BOMBAY CHAMBER
Bombay Chamber of Commerce & Industry

# SQ
raising the Sustainability Quotient

## In this Issue



**Vol.V No.3**

## Editorial

### Sustainability Appraisal

Environmental Assessment (EA) is currently practiced in India more as a requirement for obtaining environmental clearance.

The EIA notification of the Ministry of Environment Forest and Climate Change (MoEFCC) is rather project limited and does not encourage assessments that are carried out at regional level so as to influence policy and planning considerations. There have been very few cases where a rigorous regional impact assessment is carried out addressing cumulative and induced impacts.

Most of the environmental assessment related regulatory and policy frameworks in other countries have started embedding sustainability and climate change in the EA process where economic, environmental and social dimensions are looked at. There is now a strong push by the investor community as well as development financial institutions to follow "Sustainability" based Appraisals (SA).

In this issue of SQ, we are presenting an article that describes evolution of EA to SA with key definitions. We have also featured an article that describes sustainability appraisal process followed in UK at the county planning level. This is mandatory requirement in the UK. A case study of a wind farm is presented that follows regional environmental assessment and shows its benefits in the project design and optimum configuration. Finally, we have included sections on resources and update from BCCI for the interest of our readers.

**- Prasad Modak**

*Knowledge Partner*

emc™

www.emcentre.com



Published & Printed by :

**Bombay Chamber of Commerce and Industry**
'The Ruby', 4th Floor, NW
29, Senapati Bapat Marg,
Dadar (W), Mumbai 400 028
Tel.: 61200200 Fax : 61200213
Email: bcci@bombaychamber.com

Subscription Cost :

**Rs. 500/- per annum [hard copy]**

Reader's Column

We invite feedback suggestions and articles from our readers
Please write to um@bombaychamber.com



# Knowledge

## Evolution of Environmental Assessment Towards Sustainability Appraisal

***Prasad Modak***
*Executive Director, Environmental Management Centre, LLP (EMC)*
*& Chief Sustainability Officer,*
*Infrastructure Leasing and Financial Services (IL&FS)*
*prasad.modak@emcentre.com*

Environmental Assessment (EA) as a concept came about due to the thinking of "precautionary principle" and "do no harm" to the environment.

EA was conceived as a protective tool to ensure that the projects in their construction and operational activities produced least negative impacts possible and that the residual impacts were communicated to the stakeholders and mitigated by appropriate environmental management plans.

The first country which promulgated a legislation on EA was the United States of America. The National Environmental Protection Act (NEPA) laid the foundation of the EA process requiring certain projects to undergo an environmental examination. The criteria for such projects was based on project type, project size and project location. The NEPA also stated the reporting requirements for obtaining approval of the responsible administrative body.

The initiation of NEPA in the U.S. led to ripples in other countries notably in Canada, Australia, Netherlands and the United Kingdom. Each of these countries, based on

***Box-1 The Precautionary Principle***

*The precautionary principle (or precautionary approach) to risk management states that if an action or policy has a suspected risk of causing harm to the public, or to the environment, in the absence of scientific consensus (that the action or policy is not harmful), the burden of proof that it is not harmful falls on those taking an action that may or may not be a risk.*

*The principle is used by policy makers to justify discretionary decisions in situations where there is the possibility of harm from making a certain decision (e.g. taking a particular course of action) when extensive scientific knowledge on the matter is lacking. The principle implies that there is a social responsibility to protect the public from exposure to harm, when scientific investigation has found a plausible risk. These protections can be relaxed only if further scientific findings emerge that provide sound evidence that no harm will result.*

*Source: https://en.wikipedia.org/wiki/Precautionary_principle*

### *Box – 2 The National Environmental Protection Act of the United States*

*The National Environmental Policy Act (NEPA) is a United States environmental law that promotes the enhancement of the environment and established the President's Council on Environmental Quality (CEQ). The law was enacted on January 1, 1970. As the bill was an early step towards the development of the United States's environmental policy, NEPA is referred to as the "environmental Magna Carta".*

*NEPA's most significant outcome was the requirement that all executive federal agencies prepare Environmental Assessments (EAs) and Environmental Impact Statements (EISs). These reports state the potential environmental effects of federal agency's proposed actions.*

*NEPA grew out of the increased appreciation and concern for the environment that resulted from the 1969 Santa Barbara oil spill. During this time, environmental interest group efforts and the movement resulting from Rachel Carson's book, Silent Spring, helped to pass the Wilderness, Clean Air, and Clean Water Acts. Another major driver for enacting NEPA were the 1960s freeway revolts, a series of protests that occurred in response to the bulldozing of many communities and ecosystems during the construction of the Interstate Highway System.*

*Since its passage, NEPA has been applied to any major project, whether on a federal, state, or local level, that involves federal funding, work performed by the federal government, or permits issued by a federal agency. Court decisions have expanded the requirement for NEPA-related environmental studies to include actions where permits issued by a federal agency are required regardless of whether federal funds are spent to implement the action. This legal interpretation is based on the rationale that obtaining a permit from a federal agency inherently results in federal funds being expended, even if no federal funds are directly allocated to finance the particular action.*

*Source: https://en.wikipedia.org/wiki/National_Environmental_Policy_Act*

experience in the U.S. and priorities and context of their own countries came up with EA related policies and legislations. Soon the requirements of EA were followed by developing countries especially in the Asia-Pacific region

In India, environmental assessment was made mandatory under Environmental Impact Assessment (EIA) notification of 1994 under the EPA. Since 1994, the notification has been amended several times to bring in more clarity, improve implementation and address any specific issues or lacunae.

In the last three decades, EA has been followed on project level and the instrument is primarily used to identify mitigation plans prior to project clearance. The experience showed that limiting to projects alone is not going to help in the interest of sustainability, and consideration will need to be given to regional level impacts where multiple projects contribute to cumulative impacts. In other words, project clearance will have to look at regional scenarios and recognize cumulative impacts so that the carrying capacity of the region is not exceeded.

