Nature-Based Solutions for Buildings in Ahmedabad

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The Challenge

Ahmedabad's Urban Crisis

- **Extreme Heat**: 311 out of 365 days with extreme heat stress (UTCI >46°C)
- **Rapid Urbanization**: Built-up area increased by 124 sq km (2013-2023)
- **Agricultural Loss**: 129.60 sq km converted to built-up areas
- **Flooding Events**: Increasing urban flooding incidents since 2017
- **The Opportunity**: 81% residential + 15% commercial buildings offer huge potential for NBS implementation

Building-Integrated NBS Framework

Three Categories of Building NBS

🏢 **Building Envelope Solutions**

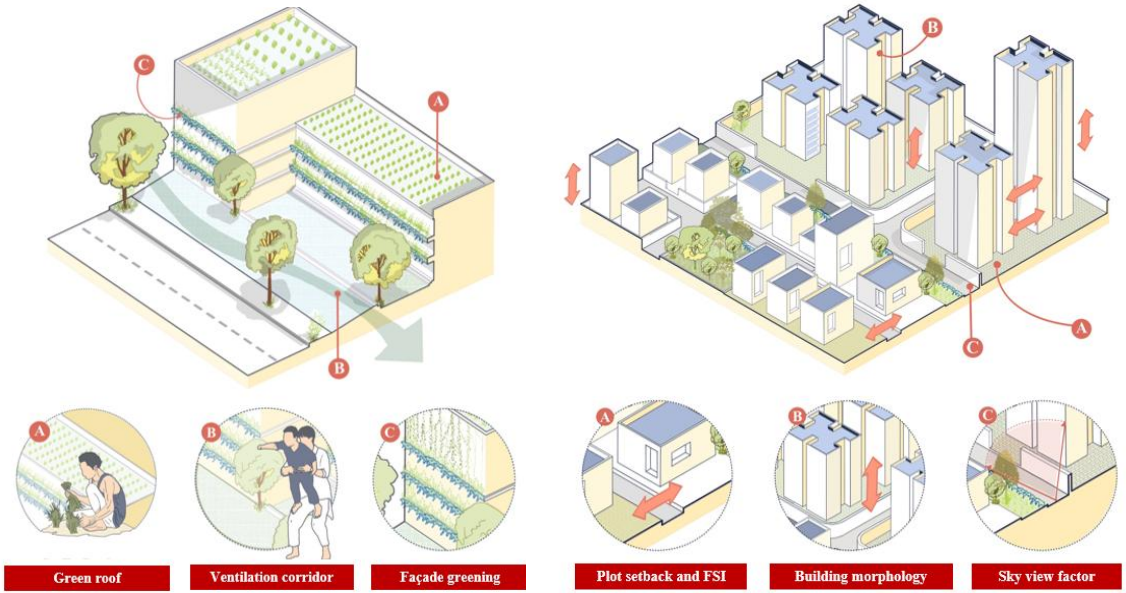
- Cool roofs (SRI 104-110)
- Green roofs & rooftop farming
- Vertical greening/façade systems

🏗️ **Building Design Strategies**

- Optimized building morphology
- Enhanced sky view factor
- Strategic plot setbacks

