STOCK OF ENGINEERING AND TECHNOLOGICAL MANPOWER IN MAHARASHTRA BY 2000 A.D.

* N.V.Bhandarkar

ABSTRACT

While carrying out decennial population census, every household is given a seperate card for supplying the details of scientific & technical persons. On the, basis of the data thus collected, the Department of Science &Technology which is a user of this data, publishes them. The latest data is available upto 1981, taking it as a base an attempt is made to estimate number of degree and diploma holders in Maharashtra upto 2000 A.D. Even prior to starting of non-aided technical institutions, Maharashtra was leading in having highest percentage of degree and diploma holders in 1981 also as compared to other states in India. Alternative method used by the Planning Commission, Govt. of India, New Delhi is also attempted for estimating the stock of Engineers. This stock can be further refined by considering actual outturn. An attempt is also made to explain relationship between manpower and outturn, outturn and enrolment.

INTRODUCTION

Engineering and Technological personnel occupy a pre-eminent position. They play a pivotal role in economic development in different 'Sectors of Economy'. Generally Engineering and Technological personnel are categorised into three levels viz.

i) Degree holders which include graduates, post graduates and doctorates etc.

ii) Diploma holders are those who come out of polytechnics after three or four years of training beyond secondary education

iii) Skilled Technicians are those who are trained at Industrial Training Institutes (ITIs) in Engineering trades.

STOCK OF ENGINEERS 1981

According to 1981 census data, there were 3,11,300 degree holders. Of the total degree holders in 1981, in India, Maharashtra accounted for 20.8% degree holders; this means, there were 64,750 degree Engineers in Maharashtra, where as in case of diploma holders, it was observed that the percentage of diploma holders was 18.8; thus in terms of absolute numbers, there were 99,114 diploma holders in Maharashtra. It is also revealed by 1981 census that Maharashtra had highest number of degree and diploma holders, followed by Tamilnadu, Karnataka and Andhra Pradesh respectively. Their share in percentages were 9.1, 8.9 and 7.5 respectively.

* NTMIS, NODAL CENTRE, VJTI BOMBAY 400 019.

STOCK OF DEGREE HOLDERS BY IMPORTANT BRANCHES IN 1981 - MAHARASHTRA

On analysing the distribution of degree holders by important branches, it was observed as under.

TABLE 1
Stock of degree holders by branches in 1981.

Sr. No.	Branches	Stock (in percentage)
1.	Mechanical	26.1
2.	Civil	5.1
3.	Electrical & Electronics	22.7
4.	Chemical	3.2
5.	Architecture	2.3
6.	Industrial	2.2
7.	Mining	1.2
8.	Other branches	17.2
		100.0
	Total No. :-	64,750

TABLE 2
Stock Of Diploma Holders By Branches In 1981

Sr. No.	Branches as classified in 1981 census	Stock (in percentage)
1.	Civil	21.8
2.	Drauftsman	20.1
3.	Electrical & Electronics	15.5
4.	Mechanical	14.0
5.	Surveyors	13.0
6.	Chemicals	3.4
7.	Mining	0.6
8.	Other branches	11.6
		100.0
	Total No. :-	99,114

TABLE 3 Distribution of Degree And Diploma Holders In Major States 1981 (Percent)

Sr. No.	States	Degree Holders	Diploma Holders	Total
1.	Andhra Pradesh	7.5	7.8	7.7
2.	Bihar	6.7	6.5	6.6
3.	Karnataka	8.9	8.8	8.8
4.	Kerala	2.2	4.5	3.7
5.	Madhya Pradesh	6.1	6.2	6.2
6.	Maharashtra	20.8	18.8	19.4
7.	Tamilnadu	9.1	8.9	9.0
8.	Uttar Pradesh	5.6	5.7	5.7
9.	West Bengal	8.2	8.1	8.1
10	Other States & Union Territories	24.9	24.7	24.8
	Total :-	100.00	100.00	100.00
	Total Number in '00'	3113..	5272.	8385.

Source :- Census of India 1981

UPDATED STOCK 1985 MAHARASHTRA

From the base stock of 1981, the up-dated stock of 1985 as estimated by taking into consideration the outturns of degree and diploma holders during intervening period and attrition rate for depletion, the estimated stock of degree holders comes to 75,600 and for diploma holders, the estimated stock comes to 1,08,400 which is 20.2 percent in case degree holders and 17.0 percent in case of diploma holders. Again in 1985 estimated stock, Maharashtra ranked first in all states in India, followed by Karnataka, West Bengal, Tamilnadu and Andhra Pradesh. Their respective share in percentages was 8.8, 8.3, 8.1, 7.9 and 6.7. This means during 1985-86 period Karnataka, West Bengal, Bihar surpassed Andra Pradesh and Tamilnadu.

