



Workshop
on
SUSTAINABLE ROAD CONSTRUCTION

22nd November 2016 (8:00am-5:30pm)

Comments and Recommendations from Panel Discussion

The following comments were made by Prof. B R Srinivasa Murthy, Prof. A Veeraragavan, Prof. G L Sivakumar Babu, Dr. V. Ramachandra, Mr. Shahrokh Bagli, Mr. H. K. Sehgal, Dr. Ashish Verma and Ms. Reashma P. S., as well as by members of the audience, including Col. Girish Kumar, Indian Air Force.

Following these comments, a list of four major recommendations that came out of this workshop is provided.

Comments

1. Need better characterization of new materials to understand how they perform
2. Need to link properties with performance and design
3. Specifications for the use of new materials are needed
4. Schedules of rates for new materials are needed
5. Tendering process should facilitate the adoption of new materials
6. Life cycle cost analysis in the selection of alternative design process should be adopted
7. Provision for green construction (such as the use of recycling) should be there
8. Capacity building is required for characterization, design and construction – need for training engineers and technicians
9. Training should be done for top level management so that they can start new things
10. New technologies should be introduced in the curriculum
11. Teachers should be trained
12. Student projects should include the use of life cycle cost analysis as part of alternative design process
13. Construction should require carbon credits – pavements of certain types must require carbon limits
14. Similar to rating system for buildings (platinum rated for example), there should be ratings for highways
15. Developers should be awarded and benefitted for developing green highways
16. Best technology should be selected for construction and not always the lowest bid
17. There should be a weighing and rating method for construction to evaluate “How green is your proposal”?
18. Life cycle cost analysis must be done
19. Adoption of new materials and technologies such as geocells must be mandated
20. IRC and NHA should encourage innovativeness
21. Improved syllabi including new materials and technologies must be started for bachelors and Masters students

22. Training and tutorials must be available for practicing engineers
23. Appropriate technology should be selected for building and maintaining roads; the right technique for the specific problem must be selected
24. Drainage should be given major consideration
25. More workshops such as the one held on sustainable road construction at CiSTUP, IISc should be conducted
26. Innovations should be encouraged at all levels
27. Middle level managers from governments and concessionaries and consultants should be trained
28. Need for maintaining pavements in good quality – translates to sustainable pavements
29. Sustainable pavements should be considered for the viewpoint of meeting transportation demand; Masters programs and their syllabi in Karnataka and elsewhere should evolve out of traditional highway engineering content only and include transportation in a broader sense
30. Consideration should be made of questions such as why and when do we need roads, clear vision regarding overall transportation systems, mode sharing at different levels - national and local
31. For development we should consider to what extent we should develop? Should we stay at a specific level? Need clarity in specifying the need for road development
32. Need to consider the increase in capacity that we get per unit of investment in road construction – per unit of width or space, how much extra capacity do we generate and for how long?
33. Considerations should be made regarding road construction – how much externalities do we generate? Noise and air pollution?
34. Clarity is needed regarding capacity building – road, rail, metro? Compare investment and space utilized
35. Include the question of capacity building in the realm of sustainable road construction
36. Recognize pavement as a structure
37. Consider structural aspects of transportation engineering
38. Post graduate students should learn more about cement concrete
39. Need schools and colleges for technicians and workmen – skill building schools are practically nonexistent, as they are for masons for building construction
40. There is a severe shortage of skilled technicians and laborers
41. More research is needed in transportation engineering
42. More deliberations are needed regarding sustainable road construction
43. More conferences such as those arranged by the TRG of India should be conducted
44. Better syllabi and training are required for all post graduate students of transportation engineering in Bangalore and other areas
45. More active participation of transportation group is required in the IRC – it is very important to comment on IRC codes and stipulations
46. Learning from site should be encouraged, to improve professionalism
47. CiSTUP, IISc can provide guidance regarding the development of sustainable road construction practices and use of innovative materials and technologies
48. More laboratory-field studies are needed to move away from ineffective empirical practices to mechanistic-empirical methods

49. Equations and relationships based on locally calibrated data and locally tested and confirmed data should be developed; examples are the use of CBR and also resilient modulus of HMA materials which involve elaborate test methods – data may be questionable
50. CiSTUP has a responsibility in conducting detailed local laboratory-field studies to develop effective, advanced and pertinent data and design methods
51. There is a need to define sustainability with respect to specific context – for example, for the defense, a strong factor related to sustainability is the effectiveness of the road to carry defense traffic and serve the defense requirements adequately throughout its design life
52. Need to proof-test new technology through experiments such as controlled conditions test tracks before they are tried in practice specifically by the defense departments
53. Development and proof testing of new and sustainable technologies can be conducted by government agencies through research contracts to IITs and NITs.
54. Need database of different properties of new materials
55. Need new test methods for both laboratory and field testing
56. Inclusion of alternative materials and life cycle cost analysis in curriculum are needed
57. Details of life cycle cost analysis should be made available for practicing engineers

Major Recommendations

1. CiSTUP can play a major role in developing and disseminating information on, new and sustainable road construction technologies.
 - a. CiSTUP can conduct pertinent research on the development of sustainable road materials, design and construction technologies.
 - b. A comprehensive workshop on sustainable road design and construction technologies could be arranged on an annual basis
2. Advanced and Sustainable road construction concepts and technologies should be included in the curriculum
 - a. Include concepts and technologies in the syllabi of post graduate students
 - b. Utilize “learning from site experience”
 - c. Encourage learning of sustainability in a broader sense - include capacity building
 - d. Setup appropriate training workshops for engineers and top level managers
 - e. Set up training programs for technicians and laborers to develop a skilled workforce to improve the overall quality of work
3. Implement Life Cycle Cost Analysis
 - a. Set up training workshops for practicing engineers
 - b. Include LCC analysis in student curriculum – post graduate and bachelors (in their project work)
4. The government should encourage the development and adoption of advanced materials and techniques for sustainable road construction
 - a. Award grants to, and help IITs and NITs to conduct relevant laboratory and field research
 - b. Enforce the use of green rating system for roads
 - c. Update schedule of rates and tendering systems to encourage and implement sustainable road construction