

CSIR - CENTRAL ROAD RESEARCH INSTITUTE, NEW DELHI
DRAFT MINUTES OF 123rd MEETING OF CSIR-CRRI RESEARCH COUNCIL

Date 14th & 15th May, 2019
Time 10. 30 hours
Venue CRRRI Council Hall

The following attended the meeting:

Chairman

Prof. Tarun Kant, Professor Emeritus, IIT Bombay

Members

Lt. Gen. Suresh Sharma, AVSM, Former Engineer-in-Chief, MoD, (Army)
Shree A.K. Gupta, Former Member, UP-PSC
Dr. I.K. Pateriya, Director (Projects- II), NRIDA
Dr. R.K. Bhandari, Former Director, CSIR-CBRI
Shree R. K. Pandey, Member, NHAI (on 14th only)
Dr. N. Gopalakrishnan, Director, CSIR-CBRI (on 15th only)
Prof. Santosh Kapuria, Director, CSIR-SERC
Prof. Satish Chandra, Director, CSIR-CRRI

Secretary

Shree K. Sitaramanjaneyulu, Chief Scientist, CSIR-CRRI

Regret

Prof. Ranganathan Sundaravadevelu, Professor, IIT Madras

Invitees (CSIR-CRRI)

All scientists attended the forenoon session of the first day of the Research Council meeting and the following scientists attended remaining proceedings also.

Name	Designation
Dr. Kishor Kumar	Chief Scientist
Dr. P. Lakshmy	Chief Scientist
Dr. B.K. Durai	Chief Scientist
Shree U K Guru Vittal	Chief Scientist
Dr. R.K. Garg	Chief Scientist
Shree P.V. Pradeep Kumar	Senior Principal Scientist
Dr. Vasanth G Havanigi	Senior Principal Scientist
Dr. V.V. L. Kanta Rao	Senior Principal Scientist
Dr. Rajiv Goel	Senior Principal Scientist
Shree G. K. Sahu	Senior Principal Scientist
Shree S.S. Gaharwar	Senior Principal Scientist
Shree Sunil Jain	Senior Principal Scientist
Dr. Devesh Tiwari	Senior Principal Scientist
Dr. Rakesh Kumar	Senior Principal Scientist

Dr. Pradeep Kumar	Principal Scientist
Dr. Ravindra Kumar	Principal Scientist
Shree Subhash Chand	Principal Scientist
Dr. Ch. Ravi Sekhar	Principal Scientist
Shree Manoj Kumar Shukla	Principal Scientist
Dr. Pankaj Gupta	Principal Scientist
Shree Binod Kumar	Principal Scientist
Dr. Neelam J. Gupta	Principal Scientist
Dr. P.S. Prasad	Principal Scientist
Shree Pankaj Goel	Principal Scientist
Shree A. K. Jain	Principal Scientist
Mrs. Parvathi G. S.	Scientist
Dr. G. Bharath	Scientist
Shree Sampath Kumar P	Scientist
Shree Durgaprasad Gola	Scientist

Item Number 1 – Welcome Address by the Director CSIR-CRRI

Prof. Satish Chandra, Director CSIR-CRRI welcomed the Chairman, Members of RC and the scientists to the 123rd Research Council Meeting. Director mentioned that the last RC meeting was held six months ago in the month of November 2018. He requested the chairman to start the proceedings.

Item Number 2 – Opening Remarks by the Chairman

Prof. Tarun Kant, Chairman RC, welcomed all RC members and the scientists to the 123rd RC meeting. He appreciated the idea of arranging the forenoon meeting with all scientists so that scientists will also know about the progress of the institute, and mentioned that the aim of the RC is to see that institute grows in stature with time. He said that this will happen with support from everyone and a good synergy is required to reach this goal.

He mentioned that CRRI is one of the oldest civil engineering labs of CSIR along with SERC, CBRI and NEERI and desired that its supremacy be maintained and it should compete with science labs as well. He also emphasized on importance of the Civil Engineering in the nation building.

