



# Approaches to mitigation of biodiversity related impacts

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# Mitigation—A problem solving step in EIA framework

Uses the inputs from evaluation stage

- **What the problem is ?** (developing appropriate strategies)
- **When the problem will occur and when it should be addressed ?** (ensuring timeliness of corrective measures)
- **Where the problem should be addressed ?** (for effective mitigation actions)
- **Who stands to gain or loss ?** (for optimizing overall project benefits)



# Mitigation seeks to

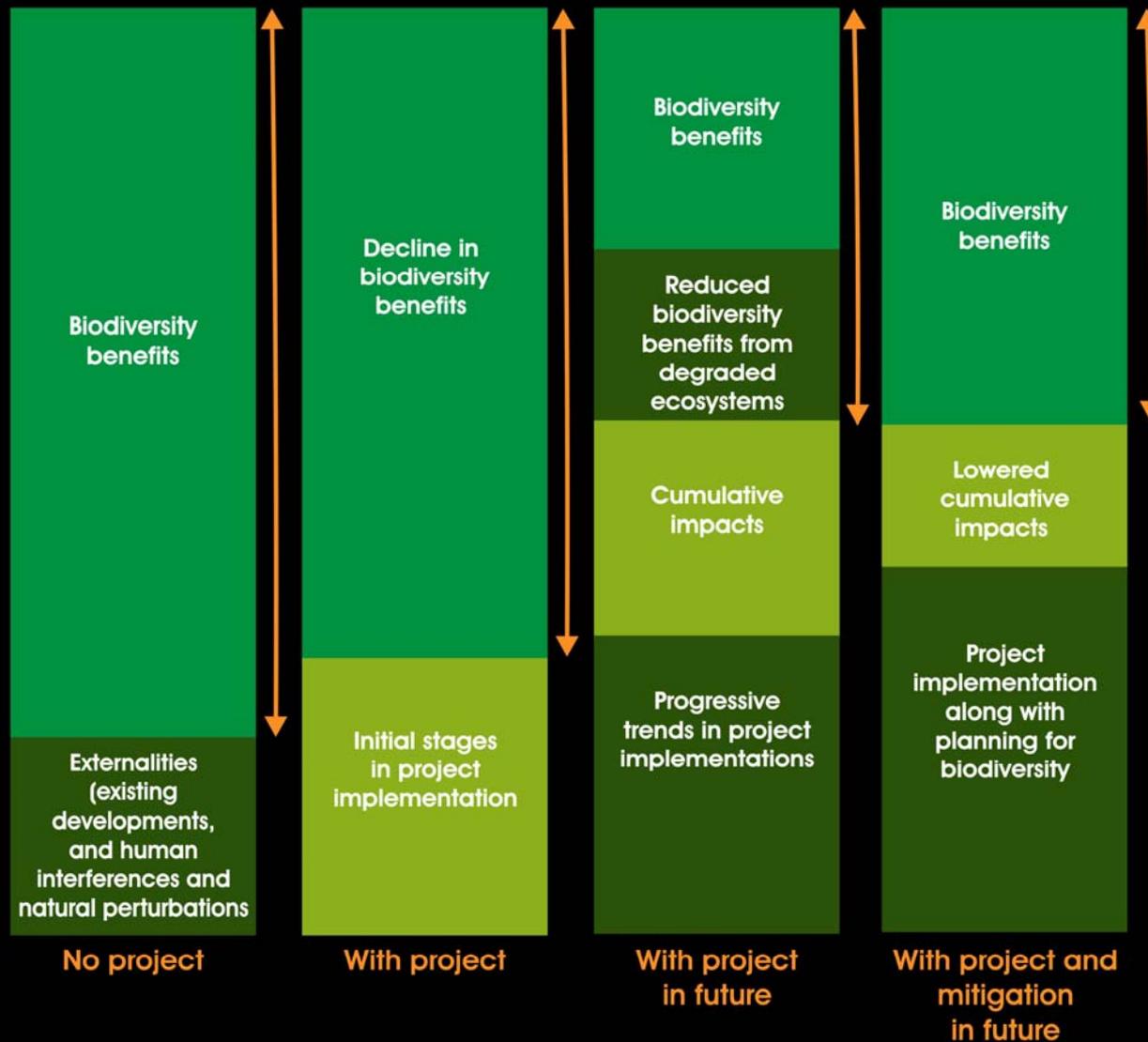
- Find better ways to doing things
- Minimize or eliminate negative impacts
- Enhance project benefits
- Protect public and individual rights to compensation

