done through compaction and turfing • Dust control measures are undertaken. • There is a provision for compensatory afforestation. • There is a positive impact on bio diversity through tree planting. • There is no provision for EE and RE.
Major district Road Bridges					• Solid waste management plan is implemented • Dust control measures are undertaken. • There is a provision for compensatory afforestation
State Highway Bridges					• Solid waste management plan is implemented • Dust control measures are undertaken. • There is a provision for compensatory afforestation

	Green Schemes with high environmental considerations	Moderately Green Schemes with moderate environmental considerations	Orange Schemes with low environmental considerations	Red Schemes with no environmental considerations	Explanation
Tubachi Bableswar LIS					• Emission of CO_2 while using DG sets or diesel pumps. • No provision for EE and RE. • Provision for compensatory afforestation
Basaveswara (KEMPWAD) LIS					• Emission of CO_2 while using DG sets or diesel pumps. • No provision for EE and RE. • Provision for compensatory afforestation
Veerabhadreshwara LIS					• Emission of CO_2 while using DG sets or diesel pumps. • No provision for EE and RE. • Provision for compensatory afforestation
Venkateshwara LIS					• Emission of CO_2 while using DG sets or diesel pumps. • No provision for EE and RE. • Provision for compensatory afforestation
Savanur LIS					• Emission of CO_2 while using DG sets or diesel pumps. • No provision for EE and RE. • Provision for compensatory afforestation
Singatalur LIS					• Emission of CO_2 while using DG sets or diesel pumps. • No provision for EE and RE. • Provision for compensatory afforestation
Moderinization of Vijayanagar canal					• Water spray tanks used to settle dust, thereby reducing air pollution • No provision for EE and RE.
Varahi Project					• Emission of CO_2 while using DG sets or diesel pumps. • No provision for EE and RE.
Modernization of Malaprabha					• Water Spray tanks used to avoid dust. • No provision for EE and RE.
Yettinahole Project					• Water spray tanks used to settle dust. • No provision for EE and RE.
Upper Badra Project					• Water conservation through Ground water recharge, drinking water supply etc. • Compensatory afforestation on land acquisition. • No provision for EE and RE.

	Green Schemes with high environmental considerations	Moderately Green Schemes with moderate environmental considerations	Orange Schemes with low environmental considerations	Red Schemes with no environmental considerations	Explanation
Nandavadagi LIS					• Emission of CO_2 while using DG sets or diesel pumps. • No provision for EE and RE. • Provision for compensatory afforestation
Sannathi LIS					• Emission of CO_2 while using DG sets or diesel pumps. • No provision for EE and RE. • Provision for compensatory afforestation
Ramthal LIS					• Emission of CO_2 while using DG sets or diesel pumps. • No provision for EE and RE. • Provision for compensatory afforestation
Buddihaal-Peerapura LIS					• Emission of CO_2 while using DG sets or diesel pumps. • No provision for EE and RE. • Provision for compensatory afforestation
Drinking water scheme					• Water conservation through ground water recharge • No provision for EE and RE. • Emission of CO_2 while using DG sets or diesel pumps.
Modernization of Anecut Canal					• Water Spray tanks used to settle dust, thereby reducing air pollution • No provision for EE and RE.

Department of Health and Family Welfare

Name of the scheme	Green Schemes with high environmental considerations	Moderately Green Schemes with moderate environmental considerations	Orange Schemes with low environmental considerations	Red Schemes with no environmental considerations	Justification
Arogya Karnataka					- No provision for EE and RE measures and waste management
Janani Suraksha Yojana					- No provision for EE strategies
Janani-Sishu Suraksha Karyakram					- No provision for EE strategies
Rashtriya Bal Swasthya Karyakram					- No provision for EE strategies
Revised National TB control Programme					- No provision for waste generation
Special Care Newborn unit					- No provision for RE/EE measures, water conservation and waste management
Community Monitoring					- Only provision for safe drinking water and household toilets and no provision for eliminating biomedical wastes
National programme for control of blindness and visual impairment					- No provision for energy efficient management used for treating blind people
National vector-borne disease control programme					- Energy efficiency standards can be incorporated
National Ayush Mission					- No provision for waste generation - There is no provision for energy efficient management strategies
National programme for the health care of the elderly					- No provisions for the energy efficiency used in the hospitals for the machines and no provision for waste disposal
National tobacco control programme					- There is no provision for energy efficiency measures
Jan-Andolan-Poshan Abhiyaan					- Energy efficiency standards can be incorporated.
Mathrushri Scheme					- There is no provision for energy efficient management strategies
Arogya kavacha					- Emergency response services - There is no provision for energy efficient management strategies. - GHG emissions can be controlled.