Item Number 3 – Confirmation of the Minutes of the 122nd RC Meeting

Shree K. Sitaramanjaneyulu, Secretary RC, informed that the minutes of 122nd RC Meeting held during 27-28 November 2018 were circulated to all RC members. He proposed that the minutes may please be considered as confirmed. Council agreed for the same and approved the minutes.

Item Number 4 – Action Taken Report

Shree K. Sitaramanjaneyulu, Secretary RC, presented the 'Action Taken Report (ATR)' of general comments and on completed projects with regard to the suggestions/observations made by the Council in its 122nd Meeting. He mentioned that all continuing projects would be presented in every RC meeting till completion as per suggestion of the members in the last meeting and action taken for the suggestions given for those projects would also be presented by respective presenters.

Item Number 5 – Director's Report

Prof. Satish Chandra, Director CSIR-CRRI presented the details of various activities held in the institute since last RC meeting. It included meeting with Sh. Nitin Gadkari, honorable minister of MoRTH, Chief Engineer of UP PWD, Airport Authority of India, DG(RD) of MoRTH, Bihar Road Research Institute, etc. He also presented the details of agreements signed/technology transferred, major projects taken up, awards received by CRRI and Scientists of CRRI at various platforms, training programs organized, lectures delivered by CRRI Scientists, deputations of scientists, visit of foreign delegates, projects handled, details of publications, patents filed, external cash flow, etc.

He also informed about other developments in CRRI such as opening of geology gallery, renovation of offices, campus and residential buildings, appointment of consultant for revision of master plan of the institute and residential campus. Rajbhasha activities, meditation classes organized in the institute, dental and eye checkup camps were also highlighted in the presentation. The Council expressed its satisfaction on the work done by CRRI since the last RC Meeting.

Item Number 6 – Remarks by Research Council (RC) Members on Directors Report

Prof. Tarun Kant, Chairman RC thanked director for presenting a comprehensive report. He mentioned that it is very creditable that about three fourth of the budget is self-earning and congratulated the entire team of CRRI and Director for this achievement. He desired to standardize the nomenclature of different types of projects. He said that final report of any project must be uploaded on intranet so that it will be accessible to everyone. He further emphasized the importance of In-house projects – such works bring good name to the institute. He desired that major outcomes from in-house projects should result in good journal papers and patents. He emphasized that labs like CRRI should not aim to submit their research output/results to predatory journals – which brings not only bad name to the laboratory but also brings the image of the country down. Such online and mostly paid publications have no citations and also have no archival value. He also mentioned that all the technical papers/reports must follow same standard format while reporting in any document. He suggested that minutes of meetings of Research Council can be uploaded on the CSIR-CRRI website and details of previous RCs should also be uploaded on the website. He further reiterated that *science content* of all projects must be improved and also a thorough *literature review* must be done before starting any project. He advised especially young scientists to develop a research culture of working flexibly beyond the office hours in the laboratory.

Dr. I. K. Pateriya congratulated the Director CRRI for bringing up ECF to a substantially high level. At present, consultancy receipts are more than R&D receipts and efforts should be made to improve R&D receipts as well. He mentioned about recent NRIDA initiatives with support of ADB of setting up five Rural Connectivity Training and Research Centers for carrying out training and research pertaining to rural roads, indicating that NRIDA would certainly like to seek help of CRRI in this regard. Another area he wanted to have discussion on and seek help from CRRI was road safety audit, as Supreme Court committee approached NRIDA for improving road safety on rural roads. He also reiterated and supported the chairman's idea of uploading the final project report of any project on CSIR-CRRI Website as it is a very good practice and same was also being followed in NRIDA. Implementation of such a practice of uploading the details of completed projects on the website would also improve not only the visibility but also the credibility of CSIR-CRRI.

Shree R.K. Pandey also congratulated the Director CRRI and the team of scientists for excellent work done in last six months, and said that there will always be a scope for improvement as the societal needs are changing every day. He mentioned that road construction is becoming very complex now-a-days because of several aspects such as environmental issues, land acquisition and meeting the criteria of long lasting, durable and cost-effective pavements. There are so many innovations and new materials/technologies in the market, but NHA could not use those technologies just because of lack of confidence, he said. He suggested that CSIR-CRRI must take a pilot project for these types of materials/technologies rather than restricting to laboratory studies so that it will give confidence to the implementation agencies. He advised that CSIR-CRRI should initiate large scale collaborative projects like Road User Cost Studies, Indo-HCM, etc.