🌿 **Building-Adjacent Solutions**

- Permeable pavements
- Bioswales & rain gardens
- Green corridors



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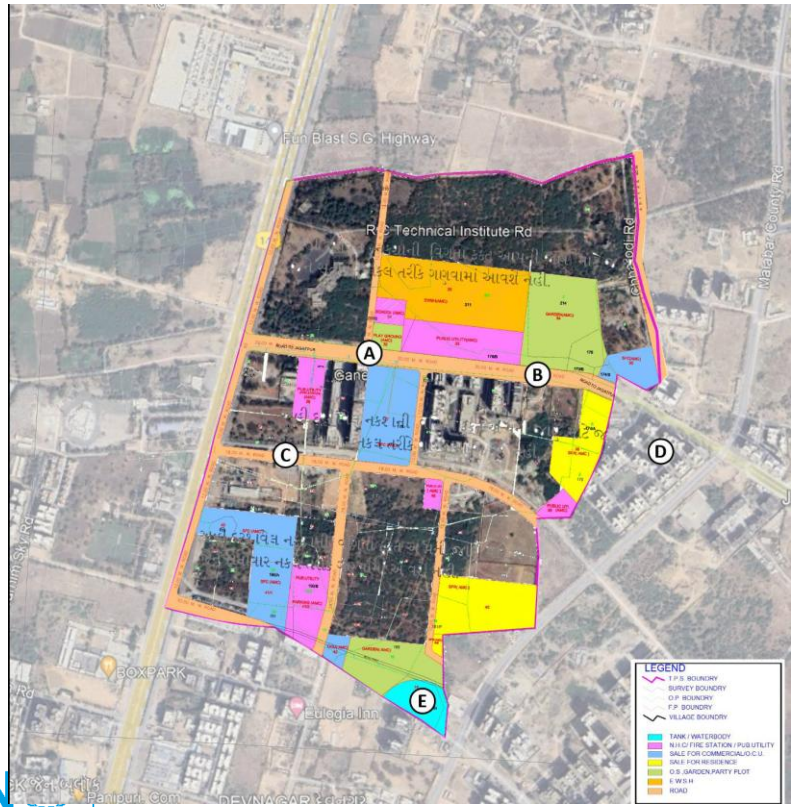
Building-Integrated NBS Framework

Temperature Reduction Potential

NBS Strategy	Cooling Effect	Application
Cool Roofs	Up to 4.6°C reduction	White ceramic tiles, reflective paint
Green Roofs	2.4°C ambient reduction	Extensive systems, rooftop farming
Vertical Greening	4.1°C evapotranspiration cooling	Low-maintenance native species
Permeable Pavement	3.5°C peak temperature reduction	20-50% void content blocks

Additional Benefits: Stormwater management (30-90% runoff reduction), biodiversity enhancement, carbon sequestration

Business Model for Implementing Nature-Based Solution



Proposed Business Plan for NbS Pilot in Ahmedabad

- ❑ Suggestive Guidelines for Implementation of Nature-based solutions (NbS) and Sustainable Building Practices (SBP)
- ❑ Draft Business Model for Pilot Implementation
  - NBS plan for Jagatpur TPS (TPS 35D)
  - Cost Estimation of the Proposed Plan for Implementation
    - Blue-Green infrastructure
    - Grey infrastructure
  - ❑ Financing Structure and Governance Mechanism
  - ❑ Risk Assessment and Mitigation Measures

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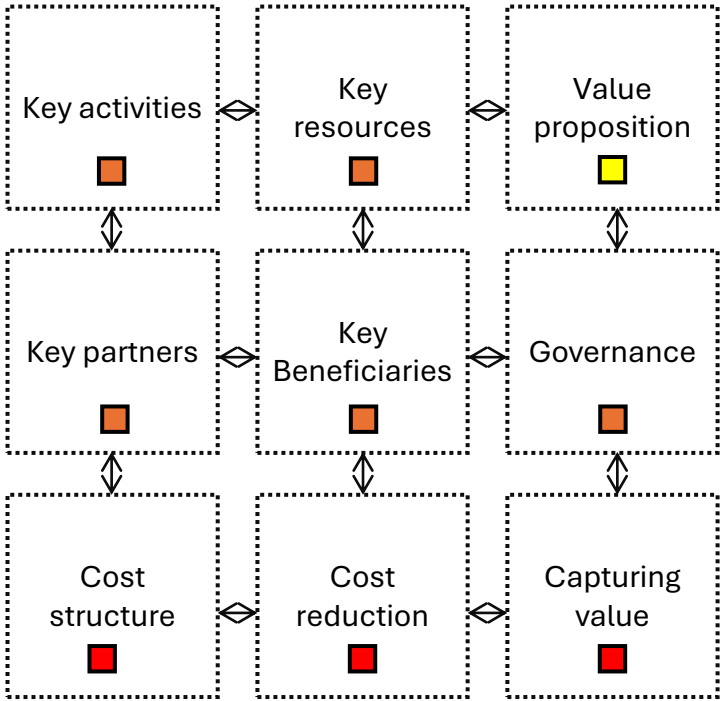
Framework for business model development