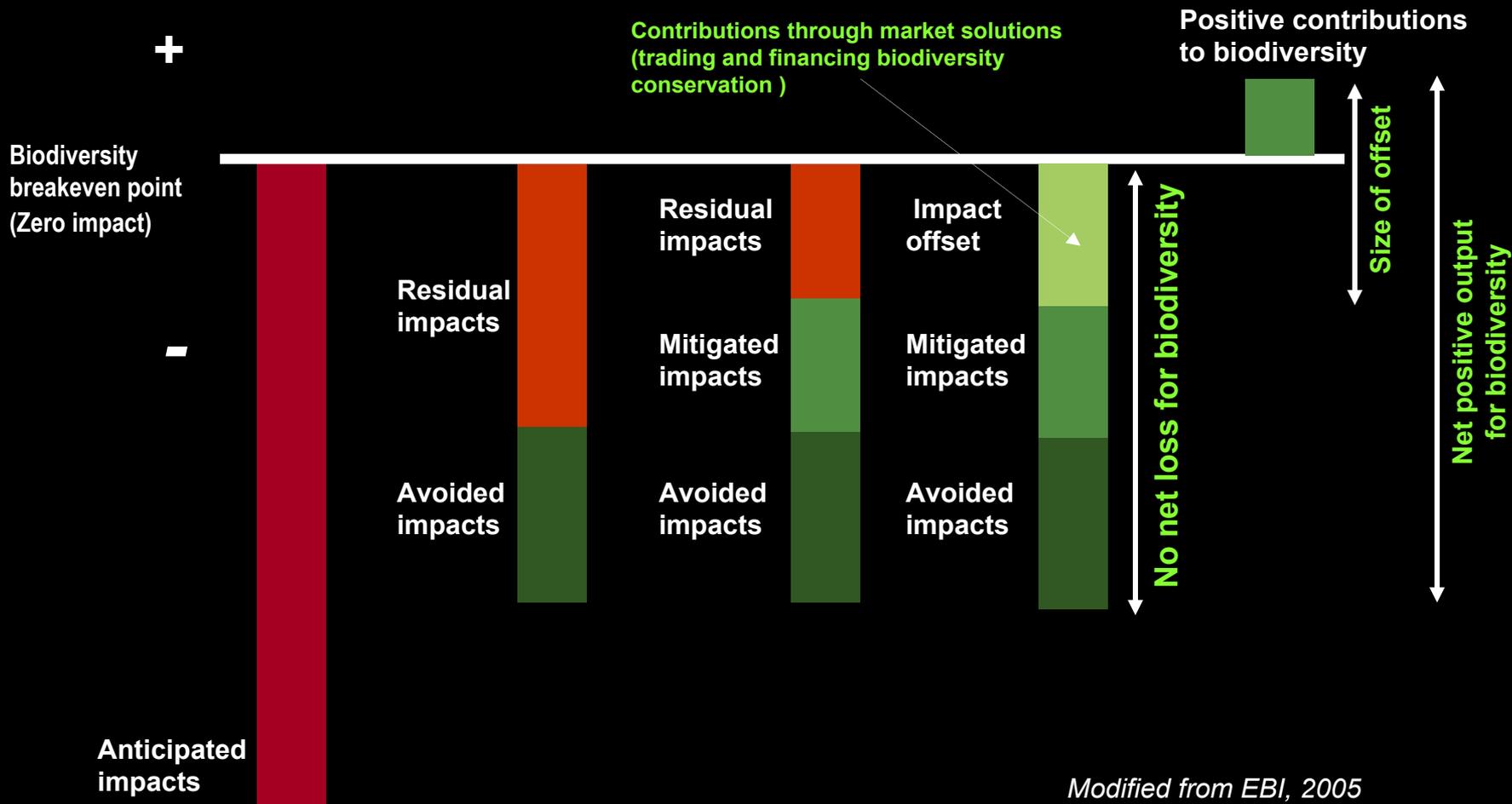


## Mitigation of impacts on biodiversity includes

Any sustained action(s) taken to reduce or eliminate adverse effects, whether by controlling the sources of impacts, or the exposure of biological and ecological receptors to them