Dr. R.K Bhandari said that he was pleased to see the progress in a number of areas. He concurred with the Chairman and re-emphasized to eradicate the culture of predatory journals. He said that CRRI should spend the ECF amount very wisely. He said there are two perspectives to see if one is successful - one way is to compare from the own previous records and see how much improvement is attained and second is to look at the present position and decide the future milestone. In the latter case, there would be more motivation and everyone can enjoy the research. He mentioned that CSIR-CRRI is a R&D driven institute and it should recommend the right and suitable technology in relation to the problem that one will understand. Projects like pothole repair machine and permeable pavements should be given extra thrust to complete these projects in time as these ideas are pursued everywhere. Technologies like UAV's, Artificial intelligence, etc. have huge potential in terms of work efficiency and quality output and suggested to make use of these technologies. He also expressed his happiness on renovation of geotechnical lab and suggested that the division should take advantage of improved infrastructure and increase the output.

Prof. Santosh Kapuria congratulated the Director for phenomenal progress made by the organization in last six months. He said that external cash flow is the money which people are paying for the services. The increase in ECF represents the recognition and enhancement in quality of service. He appreciated the CSIR-CRRI for taking up prestigious projects like a project on Airport Pavement Management System, a project by UP PWD and a project on creation of expansion joint testing facilities, etc. He mentioned that the role of the RC is to ensure that research agenda of the laboratory is clear and the same was improving. He expressed his satisfaction on the action taken report and also on action by the Director on his idea of having brainstorming session at institute level and coming up with five new project proposals to be presented in RC. He suggested that to utilize the time of RC in an effective manner, in-house research projects, sponsored research projects and major sponsored consultancy projects should only be discussed. He suggested that secretary RC should have a screening of annual report before reporting to the RC. He hoped that civil engineering will not remain empirical in approach but should bring in science. He suggested all the scientists to keep updating their knowledge regularly.

Shree A. K. Gupta also congratulated the director for upgrading the institute in terms of R&D projects. He emphasized that visibility and promotion of all the work done in CSIR-CRRI should be increased so that it reaches the policy makers. He suggested to compare the progress made in each quarter with that of previous quarter. He advised to take up a project on human behavior aspect related to road safety, particularly the reasons and circumstances due to which such behavior occurs. One has to work to eliminate/ minimise such reasons. He also suggested to make use of the available HDM4 software to maintain the pavements in scientific manner for all states of the country. He further suggested for the installation of solar panels on roof-tops of renovated buildings and inclusion of rain water harvesting mechanism in the campus.

Item Number 7 – Presentation of In-House Research Projects

S. No.	Project Details	Suggestions of the RC members
7.1	<p>Development of Guidelines for Using Construction & Demolition Waste (CDW) in Structural Applications</p> <p>February 2016 to August 2019</p> <p>Presented by Shree S.S. Gaharwar</p>	<ol style="list-style-type: none"> 1. Characterization of basic material is required to be done. 2. Explore the possibility of making use of debris resulting due to tunnel excavation 3. Long term performance is required to frame the guidelines. 4. The quantum of waste available in different areas needs to be mapped. 5. As the amount of CDW available is very less than the utilization, the guidelines may be limited to M30 and M25 grades of concrete considering the cost of processing and transportation.

