

Presentation on

Technology Sub-Mission

Under

Pradhan Mantri Awas Yojana

Housing for All (Urban)

Monday, 25th January, 2015

Nirman Bhawan, New Delhi

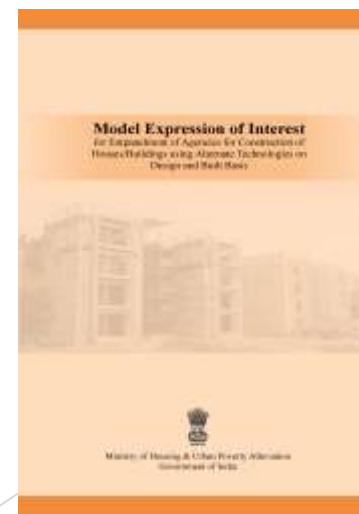
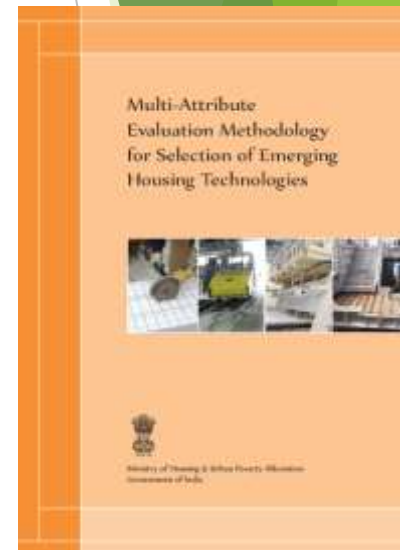
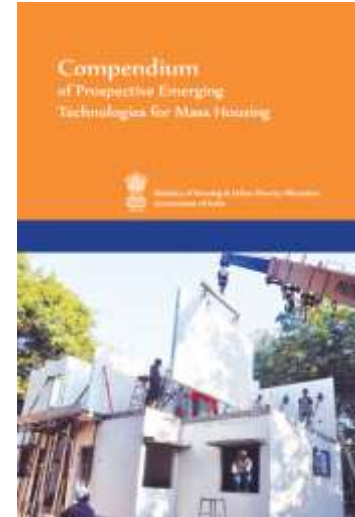
Various Activities for Regional Technical Institutes

- ▶ Identifying specific solutions and appropriate design considering local conditions and requirements
- ▶ Preparation of Manuals and Guidelines.
- ▶ Technical training of Planners, Architects and Engineers
- ▶ Identifying and transplanting global best practices with adaptation for local conditions
- ▶ Set up mechanisms for testing and accepting materials including new materials in construction
- ▶ Take up long term research projects in the field of slums, slum rehabilitation design technology.

Initiatives taken so far...

Documents published:

- Prospective Construction System for Mass Housing containing the Technology Profiles on Emerging Technologies
- Multi-Attribute Evaluation Methodology for Selection of Emerging Housing Technologies
- Model Expression of Interest for empanelment of agencies for construction of houses /buildings using alternate technologies on Design and Built basis



Emerging Technologies Identified, Evaluated and Promoted

- Monolithic Concrete Construction System using Plastic - Aluminium Formwork
- Monolithic Concrete Construction System using Aluminium Formwork
- Expanded Polystyrene Core Panel System
- Industrialized 3-S System using Precast RCC Columns, Beams & Cellular Light Weight Concrete Precast RCC Slabs



Emerging Technologies Identified, Evaluated and Promoted ...contd.