# Mitigation should bring about change in biodiversity benefits



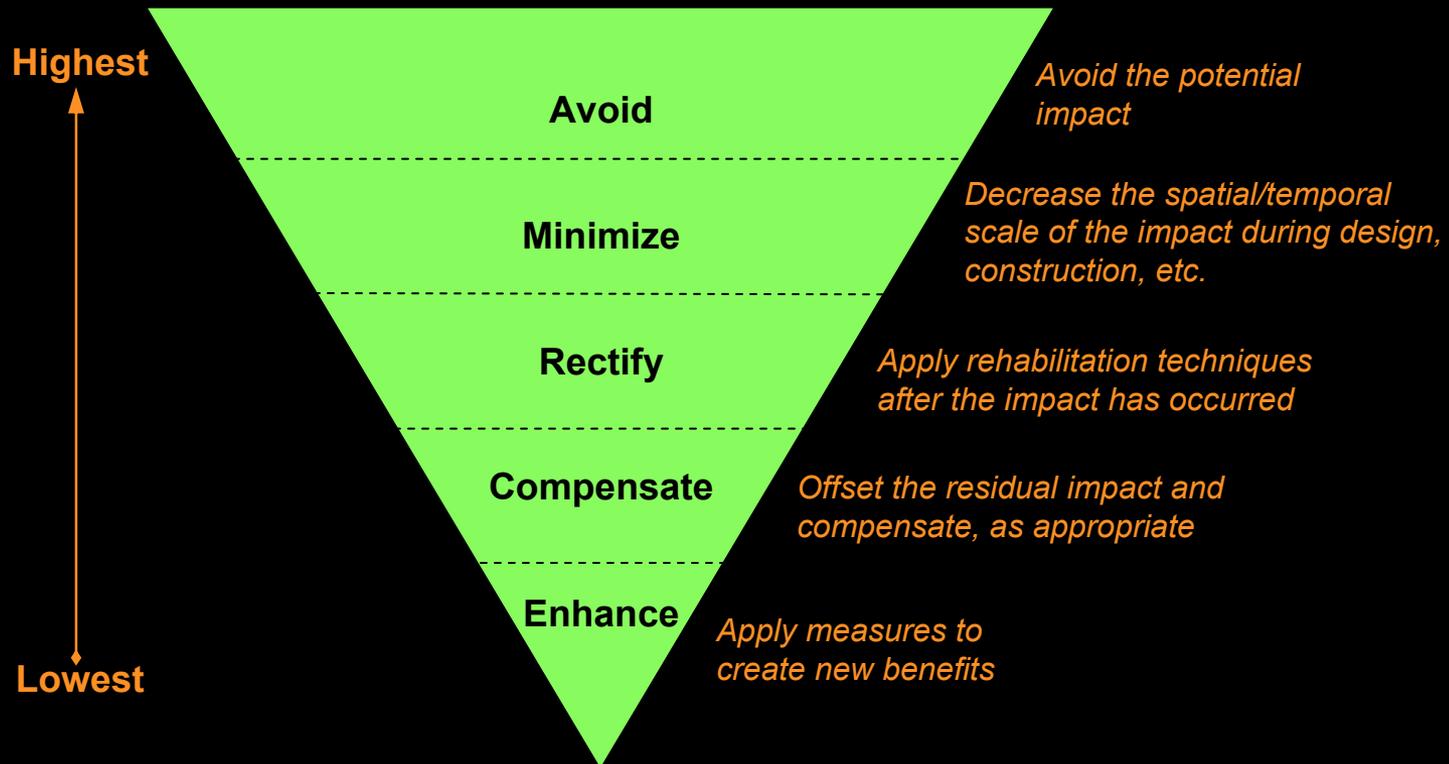




# Mitigation options

- *Alternative ways of meeting the need*
- *Changes in planning and design*
- *Improving monitoring and management*
- *Monetary compensation*

# Hierarchy of mitigation measures



(Modified from UNEP 2002 and Rio Tinto, 2004)

# Avoidance



- Apply precautionary principle
- Sensitive design
- Siting based on least damage criteria
- Avoidance of disturbance to key areas (e.g. protected habitat)
- Timing of project activities (to avoid nesting, fawning, breeding period)
- Regulatory measures

If the consequences of an action are unknown, but are judged to have some potential for major or irreversible negative consequences, then it is better to avoid that action.



# Minimization

- Substitution of techniques using BATNEEC (Best Available Technology Not Entailing Excessive Costs) (prevention of soil erosion, pollution abatement techniques to reduce emissions to the legal limits)
- Promoting bio-friendly technologies
- Controlled or regulated access during construction or operation

*contd. ..*



- Landscape and urban planning (e.g. design of expressway landscaping to complement natural ecology for extensions of habitats)
- Nature engineering solutions (Wildlife bridges, tunnels, fences and 'ecoducts')
- **Modification of a proposal** (Realignment of a road sections)
- Alternative choices (wind power as opposed to thermal power)



# Rectification

## Rescue, relocation, translocation

- Translocation of plant/animal/habitat component
- Removal and storage of top soil for restoration of wetland and terrestrial habitats
- Collection of seeds to ensure a supply of locally adapted native plants (useful practice in restoration of mined out areas)



# Repair, reinstatement, restoration

- **Reinstatement of natural habitats**
- **Restoration of hydrological functions**  
(construction of check dams)
- **Stabilization of river banks** (reconstruction of riparian use by species)
- **Special measure to restore eroded areas**