		<ol style="list-style-type: none"> 6. Outcome of the project so far is not satisfactory. PL is advised to complete it in time by achieving all the objectives. 7. Dr R.K. Bhandari pointed out that a composite view ought to be taken of Technologies and Guidelines for using Construction and Demolition wastes. All major highway projects in hilly areas generate large volumes of debris- be that because of road cuttings, slope failures, and landslides. This project which had started in 2016 is already close to its completion date and since it has not yielded the desired outcome, it would be appropriate to revisit /redesign it with a stronger/experience team. 8. In view of the above, RC. advised the Director to review and make changes in the team, if necessary to complete the project in time.
7.2	<p>Water harvesting using Porous Flexible Pavements September 2016 to August 2019</p> <p>Presented by Shree Sampath Kumar</p>	<ol style="list-style-type: none"> 1. The behavior of pavement when loaded under saturated condition should be studied. 2. Reproducibility of test results should be ensured. 3. Infiltration rate showing in the prototype is not matching with videos circulating in social media. Permeability criteria required for such pavements should be fulfilled.
7.3	<p>A Comprehensive Performance Study on Hybrid Fibre Reinforced Concrete for Concrete Pavement November 2014 to August 2019</p> <p>Presented by Shree Pankaj Goel</p>	<ol style="list-style-type: none"> 1. A chapter covering state-of-art literature should be included in the report. 2. Work on developing a model to predict the behavior of the material without actually going for the testing.
7.4	<p>Ground Improvement of Sub-Soil Below Existing Structures Using Fibre Reinforced Grouting October 2016 to October 2019</p> <p>Presented by Mrs. G. Parvathi</p>	<ol style="list-style-type: none"> 1. The effect of corrosion of steel fibres in the grout columns may be assessed. 2. Pre-analysis of the performance of inclined grout columns using numerical tool might help in physical modeling studies. 3. Stress path dependent shear strength characteristics would give performance behavior of the soil closer to the field condition. 4. Applicability and the limitations of the developed technology should be mentioned in the final report. 5. Dr Bhandari, referred to his exclusive discussion with the concerned scientist soon after the last RC meeting, during which it was pointed out that, in future, the need for such a laboratory oriented project wedded to a specific technology should be fully justified

		<p>based on sound scientific reasoning backed by a state-of-the-art report. Solutions arising from such studies hardly bear any relationship with real life problem for which many other technological options are available. Since, the project which had started in 2016 is already near the date of completion, best advantage should now be taken of the studies already completed with particular reference to assumptions made to cover uncertainties due to the enormous variability of the subsoil profiles, inadequate geotechnical characterization, neglect of ground disturbance and in situ stresses. The project completion report should bring out applicability and limitations of the developed technology.</p>
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8. Presentation on Sponsored Research Projects.

S. No.	Project Details	Suggestions of the RC members
8.1	<p>To Study the Corrosion of Various Reinforcement Bar Materials / Structural Steel Including Anti-Corrosion Coatings, Concrete Treated with Surface Coating Under Different Environment Exposure Conditions Sponsored by MoRTH, GoI, New Delhi (September 2018 to September 2021) Presented by Dr. V.V. L. Kanta Rao</p>	<p>Consider only good/standard established sources rather than going to local suppliers and the parameter like damage during transportation should also be considered for the testing.. RC members pointed out that a lot of information is available in public domain on intense and vigorous corrosion of damaged polymer coated reinforcing bars leading to sudden breakage of reinforcing bars..</p>
8.2	<p>Study of Switching Off Behavior & Awareness Campaign at 100 Intersections of Delhi Sponsored by PCRA, New Delhi. (June 2018 to March 2019) Presented by Dr. Mukti Advani</p>	<p>RC suggested to reach out to local and national media to promote the findings of the study. Council appreciated the work.</p>
8.3	<p>Development of Guidelines and Specification for Utilization of Steel Slag in Road Construction Sponsored by Ministry of Steel, Government of India, New Delhi (November 2018 to October 2021) Presented by Shree Satish Pandey</p>	<ol style="list-style-type: none"> 1. Environmental issues like leaching must be addressed in the project and if required experts from this area be consulted. 2. As it is a large scale project, take advantage of data to create additional know how. 3. Since this project deals with utilization of different varieties of steel slag, try to address all necessary issues for developing guidelines by taking care of all limitations in technology.