- Speed Floor System
- Glass Fibre Reinforced Gypsum (GFRG) Panel Building System
- Factory Made Fast Track Modular Building System
- Light Gauge Steel Framed Structures (LGSF)



Other Emerging Technologies Identified

- Wafflecrete Building System - M/s Shaival Reality Pvt. Ltd., Ahmedabad
- Modular Tunnel Form System - M/s Outinord Formwork Pvt. Ltd.,
- EPS Core Panel System - M/s Jindal Steel & Power Ltd. Angul, (Odisha)
- Large Prefabricated Panel System - M/s Larsen & Toubro Limited
- SISMO Building Technologies - M/s SISMO Building Technology Ltd., Manesar
- Precast Hollow Core Panel and Slab System
- Structural Stay-in-place – Formwork Coffer India Ltd. Gujarat
- Light Gauge Steel Structure System – Society for Development Composite, Bangalore



Demonstration Housing Project using Emerging Technologies

- The Ministry of Housing & Urban Poverty Alleviation, Govt. of India has requested the State Governments of **Maharashtra, Kerala, Andhra Pradesh, Telengana, Karnataka, Rajasthan, Haryana, West Bengal, Odisha, Sikkim, Gujarat, Uttar Pradesh, Uttarakhand, Tamil Nadu, Bihar and Chhattisgarh** for participation in the "Demonstration Housing Project" of BMTPC.
- Received requests from **Andhra Pradesh, Telengana, Odisha, Haryana, Maharashtra, Uttar Pradesh, Bihar and Karnataka**.
- The Government of Andhra Pradesh has already allotted the land for construction of 40 demonstration houses and a demonstration community building at Nellore District admeasuring 1.85 acres.
- The State Govts. of Odisha and Telengana have also identified the land for implementation of the projects.
- The layout, plans and tender for Odisha project has been finalised in consultation with Bhubaneswar Development Authority (BDA). A tender has been floated for construction of 32 houses including infrastructure development using EPS based panel System.
- For Telengana project, various modalities regarding selection of technologies, plans etc. are being worked out.

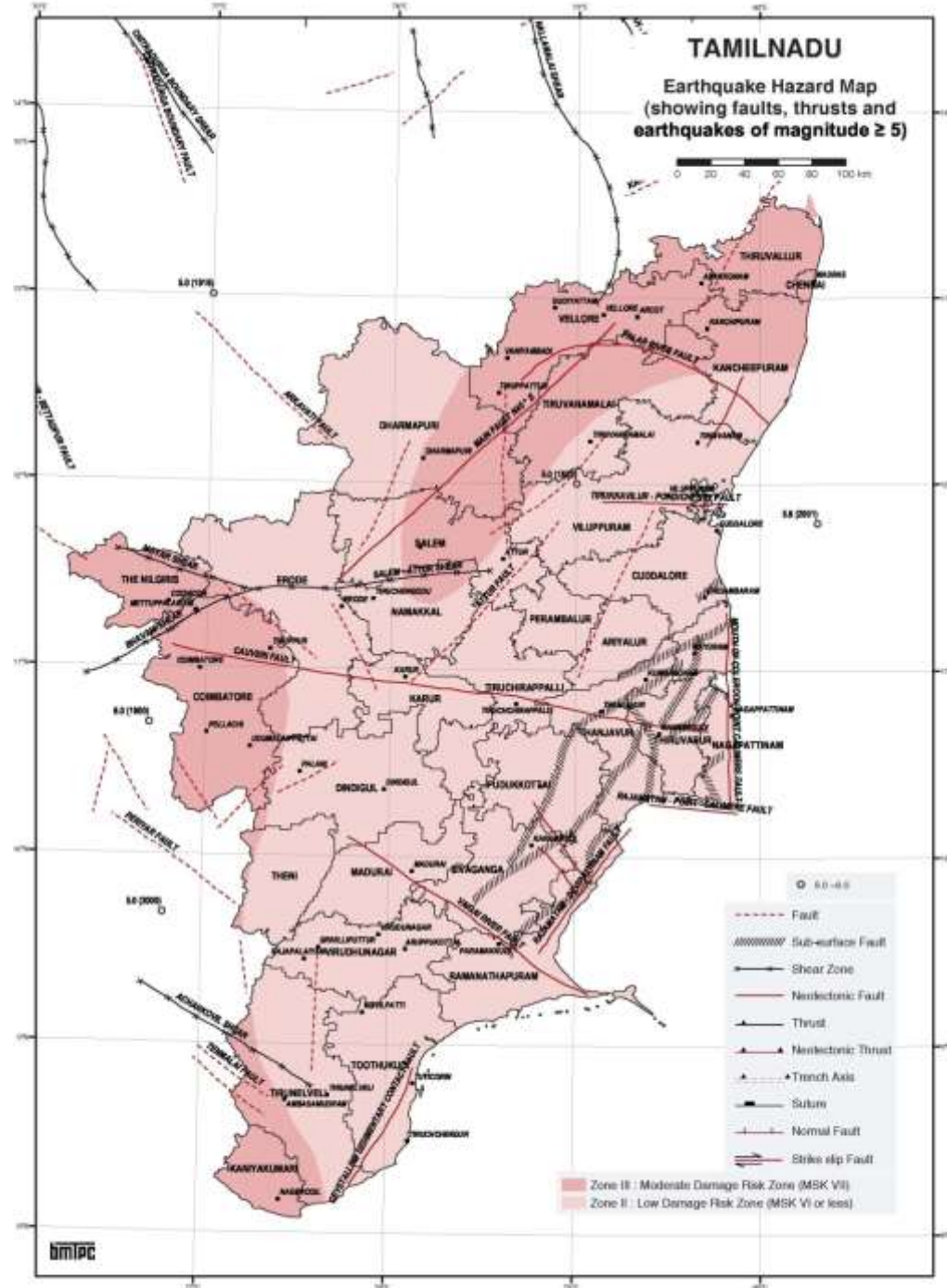
IIT Madras Proposed Center for the Urban Built Environment (CUBE)