Many countries have therefore enhanced their EA legislation to address requirements of regional EAs especially while dealing with area wide development projects such as industrial estates, network of transport corridors, urban and peri-urban developments etc. Here, apart from mitigation plans, the regulator as well as project proponent must think about planning as well as policy measures so as to avoid situations that could be unsustainable. This led to extension of EA to Strategic EIA.

At a sector level, Sectoral EA has been applied. In as early as in 1992, Mumbai Metropolitan Regional Development Authority (MMRDA) undertook Sector Environmental Assessment of Mumbai's Transportation Plan. This study was insisted on by the World Bank.

Again at the insistence of the World Bank, in 1996, the Ministry of Environment, Forests and Climate Change (MoEFCC), Government of India conducted Sectoral EA of the proposed Hazardous Waste Management Project. The focus of Sectoral EA was generation and analyses of alternatives to identify the most preferred option that would do a justice to environmental and social considerations.

### Box – 3 Strategic Environmental Assessment

*Strategic environmental assessment (SEA) is a systematic decision support process, aiming to ensure that environmental and possibly other sustainability aspects are considered effectively in policy, plan and programme making. In this context, SEA may be seen as:*

- *a structured, rigorous, participatory open and transparent environmental impact assessment (EIA) based process, applied particularly to plans and programmes, prepared by public planning authorities and at times private bodies,*
- *a participatory open and transparent, possibly non-EIA-based process, applied in a more flexible manner to policies, prepared by public planning authorities and at times private bodies, or*
- *a flexible non-EIA based process, applied to legislative proposals and other policies, plans and programmes in political/cabinet decision-making.*

*Effective Strategic EA works within a structured and tiered decision framework, aiming to support more effective and efficient decision-making for sustainable development and improved governance by providing for a substantive focus regarding questions, issues and alternatives to be considered in policy, plan and programme making.*

*Source: https://en.wikipedia.org/wiki/Strategic_environmental_assessment*

Another variant which emerged in this process was the "programmatic EA" which looked at a project from the perspective of upscaling and replication. While the project by itself many times did not require EA or an Environmental Clearance (EC), the same project when replicated or up scaled had potential adverse impacts on a regional scale. The technique of programmatic EA brought out the idea of developing mitigation plans in the form of best practices and these best practices were then embedded in the very project design. When a project of 500 bus stands was proposed in 1999 in the State of Punjab, the bus stand as an individual project did not require an EA or EC. However the design, layout and siting of the bus stand was looked at from environmental and social perspectives and a "model" project configuration was arrived at, that met with environmental and social expectations. This design was replicated all over the State.

As it was realised that there cannot be siloed approach in environmental and social issues, a specialised discipline of Social Impact Assessment (SIA) emerged. Social development specialists, especially from the Universities took the lead and started working on the methodology for SIA as a complement to EA. Ideally, both processes should have been integrated, especially during scoping, analyses of alternatives and public consultation but due to different procedural requirements as well as non-availability of "integrated expertise", we often see separately prepared reports on EA and SIA. Despite the importance of integration, even now such a practice has remained, giving a rather "piece meal" or sliced approach to deal with environmental and social issues. Again in SIA, emphasis is primarily given to the issues related to resettlement and rehabilitation rather than on the induced social impacts or creation and loss of the livelihood.

Very close to SIA is the area of Health Impact Assessment. This dimension to EA was added when impacts were visualised on a regional scale considering both environmental and social parameters over a long term. Health was considered as both direct and induced impact with complex relationships between pollution, contamination of resources and their consumption. Health Impact Assessment (HIA) is today not a separate mandatory requirement but an aspect to be factored in the EA or SIA.

Environmental assessment is essentially a generic tool that links activities with environmental components. It therefore can be placed in the establishment of Environmental Management System (EMS) of ISO 14001. In these systems EA is used to analyse project activities and associated aspects and their influence on the environmental component so as to check whether the impacts are in compliance or are threat posing a risk to human health and eco-systems.

As the understanding on the environmental impacts of making, packaging, distributing and servicing products increased, the tool of Life Cycle Assessment (LCA) emerged. LCA uses the core principles of EA to predict, assess and manage the adverse impacts, influencing thereby the product design, material sourcing and product use. EA thus provided a generic framework to address manufacturing systems and services following once again the precautionary and "do no harm" principles.

Given the expanse of EA from project level to policy and planning level, integration with social development, health and safety related aspects and application across manufacturing and servicing industry, especially for product design, the next logical step was to wrap all these perspectives into one crucible i.e. Sustainability.

Sustainability framework was thus the major extension of EA in the last decade. The idea was not just management of risks to identify and leverage opportunities. Sustainability integration or sustainability based appraisal provided a new dimension and a role beyond granting permissions. Sustainability Appraisal (SA) essentially integrated economic, environmental and social considerations.

**Integrated Assessment is synonymous to Sustainability Appraisal.**

**Box – 4 Integrated Assessment**

*Integrated Assessment (IA) brings together natural, social, and economic information to assist analysis of policy options for decision makers. The IA process also brings together scientists, policy makers, citizens, NGOs, and industry representatives to evaluate options for particularly challenging – or wicked – problems. Since IA builds partnerships and a framework to share knowledge, problems that have both arguable definitions and solutions are best suited to this process.*

*IAs vary widely depending on the geographic scope, budget, type of issue, and range of decision makers. The following are useful IA steps that ensure the process is both relevant to participants and factually credible:*

1) *define the policy-relevant question,*
2) *document status and trends,*
3) *describe the causes and consequences of those trends,*
4) *identify desired outcomes and policy options,*
5) *evaluate the likely environmental, social, and economic outcomes of each option,*
6) *provide technical guidance for implementation, and*
7) *assess uncertainty.*

*These elements are best seen as a flexible framework – different stages might be emphasized depending on the policy context and the scientific and public understanding of the issue.*

*Integrated Assessment can appear to be overly complex with vague outcomes. However, because sustainability problems often lack a clear cause or solution, the IA process offers an innovative way to build consensus and guide decisions for these pressing and unique challenges. It is also important to acknowledge that there are both tangible and intangible benefits associated with IA. The goal of this study is to communicate both sets of benefits.*

