"Reading Makes a full man, Conference a ready man and writing an exact man".

-- FRANCIS BACON

CHAPTER THREE

ENVIRONMENTAL ASPECTS OF REGIONAL ENGINEERING COLLEGES

ENGINEERING EDUCATION IN INDIA.
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ENVIRONMENTAL ASPECTS OF REGIONAL ENGINEERING COLLEGE.
CHAPTER THREE

ENVIRONMENTAL ASPECTS OF REGIONAL ENGINEERING COLLEGES

In order to interpret information needs and Information User Studies, it is necessary to consider the environment and the systems of the organisation within which users are working. To interpret the data obtained from this study fully some familiarity with all Regional Engineering Colleges and the Engineering Faculty is needed. The main intention is to look at the influence of the environmental systems on information seeking behaviour and communication information among faculty in the Regional Engineering College systems.

3.1 ENGINEERING EDUCATION IN INDIA:

Since the Vedic times, if not earlier technical training was imparted from father to son. It was also restricted in scope to certain castes. Each caste or community specialised generally in a particular craft.

In ancient time, there were considerable engineering works to their credit as we learn from recorded history. There was well planned cities with proper roads, sanitation and drainage facilities, which can seen even today, in whole or in part, which was exposed in Indus Valley excavation1.

Engineering education, unlike other types of professional education, has not had a long history. Though the ancients and medievals had built large bridges and stone houses, Castles, cities and huge temples, had constructed long high ways and aqueducts, and dug canals, which show considerable knowledge of
which are now called civil and hydraulic engineering and of properties of building materials, this knowledge must have been derived empirically. Beginning of Mechanical Engineering works are to be found in the manufacture and use of tools, means of transport, simple machinery like lathes, and weapons of offence and defence. Rudiments of Chemical Engineering are to be seen in the old metallurgical practices. But there were no organised schools for teaching apprentices the use of machinery or knowledge of processes: knowledge passed from generation to generation of craftsmen and artificers, by word of mouth, and the confined to castes and guides. This is the best example for Informal Communication of Information.

3.2 The INDUSTRIAL REVOLUTION:

With the advent of the Industrial Age, which was ushered in by the discovery of the steam engine by James Watt about 1780, and the ability to generate and to handle large amounts of power rendered possible by the invention of steam engine, men passed dependence of human neighbour and hand tools to large and complicated machinery: production of commodities passed from cottage workshops to factories. Transportation by bullock-carts, house-driven carriages, and wind or man driven boats, gave way to railroads and steamships. All this necessitated the construction of large machines, engines, ships and carriages, and gave rise to problems of industrial finance and labour.

The engineering skill has flourished in every age and the perfection has been attained by successive generations. During
the renaissance period the demand for engineering skills increased.

3.3 ENGINEERING AND TECHNOLOGICAL EDUCATION IN INDIA:

The impulse for creation of centres of technical training came from the British rule in India, and it arose out of the necessity for the training of overseers for construction and maintenance of public buildings, roads, canals, and ports, and for the training of artisans and craftsman for the use of instruments, and apparatus needed for the army, the navy, and the survey department. The superintending engineers were mostly recruited from Britain from the Cooper's Hill College, and this applied as well to foreman and artificers: but this could not be done in the case of lower grades—craftsman, artisans and sub-overseers who were recruited locally. As they were mostly illiterate, efficiency was low. The necessity to make them more efficient by giving them elementary lessons in reading, writing, arithmetic, geometry, and mechanics, led to the establishment of industrial schools attached to Factories and other Engineering Establishments.

Engineering Education in India started about 170 years ago in a few selected places. It is stated that such schools existed in Calcutta and Bombay as early as 1825, the first authentic accounts we have, is that of an industrial school established at Guindy, Madras in 1842, attached to the Gun Carriage Factory there.
Meanwhile in Europe and America, colleges of Engineering were growing up. Which drew to them men having good education, and special proficiency in mathematical subjects. This led to discussions in Government circles in India, and similar institutions were sought to be established in the Presidency Towns.

3.3.1 PURPOSE OF ENGINEERING EDUCATION

India has lagged behind, in the world economic scene, even though its natural resources are of the richest order in the world. Because of the lack of trained technicians and engineers, it could not keep pace with the developed countries.

In all industrially advanced countries technical education has received much attention, because of its immediate utility in increasing economic prosperity by the application of science and technology to industry, agriculture, transport and communication, public health and other welfare activities. In India, the low output of Engineers and technologist is only due to lack of technological institutions. India has got the lowest number of engineering graduates per million population, which is one of the reason why India has remained backward. Engineering education, therefore, has a significant role to play in the development of national productivity prosper and self sufficiency.

3.3.2 PROGRESS OF ENGINEERING EDUCATION IN INDIA

In India, from the time im-memorial, the spread of knowledge of technical and professional was in hereditary
fashion, the know-how being handed down from father to son and so on. Education has a rich tradition in India, dating back to the ages when many of the modern developed countries were still passing through the ignorance of dark ages and Indians have enjoyed the reputation of being a learned people since earliest time. In Nalanda and Takshashila Universities, where students from Far East countries and European countries used to study. Unfortunately this learning did not include technical education, so far as technical education is concerned, the progress has been at a snails pace till the attainment of independence.

There was hardly any need for technical education in India during early days, because these techniques were learnt from their parents. Technical education in the modern sense of the terms, is of comparatively recent origin in India.

3.3.3 PAST AND PRESENT SCENE OF ENGINEERING EDUCATION

The first industrial school was started at Guindy (Madras) in 1842. i.e. it was during the British rule. The first Engineering College namely, Thomson Engineering college was established at Roorkee in 1847 for training the Civil Engineers. The college was never affiliated to any university, but has been awarding diplomas which are considered to be equivalent to degrees.

