

The

CII-IIT Bombay venture

Laboratory for Geoenvironmental Research and Innovation (LGeReIn)

The ever-growing industrialization and urban development have caused serious and complex problems in the geoenvironment. The challenges associated with the handling/management (including disposal or utilization) of by-products from industries such as ash from coal-fired plants, slag (LD slag, BF slag), bauxite residue, E-waste, discharge of black liquor from paper and pulp industries, wastes from rubber industry, and resins and municipal solid wastes (MSW) are expected to be the primary contributors to this situation. In view of the above, the brainstorming session (BSS) organized by Prof. D. N. Singh, Department of Civil Engineering, Indian Institute of Technology Bombay, on 22nd August, 2018, under the aegis of SERB, India and Department of Science and Technology has proposed to conceptualize a **Laboratory for Geoenvironmental Research and Innovation, LGeReIn**, for providing techno-economically feasible solutions to industries, easy access to state-of-the-art facilities and a platform for interaction of various stakeholders for the conservation of the environment and sustainable development. Please visit <http://www.civil.iitb.ac.in/~dns/BSSIBP.pdf> and <http://www.cdeep.iitb.ac.in/cep.php> to capture the background and details. Furthermore, in collaboration with CII, a brain storming session was conducted on March 28 at IIT Bombay to establish **LGeReIn** as the Centre of Excellence (virtual) at the **Environmental Geotechnology Laboratory** (www.civil.iitb.ac.in/~dns/ENVGEO/env.html) IIT Bombay.

The prime agenda of this session was to identify and fathom several issues related to the handling, management, transportation, utilization and disposal of various industrial by-products (IBP) and municipal solid wastes (MSW). This BSS was successfully accomplished by its various delegates (industrialists, policy makers and academicians). This session brought out opportunities for alliance, like appropriate ‘match-making’, among different industries and their collaboration with IIT Bombay and other agencies, to comprehend the issues in formulating policies and their amendments to encounter the afore-mentioned challenges faced by different industries. It has been realized during the discussion that the major impediments for the proper utilization of IBPs and MSW include:

- Creation of the **Industrial Byproducts Mission** by Govt. of India through respective ministries to mainly address:
- Huge logistic costs for the movement of IBPs and MSW from their source to utilization location.

- Lack of promotion and marketing for the suitable usage of IBPs and MSW.
- Unawareness of their potential as a resource.

Discussions

The major focus areas emerging out from the discussion are:

Industrial by-products: It has been realized that various IBPs should be utilized as 'man-made' resources in the various field, such as infrastructure developments and agricultural and horticulture, suitably, in order to reduce mining of natural resources. To achieve this, it was highlighted during the discussion that **a task force should be created in the CII** to look after the activities related to the IBPs. Further, the session elaborately discussed the utilization of bauxite residues, the redmud, which is the biggest issue prevalent presently with the aluminium refineries for its handling and storage due to high alkalinity. It is suggested that bauxite residue can be utilized by the cement industry by replacing laterite. This will facilitate the usage of bauxite residues, as well as, the conservation of the laterite. The major challenge identified in this context is, high cost associated with the transportation of bauxite residues from the refinery to cement plants and achieving a break even with respect to cost, since cement industries source laterite at cheaper rates. As a solution to this, it is **requested that CII should formulate policies** for the ease of transportation of bauxite residues (and other IBPs) for the conservation of natural resources like laterite. In addition, it is proposed to initiate a study, under the supervision of IITB, to investigate the possibilities to utilize IBPs and compost for agricultural purposes, soil amendment.

Municipal solid wastes: As far Municipal Solid Wastes (MSW) are considered, field scale examples showing the utilization of fresh/wet fractions (organic rich) for generating electricity for household activities by methane production are mentioned. In addition, it has been highlighted that this organic waste could be utilized to produce NPK enriched compost. On the other hand, construction and debris (C&D) and non-biodegradable fraction (NBDF) of MSW could be utilized for making recycled products such as tiles, bricks etc. The management of refused derived fuel (RDF) through co-processing is identified as one of the viable options for its management. The large quantum of non-recyclable combustible material, which is getting segregated from the MSW in towns and cities under the Swatch Bharat Abhiyan, are identified very apt for such applications. Currently, waste to energy plants are not of adequate capacity for engrossing of this RDF, which is causing an enormous problem for their disposal. However, a large number of cement plants are already equipped to utilize this raw RDF as an alternative fuel after processing to desired specifications that are acceptable to cement plants and which are documented in the "Guidelines

on cement kiln co-processing of RDF" published by MoUHA in Oct 2018. On the other hand, it was highlighted that the utilization of NBDF as RDF damages the incinerators/boilers due to its chloride content.

