Preface

Beginning of year 2017 saw the successful completion of five year plan programmes. In particular, the 12th Five Year Plan programme, ARiEES project ended on a high note by securing high grade. A high level committee recommended that two of the work packages should be taken forward. End of the plan period also marked dawn of a new beginning particularly for CSIR-4PI. At CSIR level, organizational changes were made by moving towards theme-based CSIR from the earlier cluster-of-labs concept. Eight themes were defined with a theme director operating out of theme-directorate to address domain specific grand challenge problems. This has great relevance to the future of CSIR-4PI as the Institute aspires to play a central role in the new CSIR. It is clear that a larger engagement of the existing strength of CSIR-4PI aligns with the Earth, Environment, Ecology, Ocean & Water (E3OW) theme. However, the future of CSIR-4PI depends heavily on building up data sciences group and in that context we find that CSIR-4PI can provide expertise across all themes. For instance, data science can play a major role as a design decision support system for CSIR-NAL's present and future aircraft projects. Data driven Agricultural technologies can provide high impact solutions by bringing together plant science, drone technologies, IoT, etc. In this context, discussions were initiated to develop a roadmap and a high level committee would be looking into how CSIR-4PI can position itself in the theme-based CSIR and also define its own major programmes as it begins to take shape as a data driven Institute.

CSIR also changed the manner in which laboratories would be funded. Fast track translational projects (FTT), niche creating projects (NCP), Focused Basic Research (FBR) and mission oriented projects replace the earlier models of lab funded projects. Mission Projects are particularly important as they require targeted delivery to industry driven problems. CSIR-CEERI Pilani, in partnership with CSIR-4PI, led formation of a Mission Project on Intelligent Systems with major emphasis on Artificial Intelligence (AI). As part of this project, CSIR-4PI will provide a cloud based data platform. This is significant since it is the first concrete step CSIR-4PI will take towards realizing its mandate of establishing itself as data driven institute.

Peak ground motion database for Northwest Himalaya for better design of buildings was provided and an assessment was carried out for the seismic hazard and risk of 13 Urban agglomerations of India with high population density. Neo-Deterministic seismic hazard scenarios for India were given for disaster mitigation. Indian reference frame was defined using two decades of continuous GPS data. An estimate of 15 m slip accumulation since 1100-1250 A.D. in Darjiling Sikkim Himalaya was also provided pointing towards a real great earthquake threat in this region.

Climate change is an important area of research where CSIR-4PI continues to make significant contributions. Four WMO compliant Green House Gas (GHG) stations are maintained with one of them serving as a reference station that was used recently by NARL. Simulation of Methane and Carbon dioxide over South and East Asia, simulation of sub-surface oxygen distribution in Indian Ocean are some of the focus areas of research. These efforts should aid preparedness for meeting our COP 21 commitments. CSIR also recognized this as one of the important initiatives.

Understanding monsoon and its modeling continues to be a thrust area. In this context, MoES and MoEFCC projects under the National Carbonaceous Aerosol Programme and the National Monsoon Mission, Phase 2 were taken up. CSIR-4PI also carries out experimental ensemble prediction of Indian summer monsoon every year and communicates the same to IMD, this year

being no exception. Extreme weather events and their impact on urban areas are gaining significance. Towards this, CSIR-4PI has started validating some of the models with an intent to provide early warning.

Two CSIR funded projects were taken up, one was granted under the CSIR Young Scientist Scheme and the other, as mentioned, was granted as part of the Intelligent Systems Mission. In addition, five projects are being supported by DST, three by MoEFCC and two by MoES at CSIR-4PI. Efforts are on for engaging with Meity and industry, particularly in the area of cyber security. We are also engaging in and responding to call under Monsoon Mission, Himalayan Mission, Deep Ocean Mission etc. The modeling and simulation groups of CSIR-4PI will be able to contribute significantly to these missions of the Government of India.

As many as 26 papers were published in journals of which one was published in Nature Scientific Report which figures in Top 100 list in Earth Sciences.

One of our own scientists received a Ph. D. while three others received their Ph. D. under the guidance of CSIR-4PI faculty. One of the scientists received Raman Research Fellowship.

CSIR-4PI signed MoUs with Amrita Vishwa Vidyapeetham, Cognizant Technology India Solutions Private Limited and Indian Institute of Technology Dharwad to carry out collaborative research.

Under the Intelligent Systems Mission, a pan-CSIR data cloud will be set up. This will form an integral part of cloud based infrastructure for doing data science across many domains. Not only do we envisage that our own programmes in Earth Sciences will benefit, but various themes in CSIR system will be in a position to derive great value. To do this, there is an urgent need to put in place data science group. Future efforts will focus in this direction.