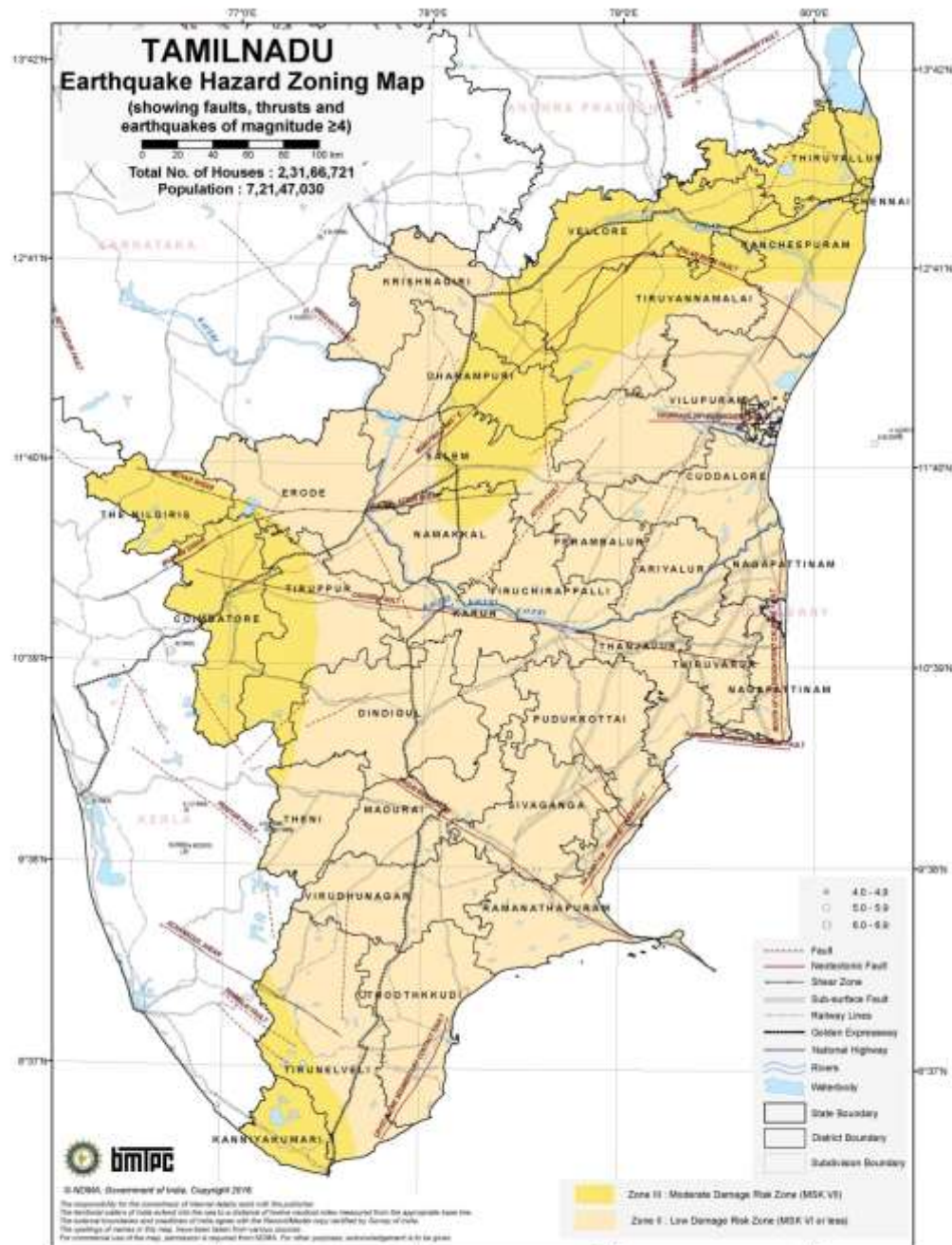
CUBE will undertake 5 kinds of activities