8.4	<p>Safe Road Connectivity for Tripura State of North East Region of India Sponsored by NMHS, G.B. Pant National Institute of Himalayan Environment and Sustainable Development, Uttarakhand. (April 2017 to March 2020) Presented by Dr. Mukti Advani</p>	<p>Data Collected for this project was appreciated by the RC. It was suggested to collect more data on landslide, if possible. In case of non-availability of landslide data, the final report should indicate the limitations regarding the same.</p> <p>While appreciating the importance of the project, R.K. Bhandari suggested that, opportunity permitting, the scope of the project should be enlarged to invoke the consideration of highway safety in a holistic sense. Currently the project aims at safe road connectivity for the state of Tripura, excluding the consideration of highway safety against hazards such as slope failures, landslides, earthquakes and floods, without which total safety cannot be ensured. Since it may not be possible to alter the scope of the project at this stage, the final project report should draw attention to this limitation and recommend a phase 2 study aiming at total highway safety.</p>
8.5	<p>Sustainable Road Pavements in High Altitude Regions Using Geosynthetics Sponsored by NMHS, G.B. Pant National Institute of Himalayan Environment and Sustainable Development, Uttarakhand. (May 2017 to May 2021) Presented by Dr. G. Bharat</p>	<ol style="list-style-type: none"> 1. As Manali-Sarchu site is a very critical reach having multiple problems in maintaining the road, the team should visit the site post monsoon and post snowfall, and the road should be designed accordingly. 2. Though the objective is limited, there could be several other problems in this section. The characterization becomes very difficult when tunnel debris is used as it contains more fines and hence strength characterization is very important. The complexities are plenty and the team should consider all varieties of complexities while implementing the project. 3. Design of sustainable road pavements in high altitude regions are usually fashioned to suit the nature and magnitude of the problems encountered at that different sites and technologies chosen for the purpose are usually picked out of a basket full of possibilities. Since the project is centered around use of Geosynthetics alone, the uniqueness of the choice should be backed by sound technical justification.
8.6	<p>Study on Decay in Modulus of Stabilized Layers in Flexible Pavements Sponsored by UPPWD, Lucknow (February 2019 to January 2022) Presented by Shree Sunil Jain</p>	<p>RC appreciated the project and hoped that the outcome of the project will be useful for implementation of cement stabilized bases.</p>

8.7	<p>Creation of Complete Range of Independent Testing Facilities for Expansion Joints Sponsored by MoRTH, Government of India, New Delhi. {February 2010 to December 2020} Presented by Dr. P. Lakshmy</p>	<p>Council appreciated and enquired regarding the delay of the project. Project leader answered all the queries. Council expressed its satisfaction and mentioned all efforts should be taken to complete the project in time.</p>
8.8	<p>Development of Methodology for Traffic Circulation Plans around Metro Stations and their Impact Quantification Using Microscopic Simulation Sponsored by PCRA, New Delhi (March 2019 to July 2020) Presented by Dr. Neeraj Sharma and Dr. E. Madhu</p>	<p>RC appreciated the concept of the project and expected the outcome will be useful for traffic circulation plans around metro stations.</p>

9. Presentation of Sponsored Consultancy Projects.

Sl. No.	Project details	Remarks of RC Members
9.1	<p>An Overview of Road Safety Audit implementation on Sambalpur-Rourkela (SH-10) from Design Stage to O & M Stage RSA Sponsored by Government of Odisha, Bhubaneswar (June 2015 to June 2019) Dr. K. Ravinder</p>	<p>1. CRRRI should gather the accident data for next one or two years to see the impact of safety measures implemented. 2. A table bringing out the observations indicating location, suggestions, recommendations along with the cost of recommendations and benefit of implementation may be prepared. The compliances made by implementing team may also be indicated in O & M cases. This will help the profession to understand the benefit of implementation of safety measures Presenter noted all the valuable suggestions and assured that same will be followed.</p>
9.2	<p>Development of Airfield Pavement Management System Sponsored by Airport Authority of India, New Delhi (April 2019 to September 2022) Dr. Pradeep Kumar.</p>	<p>RC congratulated the team for taking up such a prestigious and challenging project and suggested that more focus should be given on critical places such as aircraft wheel path, touch down points etc.</p>

10. Presentation on New Proposals (As per Suggestion of Last RC)

As per the discussion held in the last RC Meeting, the five proposals as given in the following Table were presented and discussed.