# Reclamation of mining areas

## Restoration of mine overburden dumps using geo-textile



*(Source: Codli Mines,  
M/s Sesa Goa)*

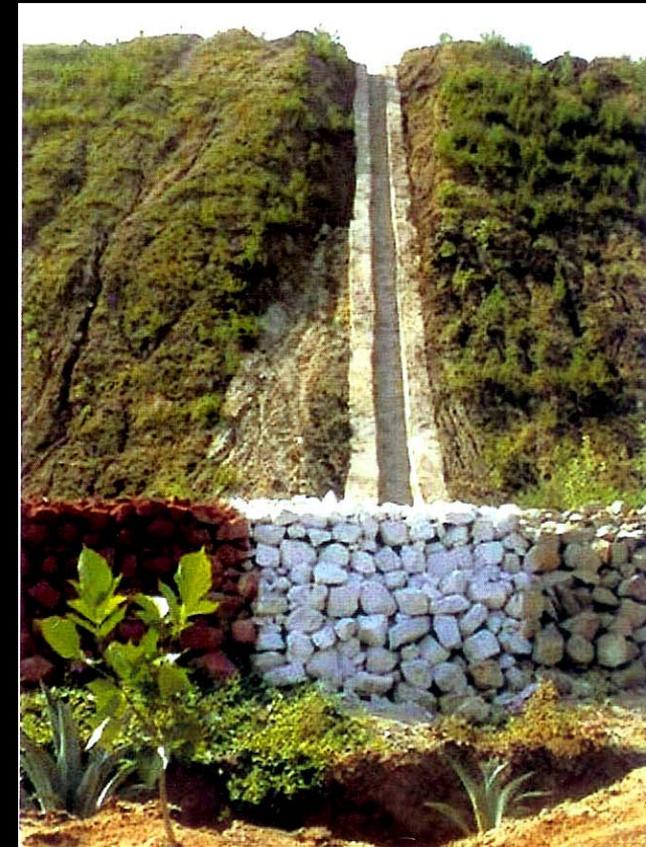




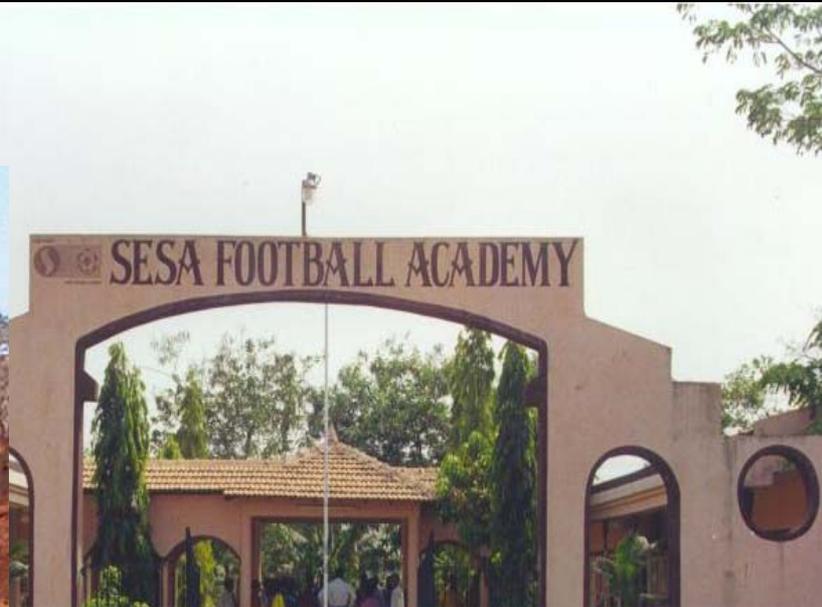
Adequate and advanced planning for reclamation of overburden dump using bio-engineering techniques

Construction of toe wall and rain water disposal drains

*(Source: Singareni Collieries Ltd.)*



# Innovative strategies for restoration of mine dumps





Pisciculture - in reclaimed pit of Sanquelim mine of Sesa Goa group

Economic benefits to local community



# Restoration of hydrological functions



Source: National Mineral Development Corporation, Govt. of India

# Use of superior technology over traditional practices



## Use of coco filters for arresting silt



(Source: SVFU, Bangalore)



# Enhancement and replacement

- Enhancing existing degraded habitats and creating additional habitats to mitigate the loss of those removed by the project
- Creating new habitat on alternative sites (re-vegetation of vacant lands, landfills, exposed rocks)
- Alternative substitutes for enhancing habitat use and value (e.g. artificial nests for improving habitat use)



# Compensation

- Upgrade legal status of habitats of equivalent or better biodiversity values for improving protection to offset losses due to land take elsewhere
- Substitution of habitat areas
- Provision of financial resources for 'creative' management (naturalisation of managed areas)



# Biodiversity offsets

Negotiations to offset residual impacts on a case to case basis

## Conservation banking

Mitigation banking

Creation or rehabilitation of wetlands in one location that can then be used to replace degradation or destruction of natural wetlands in another.

Bio-banking

Market solutions for conservation of biodiversity

Payments for access, use and management of biodiversity resources and goods and services



# Elements of the mitigation plan

- Development of species action plan
- Habitat restoration and improvement plan
- Development of off-offsite and on-site conservation actions
- Adopting market based instruments and economic incentives,
- Legal, institutional and policy instruments for mitigating impacts,
- Development of rehabilitation plan with adequate focus on linking biodiversity with livelihood improvement





# Mitigation feasibility

- Financial
- Technological
- Operational



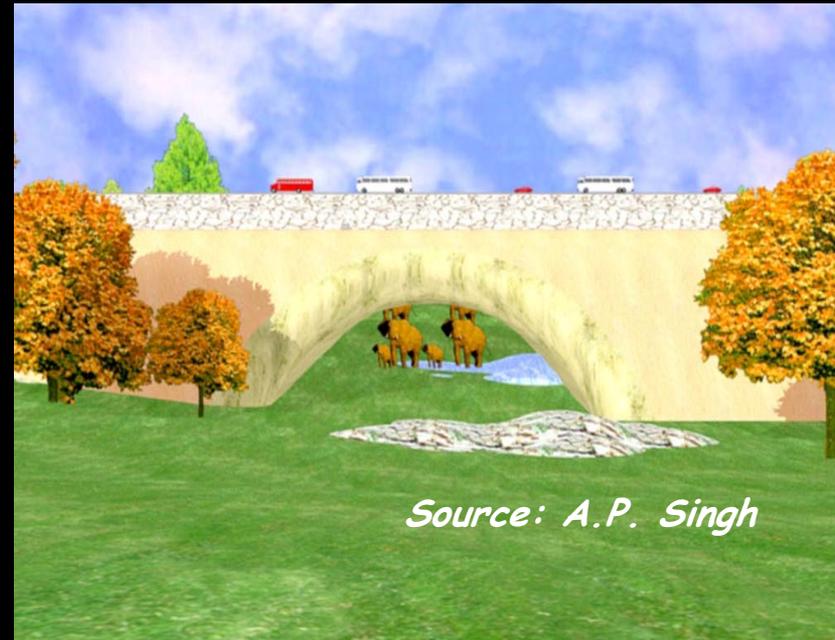
# Feasibility of mitigation options

- Conservation status of species that would be most affected
- Reversibility of impacts
- Restoration potential of habitats
- Duration of impacts
- Availability of mitigation measures
- Cost of mitigation