- ▶ *Development of policies, guidelines and standards*
- ▶ *Developing new technologies and implementing Pilot Projects*
- ▶ *Capacity Building*
- ▶ *Convening Techno-Policy dialogues*
- ▶ *Megaproject Advisory Services*

Sl. No.	Name	Occupation	Address
1.	Dr. Bhaskar Ramamurthi	Director, IIT Madras	IIT Madras, Chennai - 600 036
2.	Dr. Krishnan Balasubramanian	Professor and Dean IC & SR, IIT Madras	Centre for Industrial Consultancy and Sponsored Research, IIT Madras, Chennai - 600 036
3.	Prof. Meher Prasad	Professor, IIT Madras	Department of Civil Engineering, IIT Madras, Chennai - 600036 .

**Earthquake Hazard Map
(showing faults, thrusts and
earthquakes of magnitude ≥ 5)**





**Distribution of Houses by Predominant Material of Roof
and Wall and Level of Damage Risk in Tamil Nadu
(Ref. Census of India 2001 & 2011, Housing Series)**

Wall / Roof	Census Houses 2001		Census Houses 2011		Level of Risk Under EQ Zone			
	No. of Housing Units	% of Total Units	No. of Housing Units	% of Total	Area of Zone in % area of the State			
					V II	IV	III	
							3.1	69.9
Wall Type								
Total Category-A	6,129,163	36.4	4,827,444	22.56	-	-	M	L
Total Category-B	8,857,063	52.1	13,437,449	62.80	-	-	L	VL
Total Category-C	1,006,496	5.9	1,924,370	8.99	-	-	VL	VL
Total Category-X	940,882	5.5	1,208,859	5.65	-	-	VL	VL
Total Buildings	16,996,604		21,398,122*					
Roof Type								
Total R1-Light Weight Sloping Roof	5,010,445	29.5	5,210,713	24.35	-	-	L	VL
Total R2-Heavy Weight Sloping Roof	6,179,682	36.4	6,259,187	29.25	-	-	L	VL
Total R3-Flat Roof	5,806,477	34.2	9,928,222	46.40	Damage Risk as per that for the wall supporting it			
Total Buildings	16,996,604		21,398,122*					

* Excluding Locked and Vacant Houses

Housing Category by Wall Types

Category-A: Buildings in field –stone, rural structures, unburnt brick houses, clay houses

Category-B: Ordinary brick building: buildings of the large block & prefabricated type half timbered structures, building in natural hewn stone

Category-C: Reinforced building, well built wooden structures

Category-X: Other materials not covered in A,B,C. These are generally light (see R1)

- Damage Risk for Wall types is indicated assuming heavy flat roof in categories A,B and C: Reinforced Concrete Buildings.