In pursuance of the Government policy, three engineering colleges at Bombay, Bengal and Madras were opened during 1856 in the three Presidencies. In Bengal, a college called the Calcutta Colleges of Civil Engineering was opened at the Writers Buildings.
in November 1856, later the name was changed to Bengal Engineering College in 1857. All these three Colleges catered Civil Engineering courses.

The Victoria Diamond Jubilee Technical Institute started in Bombay in 1887, and conducted course in Electrical, Mechanical and Textile Engineering. In the early part of the 20th century a few more institutions started coming up.

In 1915 the Indian Institute of Science, Bangalore opened Electrical Engineering classes under. Dr. Alfred Hay, and began to give certificates and associateships, and later these were regarded as equivalent to a degree. In 1917, the first degree course in Metallurgy was started by the Banaras Hindu University. In 1919, the Maelgan Engineering College started functioning at Lahore. This was succeeded by Punjab College of Engineering and Technology at Chandigarh. Since then the development of technical education both in diversity and in number has been rapid and the pace was further accelerated after the independence in 1947.

Although the first technical institute in the country was established more than a centry ago, technical education remained static for a long time. There was no co-ordination between the various institutions in the country and an integrated approach of All-India basis did not exist.

The "All India Council for Technical Education" (AICTE) which was set up by Government of India in November 1945, but which remained in a nascent state before the advent of independence came to the country's rescue. This was the first
step to develop the technical education in the country for an integrated approach.

3.4 REQUIREMENTS OF ENGINEERING AND TECHNICAL PERSONNEL:

Scientific Man-Power Committee's Estimate:

The Scientific Man-Power Committee appointed by the Government of India in March, 1947, assessed the requirements for scientific and technical personnel during the next 5 to 10 years (1947-52, 1952-57) to meet the demands of the various Government Departments, for schemes of expansion of industrial and agricultural production, transport, medicine, education and other fields in accordance with declared policies of the Government.

It maintained in 1947, that overall requirements of the country in scientific and technical man power during the next five to ten years period would be about 54,000 engineers and 27,000 technologists. The available resources of training were hardly sufficient to meet 50 percent of the requirements of necessary facilities in education and research in the various branches of science, technology, engineering, medicine and agriculture.

At the time of independence, India possessed 35 technological institutions imparting education to 2,940 students annually. There were 53 polytechnic schools imparting education to 30,670 students every year and giving them Diploma.

Simultaneously with the setting up of the council (AICTE),
the Government appointed a "High Powered Committee" in 1945 to look into the problems of technical education. Another development prior to independence was the establishment of the Council of Scientific and Industrial Research (CSIR). These two committees had worked under the Joint Chairmanship of the late Shri N.R. Sarkar and made several recommendations.

On the recommendations of the First committee, the Five Indian Institutes of Technology came into existence. The second committee was responsible for the setting up of a network of Regional Engineering Colleges and National Laboratories and Industrial Research Institutes. Subsequently the Engineering Personal Committee (1956) and the Post Graduate Engineering Education Committee (1962) and the Scientific Man Power Committee helped the Government to have proper assessment of the problems of Technical Education and to accept the concept of integrated planning in technical education.

The 'All India Council for Technical Education' (AICTE) which is now a main advisory body of Central and State Government has set up various bodies for organising and development of technical education above the high school stage.

The council made excellent arrangements for the performance of its functions with the assistance of

i) All India Board of Technical Studies in specified fields (seven boards).

ii) Four Regional Committees, one each for the North, South, East and West zones were made in the country for this purpose, and

iii) A Co-ordinate Committee, that co-ordinates the work of the various committees and Boards and has power
to take decisions and on behalf of the council when it can not meet.

The Council meets once in a year or so to discuss broad principles, problems and programmes, whereas the Regional Committees and the co-ordinating committee meet often.

The All India Board of Technical Studies in various fields advice the council on all technical matter pertaining to their respective fields. The Regional Committees form the backbone of the council in the development of Post Graduate and specialised courses the council has appointed special committees to assist it. Boards of Technical Education has been setup on most of the states to look after technical education at the state level.

The All India Board of Technical Studies lay down the standards and frame courses in a variety of subjects that serves as a guide to the institution in the country and qualify students for this award of National Diploma and Certificates. The seven Boards cover the following fields of:

1. Engineering and Metallurgy
2. Chemical Engineering and Chemical Technology
3. Architectural and Regional Planning
4. Textile Technology
5. Applied Arts
6. Commerce
7. Management Studies

In an expanding system of education, institution should
have the capacity to grow to maturity to project themselves into the future and anticipate changes, to prepare their products to meet the challenges of new situations. This is all the more necessary for technical institution which are constantly exposed to the powerful influence of industrial development and scientific progress.

India needs, not only skilled workers and technicians, but also quality scientists and engineers, who are not merely specialists but are capable of looking well beyond their own fields, who can understand the inter-relationships of different disciplines and can co-ordinate a diversity of skills techniques, materials and experience in the solution of engineering problems. Before 1947, there was hardly an institution which provided facilities for advanced engineering studies and research. Indian students had to go abroad for such work. Today over a dozen of institutions have been developed within the country, where facilities for post graduate studies have been organised for about 500 scholars and the facilities are being steadily expanded. The fields of study also cover a core range, some of which like Power Engineering, Dam Construction and Irrigation Engineering, Structural Engineering, Production Engineering, Aeronautical Engineering and Metallurgy and of particular importance to the development of this country. The facilities for post-graduate studies and research will be increased in the course of the next five years in order to cater for about 2,000 scholars.
3.5 THE FIVE YEAR PLAN PROGRAMMES:

As the sheet-anchor for the economic development of India, technical education has to serve a two-fold purposes. First, it should train men who are professionally competent not merely in the narrowly vocational sense but in the broad sense of enabling engineers to see their own activities in their human and social contexts. Second, it should be instrumental in the creation of a new society and a new economic order, as well as a new physical environment. In order to secure these objectives, technical education should respond continually to both scientific and technological advances and to social and economic changes.