Sl. No.	Project Proposal	Remarks and Decision of the RC
1	Design of Prefabricated Plastic Slab Panels for Road Construction Presented by Shree Gagandeep Singh	RC appreciated the idea and expressed that more state-of-art on the subject matter is required in the concept. Types of plastic which can be used, method of collection, separation, shredding and mixing may also be included in the project. Therefore, RC desired that improved version of proposal may be presented in the next RC with up to date review of literature.
2.	Development of Automated Road Inventory and Pavement Condition Monitoring System Presented by Dr. Pradeep Kumar	RC appreciated the concept and approved the project for further processing either through CSIR or In-House funding.
3.	Comprehensive Risk Management of Probable Rock fall and Mitigation Measures at Strategic Locations Presented by Dr. Pankaj Gupta	RC did not find it appropriate for taking it further. When talking of comprehensive risk management in hazardous hilly areas, it will be necessary to design for risk management in the multi-hazard eco-system of which rockfall management would only be a small part. There are, however, situations in the field which threaten road safety predominantly due to rockfalls. In that case, there will be four aspects to it: (1) understanding the sources of rockfall through large scale mapping and field investigations and (2) analysis of the plausible mechanisms of rockfall and elements at risk (3) choice of appropriate technology to effectively fix the problem and (4) criteria and instrumentation for early warning. The project may be recast taking the above suggestions into consideration. RC desired that a new proposal based on the above note sent by Dr. R.K. Bhandari, honorable RC member should be prepared and presented in the next RC Meeting.
4.	Trip Generation Manual for Indian Roads Presented by Dr. Ch. Ravisekhar	RC appreciated the concept and approved the project as it will be useful for policy makers and transport planners.
5.	Design of Light Weight Pedestrian FOB through composite technique By Shree G. K. Sahu	RC appreciated the project and found that presentation lacked state-of-art and the concept. RC suggested the presenter to coordinate with SERC, Chennai and DRDO to make a revised proposal and the same shall be presented in the next RC meeting.

11. Recruitment of Group IV Scientists & RC Meeting with Director

Director CRRI informed that RC approved 11 posts of Group IV Scientists at entry level in 121st RC meeting held in the month of April 2018 and the recruitment process is in progress. In order to process the recruitment of another 11 posts (10 % of sanctioned posts) as per the instructions given by RAB, CSIR, a note was placed before the RC by the Section Officer (Personnel) for its consideration. The following decisions were taken.

- The RC, CRRI took note of the instructions given by the RAB, CSIR regarding the new appointments to be made and decided to restrict the recruitment of Scientists to 10% of the sanctioned strength in this recruitment cycle also which worked out to 11 posts.
- The RC discussed the recruitment proposal and approved that 11 positions be filled up at Group IV(2), i.e., all positions may be filled up at Entry level in the areas of Bridge Engineering & Structures and Traffic & Transportation Engineering with 05 (five) positions in each area and Environmental Engineering with 01 (one) position.

12. RC Meet with the Scientists of CSIR-CRRI

Director, CSIR-CRRI welcomed and thanked Prof. Tarun Kant, Chairman and other Members of RC for sparing their time and giving suggestions for improving the R&D in the institute. Prof. Tarun Kant in his address expressed happiness on improvement in R&D activities and mentioned that still there is a room for improvement. He exhorted younger scientists to work hard as they are the builders of future of the lab. He expressed the the young scientists who are fresh from university system must be having many ideas in their mind and they should try to pursue those ideas in CSIR-CRRI. He mentioned that many technological developments have taken place without going through the science route and cited the example of development of composites during World War 2 for weapons before science on the subject matter was developed. The attention should however, be paid to both, science and technology. He observed that five new presentations made before the RC were technology oriented. He suggested that young scientists should try to follow the usual path - science first and then technology.

Chairman emphasized that CRRI should try to become number one institute among the CSIR laboratories. He also suggested to create a group in the institute which may works full time on analytical and computational aspects in pavement design. He advised CSIR-CRRI to develop its own software for pavement design initially with linear response analysis and later with visco-elastic and plastic materials.