UP DATED STOCK OF DEGREE AND DIPLOMA HOLDER IN MAJOR STATES - 1985 IN PERCENT IN SOME SELECTED STATES IN INDIA

Sr. No	State	Degree Holders	Diploma Holders
1	Andhra Pradesh	6.7	7.3
2	Bihar	7.9	7.1
3	Karnataka	8.8	8.3
4	Kerala	2.9	4.7
5	Madhya Pradesh	6.7	7.1
6	Maharashtra	20.2	17.0
7	Tamilnadu	8.1	8.3
8	Uttar Pradesh	6.4	8.4
9	West Bengal	8.3	8.1
10	Other State & Union Territories	24.0	23.7
	Total :-	100.00	100.00
	Total No. in '00'	3745.	6376.

Source :- CERPH Estimates

PROJECTED STOCK OF ENGINEERING & TECHNOLOGICAL MANPOWER UPTO 2000 A.D.

The centre for Research Planning and Action New Delhi has Projected engineering and Technological Manpower 1990-2000 A.D. for India as under :-

TABLE 5

Category	Base Stock 1981	Updated stock 1985	Projected Stock (in '000')		
			1990	1995	2000
1. Degree holders	311	375	467	573	693
2. Diploma holders	527	638	804	998	1,220
Total :-	838	1,012	1,271	1,571	1,913

From 1982-83, the technical education got a boost in Maharashtra by starting non aided technical institutes; the product of these institutions started coming into labour market from 1986 in case of Polytechnics & from 1987 in case of Engineering and Technological institutes Considering the flow of outturn from these institutions, the estimated stock in Maharashtra for Engineering & Technological degree and diploma holder is estimated as under.

Projected stock of E&T Manpower 1990 to 2000 A.D.

TABLE 6

Category	Base Stock 1981	Updated stock 1985	Projected Stock		
			1990	1995	2000
1. Degree holders	64,750	75,600	94,500	1,18,125	1,47,656
2. Diploma holders	99,114	1,08,400	1,35,400	1,69,200	2,11,562
Total :-	1,63,864	1,84,000	2,29,900	2,87,375	3,59,218

The disciplinewise break up can be arrived at by carrying out detail exercise since 1985 onwards. These are being compiled.

ALTERNATIVE SCENARIO FOR ESTIMATING STOCK OF ENGINEERING MANPOWER

The Institute of Applied manpower Research, New Delhi has worked out stock of Engineers taking 1985 as bench mark year which was adopted by the expert committee of National working group on manpower projection and vocationalization in April 1986. The Stock of manpower is viewed at from different angles viz.

i) Living Stock
ii) Working age
iii) Working Stock &
iv) Labour force.

While living stock of manpower of a category refers to all such persons in that category who are living at that points of time under references, the terms working age of stock of manpower is defined as the total number of persons to a working age group which in Indian context is 15-59 years. The working stock of workers of a given category of manpower comprises of all such persons who are actually working at that points of time under references. The stock of manpower based on 'Labour force' concept comprises the working stock and the unemployed who are seeking or available for work. The stock of manpower under 'Labour Force Concept' is also termed as 'economically active' stock of manpower.

The living stock of engineers and diploma holders are worked out using the same proportion as revealed by 1981 census, thus the living stock works out as under :-

Table - 7

Estimates of living stock of engineers 1981, 1985, 1990 and 1995 and 2000 in Maharashtra.

Category	1981	1985	1990	1995	2000
1. Degree	73,403	88,355	1,10,444	1,38,055	1,72,569
2. Diploma	95,955	1,13,939	1,42,424	1,78,030	2,22,538
Total :-	1,69,358	2,02,294	2,52,868	3,16,085	3,95,107

Table - 8

Estimates of stock of Engineers in working age group (below 60 years) by 1981, 1985, 1990 & 1995, 2000 in Maharashtra.

Category	1981	1985	1990	1995	2000
1. Degree	63,419	74,720	93,400	1,16,750	1,45,938
2. Diploma	80,050	95,404	1,19,255	1,49,069	1,86,336
Total :-	1,43,469	1,70,124	2,12,655	2,65,819	3,32,274

Table - 9

Estimates of Stock of Economically Active Engineers by 1981, 1985, 1990, 1995 & 2000 in Maharashtra.