The purpose of technical education system has been to generate manpower to meet the requirements of the socio-economic progress of the country. It has been expanded to accelerate this progress to such an extent that India, today, has one of the largest pools of engineers at various levels. This expansion and diversification have resulted through systematic planning through the Five Year Plans.

The Five Year Plans have demanded increasingly large numbers of engineers, technicians and skilled workers for the execution of various development projects in industry, commerce, power-generation, communication, defence etc. The policy of the Central Governments as also of the State Governments are therefore to expand facilities for technical education at all levels. The policy is reflected in a number of schemes undertaken during the First and Second Five Year Plan periods for the establishment of new technical institutions and to expand and
develop the existing ones. In 1950, there were only 50 institutions for the first degree courses in engineering and technology and 86 institutions for diploma courses. Their admission capacity was about 4100 students for the degree courses and 5900 students for the diploma courses. By 1961 the number of institutions for degree courses increased to 100 and that for diploma courses to 196. The admission capacity of the institutions also increased to over 13,860 students for degree courses and 25,570 students for diploma courses. In quantitative terms, technical education facilities have been expanded more than three-fold at degree level and five-fold at diploma level during the last ten years. An amount of Rs.900 million was provided by Government for technical education during this period. During the First Plan period, the Central Government and the All-India Council for Technical Education completed a number of programmes begun earlier, and the total outlay on technological education was about Rs.11.5 crore.

The Second Five Year Plan (1957-61) made a provision of about Rs.48 crore for technical education. Part of this provision was for technical education. Part of this provision was for completing schemes initiated during the First Plan, the rest was earmarked for the establishment of new Institutions and courses. Post-graduate courses and research in engineering and technology were also to be organised at many selected centres.

In 1959-60, the Indian Institute of Technology, Madras, was established and 120 students were admitted for training. When fully functioning it was to provide facilities for 1,600
undergraduate and 500 postgraduate students and research scholars in engineering and technology. Steps were taken to start Regional Engineering Colleges to provide facilities for technical education on a similar scale. Preliminary work in connection with the establishment of a college of engineering and technology at Delhi was also taken in hand.

The planning Commission appointed a working group on Technical Education and Vocational Training to assess the requirements of technical personnel in the Third Plan. It assessed the requirements of engineering personnel in the Fourth and the subsequent Plans as well and recommended the creation of an additional intake of 5,000 in engineering colleges for regular courses and 2,000 for part-time and correspondence courses, and similarly 10,000 and 5,000 respectively in polytechnics. The working group also recommended improvements in the quality of teaching personnel, equipment and the like for Regional Engineering Colleges.

The Third Five Year Plan (1961-66) laid particular stress on increasing trained personnel in different fields at all levels, securing teachers in sufficient number, provision of scholarships and fellowships for talented students, introduction of part-time, short-term and correspondence courses, development of special courses in certain fields, proper utilisation of available physical facilities, reduction of wastage and promotion of research. The Third Plan provision made for expansion of facilities at the degree and diploma levels in engineering and technology to increase annual admissions from 13,860
for degree courses and 25,570 for diploma courses to 19,140 and 37,390 respectively.

Considerable expansion of facilities for engineering education took place during the Second Plan. The number of colleges went up from 65 to 100, the annual admissions increasing from 5,890 to 13,860. The number of polytechnic which offered diploma courses rose from 114 to 196 and their annual admissions increased from 10,480 to 25,570. During the Second Plan the annual turn out of graduates rose from 4,020 to about 5,700 and of diploma holders from 4,500 to over 8,000. The trained manpower needed for the Third Plan was expected to come from institutions already established by the end of Second Plan.

By the end of 1961-62, a total of 111 engineering colleges were functioning in the country with a sanctioned admission capacity of 15,690 students.

The Fourth plan began with an admission capacity of 25,000 for the degree and 48,600 for the diploma courses. The actual admissions had, however, gone down to about 31,500 for diploma courses and 17,000 for degree courses due to unemployment among the engineers in 1968-69. As the employment situation improved the admissions increased to 37,000 at the diploma level and 20,000 at the degree level in 1973-74.

During the Fifth Five Year Plan 1974-79, the main stress was on the consolidation and improvement of the quality of the technical education system. In 1974-75, there were 138 engineering colleges, with an annual admission capacity of 27,000
and 307 polytechnics, with capacity to admit about 50,000 students annually. The cut back in the level of students admission, introduced in 1968, was to be restored in stages depending upon the provision of physical facilities in individual institutions and the estimates of future demand for engineering manpower. The quality improvement programmes comprising faculty development, curriculum reforms and preparation in instructional materials were to be modernised and obsolete equipment in the older institutions replaced to keep pace with the changing technological requirements.

During the plan period, efforts were made to bring about a qualitative development in technical education through development of faculties, curricula and preparation of teaching material. Stress was placed on improvement in quality in terms of faculty development, replacement of obsolete equipment and diversification of courses. Regional Engineering Colleges and engineering departments in the universities were further developed.

The Engineering and Technology Penel constituted by the University Grants Commission continued to advise the Commission regarding the measures of improvement of standards and facilities for teaching and research for development of inter-disciplinary and multi-disciplinary programmes in engineering, technology and pharmaceutical Sciences.