*Source: www.graham.umich.edu/pdf/ia guide.pdf*

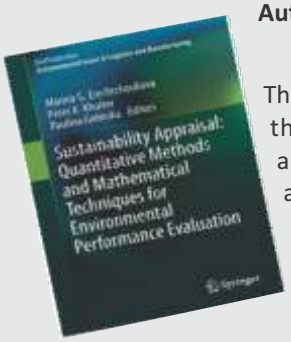
Sustainability based EA or sustainability appraisal is therefore the recent avatara of EA. It has been widely practiced for planning local area development in the United Kingdom and has been made mandatory for such appraisals to be carried out and reported. A few private sector equity companies have also evolved sustainability appraisal frameworks as also Developing Financial Institutions (DFI). Some of the DFIs such as World Bank, IFC, and DFID have already set up sustainability based / driven environmental and social assessment requirements. The dimension of climate change has been recently added. In specific, Asian Development Bank (ADB) has come up with climate proofing and its integration in the environmental assessment.

After years of experience in the application of EA, several "templated" environmental management plans have emerged. These plans are essentially a repository of good practices and have influenced project design and project management practices. These best practices have been now mainstreamed and are implemented up-front without a push from legislation. This is perhaps the future of Environmental Assessment.

## BOOKS ON SUSTAINABILITY APPRAISAL


**Author: Barry Dalal-Clayton and Barry Sadler**

This book highlights how SA can be used to analyse and integrate the key environmental, social and economic pillars of sustainability into decision-making at all levels, from policy to project to investment; by government, business and industry, or international organizations.




**Author: Marina G Erechtchoukova and Peter A Khaiter**

This book is a reference to the state-of-the-art practices in sustainability appraisal including the development and application of sustainability indices, quantitative methods, models and frameworks.


**Author: Transport and the Regions Great Britain, Department of the Environment**

This book sets out the guidelines which regional planning bodies can use when preparing their sustainability appraisals of regional planning. It aims to develop a logical and consistent methodology covering environmental, economic and social impacts, while acknowledging that methodology and techniques will expand and improve as relevant practice develops over time.


**Author: Nihal Amerasinghe**

This book covers all facets of the project management cycle. It addresses all the contemporary requirements in the preparation and implementation of sustainable projects. The book presents an A-Z coverage of all the relevant topics on sustainable project management.

# Sustainability Appraisal: A Case of United Kingdom (UK)

***Krupa Desai***
*Environmental Planner, Environmental Management Centre, LLP*
*krupa.desao@emcentre.com*

*This article has been compiled from Planning Guidance Website developed by UK Government for the benefit of the readers to understand the process of Sustainability Appraisal used and applied in UK for Sustainable Development at a regional scale.*

## What does Sustainability Appraisal (SA) means to UK?

In UK, SA is a systematic process that is carried out during the preparation of a Local Plan (refer to Box 1 for Local Plan). Its role is to promote sustainable development by assessing the extent to which the evolving plan will help to achieve relevant environmental, economic and social objectives. Refer to Box 2 for the definition of SA in UK Planning Law.

***Box 1: Local Plan***

*Local Plan is a plan that sets out a vision and a framework for the future development of the area. It addresses the needs and opportunities of the area in relation to housing, the economy, community facilities and infrastructure – as well as a basis for safeguarding the environment, adapting to climate change and securing good design. Each local planning authority is responsible for developing Local Plans for their area.*

***Box 2: Definition of SA in UK Planning Law***

*SA is an appraisal of the economic, environmental, and social effects of a plan from the outset of the preparation process to allow decisions to be made that accord with sustainable development.*

SA process is an opportunity by which the plan can contribute to improvements in environmental, social and economic conditions. It is also a means of identifying and mitigating any potential adverse effects that the plan might have. By doing so, it makes sure that the proposals in the Local Plan are the most appropriate. The SA report should be submitted with the Local Plan for independent examination. It will be examined as part of the evidence base for the Local Plan. The SA report should help to demonstrate why the proposals in the Local Plan are the most appropriate.

The local planning authority is responsible for ensuring that the SA has been carried out along with the Local Plan preparation. Section 19 of the Planning and Compulsory Purchase Act 2004, UK mandates a local planning authority to carry out a SA of each of the proposals in a Local Plan during its preparation.

## How SA is conducted in UK?

SA is integral to the preparation and development of a Local Plan to identify how sustainable development is being addressed by the Local Plan. The work on SA starts simultaneously along with the start of work on developing the Local Plan. Figure 1 shows the key stages of the Local Plan preparation and the relationship with the SA process.

### Stage A: Setting the Context and Objectives, Establishing the Baseline and Deciding on the Scope

In this stage relevant international, national, regional and local plans, policies and programmes are reviewed. The review helps in identifying the existing sustainability objectives of the region. The Local Plan is assessed on the basis of how it will contribute to the existing sustainability objectives of the region.

Baseline information on environmental, social and economic characteristics, which are supposed to be impacted by the Local Plan, are collected. Baseline information includes the historic trends as well as future trends without the implementation of the Local Plans. The baseline analysis helps in identifying the issues/gaps. The Local Plan can focus on the issues emerged out of the baseline analysis.

