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**ANALYSIS AND INTERPRETATION OF FACTORS INFLUENCING FERTILITY & MEASURES TO CHANGE THE OCCUPATIONAL PATTERN IN INDIA**

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**ABSTRACT**

India's present demographic dilemma might not be what it is today, were it not for the relatively backward position which the majority of Indian women occupy in the social economy. Such social attitudes and institutions as early marriage have a very definite impact on population Growth. Besides early marriage, the universality of marriages, the unsuspecting nature of the infertility and the unwanted barriers of women, the desire for male children the social ban on widow remarriage, the lack of economic independence for single women, want of Prolonged Education, training and professional careers for women in general, the unhappy plight of widows, divorced and separated woman all have a direct effect on family size and population growth. "It is obvious that the emancipation of women in political, legal, social and particularly economic sense can basically alter the magnitude of India's population Problem".

**Key Word:** Fertility, Occupational Pattern, Economic Status

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It denotes the Physiological capacity to conceive and bear children. The proportion of all women who are fecund or infused is not known with any precision. In some societies where practically all women are married and while there is a strong pressure to have a children it has been found that as few as 1 or 2 percent of these married have born children after several years of Married life. "The full effect of fecundity would be realized if (if) all the females throughout their entire child bearing period has sexual intercourse with procreative men and did nothing to prevent conception and produce abortion".

"Fertility, on the other hand, refers to the actual reproductive performance – whether applied to an individual or a group."

In all the countries, in fact, in almost any conceivable human circumstances, there must be a gap between fecundity and fertility. The Indian fecundity is low lies mean that a smaller number of children in proportion to the total population is born in India every year for this is notoriously construe, but that other things being equal, an Indian women during reproductive period is capable of producing a small number of children than, say, an English lady.

The upper limit of fertility is determined by fecundity, it would be reached if all females gave birth to as many children as they possibly could. The lower limit is zero. It would be reached, if a general birth strikes were 100 percent successful. "In no other country of the world there is an exact equation between fecundity and fertility although in India there is a much higher degree of approximation than in the west. The upper limit, according to Kuczynski." Are 65 and actually it has seldom exceeded 55.

Civilized man has excessive fecundity and abundant fertility, which is constantly underestimated. "The fecundity of man is at least twelve hundred times as great as in needed to keep up population of women, it is at least four times as great as is needed."

## FACTORS AFFECTING FERTILITY

(1) Education and fertility:- The role of education in the determination of the patterns of population can be viewed in many ways. The effect of the school system increases aspirations and broaden the horizon which is bound to affect the attitude of the size of the family. Alternatively the importance of educational qualifications as a screening device for job selection allows us to classify people according to economic status i.e. higher the education, higher will be the economic status, and thus lower the fertility. Higher education enables the funds to seek employment which may act as a base in increasing the size of family. Education makes her aware about the meaning of living and purpose of life. It inculcates a habit of reading and enables, the people to develop other hobbies. Thus recreational avenues increase. People become more responsible to themselves and towards the society. This consciousness towards happening and events inspires them to play an active role in shaping the society. The values of liberty and urge for maintaining social status force the people to shift this centre of activity from family to community thus increase their vertical as well as horizontal immobility. This social interaction of the people is bond to influence this family size.

### (i) EDUCATION AND FERTILITY

The role of education in the determination of the patterns of fertility can be viewed in many ways. The effects of the school system increase aspirations and broaden the horizon which is bound to affect the attitude towards the size of the family. Alternatively the importance of educational qualification as a screening device for job selection allows us to classify people according to economic status, i.e., the higher the education, the higher the economic status and thus lower the fertility. Higher education enables the females to seek employment which may act as a barrier in increasing the size of the family. Education makes her to know the meaning of living and the purpose of life. It inculcates a habit of reading and enables the people to develop other hobbies, thus recreational avenues increase. People become more responsible to themselves and to the society. Their consciousness towards happenings and events inspires them to play an active role in shaping the society. The values of liberty and social status get recognition. The craze for liberty and urge for maintaining social status force the people to shift their centre of activity from family to community thus increases their vertical as well as horizontal mobility. This social interaction of the people is bound to influence their family size.