The Sixth Five Year Plan (1980-85) took into account the existensive infrastructure of facilities that had been created
for technical education at diploma, degree and post-graduate levels as well as for such supporting services as teacher training and curriculum development. The emphasis during the plan was to be on:

(i) Consolidation and optimum utilisation of these facilities,

(ii) Identification of crucial areas and creation of necessary facilities for education in emerging technologies in the light of a proper assessment of future technological manpower requirements,

(iii) Improvement of the quality of technical education at all levels, and

(iv) Furtherance of national efforts to develop and apply science and technology as an instrument of the country's socio-economic progress.

On the eve of the Sixth Plan the intake capacity of all engineering institutions was 25,000 for degree courses and 50,000 for diploma courses. This was considered inadequate for the increasing demand for technical personnel expected during the next ten years.

The draft of the Seventh Five Year Plan (1985-1990) indicated that the main emphasis was to be laid on consolidation and optimum utilisation of existing infrastructure and facilities, identification of critical areas and creation of infrastructure in new areas of emerging technology, improving quality and standard of education, modernisation of laboratories and effective management of the overall system.

The major programmes will be,

(i) improvement of polytechnics,
(ii) removal of obsolescence,
(iii) women education,
(iv) application and extension of science and technology to rural development,
(v) continuing education,
(vi) interaction between technical education and industries, and
(vii) removal of regional imbalances etc.

Trained manpower at middle level is needed for a wide range of professional duties, for application of knowledge in field operation, in production and construction, testing and development, etc. For this purpose, diploma courses are offered in 400 polytechnics with an annual enrollment capacity of about 65,000 students. They provide for a variety of specialisation in engineering and technical as well as in few non-technological fields. For the professional engineering and technological training, 160 engineering colleges offer courses leading to Bachelor’s degree in engineering and technology. The total admission capacity per annum for these courses is about 30,000. The number of institutions offering post-graduate course is 96 with an annual intake capacity of about 6,000.

The seventh Plan emphasized consolidation and optimum utilization of existing infrastructural facilities; their upgradation and modernisation, identification of critical areas and creation of infrastructure in new areas of emerging technology, effective management of overall system and institutional linkages between technical education and other development section.
Under the thrust areas programme of technical education and SIO projects with a grant of Rs.53.43 crore were supported for strengthening of facilities in the crucial areas of technology where weaknesses exist, 685 projects involving a grant of Rs.76.84 crore were supported for creation of infrastructure in areas of emerging technologies and 202 projects involving of Rs.271 crores were supported for programme of new technologies. A comprehensive report of requirement of instrumentation engineers at National Manpower Information System (NTIMS), the number of Community Polytechnics (CPs) increased to 156 with an annual training of 20,000 rural youth and women.

The following new schemes were started as part of the implementation of National Policy of Education:

(i) Continuing Education: The scheme envisaged preparation and dissemination of course material packages suited to the needs of industry. Under the scheme implemented by 5 Indian Institutes of Technology (IITs) 4 Technical Training Teacher’s Institutes (TTTIs) 1 Indian Society of Technical Education (ISTE), 4 Regional engineering colleges 4 polytechnics, more than 30,000 working professionals have undergone training.

(ii) Institution-Industry-Interaction: Under the scheme, proposals of 21 engineering colleges and 11 polytechnics have been approved for interaction with the industry.

(iii) Research and Development in Technical Education: 126 R&D Projects were supported.

The actual expenditure on technical education section in the seventh plan was Rs. 1083.34 crores, of which Rs.610.96 crores was in the Central Plan and Rs.472.38 crores in the State Plan.
3.5.1 SIGNIFICANCE OF EIGHTH FIVE YEAR PLAN (1992-97)

The higher education system at present suffers from several weaknesses such as proliferation of substandard institutions, failure to maintain academic calendar, outdated curriculum, disparities in the quality of education and lack of adequate support for research. Recent consultation including the "Brain Storming" session organized by the Planning Commission to consider future directions have underlined the following thrust areas:

(1) Integrated approach to higher education;

(2) Excellence in higher education;

(3) Expansion of education in an equitable and cost-effective manner in the process of making the higher education system financially self supporting;

(4) Making higher education relevant in the context of changing socio-economic scenario;

(5) Promotion of value based education;

(6) Strengthening of management systems in the universities and colleges.

The perspective of development of technical education for the Eighth Plan would have to take into account the following imbalances and distortions.

(i) During the past four decades, there has been a phenomenal expansion of technical education in the country. Today, there are 200 recognized technical education institutions (TEIs) at the first degree level and more than 560 polytechnics at the diploma level with annual admission capacities of 40,000 and 80,000 students respectively. About 140 institutions offer facilities for post-graduate studies and research in several specialized areas with an annual capacity of 9,400 students.

(ii) The quantitative expansion has resulted in the lowering of the standards and there exists a structural imbalances of skill requirement of the
business sector and the traditional curriculum followed by the educational institutes. These factors give rise to problems of unemployment and under-employment.

(iii) The infrastructural facilities available in the vast majority of TEIs are extremely inadequate. There is an acute shortage of faculty with about 25 to 40%.

(iv) The TEIs are functioning in isolation, linkage and interaction between TEIs and user agencies such as industries, R&D and design organisations and development sectors are not sufficiently strong. There is no strong interaction among institutions by way of sharing of facilities like equipments, libraries, teaching faculty and other resources.

The Eighth plan has identified the following factors under thrust area:

(1) Modernization and upgradation infrastructural facilities.

(2) Quality improvement in technical and management education.

(3) Responding to new industrial policy and industry-institution R&D labs interaction.

(4) Resource mobilisation and

(5) Institutional thrusts.