Dr. I. K. Pateriya suggested that any new proposal planned at institute level may be shared with RC members to seek and incorporate their suggestion at initial stage itself. He hoped that proposed projects on “Development of Automated Road Inventory and Pavement Condition Monitoring System” and “Design of Light Weight Pedestrian FOB through Composite Techniques” would be extremely useful for rural roads and hoped that both of these may get funding from the Ministry of Rural Development, Govt. of India, New Delhi. He requested CRRI to help NRIDA in its endeavor to setup the 5 Rural Connectivity Training and Research Centers across the country and also Rural Roads Network Management Units being setup in the states of Assam, Chattisgarh, Madhya Pradesh, Odisha and West Bengals by training of their staff in the field of initiating research work , data collection and road maintenance.

Shree A. K. Gupta shared his past experiences regarding the implementation of ROMDAS and Management systems in the state of Uttar Pradesh. He suggested to CSIR-CRRI to promote HDM 4 for managing the pavements at national and international level in a scientific manner. He suggested that scientists should take-up the research projects which are directed to solve one or more problems of society.

Dr Bhandari complimented the Director and scientists for the impressive cash-in-flow. Whereas it is certainly a matter to be happy about, it also poses a big challenge before the laboratory to ensure efficient management of the projects so that the funding gets effectively utilized, for the purpose it is intended in the specified time frame.

He advised the scientists to spend more time in identification of problems for research based on the felt needs in the highway engineering practice, thematic state of the art report, consultations with the peer group and anticipated impact of the outcome of the deliverables. While formulating the project, he advised the scientists to ask -Why is the project necessary and what will happen if it is not taken up? Who are going to be benefitted by it? What are the deliverables envisioned and what difference it is going to make?

To give a fillip to discussion leading to identification of high priority projects in Geotechnical Engineering, he advised the scientists of the Geotechnical Engineering division to (a) get challenged by hitherto unsolved problems of priority in the field of highway engineering (b) develop first a long, and then, by discussion, a short list of high priority R & D projects identified to address real life problems (c) pick the projects out of the short list to match the institutional priorities.

Prof. Santosh Kapuria mentioned that proposed project of making indigenous road survey system will be a good contribution to the country and hoped that it will be developed at par with foreign available systems. He reiterated that India should have its own pavement design software. He further said that development of trip generation manual is a good project and will be useful to the country. He said that procuring equipment in CSIR is much easier than in any of the IITs and therefore, research output should at least be comparable to that in IIT

Lt. Gen. Suresh Sharma defined the roles of a scientist and an engineer. A scientist investigates the problem in order to prevent it while an engineer fixes the problem after it has occurred. He coined the word "Science of Things" on the lines of "Internet of Things" and highlighted the need of collaborations and multi-disciplinary approach to solve a problem being faced by field engineers. He emphasized on the need of a scientific approach to collect the data, store the data and use of the data as the future lies in capturing & processing of big data.

Dr. N. Gopalakrishnan suggested to identify the problems which were not solved by anyone till now, and create a difference. It is not always possible to succeed every time at the end of the project, but the experience from that project can be used to improve the proposal for the next project. He advised young group to work on tools such as Artificial Neural Networks and Machine Learning as these offer niche areas for them.

Director CRRRI concluded the meeting by thanking all the members for their suggestions and ensured that all the suggestions will be noted and implemented in future.

13. Discussion on CSIR-CRRRI Annual Report

Research council appreciated the efforts made by ILT in preparation of CSIR-CRRRI annual report (2018-19). After detailed discussions, it was suggested to have a proper font size and typeset for the report as a whole and a standard format for the documentation of research papers. It was suggested to remove all publications which are not in standard refereed journals. Further, there should be uniformity while reporting the information for different projects.

14. Visit to R&D Divisions and Laboratory Facilities

RC members visited the laboratory facilities available in Geotechnical Engineering and Traffic & Transportation Engineering.. RC members found the facilities as state of art facilities and hoped that by using these facilities, the institute could do a lot of R&D projects of national importance.