Housing Category by Roof Type

Category- R1: Light Weight (Grass, Thatch, Bamboo, Wood, Mud, Plastic, Polythene, GI Metal, Asbestos Sheets, Other Materials)

Category- R2: Heavy Weight (Tiles, Slate)

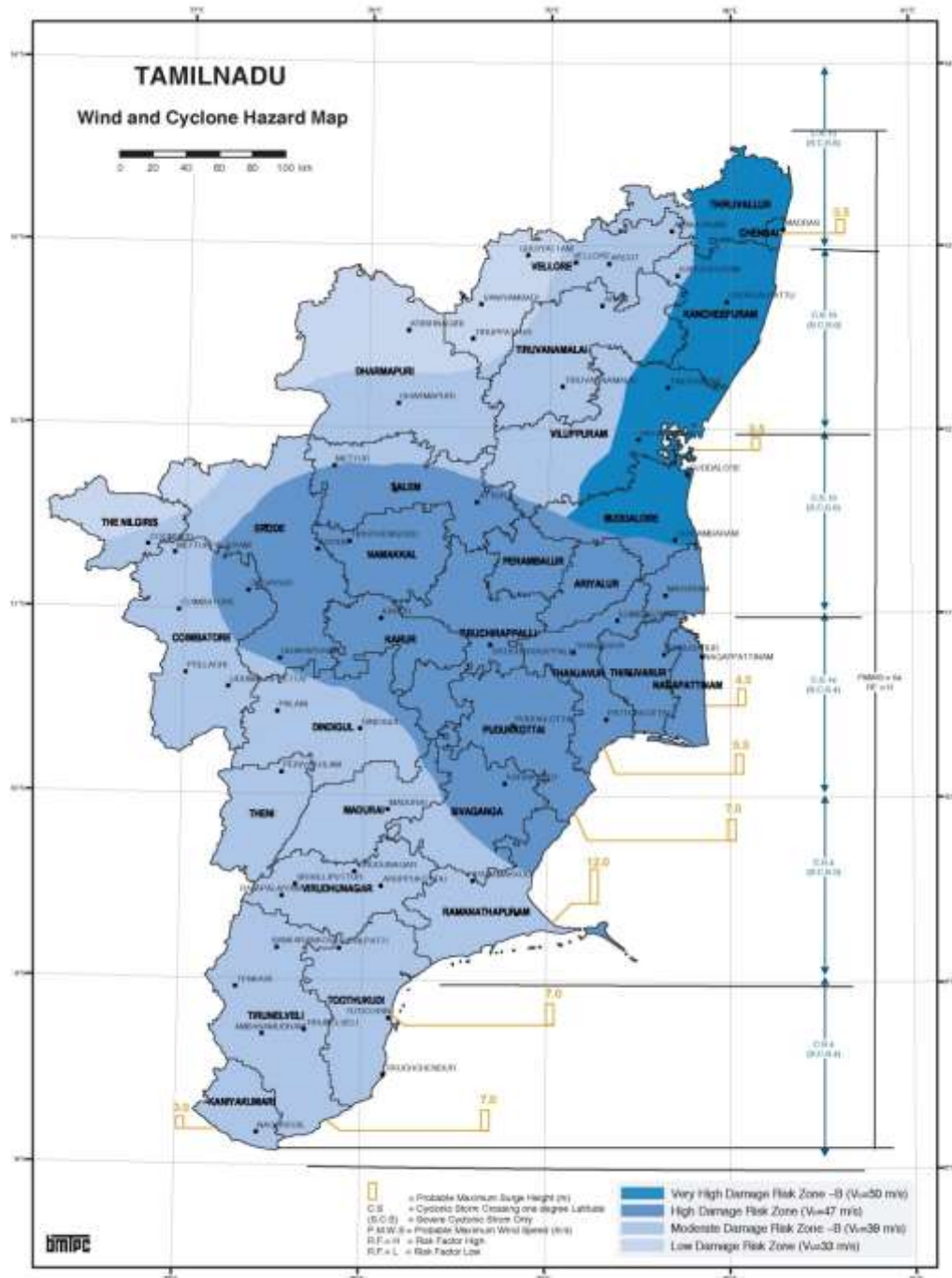
Category- R3: Flat Roof (Brick, Stone, Concrete)