The eighth plans outlay on Technical Education was Rs.2786.38 crores, of which Rs.824.00 crores was in Central Sector and Rs.1804.66 crores in State Sector and Rs.157.72 from Union territories.
3.6 REGIONAL ENGINEERING COLLEGES

In 1953, the Engineering Personnel Committee established by the Planning Commission of Government of India, recommended for the establishment of eight Regional Engineering Colleges in the Country, and further suggested that two of those be situated in Southern Region. The Karnataka Regional Engineering College, Surathkal, is one among the two proposed in the South. Initially only eight (8) such Regional Engineering Colleges were started and subsequently six (6) more were added bringing the total into fourteen.

These fourteen RECs were set up as joint venture of both Central and State Government, one each in the major States, during the Second and Third Five Year Plan periods to enable the country to meet the increased need for trained personnel during subsequent Plan period with a view to develop the engineering education of the region concerned.

Though these colleges are autonomous in respect of administration, management and financial matters unlike the Indian Institutes of Technology they are not empowered to confer degree or diploma. Instead, they are affiliated to an university of the region concerned. Most of these colleges conduct Postgraduate courses also.
These colleges are located in the following places:

(1) Allahabad
(2) Bhopal
(3) Durgapur
(4) Calicut
(5) Jaipur
(6) Jamshedpur
(7) Kurukshetra
(8) Nagpur
(9) Rourkela
(10) Srinagar
(11) Surat
(12) Surathkal
(13) Tiruchirapalli
(14) Warangal

The fifteenth REC at Silchar in Assam started functioning in November 1977 and the sixteenth at Hamirpur in Himachal Pradesh in July 1986. REC at Jalandhar in Punjab started functioning in 1991-92. With this, the number of RECs in India has now gone up to 17. The map is showing the location of RECs in India (Fig.1). The details of Regional engineering have been given in Table 3.1.
REGIONAL ENGINEERING COLLEGES IN INDIA.

1. K.R.E.C. SURATHKAL, KARNATAKA
2. R.E.C. WARANGAL, ANDRAPRADESH
3. R.E.C. CALCUT, KERALA
4. R.E.C. THIRUCHIRAPALLI, TAMILNADU
5. V.R.E.C. NAGPUR, MAHARASTRA
6. R.E.C. ROURKELA, ORISSA
7. REGIONAL INSTITUTE OF TECHNOLOGY, JAMSHEDPUR, BIHAR
8. R.E.C. WEST BENGAL, DURGAPURA
9. R.E.C. SILCHAR, ASSAM
10. MOTILAL NEHRU R.E.C., ALLAHABAD, UTTAR PRADESH
11. MAULANA AZAD COLLEGE OF TECHNOLOGY, BHOPAL, MADHYA PRADESH
12. SARDHAR VALLABAI REC & TECHNOLOGY SURATH, GUJARATH
13. MALAVIYA R.E.C. JAIPUR, RAJASTHAN
14. R.E.C. KURUKSHETRA, HARYANA
15. R.E.C. SRINAGAR, JAMMU & KASHMIR
16. REGIONAL ENGINEERING COLLEGE, HAMIRPUR
17. DR. B.R. AMBEDKAR REGIONAL ENGG. COLLEGE, JALANDER.

FIG. 1
### TABLE 3.1
**Details of Regional Engineering Colleges in India**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of College</th>
<th>U.G.</th>
<th>P.G.</th>
<th>Research</th>
<th>No. of Courses</th>
<th>No. of Intake of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>K.R.E.C., Surathkal</td>
<td>8</td>
<td>15</td>
<td>8</td>
<td>8</td>
<td>180</td>
</tr>
<tr>
<td>2.</td>
<td>Regional Engineering College, Warangal</td>
<td>7</td>
<td>14</td>
<td>-</td>
<td>105</td>
<td>310</td>
</tr>
<tr>
<td>3.</td>
<td>Regional Engineering College, Calicut 1961</td>
<td>7</td>
<td>10</td>
<td>4</td>
<td>177</td>
<td>350</td>
</tr>
<tr>
<td>4.</td>
<td>Regional Engineering College, Tiruchirapalli</td>
<td>6</td>
<td>7</td>
<td>6</td>
<td>82</td>
<td>280</td>
</tr>
<tr>
<td>5.</td>
<td>Vishweshwaraya Regional Engineering College, Nagpur, 1961</td>
<td>6</td>
<td>9</td>
<td>19</td>
<td>66</td>
<td>331</td>
</tr>
<tr>
<td>6.</td>
<td>Regional Engineering College, Rourkela 1961</td>
<td>7</td>
<td>9</td>
<td>9</td>
<td>156</td>
<td>428</td>
</tr>
<tr>
<td>7.</td>
<td>Regional Institute of Technology, Jamshedpur</td>
<td>7</td>
<td></td>
<td></td>
<td>105</td>
<td>300</td>
</tr>
<tr>
<td>8.</td>
<td>Regional Engineering College, Durgapur</td>
<td>6</td>
<td>7</td>
<td>6</td>
<td>82</td>
<td>280</td>
</tr>
<tr>
<td>9.</td>
<td>Regional Engineering College, Silchar</td>
<td>5</td>
<td></td>
<td></td>
<td>69</td>
<td>210</td>
</tr>
<tr>
<td>10.</td>
<td>Motilal Nehru Regional Engineering College, Allahabad</td>
<td>6</td>
<td>7</td>
<td>6</td>
<td>107</td>
<td>340</td>
</tr>
<tr>
<td>11.</td>
<td>Maulana Azad College of Technology, Bhopal</td>
<td>7</td>
<td>9</td>
<td>12</td>
<td>134</td>
<td>350</td>
</tr>
<tr>
<td>12.</td>
<td>Sardar Vallabhbhai Regional College of Engineering and Technology, Surat</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>120</td>
<td>1493</td>
</tr>
<tr>
<td>13.</td>
<td>Malaviya Regional Engineering College, Jaipur</td>
<td>5</td>
<td>8</td>
<td>11</td>
<td>142</td>
<td>1395</td>
</tr>
<tr>
<td>14.</td>
<td>Regional Engineering College, Kurukshetra</td>
<td>4</td>
<td>-</td>
<td></td>
<td>86</td>
<td>295</td>
</tr>
<tr>
<td>15.</td>
<td>Regional Engineering College, Srinagar</td>
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<td>16.</td>
<td>Regional Engineering College, Hamirpur</td>
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<td>17.</td>
<td>Dr. B.R. Ambedkar Regional Engineering College, Jalandar, Punjab.</td>
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As observed from the statement the some of the REC started in sixties and seventies has more departments and students.
Strength is approximately from 1000-1500. They also run P G Courses. Nine (9) REC having P.G Courses and the strength of the students raised from 150-200. These REC having very good library facilities and well equipped laboratories and later the needs of Research scholars. On going research is being carried out in difficult subjects in Engineering. The REC started during eighties have less number of departments and strength of students. In these colleges the faculty strength is also less.