Category	1981	1985	1990	1995	2000
1. Degree	55,182	64,983	81,229	1,01,536	1,26,920
2. Diploma	69,654	82,977	1,03,721	1,29,651	1,62,064
Total :-	1,24,836	1,47,960	1,84,950	2,31,187	2,88,984

While working out 'Economically Active Engineers' a uniform labour force participation rate of 87% as used by expert committee is used. It is also revealed that there are variations in estimated number of Engineers in 1st method and alternative method due to conceptual difference.

The estimated number of unemployed can be worked out after knowing the absorption rates of engineering personnel in different sectors of Economy. For this purpose students follow-up study has undertaken for 1984 and 1988 batch of students passed out during those years. On processing and analysing the data, a seperate paper would be prepared in due course. The above sets of figures give optimum and minimal number of Engineers at different points of time. The above estimates would be refined after knowing the absorption rates giving break up of employed and unemployed engineering persons. Also actual outturn for each discipline will be taken into account as the growth rate of outturn may differ from assumed growth rates as present estimation.

RELATIONSHIP BETWEEN MANPOWER ESTIMATES AND EDUCATIONAL OUTTURNS

On critical examination of outturn results, it is observed that some disciplines have a high output rate , like Civil, Electronics and Pharmacy, if this situation is continued, then there is an apprehension of large scale unemployment amongst these students which will lead to frustration. So it is worth while to study the relationship between manpower estimates in terms of Educational qualifications i.e. net additional manpower and educational outturn. Educational outturn of a certain year can be related to the net additional manpower for that year from the following equation.

Equation :

Educational outturn - non labour force component net out migration + backlog of unemployment = Net additional manpower + replacement needs + likely shortage.

Three renowned economists and manpower experts Mr.Burgess, Mr.Layard and Late Pant established a relationship between manpower demand and educational outturn by going through the following three steps.

1) Manpower estimates were deflated to allow non labour force participation.
2) Having obtained the total stock for two different years, the annual growth rate of stock was worked out i.e. to estimate net additional manpower from total demand.
3) The annual educational output needed to produce required stock was then calculated by means of the following formula

$$P = S\ (r+w)$$

where

P = Educational output in a given year.

S = Total stock in that year.

r = Rate of growth of stock in that year.

w = Rate of attrition due to death for that year which is generally assumed to be one percent per year in case of Diploma holders and 0.8% in case of degree holders.

It may be remarked that S r represents net addition to the stock during that year under consideration, while S w represents replacement needs. No allowance is made for non educational component; similarly, adjustments for migration and the backlog of unemployment and shortages was not specifically made in the study by them.

RELATIONSHIP BETWEEN OUTTURN AND ENROLMENT

Following three factors are required to be considered in this relationship.

1) Duration of the course.
2) Stagnation
3) Dropout.

An hypothetical illustration could be given by considering a three years course for which stagnation and drop out rates may be assumed as under :-

a) 70% of the students admited to the first year of the course, complete the course in the three years.
b) 15% of the students complete in four years.
c) 5% of the students complete in five years.
d) 10% of the students admited to the first year of the course drop out without completing it.

Problem :-

What should be the intake in 1987 so that we can have out turn of 3,500 in 1990. Denoling outturn by 0, and intake by X the following equation will provide the solutions.

0 (1990) = X (1987) 0.7 + X (1986) 0.15 + X (1985) 0.05

As this exercise is carried out in the year 1987, the intake figure for 1985 and 1986 should be know. Suppose they are 3,000 and 3,500 respectively.

Then by substituting these values and solving the equations, we should get intake in 1987 which comes to 4,040 for the required outturn of 3,500 in 1990.

Thus for desired outturn, one can control the intake by above method for concerned discipline.

Inferences which could be drawn by above study are in brief as under -

1. Since Maharashtra is having largest number of institutions as well as stock of Engineers, it is imperative to keep close watch on demand and supply position.
2. The point is more valid in the background of new liberalised industrial policy of the Govt. of India. Impact of this policy will be visible in next 2/3 years.
3. The Administrators and Technical Educational planners will get deeper insight of the problem so that they can mould their policy in a desired manner.

REFERENCES

1. Census of India 1981.
2. Study carried out by Department of Science & Technology Govt. Of India.
3. NTMIS Study.

* * * * *