*Thank you...*

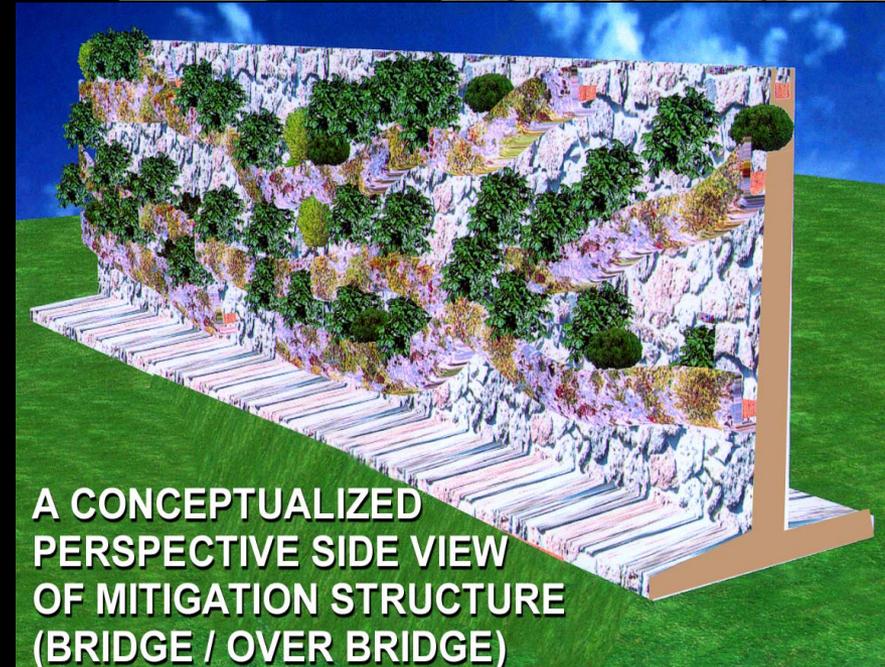
# Sensitive design



# Ecologically sensitive design planning

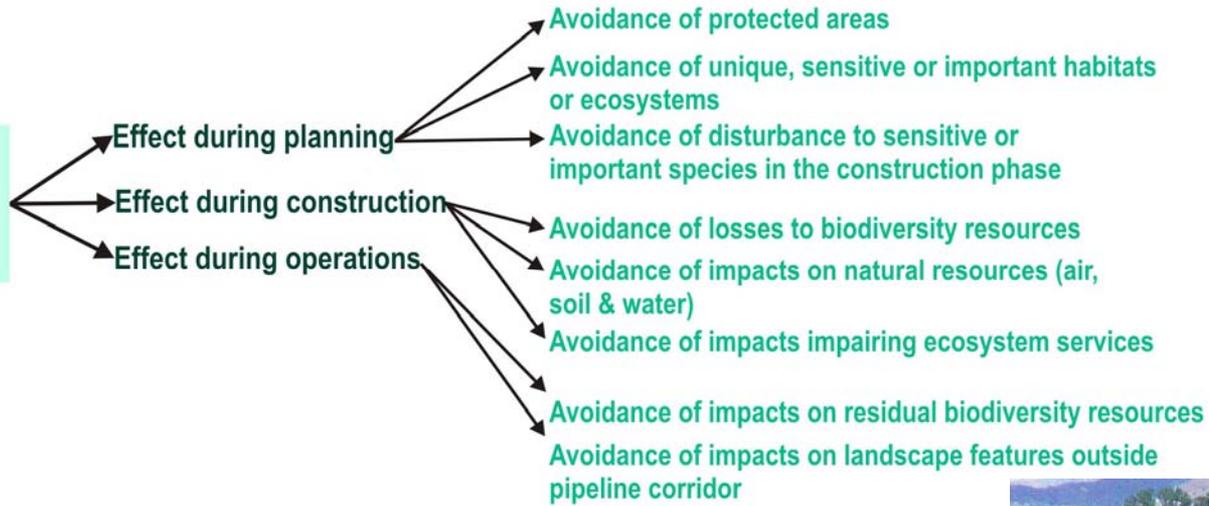


Source: A.P. Singh



# Siting options for least damage

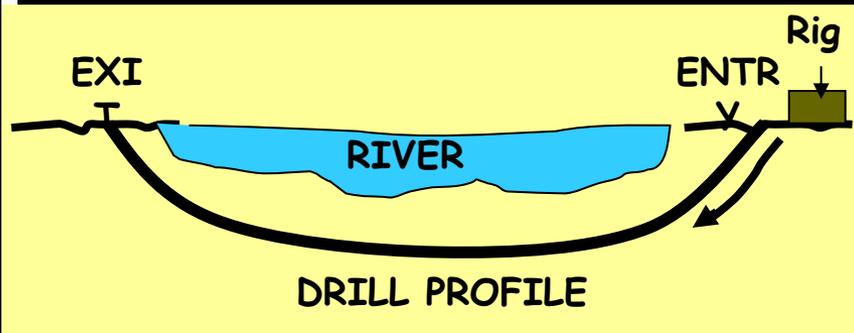
Potential to impact diversity



# Alternative technological options



Recognizing the ecological benefits of Horizontal Direction Drilling technology over Open Cut method for laying pipeline across a river