3.7 ENVIRONMENTAL ASPECTS OF REGIONAL ENGINEERING COLLEGE:

There are several factors influencing the Engineering college faculty over the years in seeking information. The Scientific studies according to Sharma (1979), made in this direction, reveals that the creativity and personality characteristics make it clear that the various characteristics may be responsible in creative individuals which help them sustain creative activity throughout as a distinction feature not found in ordinary man. Empirical views indicates human intellectual, cognitive attitudinal, actional, infantile experience, emotional and behavioural factors playing an important role in creative determination. Information seeking and communication behaviors is influenced by intellectual factors viz., anxiety, aspiration, frustration, imagination, memory, ability to deal with the concepts, logical thinking reasoning and also by perceptual factors as the cognitive side. As a whole, the creative person (engineering faculty)should be highly sensitive, aesthetic sense, independence of judgment initiatives and preference for perceptual novelty and complexity.
The act of generation of new information seeking behaviour is further influenced by the following:

a) Personal Qualifications
b) Surroundings
c) Encouragement
d) Invisible colleges
e) Family
f) Age
g) Sex

Adolf Butenandh H.C (1973) says that, 'it (research) is a human activity undertaken in a systematic and rationally verifiable manner, and directed towards the acquiring of new knowledge. In order to pursue such activity the individual has to possess certain personal qualifications which can be developed and strengthened as the scientific activity proceeds......"8.

The creative scientist engineering faculty should be alert to his surrounding in sensing the future, he must be active in completing his aims and objectives even by sacrificing the things for this purpose. Interest in solving the complex problems is the basic essence of the acts of creativity.

The interaction between human beings and their environment initiates for certain creative activities. Naturally knowledge grows in the individuals by learning process such as reading of books, journals etc., which bring him close to the society and its problems and needs, and understand his
surroundings in which he lives. This alerts the mind of creative person to think of solution or find out reminders, which naturally leads to scientific research, advancement and revolution.

Khanna, J.K (1985) accounts the following social factors that lead to the knowledge explosion.

(1) the increase in population pressure
(2) to satisfy the material wants
(3) social pressure demands
(4) social freedoms and sound economy
(5) environmental condition etc

Pollution and peace are the other social factors influencing the generation of new knowledge. The creative person wishes his surroundings to be peaceful and unpolluted. The calm atmosphere allows them to concentrate more as their work by way of thinking. Researcher enjoy more in reading documents in the calm atmosphere. Pollution here includes noise, air and ever troublesome neighbours. Sometimes it so happens that creative person are disturbed by the nasty behaviors of their neighbours at home and their colleagues in the institutions. Hence healthy atmosphere in the surroundings plays a prominent role in the life of a scientist, engineer, manager, teacher etc. who is involved in research activity.

Some methods have been adopted to encourage the research activity among scientists and creativity among writers. The fulfillment of personal requirements and ambitions of the
information generators is inevitable when they can use their brains for the development of the nation. Motivation in one form or the other accelerates the research activity of the person. The following are some of the motivating factors for teaching faculties.

- a) promotional avenues
- b) financial assistance
- c) recognition of the research work
- d) encouragements from colleagues/friends and
- e) team research spirit

The attitude of the higher officials, friends and colleagues plays a key role on the psychology of a creative person. Encouragement from these circles inspire him to take up more and more research work, leading to generation of new information.

Regional, national and international conferences and meetings plays an important role as the media in the communication of information. These are the places where discussions between different groups as between the participant take place. The exchange of thoughts, help the participants either giving rise to new ideas as getting feedback or the both.

Invisible college faculty groups, which comprise of prominent and respected researchers who have acquainted with one another and communicate with one another are the high producers in terms of numbers of papers. The communication among the members of the group is crucial and at the forefront of the research area.

Family background plays a key-role on the life style of a
man. According to Krench, D (1970)" rigidity and becoming set in a particular thought pattern stand in the way of the creative process. Such factors as being too concerned about the future, concerned about failures as preoccupied with problems of everyday reality can also generate one's productivity. All these seem to work against the kind of open mindness required." Often the mother is recalled as a great source of encouragement, and some feel their mother very significant in their careers. The impact of an older or younger brother as a source of inspiration or a colleague is seen in a number of instances". The size of the family, the attitudes of the mother, wife, and children, marriages of the dependents; health problems of the family members as well as personal problems with the relatives and with neighbours are the paramount factors linked with the act of information generation and communication 10.