Demographers have often pleaded for an increase in the female age of marriage so that fertility may be reduced. Female education increases such 'mean-age at marriage'. Researches on fertility and migration have established an inverse relationship between the two. The migratory people used to have small family. Education increases such migratory tendencies. Sociologists propagate the individuation is inversely related to fertility and education makes a female more self-conscious.

## REVIEW OF LITERATURE

The relevant survey shows that women who have attended high school have significantly fewer children than those having less education. The Mysore Population Study revealed that in Bangalore City, the average number of children born to every married illiterate or educated up to middle school woman above the age of 45 was about 5.5, while that for woman with high school or college education was 3.9.

The National Sample Survey, conducted in urban areas revealed that the number of births to women with education up to the primary level only was of the order of 6.5%. Corresponding figures for women with middle and high school were 5.04 and 4.58 respectively. For women with university education it was as low as 2.01

Driver obtained the average number of children as 4.7 in case of uneducated husband, 4.5 for primary passed, 4.3 for middle passed, 3.9 for high school and 4.0 for college educated husband. The average for uneducated wives was 4.6, for primary school passed 4.7, and above primary educated it was 3.8.

Dutta, in a study of a sample of women from rural tracts of eight districts of West Bengal and Calcutta proper, classified rural couples into three groups: (i) both husband and wife literate; (ii) husband literates, wife illiterate; (iii) both husband and wife illiterate. He found that couples of high literacy had a higher average number of children born and surviving, and considers it due to higher living standard.

In Greater Bombay, it was found that the average number of children ever born were 3.41 for those who were either illiterate or literate without formal education; 3.01 for those who had education from primary up to matriculation; and 1.95 for those who had education above matriculation from the above account one may very safely include that formal education is ordinarily associates with low fertility.

### (ii) RURAL URBAN RESIDENCE AND FERTILITY

The urban population is less fertile than rural and the reproductive pattern varies inversely with the size of the city is a fact most widely observed in all over the world.

### (iii) RELIGION AND FERTILITY

Studies on differential fertility with reference to religion showed that the Muslims in India has a higher fertility than non-Muslims. Kingsley Davis calculated child-woman ratio from the census data for the Hindu and the Muslim females from 1981 – 1941 and found that the Hindu ration was lower than the Muslim throughout the period. Davis further observed that the number of children per 1000 married women indicating the level of marital fertility was also greater among Muslims (900) as compared to Hindus (817). In central India a Muslim woman was found to give birth to an average of 4.6 children as against 4.5 by an average Hindu woman, 4.9 by Buddhists and 4.1 by others. Patnaik found that Muslim fertility is higher at all levels of education than that of Hindu female. Results of his study are as under:

**Table : 1.1**

**Mean Fertility According to Religion and Education of Wife**

Religion	Education of Wife			
	Illiterate	Literate	Schooling	College
Hindu	4.95	3.42	3.07	2.77
Muslim	5.69	4.32	3.80	3.28

It may be observed that irrespective of the level of education of wife, the fertility among Hindu is less than that of Muslims.

N.S.S. survey (19<sup>th</sup> round, 1964 – 65) found that the Hindus and Muslims differ little so far as fertility is concerned. But the fertility of the Sikhs was substantially higher in both rural and urban areas. The total fertility rate for the Sikhs was 5.72 for rural and 5.83 for urban areas whereas the Hindu fertility rates were 5.45 and 5.14 for rural and urban areas respectively S.P. Jain study showed that the average number of children born per couple among Hindus in rural Punjab was 4.87, among Sikhs 4.78, among Muslims 5.12 and among Christians it was 5.58.

### (iv) MARRIAGE AGE AND FERTILITY

Marriage is the legal union of persons of opposite sex. The legality of the union may be established by civil, religious or other means as recognized by law of each country. In demography, it is not the formal ceremony

of marriage but the age of effective marriage (the marriage after which husband and wife live together) which is relevant.

The N.S.S. 17<sup>th</sup> round has shown that the average age of effective marriage increase steadily in the rural area from 15.62 years in 1921- 30 to 16.11 years in 1961 – 62. The 19<sup>th</sup> round of N.S.S. provides the % distribution of effective marriage age for the different communities classified by religion for both rural and urban areas.