Overview of the Business Model Proposition



Value proposition | Value creation and delivery | Capturing the value

- ❑ Draft guidelines for feasibility assessment
- ❑ **Roadmap for the Pilot**
- ❑ Milestones and criteria for successful implementation
- ❑ Policy-level advocacy- in financing, operation
- ❑ Key performance indicators- baseline and targets
- ❑ Timeline and draft agenda for

Cost of Implementing Pilot NbS in Ahmedabad

Table 9. Cost Estimate for integrating Nature Based Solutions at the TP Scheme Level (considered the public land only)

Sl. No.	Proposed strategies	Land Use (as per the TPS)	Land Ownership	Unit Cost (derived from literature)	Quantity	Unit	Total Cost (Rs.)
1	Urban Forestry (multilayered, low maintenance plantation with native species)	AMC Garden	Public	Rs. 300-350 per sq.ft. or Rs. 3,229–3,764 per sq.m.			
2	Pocket (urban) park with bioretention areas (e.g., detention ponds) and pervious walkway			Rs. 200-250 per sq.ft. or Rs. 2,100–2,700 per sq.m.			
3	Percolation (Injection) wells			Rs. 1,50,000-2,00,000			
4	Bioswales with vegetative and/ gravel filters	Roads		Rs. 450-500 per sq. m or Rs. 42-47 per sq.ft			
5	Paver blocks (permeable) with tree box			Rs. 800 per sq.m for 10 cm; Rs. 1600 per sq.m for 20 cm (Porous Concrete)			
6	Raingardens			Rs. 50-250 per sq.ft.			
7	Tree (native) plantation			Rs. 80-100 per sapling			
8	Constructed Wetlands (to naturally treat stormwater and rejuvenate water bodies) with detention pond	Water Body		Rs. 5000 per sq. m (approx.)			
9	(A) Green roofs (B) Green facades (vertical greening) (C) Rooftop rainwater harvesting system (D) Percolation wells (e.g., Khambati Kuva or Injection Wells) (E) Cool roofs	Public Utility		(A) Rs. 80-100 per sq.ft.			
		EWSH		(B) Rs. 500-800 per sq. ft.			
		Sale for Residential	Public *(eventually private)*	(C) Rs. 10,000/KL			
				(D) Khambati Kuva 30 ft depth: 3 ft Dia ~ Rs. 60,000 30 ft Dia ~ Rs. 10,00,000	4	Nos	2,40,000
		Sale for Commercial		(E) Rs. 17-20 per sq.ft	-	-	-
				Total (Rs.)	11,70,22,000		
				Adding 10% contingencies / misc. costs (Rs.)	1,17,02,200		
				Adding 20% for Gujarat's Context due to higher rates (Rs.)	2,34,04,400		
				GRAND TOTAL (Rs.)	15,22,03,600 (Fifteen crores twenty-two lakhs three thousand and six hundred)		

Table 11. Summary of the cost structure of proposed NbS integration at TPS level

Total Cost Estimate for integrating Nature Based Solutions as the TP Scheme Level is **Rs. 15.3 Crores (INR).**

Total Cost Estimate for Conventional Grey Infrastructure is **Rs. 65.6 Crores (INR).**

Total Infrastructure Cost on Integrating NbS after reducing 10% of overlapping cost (e.g. excavation, labour etc.) is **Rs. 74.27 Crores (INR).**

Additional cost paid for executing NbS at TPS level is **Rs. 8.6 Crores (INR).**

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