Age and sex are also influencing the research activity of the engineering faculty members. The information generation is constantly growing with age or there is a decline in it. There are studies relating to creative characteristics of persons at different ages. Rossman, J (1935) made a study of the childhood, education and age of 710 inventors. The results showed that invention started in the early years of adulthood of the inventors than creative persons of other fields. Rossman observed that 61% made their inventions before they attained the age of twenty years, over aging 21-23 years of life11. According to Smith C.J and Kragh Ulf, (1975) creative process in adults differs from creative process in adolescents and also in
children. Creativity at a mature age is primarily associated with recreation of dormant developmental alternatives once discarded in favour of the main line of development, and in principle the normal adults need not lack creative possibilities. Creative efforts in middle age are however affected by social factors. In addition to the physical fitness i.e., thinking, capacity, retaining to thought contents in memory capacity to read and write etc.  

Now-a-days sex is the neglected factor that can be related with creativity in the society. Females are competing with males in every field and moving together to shoulder the social responsibilities. Both the sexes are doing research works aimed at the uplift of the society in the field of science and technology, social and behavioural sciences.

According to Cole, J.R & Cole, S (1973) 13 Kyuik, S (1950) 14 males are found more productive than females, publishing an average 40-50 percent more papers than their female counterparts. The study of Palmer, J (1991) also revealed that a group of scientists containing 50 percent female showed a slightly lower publishing rate than other groups which contained 11 to 15 percent female scientists 15.

In India till recently woman was more confined to the affairs of the family. Generally she concentrates on the welfare of the children and other members of the family. Although she equally bears the burden of the family, social freedom is less seen among Indian women compared with the women of the western
countries. This automatically makes her less aware of the social problems and it affects free thinking etc.

All these factors influence the engineering faculty member in their academic excellency and these things are observed during the interview and discussion made during research study as explained in analysis part.

According to Kurt Sontheimer (1971), "the modern trend rewards research into the future purports to be quite different from previous approaches to prediction. Those involved consider their work to be based on scientific premises, and their apprehension about the future is caused by concern at the development of a world determined by the discoveries and achievements of science and technology, a situation increasing in intensity with the passing of each new day... Human activity is constantly bound up with the future, being determined by decisions which are of consequences for the future. The extent to which our actions are resolute and responsible depends on the clarity of the picture we have of the future, and the degree of objectivity we can achieve in imagining what it is going to be like. We seek to anticipate the future in order to be able to act more correctly... Research into the future which is undertaken in earnest seeks with the aid of scientific methods to capture in its field of vision. In this way it is able to make new observations which provide more reliable points of orientation for social activity"\(^{16}\). Based on these views it can be said that the engineers should have the ability to predict the future of the developments of the world. Accordingly, he has to
prepare the solutions for various problems which are mainly based on the ability of keen vision of the engineers.

In similar context, Bhattacharya (1978) says that "resources are needed for survival and development. As a resource, or more specifically as an energy resource, information is directly related to the notion of 'National development'. The efficient and effective functioning of a national development system calls for the economic utilization of the resources forming the input to the system; and these include resources - such as manual, mechanical, financial, material and intellectual resources". Intellectual resources may be viewed as consisting of the following:

a) the intellectual faculty of the people of the nation, and
b) information.

These two resources are intimately related to each other. Intellect uses information to create new information, which, in turn, enriches the store of existing information; and the cycle goes on and on.

Donald E. Walker (1981) expresses that every time a person learns something new, solves a problem, or makes a decision, he engages in an act of synthesis and interpretation. The complexity of process and the significance of the results vary, but a central element in the activity is the identification of some new items as information and its integration into a body of new knowledge that the person has accumulated in the course of his experience. The body of knowledge may constitute the core of
a scientific discipline, and the addition of the information may result in a creative insight with a revolutionary impact or the field. Or the knowledge may be quite informal, reflecting little on specific education or training, and the added information may simply allow the person to complete what he was doing without any clearly discernible effect on what he can be said to know"18.

Some of the factors affecting information seeking behaviour (and information needs), are now discussed here.

Paisely (1968)19, pointed out that in order to interpret the data from user studies it was necessary to examine the systems within which the scientist worked and by which he was affected. Paisley considered that ten systems affected the scientist, of which eight could be regarded as forming a series of almost concentric circles. The ten systems postulated by Paisley are now described.

i) "The scientist within his culture". The cultural system awards prizes, establishes universities and emphasizes the importance of the priority of discovery.

ii) "The scientist within a political system". This refers to the political systems affecting the scientist.

iii) "The scientist within a membership group". This refers to the scientist as the member of a professional body. The professional groups usually control the official information systems in a field.

iv) "The scientist within a reference group". This is a group who share certain characteristics with the scientist, such as specialization or training. A reference group is not necessarily a subset of a membership group.
v) "The scientist within an invisible college". The "invisible college" is a concept first proposed by Price (1963).20 'The invisible college' is a subset of (iv) and consists of a group of scientists who know each other and share information by direct communication.

vi) "The scientist within a formal organization". The formal organization incorporates scientists of different status levels at the same location. It is the policy of the employer which determines which science information systems the scientist has access to.

vii) "The scientist within a work team". The scientist's work team, being familiar with his work and information needs, are able to provide information through conversation without duplication or redundancy. This is the most important system.

viii) "The scientist within his own head". Supported by all the other systems, this system is concerned with factors such as motivation, intelligence, creativity, and cognitive structure. This system is involved in determining the relevance of information inputs and the nature of information outputs. Paisley (1968),21 described two other systems which cut across these eight.

ix) "The scientist within a legal/economic system". This system includes patents, copyrights and industrial secrecy which affect the flow of information.

x) "The scientist within a formal system." This is the formal information system including libraries and information services.