SA framework (refer Box 3) is then developed. The framework consists of sustainable objectives and key issues

***Box 3: Example of SA Framework***

| Objective | Issue | Indicators |
|---|---|---|
| *To improve the health and well-being of the population and reduce inequalities in health and well-being.* | *Urban areas includes pockets of poverty and poor health* | • *No. of people accessing the environment for health benefits*<br>• *Working days lost through illness*<br>• *% population engaged in active travel. No. of people in fuel poverty*<br>• *% of residents within 4 km of a medical doctor*<br>• *Life expectancy*<br>• *Disabled Living Allowance claimants*<br>• *Investment in access, interpretation, information to encourage use of natural environment for health benefits* |

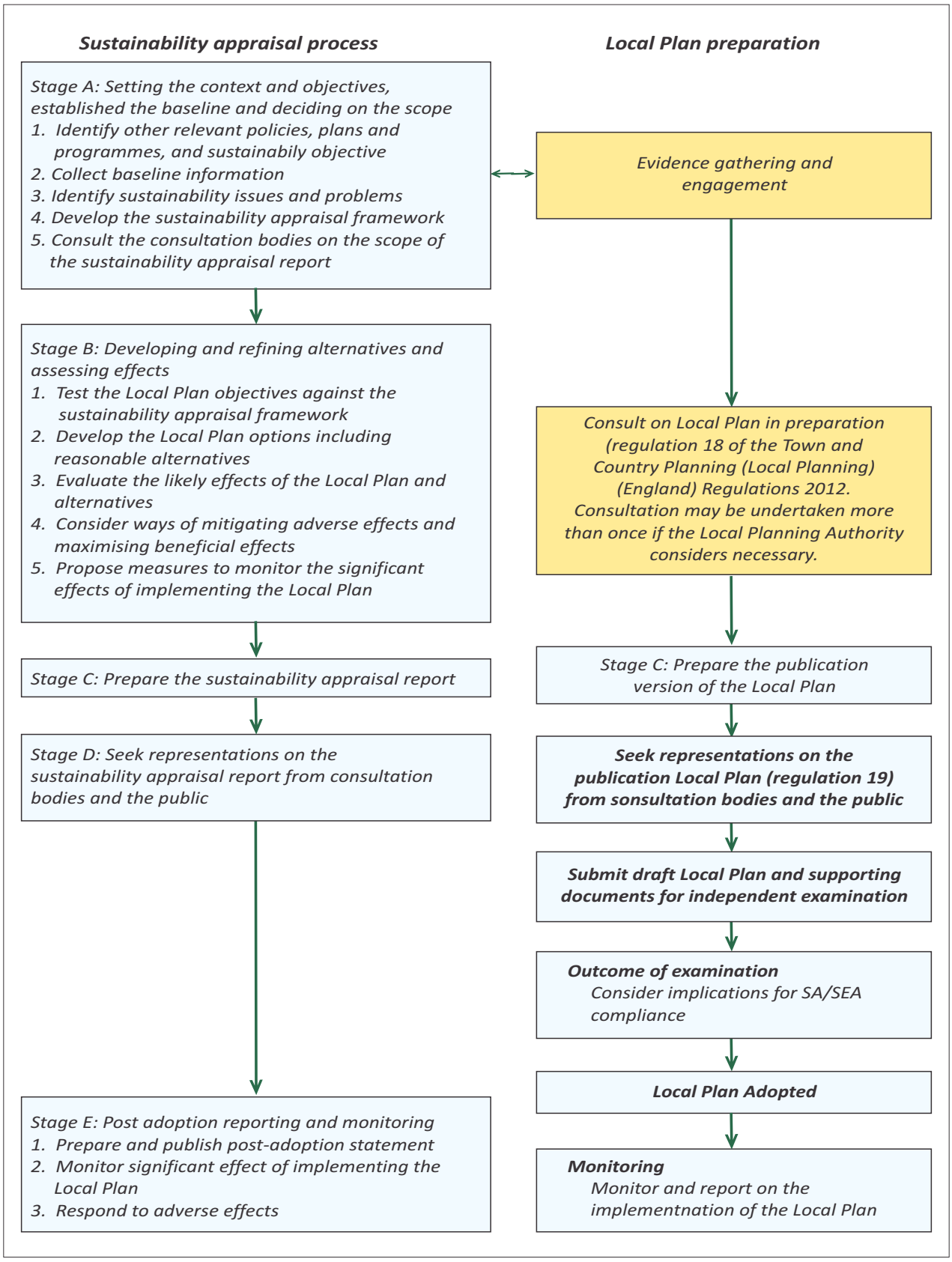



*Figure 6: Key stages of local plan preparation and their relationship with the SA Process*

identified in the above stages. The list of potential indicators relevant to measure sustainable objectives are developed in the framework. The indicators will be used to provide a basis for future monitoring to allow an assessment of whether or not the plan is effective in addressing the sustainability objectives. The SA framework is reviewed by the consultation bodies[3] for soundness of the framework.

## Stage B: Developing and Refining Alternatives and Assessing Effects

In this stage, mitigation alternatives/ options to the issue are identified (refer Box 4). The alternatives/options are ranked on preference basis (refer Box 5). The most preferred option will be adopted by the Local Plan. The SA should outline the reasons for which the alternatives were selected and the reasons for which the options were rejected. It should provide conclusions on the overall sustainability of the different alternatives, including those selected as the preferred approach in the Local Plan.

## Stage C: Preparation of SA Report

SA report is prepared by elaborating on the above stages (A and B).

## Stage D: Seek Representation on The SA Report from Consultation Bodies and Public

The consultation bodies, other consultees and the public are consulted to allow them to express their opinions on the SA report within a given timeframe. This helps to ensure that views of stakeholders can be taken into account during the appraisal and also facilitate an open and transparent assessment.

## Stage E: Post Adoption Reporting And Monitoring

The monitoring of the Local Plan is done with the help of the indicators developed in the SA Framework in stage A. Local planning authority monitors the significant environmental and social effects of implementing the Local Plan. This enables the local planning authority to identify unforeseen adverse effects at an early stage and allow for appropriate remedial actions. Monitoring also allows the actual impacts of the plan to be assessed to check whether they are in accordance with those predicted during the appraisal process. This will enable future predictions to be more accurately informed.