**Table 1.2 : Age of Marriage by Religion**

Rural					Religion	Urban				
Effective marriage age (yrs)						Effective marriage age (yrs)				
0-15	15-19	20-24	25 +	Not recorded		0-15	15-19	20-24	25+	Not recorded
24.3	63.4	8.0	2.7	0.7	<b>Hindu</b>	20.6	61.8	14.1	2.9	0.6
29.8	58.0	7.9	3.2	1.1	<b>Muslim</b>	21.3	62.9	12.6	2.9	0.3
-	62.4	23.0	7.6	-	<b>Sikh</b>	5.2	55.78	38.3	0.7	-
-	79.0	16.8	1.4	-	<b>Christian</b>	5.1	61.0	22.8	11.1	-
24.1	63.2	9.1	2.8	0.8	<b>All</b>	19.9	61.7	14.6	3.3	0.5

**Source:** N.S.S. 19<sup>th</sup> round (1964 – 65)

In the above table, figures for Sikhs and Christians in rural areas do not sum upto to 100, probably due to a printing error. The table indicates that Sikhs and Christians have a late marriage pattern. Hindus and Muslim have an early marriage pattern. 15– 19 is the most likely age for female marriage among all religious communities in rural as well as in urban areas. Economic factors like income, occupation, the nature of employment etc. determine the attitude towards the size of the family and towards the use of various methods of family and towards the use of various methods of family planning. Poverty with its associated factors such as illiteracy, ill health, poor diet etc. keeps the birth rate high, whereas, the richness is associated with the lower fertility. Some of the leading economic factors and their role in determining the level of fertility is being examined below.

#### (v) OCCUPATION AND FERTILITY

Occupation is an important economic factor that influences fertility very much. Several studies have been conducted by the demography in this field, some leading research-findings are being given below:

Sovani in his Kolhapur Survey observed that the wives of agricultural labourers had an average 4.0 live births while small cultivators had 4.7 births and large cultivators had 5.1 live births.

Davis' in his study indicated that the average number of children ever born was 5.07 for agriculturists, 5.01 for menials, 4.99 for non-agriculturists and 4.82 for professionals in the rural areas of 25 districts.

Kutty observed that the average number of children was less among officials of higher ranks followed by semi-skilled and unskilled workers.

#### (vi) INCOME AND FERTILITY

Income is an important economic factor that determines the levels of fertility. Income influences fertility indirectly as it determines the socioeconomic status of the couple and that in turn determines fertility. Women of lower income groups tend to bear more children partly because more of their children die in infancy and so these women have shorter lactation and hence they conceive again and partly because they need more children to replace the lost ones, so they continue to bear children at later age too. At lower levels

of income, children are not the liabilities rather they are the assets. The parents spend a very little on their education or on medical care. Children start earning at an early age. To them more children means more hands to earn. So poor people do not see harm in increasing the size of the family. Many studies have confirmed this view. The 19<sup>th</sup> Round, of National Sample Survey (1964 – 65) established a negative association between expenditure and birth rate.

#### **(vii) FEMALE EMPLOYMENT AND FERTILITY**

The female employment has proved to be the most dominant factor that arrests the size of family, Patnaik in a study found that working female had 2.48 children where as non-working had 4.41. The lower fertility among working women may be attributed to several reasons: they may be more educated than non-working women; they are more exposed to communication and mass – media than non – working; they have lesser time for family rearing than others, they may have more means secrete on and finally may have their own social life and an Important style of living than that of the housewife.

#### **DEEP ROOTED VALUES-**

The gap between attitude and practice seems to be due to deep rooted values. Agricultural community has the view that children as a source of economic section and security in old-age, such values tend to change. Gradually and steadily. In a study of social change in three groups (Pre Industrial, Semi Industrial and Industrial, Mathew K.K. and Kesir e.v. (ed.) has supports that all the three groups were worried about education of children who wanted their children to have a bathe standard of living and security of employment than that of themselves. This is an encouraging trends Bethe understanding of these values and changes that take place, are really needed.