The importance of the environment is supported by several authors. For example, Herner (1954),22 and Bichteler and Ward (1989),23 found evidence that the employment situation affects behaviour. Skelton (1973),24 accepted that one problem with the development of generalised profiles of a typical scientist was the differences occurring between disciplines and different jobs. Orr (1970),25 also considered the environment of the scientist in his model of information behaviour.
3.7.1 PERSONAL FACTORS:

Information behaviour also varies with the type of scientist, e.g. pure or applied science. Other factors involved include the degree of the scientist's previous familiarity with the area and his personality and level of experience (Garvey et al., 1970a26; Robertson and Roy, 197527; Orr, 197028).

3.7.2 STAGE OF SCIENTIFIC WORK:

Just as the information needs of the scientist vary during the course of a project so the sources used to meet these needs also vary. Garvey et al. (1970a)29, found that journals were the most used source of information for placing completed work in context with previous work and for integrating the work into the body of current scientific knowledge. Local colleagues and students were used when information for designing apparatus, data-collection or selecting a technique for gathering data was required. Books were used both to provide general and specific information. Reprints and meetings were important sources of information on other ongoing research in the scientist's area (Garvey et al., 1970a)30.

3.7.3 NATURE OF THE NEED:

The perceived urgency of the need affects information seeking behaviour. Thus "it would be nice to know" needs elicit different behaviour to "I absolutely must know" needs. A range of urgency exists between these two extremes (Krikelas, 1983)31. Considering above studies about the environmental aspects the R.E.C.'s activities have been described. In order to interpret
information needs and use studies it was necessary to consider the systems within which scientists worked, Paisley (1968)\textsuperscript{32}. Thus to interpret the data obtained from this study fully some familiarity with the Engineering Faculty of RECs taken into consideration.

All RECs faculties have international reputation for quality of their large and active research programmes. Faculty have strong tradition of research and academic activities. RECs encourage overseas links and there are visits by foreign engineers and scientists. The appointment of foreign visiting staff and collaborations with RECs are done. Several engineering faculty are also visiting abroad to deliver expert lectures and for other academic and industrial consultations. During that time, some of them gather the information for their research field. One of the respondents in the interview had expressed his way of receiving the information as follows:

"I find better information facility in I.I.T's & I.I.Sc. Libraries. More and more information is flooding and there should be a way to streamline these and provide the required information to the researchers who are in need of it. An effort regarding this is done in organisations institutes where I visited and I am getting information for my projects from last three years whenever I need from those institutes".(R19)

Faculty are having many types of links with industries from the departments for research project collaboration with industries for consultations and as expertise. Some of them will get the required information from industries. When asked for problems and needs of information one of the respondents has expressed his views as:
"Computing facility in providing information services must be improved. Industries network of research may be established. There are some directive programmes which can be used through industrial network. These network of research programmes of western countries should be linked to R & D's of Indian Industries and R.E.C libraries." (R52)

About six R.E.C. Libraries are located at the heart of engineering college, with all the modern information technology facilities including computing, on-line and CD-ROM facilities. These libraries have an excellent collection of books and other reading materials. The journal collection and some conference proceedings sources of information had an effect on information seeking behaviour, which is supported by the comments of the engineering faculty interviewed during this study.

"Most unfortunate thing to our library is not getting the required information in our field for example subscription of journals, getting conference proceedings. It has the difficulty of financial supports, which is to be improved." (R15)

"It is a quite new area I am working. Library must help me to get more information on this topic. Library has to subscribe more journals on this subject to support my research." (R28)

"Provision of good library is essential part of the college. There must be services to provide current information to research teams. I will get this information from INSDOC and BLLD Library till today. There must be improvement in services. According to communication and publications of research results the researcher must be free from administration work. In other words, he should be free to do research." (R29)

These sentiments were echoed by many of those interviewed. Other similar comments included the service factors of the library are as follows.
"Keeping up to date of information in my field is prime duty of me, but library has to provide required information to related to my research area. All conference publications may be procured and the conference proceedings participated by college faculty be collected and kept in library for future reference to others also. The comprehensive accessibility to all publication is necessary."(R72)

"I feel in engineering colleges very often getting information data to begin some sort of research work is more difficult. I expect more information from library at all levels to each of us to do our research projects."(R80)

"There are too many journals and too many publications. It is difficult to find out worthy relevant papers. Better automated information system is needed to retrieve information to one who needs it. There is a need of better service from our library. Our research teams also co-operate with library to retrieve the information. Financial stringency of library must be removed and it should be supported with better financial grants."(R61)

Information technology and audio-visual provision has formed an important element in the design of the library. R.E.C Libraries in common, are much higher standard than other engineering institute libraries, but at present they are facing some financial restrictions. There is no sufficient provision for subscription of new journals. Interlibrary loans are available and are used by faculty members interviewed. Many respondents mentioned their increased usage of interlibrary loans due to library’s financial restriction to get the whole documents. However, interlibrary loans are not without problems of time and judging the relevancy of the article from the title or abstract as there is no opportunity to browse. The engineering faculty have access to online searching through the library. One of the respondents has expressed his view about
online services of the library.

"There are many dissemination of information databases. Increasingly library is not able to log on for these due to cost effectiveness. I feel online facility has to be extended to laboratories. Because every time I will go to library I spend lot of time there and some time I did not get relevant material from the online. If it is with me I can use it whenever I am free. There is growing need for this information technology among the research fellows."(R21)

"If Online information on my topic be given every quarterly by the library it is very useful to research."(R59)

The engineering faculty have access to CD-ROM COMPENDEX. Many of the interviewed faculty have used the CD-ROM and some of them have seen the demonstration of this and are keen to try this new information source. However perception of its potential utility has been discussed in analysis part of this study.

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