***Box 4: Example of Mitigation Alternatives to the Issues***

**ISSUE 1: HOW BEST CAN THE LOCAL PLAN ENSURE THE HOUSING NEEDS OF OLDER PEOPLE ARE MET?**

***Option 1a:*** *The Local Plan could set out that residential development for older people be provided through smaller properties and opportunities for flats and bungalows exclusively for those 55 / 60 years and over, and retirement accommodation and care homes in the more sustainable settlements, both with access to a good range of services and facilities, including public transport*

***Option 1b:*** *The Local Plan could identify specific appropriate sites in the larger and more sustainable settlements for special needs housing, including the elderly*

***Option 1c:*** *The Local Plan could make no specific provision for elderly persons housing but assumes that this will be delivered by the market as part of the overall housing provision within the National Park*

***Option 1d:*** *The Local Plan could allow for appropriately sized annexes and free-standing accommodation to be built within the curtilage of existing properties where they do not detract from the existing built form*

***Box 5: Example of Ranking the Alternatives***

| *Sustainability topic* | *Discussion of relative merits of options* | *Rank of preference* | | | |
|---|---|---|---|---|---|
| | | *1a* | *1b* | *1c* | *1d* |
| *Housing* | *Options 1a, 1b and 1d set out complementary approaches to older people's housing needs.*<br>*Option 1c, through relying on the market, is less likely to deliver housing which meets the needs of older people.* | *1* | *1* | *4* | *1* |
| *Health and Wellbeing* | *Options 1a, 1b and 1d set out complementary approaches to housing needs which will support older people's health and wellbeing.*<br>*Option 1c, through relying on the market, is less likely to deliver housing which meets the needs of older people. This is likely to have implications for the health and wellbeing of this group.* | *1* | *1* | *4* | *1* |

[3] *Certain organisations with environmental responsibilities are defined as consultation bodies.*

***References:***


*http://planningguidance.communities.gov.uk/blog/guidance/strategic-environmental-assessment-and-sustainability-appraisal/sustainability-appraisal-requirements-for-local-plans/*

*https://www.southdowns.gov.uk/planning/planning-policy/national-park-local-plan/evidence-and-supporting-documents/sustainability-appraisal/*

*https://www.milton-keynes.gov.uk/planning-and-building/planning-policy/sustainability-appraisal-and-appropriate-assessment*

# Mainstreaming Environmental and Social Aspects in the Planning of Wind Energy Production

*Rohit Pansare*
*Senior Environmental Planner, Environmental Management Centre LLP*
*rohit.pansare@emcentre.com*

Wind energy has become one of the preferred renewable energy technologies. Today, electricity generating wind turbines employ proven and tested technology, and provide a secure and sustainable energy supply. In India, wind energy is viewed as a clean source of energy which is decentralised and can fill the demand-supply gaps. Figure 1 shows the trend of wind power generation across countries. China and the United States of America have been the leaders with Germany, India and Spain falling in the mid-range.

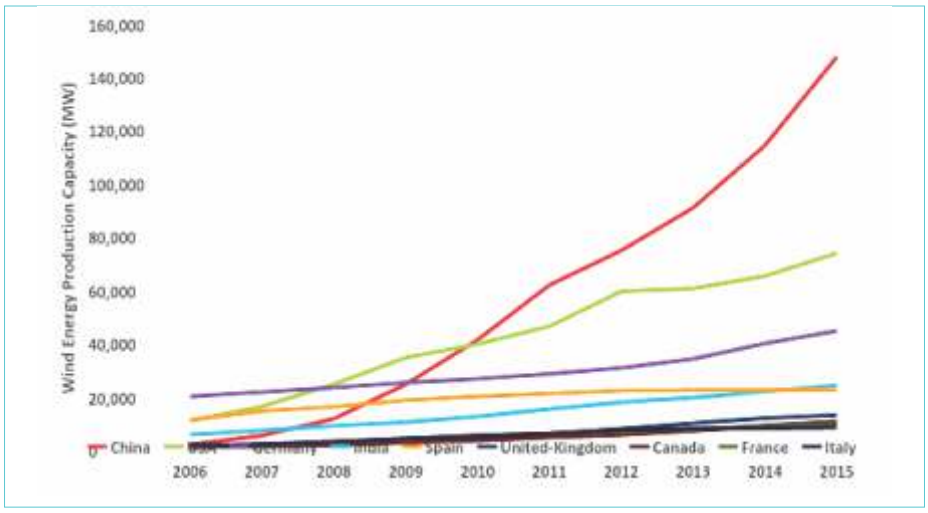



***Figure 1: Wind Energy Production Capacity (MW)***

*Source: http://www.thewindpower.net/statistics_en.php accessed on 19th march 2016*

At the recently concluded COP21 negotiations, India shared ambitious plans for expansion of its renewable energy capacity as reflected in its INDC[2]. Currently about 70% of this installed renewable energy capacity consists of wind energy. Globally, India ranks as the 5th largest in terms of installed wind energy capacity. With a potential of more than 100 GW, the aim is to achieve a target of 60 GW of wind power installed capacity by 2022. Wind energy generation in the country is concentrated in Tamil Nadu, Karnataka and Andhra Pradesh in the South; Maharashtra, Gujarat in the west with latter leading the pack. In spite of the surge in wind energy projects in the country, several issues plague setting up of a wind farm. Availability of land and capital investment being some of the important issues.

## Components of Wind Farm

An advantage of wind energy has always been the small foot print of individual units which can be accommodated based on the type of turbine and the access roads in about half an acre. A typical wind farm will include one or more wind turbine towers that hold the turbine and the generator, an investor to convert DC to AC, transmission lines to feed into the grid and access roads.

When air hits the wind turbine, the blades spin, converting the blade's kinetic energy into mechanical energy. This rotary motion then travels down the shaft and drives the generator where the electricity is produced. Typically most wind turbines are mounted in the horizontal plane (like the propeller of a plane), and therefore it is key that the blades face directly into the wind.