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#### **HYPOTHESIS**

1. Occupational pattern has no relation with fertility.
2. Economic status also determines the size of the family.

#### **ANALYSIS AND INTERPRETATION OF FACTORS INFLUENCING FERTILITY**

The purpose of the present investigation was to make a comparative study of fertility levels and family planning practices in urban, semi - urban and rural areas of Uttar Pradesh. The first independent variable, i.e. locale and its different levels as rural, semi- urban and urban. The second independent variable economic status (ES) and its various levels are high economic status. Moderate economic status and low economic status. The third independent variable i.e. educational and its various levels are illiterate, moderately literate (high school/intermediate) and highly literate (graduate and above), and the last independent variable is region and its two levels are rural and urban. The raw scores obtained from 810 females of 54 different groups are given in Appendix 'B'.

A 3x3x3x2 factorial design necessitates 54 cells. Hence, the sum scores of the individual's 54 cells were calculated. The sum scores of the individuals in each cell are given in Table 1.3:

**Table 1.3 Sum fertility scores of various groups**

		Rural	Semi-Urban	Urban	Total
Rural	Highly Economic Status	89	54	52	195
	Moderate Economic Status	96	59	58	213
	Low Economic Status	103	69	65	237
<b>Illiterate</b>					
	High Economic status	73	51	44	168
	Moderate Economic Status	85	59	51	195
	Low Economic status	91	69	55	215
Rural	High Economic Status	59	54	49	162
	Moderate Economic Status	76	58	56	190
	Low Economic Status	79	63	61	203
<b>Moderately Literate</b>					
Urban	High Economic status	56	55	45	156
	Moderate Economic status	76	59	55	190
	Low Economic status	88	65	58	211
Rural	High Economic status	66	54	46	166
	Moderate Economic status	71	58	54	183
	Low Economic Status	81	63	60	204
<b>Highly literate</b>					
Urban	High Economic status	67	44	43	154
	Moderate Economic Status	74	54	48	176
	Low Economic status	80	65	58	203
	<b>Total</b>	1410	1053	958	3421

**ANALYSIS AND INTERPRETATION OF DATA:**

In order to find out the significant effect of four independent variable i.e. locale, economic status, educational level and region on the dependent variable i.e. fertility level, the data given in Appendix B were analyzed by using four way analysis of variance techniques.

**EFFECTS OF LOCALE:**

A look at summary table of analysis of variance reveals that the F values for first independent variable, i.e., locale is 172.42 which is significance at .01 level of confidence CF: 2; 756 = 172.42 (.01). This leads us to conclude that locale is an influential factor in fertility level. Thus, the null hypothesis was rejected and our research hypothesis that there is a significance difference in the fertility level of the females coming from urban, semi-urban and rural areas was confirmed.

**Table: 1.4 Mean Fertility Score at Three Levels of Locale**

Local	Total Fertility	N	Mean
Rural	1410	20	5.22
Semi-Urban	1053	20	3.90
Urban	958	20	3.55
<b>Total</b>	<b>3421</b>	<b>810</b>	<b>12.67</b>

The mean square for factor locale correspond to a comparison between the mean for three locales, i.e., rural, semi urban and urban averaged over the three levels of economic status, three levels of educator and two

levels of region factor. The mean for the first level of locale, i.e., rural can be read from 5.3 and is equal to 5.22 the mean for the second level of locale, i.e., semi-urban can also be obtained.

## **MEASURES TO CHANGE THE OCCUPATIONAL PATTERN OF INDIA**

Read this article to learn about the Measures to Change the Occupational Pattern of India!

If an agricultural economy can be changed into industrial economy, the occupational pattern of India will be automatically changed.

### **1. POPULATION CONTROL:**

Rapid growth of population is the main problem faced by the Indian economy. According to 2001 census, the active labour force has been estimated to be around 40 crore out of this, two thirds joined the rank of rural labour. Lack of alternative employment facility has compelled them to work in agriculture.

This leads to overcrowding in agriculture. As a result the problem of decreasing the proportion of population dependent on agriculture has become relatively difficult. So we have to keep the population growth rate within one percent and take the following steps to change the occupational pattern in our country.

### **2. RAPID INDUSTRIALISATION:**

The process of industrialisation is slow in India. This is the main cause for the traditional nature of our occupational pattern. Deficiency of capital and other complementary resources are the main obstacles in the path of rapid industrialisation. Therefore accelerating the process of industrialisation through rapid capital accumulation is the need of hour. This will divert surplus labour from agriculture resulting in the change of our occupational pattern.