(Source: WII and Bharat Petroleum Corporation Ltd)

# Timing of project activities



Location of Hazira-Bijapur-  
Jagdishpur gas pipeline,  
M.P., India

Avoid nesting, breeding  
period of Great Indian  
Bustard



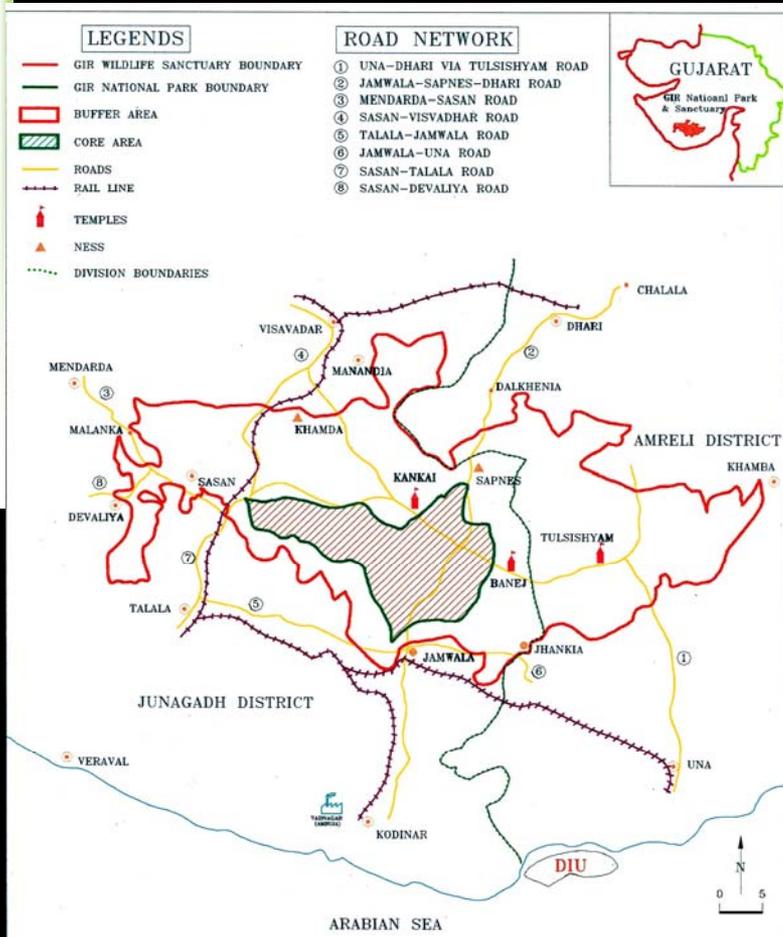
# Right of Way management in transportation corridors