Recommendations and way forward

In order to tackle the aforementioned impediments and to create a supply chain for IBPs and MSW, the delegates proposed the following:

- Creation of an online portal containing essential information (viz., quality, characteristics of the byproducts, quantity) associated with different IBPs, along with their GPS location of creation and storage and generation of hazard map of India for adopting suitable transportation system/scheme
- Induction of schemes for IBPs and MSW similar to the 'Swatch Bharat Mission' and 'Carbon credit'.
- Communities and user-based cooperative societies of entrepreneurs, academicians and business professionals should be formed who would be directly benefited by the optimum utilization of the material, human intellectual resources and regenerated energy and materials (either by recycling, reuse or regeneration).
- **Establishment of a nationwide data bank of the electronic credit system** in terms of automatic credit-debit score points may be maintained with e-banking concept which would enable and empower these societies, entrepreneurs and researchers to increase their access for novel technologies, human intellectual resources at the national level on a mutual basis through credit score points. This approach would become self-propelled without any need for subsidies in the long run.

It was realized by the delegates who were present at the session that this is the high time a virtual research and excellence centre **LGeReIn**, based at Environmental Geotechnology Laboratory, IIT Bombay, should be created.

At the closing session Dr. Y. S. Rajan thanked Dr D N Singh and his team of young scholars as well as the participants for the focussed and action-oriented discussions. He said that he heard about **LGeReIn** and the novel concept of human-made resources a few months ago when Dr DNS presented these ideas in a seminar at Mumbai. Dr. YSR was happy to note several *beyond the horizon and just in horizon* opportunities for India. The specific proposals described by the participants at the concluding session showed a good reward for the hard work for a decade done by Dr DNS and the team at IITB. Actions on these proposals, while would give a very good

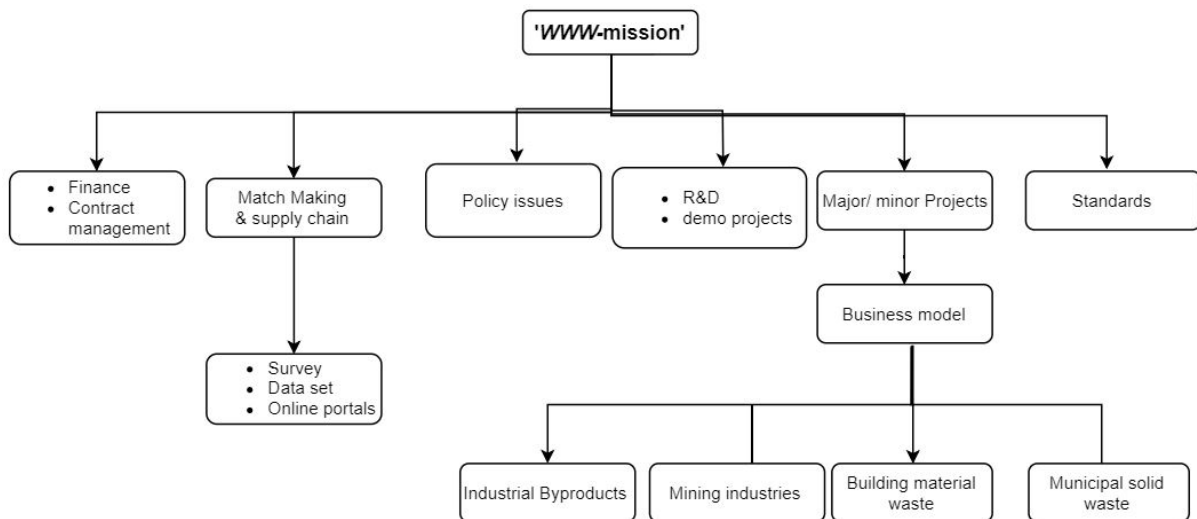
beginning for **LGeRIn**, Dr. YSR said that alone would tackle only less than 5% of the problems facing India and more so only pick up 5% of immense opportunities before India. We in India have always been slow followers thus coming in 6th, 5th etc. in the world even in our “best” sectors! Here is an opportunity where India can be a front runner and lead the world. It would lead to several-faceted benefits in business, employment, R&D challenges in different fields, in addition to great contributions to environmental health. While **LGeRIn** at IITB should continue its role as knowledge fountain, the totality of India’s opportunities say even 50% of it cannot be captured in that mode. It is necessary to have a parallel organisational structure to identify, facilitate, handhold, incubate, help scale up etc of all other activities in this Area of Action. Dr. YSR suggested that the issues of waste management (viz., solid as well as liquid wastes from different industries), mines, public places, community-habitats etc. in India, should be tackled as ‘**Waste to Wealth and Welfare Mission**’, designed as **WWW-mission**. While being a separate entity, it should be under the overall leadership of Dr DNS. There has to be a full-time Mission Director (CEO) reporting to a Board or Council. Based on the excellent discussions that took place it appears that to begin with the following elements have to become important verticals for action.