### **3. DEVELOPMENT OF SMALL SCALE AND COTTAGE INDUSTRIES:**

India is a labour surplus country. To increase the rate of labour employment per unit of capital, we have to give emphasis on small scale and cottage industries. These industries are based on labour intensive techniques of production. According to one estimate Rs. 70,000 worth of investment is necessary to create one unit of labour employment in heavy industries while Rs. 10,000 investment is required to employ one labour in small scale industries.

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This shows that the employment potential of small scale industries is seven times more than that of heavy industries. Here we are not underestimating the importance of heavy industries. But many consumer goods which can be produced by small industries should not be produced by the heavy industries. In rural and semi urban areas these industries can be complementary to agriculture and allied activities and will help in changing the occupational pattern of the country.

### **4. APPROPRIATE PRODUCTION TECHNIQUE:**

#### **GENERALLY, THERE ARE TWO MAIN TYPES OF PRODUCTION TECHNIQUE:**

(a) Labour intensive technique

#### **ADVERTISEMENTS:**

(b) Capital intensive technique.

In India, the process of industrialisation started from second plan gave importance to heavy industries based on capital intensive technique. This failed to generate adequate employment in the industrial sector. As a result surplus labour could not be withdrawn from agriculture to be employed in industries.

In overpopulated and underdeveloped country like India, the economists have tried to develop an appropriate production technique as a compromise between the above two techniques. This technique is not expensive like capital-intensive technique nor it is traditional like the labour intensive technique. It makes maximum

utilisation of labour and helps in economic development. This technique has vast scope in a labour surplus country like India. So adoption of this technique will go a long way in changing the occupational structure of our country.

#### **5. EXTENSION OF NON-FARM EMPLOYMENT:**

Creation and extension of non farm employment opportunities in rural areas will relieve pressure from agriculture. For this purpose, agro industries, small scale and cottage industries should be set up in rural areas. Efforts should be made to build rural infrastructure. This will help in changing the occupational structure of the country.

#### **6. MAN POWER PLANNING:**

Man power planning should be integrated with economic planning. The vast supply of unskilled and illiterate labourers and village artisans are still outside the main strata of economic planning in our country. Since India is a vast and diverse country. We need a regional approach to human resource management. By formulating a separate plan for each region, we have to integrate it with the national plan. This will help in changing the occupation pattern of our country.

#### **7. MODERNISATION OF AGRICULTURE:**

Indian economy is mainly agricultural. But it still shows the symptoms of traditional agriculture. To withdraw surplus labour, institutional reforms are necessary in agriculture. Consolidation of holdings and introduction of modern techniques of cultivation etc. will divert surplus labour from the agricultural to non-agricultural sector (June 2004) During the last two decades, agricultural expansion, logging, development, and other human activities caused the deforestation of more than 120,000 square kilometers each year. In contrast, an area only one-tenth that size was regained due to reforestation efforts and natural re-growth.<sup>1</sup>This is the continuation of an historical process that has left the world with less than half of its original forests. While population growth and density are unquestionably related to forest cover trends, there is no simple way to describe or predict that association. Not surprisingly, the relationship is as complex as the regional and cultural variations in human societies and the changes in those societies over time.

#### **CONCLUSION:**

A questionnaire having close type questions regarding the family planning practice was administered on the female of the study and following results were obtained in this regard.

1. It was found that highest percentage of females (87.41 %) have used and only 12.59% females have never used in the past one or the other family planning method. This trend of High percentage of females who have used family planning method in the past, is found consistently high, irrespective of rural-urban, economic status, educational level.
2. Analysis of responses in regard to question “ are you using family planning method now a days’ has revealed that the only 50.98 percent females marked on “Yes” that they are using while 49.02 % females marked on “No” that they are not using males on locale, economic status, educational level and rural-urban region have demonstrated that highly literate females of high economic status living in urban area of urban region are using family planning method in higher percentage that the other combinations.
3. Analysis of item released to source of knowledge about family planning has revealed that highest percentage of females get information from neighbor and friends. The second best source of knowledge, was found to be close relative. This holds true in all categories of females.
4. Analysis is responses found to sources of obtaining the family planning materials has demonstrated that highest percentage of females irrespective of local, economic status, educational level and region

variations have reported husband as a source who brings family planning materials. Another not able fact which has emerged from the analysis is that females irrespective of variations in educational level and economic status still hesitate in purchasing family planning materials.