Earthquake Hazard Proneness

- EQ Zone V: Very High Hazard Zone (MSK>IX)
- EQ Zone IV: High Hazard Zone (MSK VIII)
- EQ Zone III: Moderate Hazard Zone (MSK VII)
- EQ Zone II: Light Hazard Zone (MSK VI)

Level of Damage Risk

- Level of Risk: VH = Very High, H= High, M= Moderate, L= Low, VL= Very Low



TAMIL NADU

[illegible]

Indian Standard Codes on Earthquake Resistant Design & Construction

A. For General Structural Safety		
1.	IS 1905:1987	Code of Practice for Structural Safety of Buildings: Masonry Walls, With 1 Amendment, Reaffirmed in 2012
2.	IS 1904:1986	Code of practice for design and construction of foundations in soils: General requirements (third revision), Reaffirmed in 2010
3.	IS 456:2000	Code of Practice for Plain and Reinforced Concrete (fourth revision) With 4 Amendments, Reaffirmed in 2011
4.	IS 800:2007	Code of Practice for General Construction in Steel (third revision) With 1 Amendment, Reaffirmed in 2012
5.	IS 883:1994	Code of practice for Design of Structural Timber in Building (fourth revision), Reaffirmed in 2009 (fourth revision is under print)
B. For Earthquake Protection		
1.	IS 1893: Part 1: 2002	Criteria for Earthquake Resistant Design of Structures (Part 1) General Provisions and buildings (fifth revision) With 2 Amendments, Reaffirmed in 2012
2.	IS 1893: Part 2: 2002	Criteria for Earthquake Resistant Design of Structures (Part 2) liquid retaining structure
3.	IS 1893: Part 3: 2014	Criteria for Earthquake Resistant Design of Structures (Part:3) Bridges and Retaining Walls
4.	IS 1893: Part 4: 2005	Criteria for Earthquake Resistant Design of Structures (Part:4) Industrial Structures Including Stack: Like Structures, Reaffirmed in 2016,(1st revision is under print)
5.	IS 4326: 2013	Earthquake Resistant Design and Construction of Buildings: Code of Practice With 4 Amendments, Reaffirmed in 2013
6.	IS 13920: 1993	Ductile Detailing of Reinforced Concrete Structures subjected to Seismic Forces : Code of Practice With 2 Amendments, Reaffirmed in 2013 (fourth revision is under print)
7.	IS 13828:1993	Improving Earthquake Resistance of Low Strength Masonry Buildings - Guidelines, With 3 Amendments, Reaffirmed in 2013
8.	IS 13827:1993	Improving Earthquake Resistance of Earthen Buildings - Guidelines, With 2 Amendments, Reaffirmed in 2013
9.	IS 13935:2009	Seismic evaluation, repair and seismic strengthening of masonry buildings - Guidelines (first revision), with 1 Amendments, Reaffirmed in 2013
10.	IS 15988:2013	Seismic Evaluation and strengthening of Existing Reinforced Concrete Buildings- Guidelines
C. For Cyclone/Wind Storm Protection		
1	IS 875(3) - 1987	Code of Practice for Design Loads (other than Earthquake) for Buildings and Structures, Part 3, Wind Loads
2	IS 15498:2004	Improving cyclone resistance of low rise houses and other buildings
3	BMTPC: 2010	Improving Wind/Cyclone Resistance of Housing - Guidelines

Green Interventions...