1. The ‘*match-making*’ between different parties (two or more than two parties) should be an important immediate activity. It is to be done with speed and due care. It is not mere paper shuffling or email forward. This should be initiated/ facilitated with the help of IITB or other agencies having the willingness, capability, contacts and networks in a partnership mode worked out by the Mission. Most of these services will be on suitable payments. Subsequently, these teams should expand the initiatives by making a sustainable strategy (viz., synergistic R&D, innovative product/technology development, etc), by working closely with other verticals of the Mission. In addition, building a platform containing information related to various industrial byproducts, survey results etc could be added services. This exercise would facilitate the creation of portals, which could be employed for the utilization of byproducts, minimization of transportation cost, etc. Due care should be taken to protect IPR’s of parties which include business confidential information/data.

2. Under this mission, all projects related to utilization of industrial byproducts, mining issues, building and construction waste, municipal solid waste, etc., should be initiated with proper ‘*business model*’. This should consider the ‘*supply chain*’ to transfer the deliverables (viz., products or technologies) to address the huge market that already exists not only in India but also in other countries. Even delivery of “intermediates” can be a viable business model in a number of cases.

3. Other verticals of the Mission are depicted in the figure below which YSR briefly described. Each of the boxes would require full-time attention from persons with experience/ interest. While core staff would be placed in these, actual work would need help by many professionals all over India and if need be from abroad. For the first five years in order to sustain these professionals and their support staff, a budget of about Rs 15 to 20 crores should be made available to the Mission. Also, with suitable govt policies, users/ philanthropists would also be contributing. There have been successful Missions on these lines earlier supported by GoI such as Sugar Technology Mission, Fly Ash Utilisation Mission, Advanced Composites Mission executed by TIFAC and Leather Technology Mission executed by CLRI/ CSIR. The boxes given below are essential and the details would need to be elaborated with some examples many of which came up during the BSS.

In a nutshell, the WWW-mission could be summarized as follows:



From: [Sangeeta Karki](#)
To: dns@civil.iitb.ac.in
Cc: [Rachna Jindal](#)
Subject: Article on CII- IITB MoU for LGRReIN, published in CII Communique- October 2019.
Date: 31 October 2019 12:20:09
Attachments: [image003.png](#)
[Article on CII-IITB MoU for LGRReIN.pdf](#)

Dear Sir,

Please find below the article on CII- IITB MoU for LGRReIN, published in CII Communique- October 2019.

Regards,
Sangeeta Karki



Waste Management

Geo-Environmental Research & Innovation

India's rapid development and growth is also bringing major geo-environmental challenges associated with waste generation and inadequate waste collection, transport, handling, treatment and disposal. Addressing the wide variety of issues pertaining to waste generated from various industries requires in-depth understanding of the problem, along with its socio-economic implications.

Realizing the need to address these challenges, the Department of Civil Engineering, IIT Bombay, launched the 'LGRReIn' – Laboratory for Geo-Environmental Research and Innovation.' initiative. To take the initiative forward, IIT Bombay signed a MoU with CII in September. The laboratory would act as a nodal center between industry and academia offering advocacy, studies and research and technology development, particularly for disposal/handling and utilization of industrial by-products and wastes. ■

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