5. Analysis of item related family planning method use first time has brought out the fact that highest percentage of females, irrespective of locale, economic status, educational level and region variations have reported the use of condom followed by oral pills as the second highest.
6. Analysis of responses related to the question of family planning method being used now a days has revealed the fact that highest percentage of females irrespective of locale, economic status, educational level and region variation have reported that they are using now a days condom as family planning method. The second most popular method being used currently for family planning is oral pills by all categories of women.
7. Analysis of responses of females obtained with regard to be in favour or not be in favour of family planning, has shown that the highest percentage of females irrespective of other variations like locale, educational level, economic status and rural-urban region are in favour of family planning. However, highly literate females of high economic status living in urban areas are more in favour than other group of women.

### REFERENCES

1. Food and Agriculture Organization (FAO), The Global Forest Assessment 2000 (Rome: Food and Agriculture Organization, Committee on Forestry, 2000).
2. Thomas K. Rudel, Kevin Fleisher, Diana Bates, Sandra Baptista, and Peter Holmgren, "Tropical Deforestation Literature: Geographical and Historical Patterns," *Unasylva* 203, Vol. 51 (2000): 11-18; Alexander S. Pfaff, "What drives deforestation in the Brazilian Amazon?" *Journal of Economics and Management* 37 (1999): 26-43.
3. FAO, The Global Forest Assessment 2000.
4. Phillip M. Fearnside, "Human Carrying Capacity Estimation in Brazilian Amazonia as the Basis for Sustainable Development," *Environmental Conservation* 24 (1997): 271-82; and Frederick A.B. Meyerson, "Human Population Density, Deforestation and Protected Areas Management: A Multi-scale Analysis of Central America, Guatemala, and the Maya Biosphere Reserve, Proceedings of the International Union for the Scientific Study of Population, XXIV General Population Conference (Salvador, Brazil, 2001).
5. C.H. Wood and David L. Skole, "Linking satellite, census, and survey data to study deforestation in the Brazilian Amazon," in *People and Pixels*, ed. D. Liverman et al. (Washington, DC: National Academies Press, 1998).
6. Suzi Kerr, Alexander S. Pfaff, and Arturo Sanchez, "Development and Deforestation: Evidence From Costa Rica (unpublished paper, 2003).
7. Frederick A.B. Meyerson, "Population, Biodiversity and Changing Climate," *Advances in Applied Biodiversity Science* 4 (2003), Chapter 11 (2003): 83-90.
8. FAO, The Global Forest Assessment 2000.
9. Andrew D. Foster and Mark R. Rosenzweig, "Economic Growth and the Rise of Forests," *The Quarterly Journal of Economics* (May 2003): 601-637.
10. A. Balmford et al., "Conservation Conflicts Across Africa," *Science* 291 (2001): 2616-19.
11. Richard P. Cincotta, Jennifer Wisniewski, and Robert Engelman, "Human Population in the Biodiversity Hotspots," *Nature* 404 (2000): 990-92.
12. P.A. David and M.W. Reder (New York: Academic Press, 1974); see also R.A. Easterlin, L. Angelescu McVey, M. Switek, et al., "The Happiness-Income Paradox Revisited," *Proceedings of the National Academy of Sciences* 107 (2010): 22463-68.
13. See N. Stern, *The Economics of Climate Change: The Stern Review* (New York: Cambridge University Press, 2007).
14. See F. Schneider, G. Kallis, and J. Martinez-Alier, "Crisis or Opportunity? Economic Degrowth for Social Equity," *Journal of Cleaner Production* 18 (2010): 511-18.
15. T. Barker and P. Ekins, "The Costs of Kyoto for the U.S. Economy," *Energy Journal* 25 (2004): 53-71.
16. Intergovernmental Panel on Climate Change (IPCC), *Climate Change 2007: Mitigation of Climate Change* (New York: Cambridge University Press, 2007).
17. J. Creyts, A. Derkach, S. Nyquist, et al., "Reducing U.S. Greenhouse Gas Emissions: How Much and at What Cost? U.S. Greenhouse Gas Abatement Mapping Initiative," executive report (New York: McKinsey and Company, 2007).
18. See J. Broome, "The Ethics of Climate Change," *Scientific American* 298 (2008): 97-102.