Conservation of scarce natural resources for building Materials & components

- ▶ ***Optimum use of supplementary Industrial/ agricultural bye-products/ waste materials, construction & demolition waste etc.***

(Portland Pozzolana Cement (PPC), Glass Fibre Reinforced Gypsum (GFRG) Panels, Ready Mix concrete (uses high content of Fly Ash), Fly Ash based bricks/blocks, Auto-Claved aerated Light weight blocks (uses upto 70% Fly Ash), Fibre cement boards/ sheets, Aggregates from C&D waste etc.)

- ▶ ***Use of alternate material/component having same function comparable to conventional material/component***

(Expanded Polystyrene system (EPS) for Walling & roofing, GFRG system, Rat-trap bond for walling, filler slab for roof & intermediate slabs etc.)

- ▶ ***Requiring lesser natural resources for same product/function through Pre fabrication technique***

(Pre-fabricated concrete components, hollow core slabs, Light Gauge steel structural system, EPS System, Aerocon light weight panels, Plank & Joist system for roof & intermediate slabs, Ferro-cement component, Pre-cast waffle units, hollow blocks etc.)

- ▶ ***Use of renewable resources as fast growing species of plantation timber, bamboo etc.***

Green Interventions...

Energy efficiency in buildings

- ▶ *Low embodied energy Materials i.e. Materials requiring lower energy in production*

(GFRG walls & roofing panels, Fly Ash bricks/blocks, compressed earth blocks, Concrete blocks using recycled or locally available stones, etc.)

- ▶ *Energy efficiency during operation of the building*

The products like AAC blocks/ panels, Polystyrene & other similar insulation materials in walling & roofing bring significant operational energy efficiency. Other options are cavity wall as rat trap bond for walling, hollow blocks, perforated bricks/ blocks etc.

Building products/components requiring lower transportation of raw material & in final form

Expectations from States

- ▶ Policy level intervention at state level so as to adopt new technologies identified by BMTPC or any other new technology suiting to state
- ▶ Creating enabling eco-system for mainstreaming these technologies e.g. inclusion of technologies in state specifications, creating capacities at state level which may include engineers, architects skilled workforce, contractors, training etc.
- ▶ Confidence building amongst beneficiaries, general public, professionals through demo construction
- ▶ Demonstration housing project in collaboration with BMTPC for which a land (~1 acre) may be provided by state free of cost
- ▶ Establishing linkages with IITs and NITs for DIME (Design, Implementation, Monitoring & Evaluation).
- ▶ Active Interaction with Technology providers for adoption of technologies in the states
- ▶ Study Visits in different states & abroad to share their knowledge & experience in using new technologies for mass housing

What we propose to do ???

- ▶ Handholding, sensitization and Capacity Building Programmes in different States for confidence building in the minds of stakeholders on emerging and proven technologies
- ▶ Demonstration Housing Projects in willing States
- ▶ Creation of Knowledge Portal on Technologies
- ▶ Holding conferences in association with different Chambers like ASSOCHAM, FICCI, CII, CREDAI, NAREDCO, etc. in different States so as to involve private sector for mass scale adoption of new technologies
- ▶ Extending technical support to states in identification & selection of technologies for HFA, DPR preparation, tender preparation & evaluation, implementation, onsite training etc.
- ▶ Comprehensive manuals on identified technologies with IITs/NITs
- ▶ Conduction of monthly open house discussions for mainstreaming emerging technologies
- ▶ Organization of Exposure Visits of mass housing projects

Thank you