Regulating speed and controlling access



INDIA

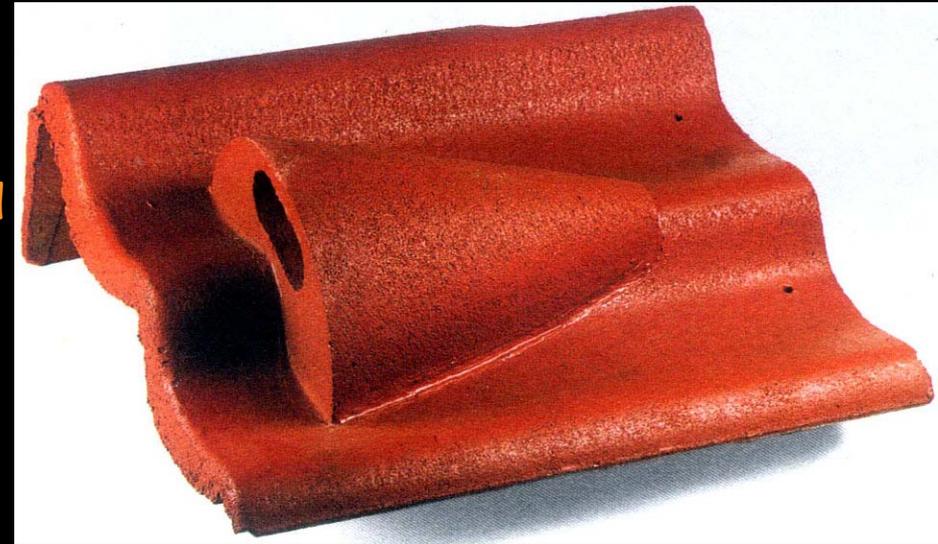
Gir Forest Reserve





# Biodiversity friendly technological options

Design of tiles to allow swift and sparrows to build nests

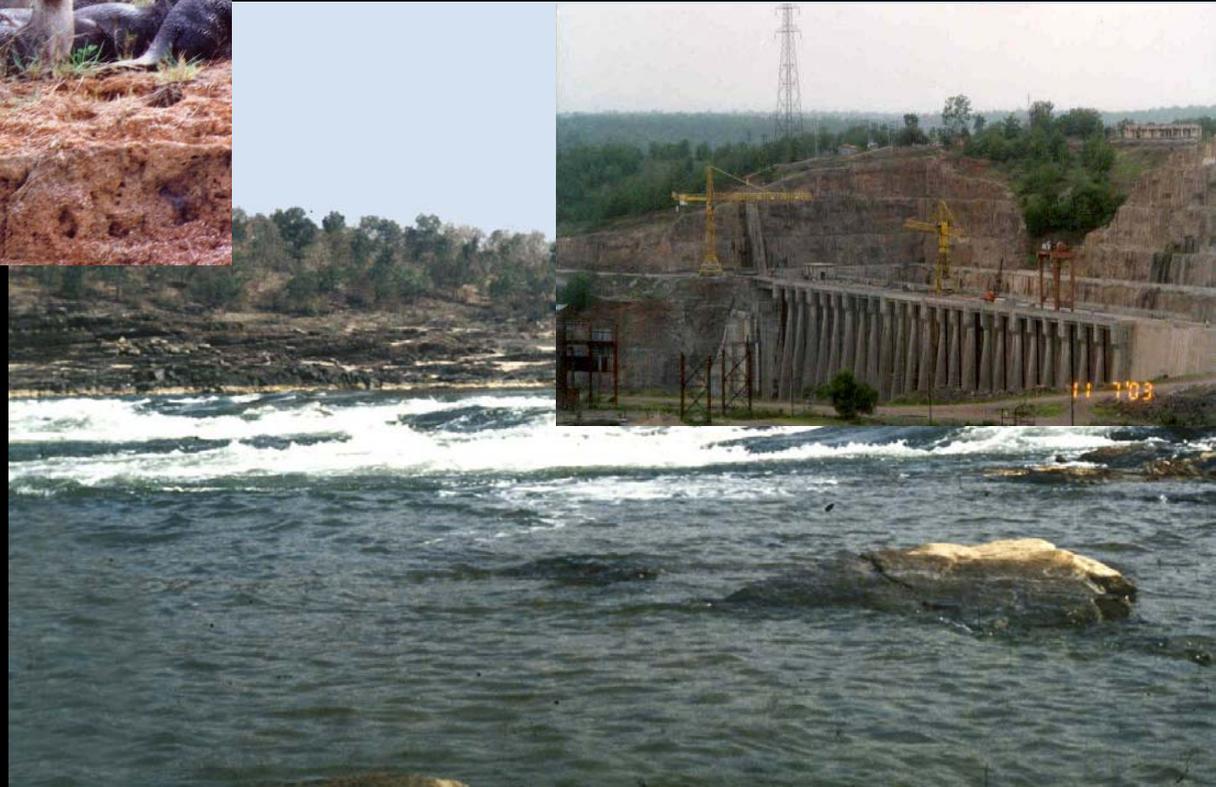


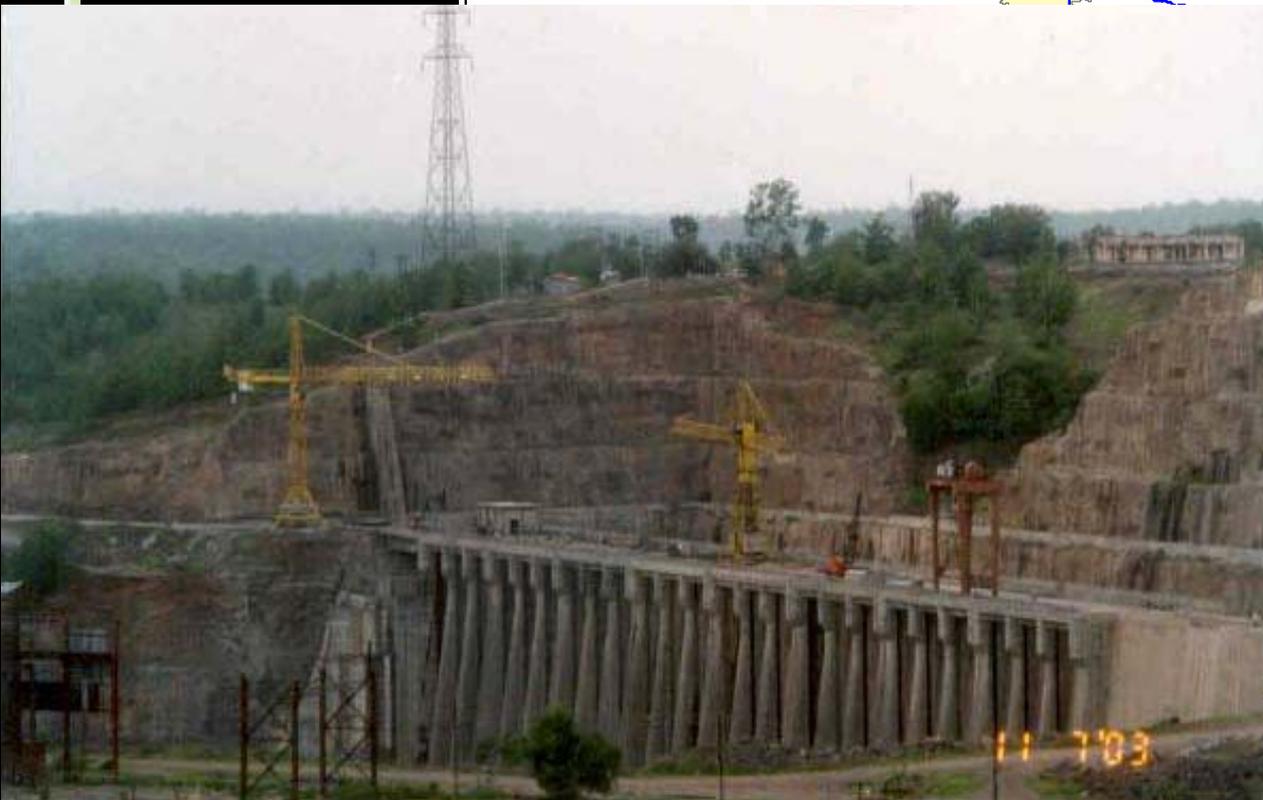
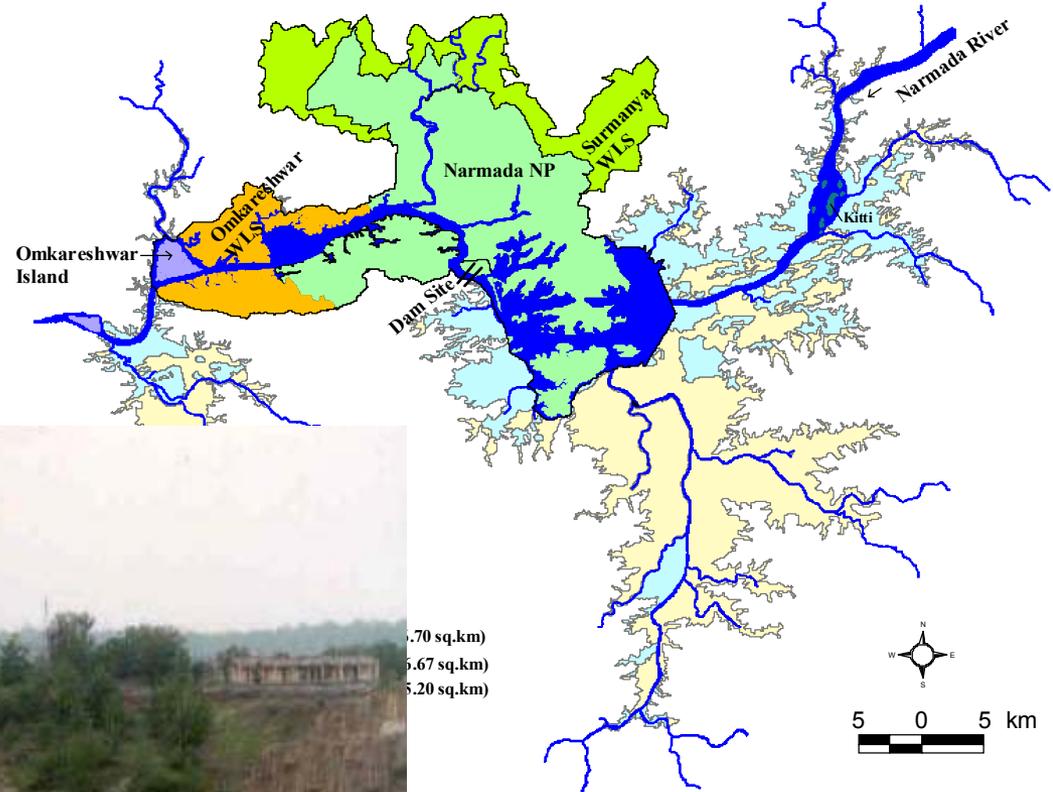
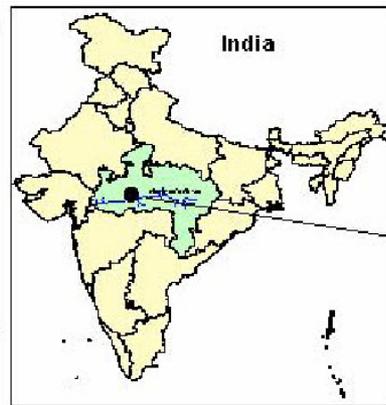
Design of tiles for protection of bats

*(Source: M/s Lafarge)*



Reservoir of the  
Periyar dam





# Collection of seeds to ensure a supply of locally adapted native plants



# Landscape planning



Raise clumps of trees in the flight path of birds to make them fly higher.



*(Source: Public works department, Government of the Netherlands)*

# Nature engineering solutions for road related impacts



*Source: Public works department, Government of the Netherlands)*



# Construction of fences and subways for small animal movement



*(Source: Public works department, Government of the Netherlands)*

# Alternatives at the planning stage may be useful in offsetting biodiversity losses



# Alternative habitat creation and management



Naturalisation of mine void as a wetland habitat



Creative management of alternative habitats



*(Source: M/s Narmada Cement Ltd.)*