## Wind Farm Development Process

With the purpose of research, development and deployment of new and renewable energy projects, to supplement the country's energy needs, the National Institute of Wind Energy (NIWE) has been setup by the Ministry of New and Renewable Energy (MNRE) as an autonomous research institute. One of MNRE's role is to identify windy sites for establishing wind energy projects. A wind farm developer chooses from the available sites to setup their project. Often the wind turbine manufacturers are also the developers who identify potential sites. Once a site has been finalised and acquired, the developer erects wind masts at the site. Before actual installation of the Wind Turbine Generators (WTGs), the developer collects data for a year to access the site

[2] *http://www4.unfccc.int/submissions/INDC/Published%20Documents/India/1/INDIA%20INDC%20TO%20UNFCCC.pdf*

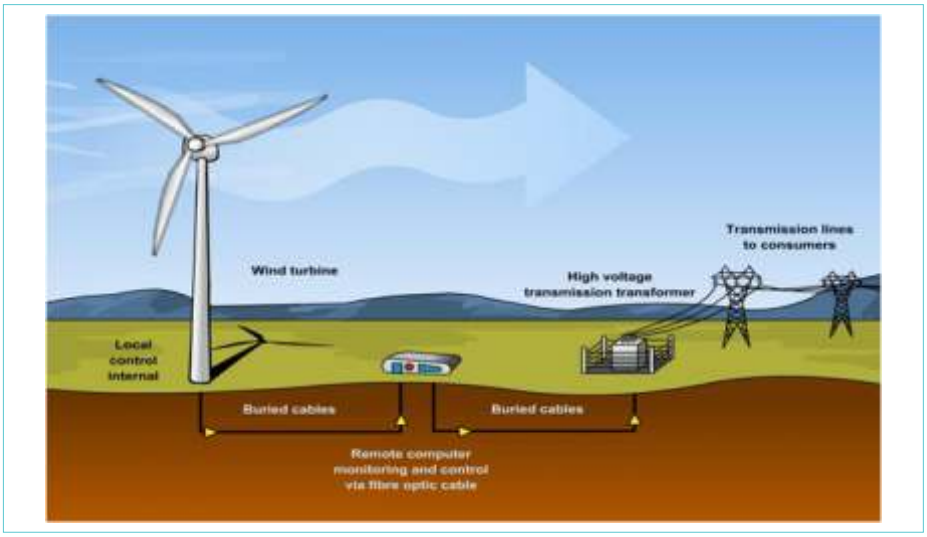



***Figure 2: A Typical Wind Farm Setup***

*Source: https://thelenahernandez.wordpress.com/2013/06/05/wind-energy/, accessed on 19th March 2016*

suitability. Following this the developer starts the process of site preparation for setting–up of the wind farm. This includes clearing of the acquired land, providing access routes, extension of transmission lines up to the nearest sub-stations, setting up the transformer and substation. The on-site assembly process begins after this. The components of the wind turbine are transported from the manufacturer to the site and assembled on-site. Once the wind farm is ready, the developer identifies interested investors. The developer enters into a contract with the investor, for operation and maintenance of the windfarm, while the investor can profit from the sale of clean energy in the market or to the grid.

## Environmental and Social Issues of Wind Farms

The environmental and social impacts of wind farm development can be generally categorised into impacts during land acquisition, construction, operation and decommissioning phase. The construction and decommissioning phases may require clearing of the land for assembly of the WTG and for the approach road. Visual impact or intrusion is also a factor in case of tourism or proximity of WTGs to residential sites.

During the operation stage a wind turbine directly causes Shadow Flicker and Noise impact. Shadow Flicker results from the intermittent shadow cast by the rotating blades of the wind turbine and is the highest at dawn and dusk. Shadow flicker is known to induce headache, stress in humans and to frigthen livestock. Noise is an issue during the operation phase resulting from the mechanical movement of its components and the rotor blades slicing the air.

Birds and bats are known to be at risk of injury or to be killed by rotors or electrocution by transmission lines of the transformer stations. Other impacts include fragmentation of habitat due to construction of access roads in forests. It is important therefore that the sites of the Wind Farms are chosen factoring the migratory routes of birds and the biodiversity.

## Environmental Clearance and Application of other Environmental Regulations

**Unfortunately, the EIA 2006 notification does not cover wind power projects; therefore, these are exempted from applying for environmental clearance (EC).** Recognised as green energy initiatives; wind energy projects, enjoy an elevated status in the clearance process in India. The 'no objection' certificate that is issued for wind energy projects is automatically renewed after 5 years. However, projects located in forest areas require a Forest Clearance for which MoEF has issued guidelines.

Noise impacts are regulated under the Air (Prevention & Control of Pollution) Act (1981) and the Noise Pollution (Regulation and Control) Rules (2000). The State Pollution Control Boards handle the monitoring and regulation of Noise Pollution due to Wind projects. The State governments are responsible for categorization of areas based on their sensitivity in silent zones around hospitals, educational institutes and courts. Forest areas or protected areas are however not included, making them vulnerable to impacts from Wind farms.

As many of the investors are of international origin they expect compliance with not only the MoEFCC norms but also the IFC and World Bank Environmental, Health & Safety Guidelines for Wind energy. Globally and in India, Wind Energy Production is investor driven and therefore the Equator Principles, based on the IFC Performance Standards become an important check point for appraisal based on Environmental and Social aspects. Hence, environmental assessments are carried out due to investors requirements rather than requirements of EC. This leads to a need to follow international best practices, layout optimization of the farms to minimize both on-site and off-site environmental and social impacts. This helps in neutralizing or alleviating the adverse impacts right in the siting and project configuration. Analyses of alternatives becomes a core driver of the impact assessment.

## A Strategic Approach to Mainstream E&S Aspects in Wind Farm Development

Locations of Wind farms is of utmost importance to minimise impacts and to assure investors, safe returns on their investment. To minimize the impacts on wildlife, water bodies and human settlements, it is important to select sites that are at a safe distance from these receptors. Although the site requirement for setting up of a commercial wind farm is less exhaustive compared to solar or hydropower, the noise and shadow flicker effect need to be carefully addressed through quantitative modelling. As the expanse of the wind farms is large, a regional impact assessment with cumulative considerations must be looked into.

By taking up such types of assessment in the early stages of developing wind farms it is possible to predict, minimize and mitigate the likely impacts on the surrounding environment and identify communities and other receptors that may be affected. The methodology, develop at Environmental Management Centre LLL (EMC), (described in the next section) emphasizes creation of scenarios and makes use of advanced tools of GIS and mathematical modelling. This process comes with recommendations to the investor or developer to select 'less risk' sites and wind turbine configurations to invest with confidence. Experience at EMC LLP shows that assessments of such nature lead to optimal configuration of wind turbines from environmental, social and economic perspectives.

Figure 3 shows the various steps in the methodology of regional and cumulative impact assessment that makes use of various Geographic Information System (GIS) and modelling tools.

As a first step, potential sites need to be assessed from a regional scale to the meso scale to rule out environmental and social risks. For this purpose, a hierarchical approach can be adopted, which could include all considerations, from global climate and wind patterns to the local biodiversity and socially sensitive receptors. GIS is a useful tool as it can draw together and analyse data from disparate sources. Using a hierarchical approach, a variety of data is integrated (including environmental, social and technical aspects), quantitative as well as qualitative for taking optimum siting decisions. Layers of environmental, social and technical criteria are combined using the overlay function in GIS to produce a constraints map showing the most and least suitable areas for locating wind energy facilities. In this process receptors and critical infrastructure like heritage sites, protected areas and electric substations are also identified. Buffers are created for all the sensitive receptors on basis of the IFC EHS Guidelines for Wind Energy, especially to maintain safe distance from the project site. Based on the location sensitivities, decision makers can further prioritize the sensitive layers and create more stringent buffers.

For large areas, remote sensed imageries could be used, processed for Land Use and Land Cover classification (LULC) and processed in GIS. Wind speeds at the height of a wind turbine depend strongly on terrain elevation, exposure, slope, and orientation to prevailing winds. These estimates can be arrived at using a GIS-based Digital Elevation Model (DEM). In addition, GIS can account for other factors that affect wind site suitability, such as the distance to nearby transmission lines, proximity to protected areas, and type of vegetation cover.

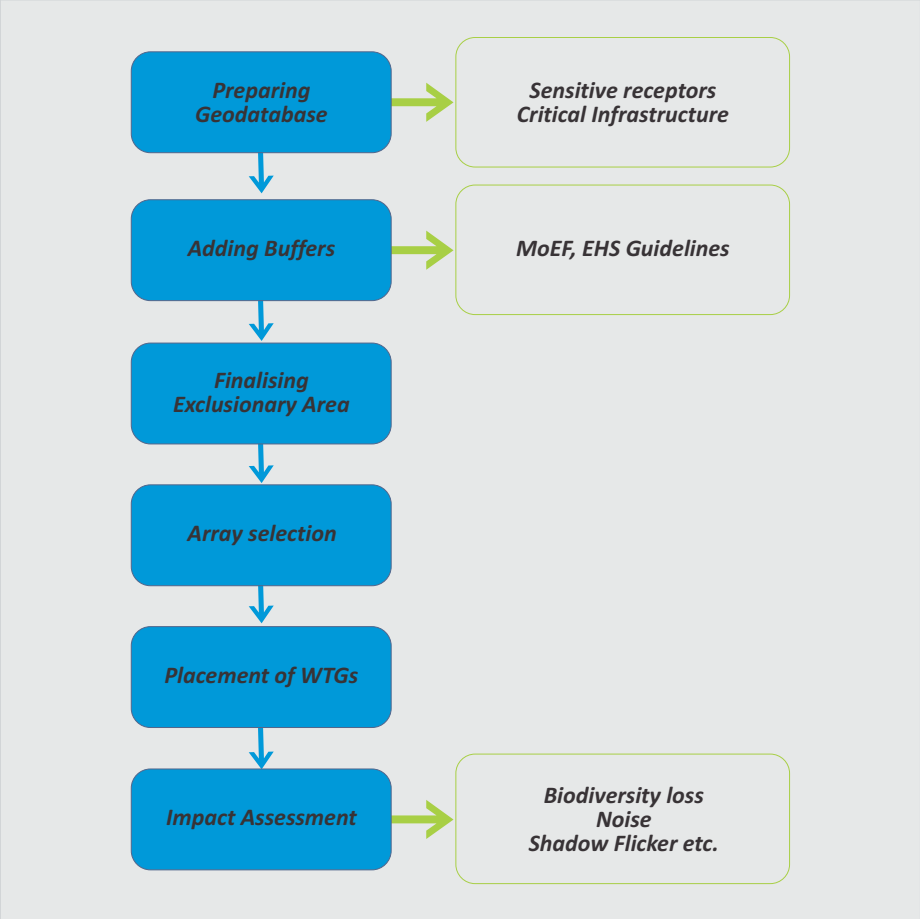



*Figure 3: Methodology for the Management of Environmental and Social Issues*

In the next step an array of locations of Wind turbine generators (WTGs) is created and overlapped with the geodatabase created in the GIS. Scenarios can now be built based on different priorities of sensitive receptors. Modelling for Noise and Shadow flicker related impacts is carried out to assess the impacts due to siting and the array of WTGs chosen.

According to the IFC EHS guidelines for Wind Energy for noise impact due to turbine noise at all sensitive receptors should be below 35 decibels dB (A) at a wind speed of 20 meters/second at 10 meter height of WTG. Similarly the shadow flicker impact, experienced at a sensitive receptor should not exceed 30 hours per year and 30 minutes per day on the worst affected day, based on a worst case/most impacted scenario. Considering the above and using appropriate modelling tools, siting alternatives can be compared to arrive at most impacted, moderately impacted and worst impacted configurations of WTG that translate into low risk, moderate risk and high risk investments. Figures 4 and 5 show illustrations of the modelling results. The impact predicted is on cumulative basis.

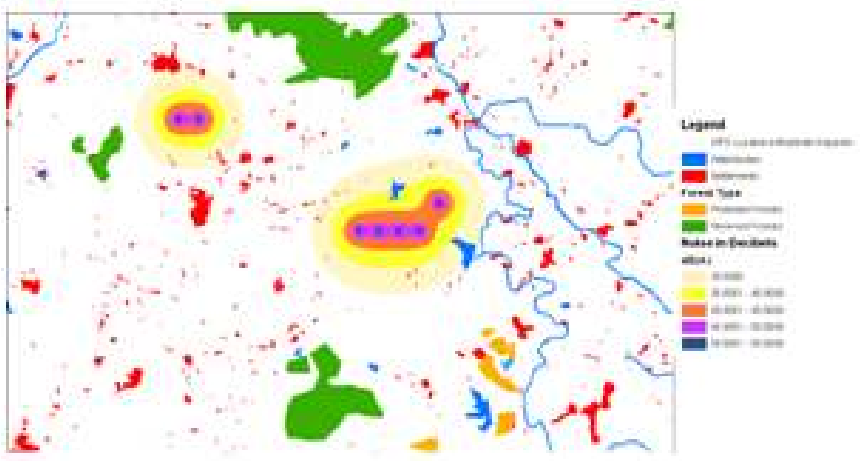



*Figure 4: Noise Modelling results showing affected receptors*

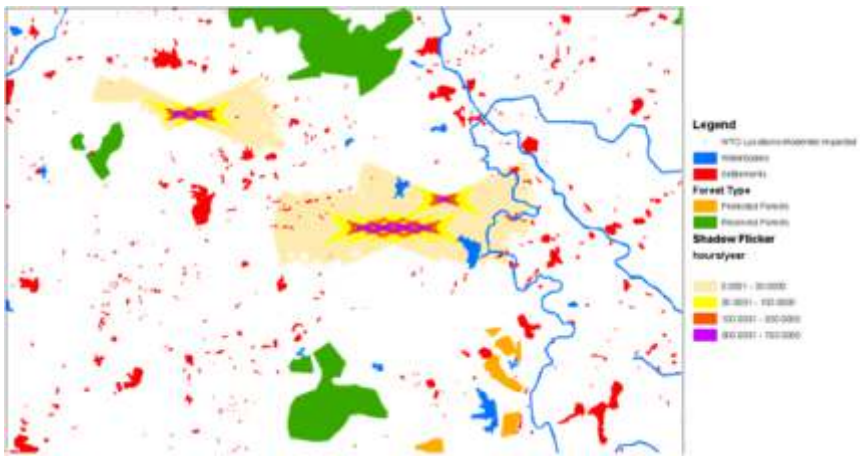



*Figure 5: Shadow flicker Modelling Results showing affected receptors*

The output from these can be used by Wind energy developers for further micro-siting of the WTGs and associated decision making. Investors can assess the risk of investing in wind energy projects in advance using this methodology and tools.

## Conclusion

India has high potential for Wind energy development. With the declaration of ambitious renewable energy plans in COP21, it is essential that development of Wind energy supplements the energy needs of the country with minimum impact to its environment. The present regulations do not ask for Environmental Clearance. There are however imminent environmental and social (E&S) impacts/risks in wind farm development. By using GIS and modelling techniques, E&S issues can be comprehensively addressed to arrive at optimum siting and WTG configurations – by essentially mainstreaming the E&S issues. Such an approach deploying regional level assessment, building scenarios and recognizing cumulative impacts can help the international investors in particular to address impacts right in the planning & design stage and come up with environmentally sound, socially acceptable and economically attractive solutions.

# Sustainability Committee Activities

## Conference on "Safety Excellence in City Offices and Transport on Road"

**January 28-29, 2016**

Conference on "Safety Excellence in City Offices and Transport on Road" organized by Bombay Chamber of Commerce & Industry, on 28th & 29th January, 2016 with the support from ICICI Lombard General Insurance Ltd. and Bombay City Policy Research Foundation (BCPRF). Safety has always been viewed as a part of compliance but now-a-days is considered as a fundamental business value. Safety is increasingly gaining importance and in the process of striving towards Safety Excellence, it is very crucial to understand safety issues/risks involved at workplace and on road to embrace Safety in its totality. The focus areas for the Conference were 1. Office Safety with a focus on Fire Safety 2. Road Safety. The focus on fire safety is to discuss on reducing the risk and losses of humans and materials and on road safety to reduce accidents while driving for work and /or commuting.

## Workshop on "Continuous Emission Monitoring Systems (CEMS) for Industries" - February 17-18, 2016

The USAID LEAD program, in collaboration with the Bombay Chamber of Commerce and Industry organized two day Technical Assistance (TA) program on "Continuous Emission Monitoring Systems (CEMS) for Industries" on Feb 17-18, 2016 in Mumbai, India. Day one of the workshop focused on a classroom lecture methodology which brought in experts from the industries to talk about the CEMS technology and the challenges. Day two was a site visit to TATA Power- Trombay for the live demonstration of Stack Monitoring and Ambient Air Quality Monitoring Systems (AAAQMS). The second site was the facility of Indofil Industries Limited at Thane for the demonstration of effluent monitoring systems. The goal was to help industries gather real-time information on pollution loads from stationary sources, which will in turn facilitate all involved stakeholders, including regulators, to plan regulatory reforms, and to ensure more transparent and effective implementation of regulations.

**FORTHCOMING PROGRAMS:**

## E-Waste to No-Waste: Contributing to End-of-Life Solutions

- June 17, 2016 at Bombay Chamber of Commerce & Industry.

The event is being organised on E-Waste management and handling in Indian industry will focus on the "beyond compliance" scenario. The objective is to highlight simple yet effective ways to manage and handle e-waste at individual and corporate level. The event is envisaged to bring in electrical and electronic manufacturers', e waste recyclers; NGOs working in this sector who will throw light on the various ways manage e-waste.

The senior officials from the Ministry of Environment Forest and Climate Change and Ministry of Information Technology; Central Pollution Control Board and private market players who will share their ideas and thoughts on ways to manage and handle e-waste which is a potential hazardous waste being accumulated at an alarming rate. It would be a one common platform for all stakeholders related to e-waste in one or another form who will come together and take a pledge to safeguard the environment.

*For more details contact:*

*Ms. Usha Maheshwari on Tel.:022 61200214, Email: sustainability@bombaychamber.com*

*Ms. Roshni Sudesh on Tel.: 022 61200227, Email: csr@bombaychamber.com*