Living in Guwahati: An Environmental Perspective

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Abstract

The quality of environment plays an important role in determining human well-being because there is a link between ecosystem change and human well-being. The direct and indirect services provided by the ecosystem have implication for life quality and vice versa. It has been found that citizen having better environmental amenities enjoy better life in comparison to those who have been suffering from high levels of atmospheric pollution, environmental disasters and traffic congestion. Differences in environmental qualities over space and such differences in environmental qualities or amenities have differential effects on quality of life. Mainly, the city dwellers in developing countries suffer from inadequacy of basic amenities of urban life like water supply, traffic facilities, clean air, open space, scientific waste disposal method and proper sanitation system. Therefore, it is necessary to address these issues because they have potential to create disorder in life to a great extent. The main objective of this paper is to study the environmental problems in the city of Guwahati with the help of a case study.

Living in Guwahati: an environmental perspective

Introduction

The quality of environment plays an important role in determining human well-being. To explain how environment and human well-being are interlinked Alcamo et al. (2003) has provided a four-year international work programme designed to meet the need of decision- makers for scientific information on the links between ecosystem change and human well-being. This report tries to show that ecosystem influences the level of well-being by various types of functions. The direct and indirect services provided by the ecosystem have implication for quality of life and vice versa. For most animals livability is largely an ecological matter, for the human species societal qualities are involved as well. The livability of one's society is the degree to which collective provisions and demands fit with individual needs and capacities (Veenhoven et al., 1995). Livability-theory is closely connected to the idea that there are universal human needs. It sees human societies as collective arrangements to gratify these needs, and assumes that societies can be more or less effective in that respect. Without taking into consideration the aspect of environmental well being the extent of human development is not complete. Therefore, it has been proposed that element of environment has to be included somehow to have better idea about human well being (Dasgupta, 1999; Neumayer, 2001 and Sagar et al., 1998).

There are plenty of studies which show that environmental quality affects life. Parikh (2004) establishes link between the impacts of air pollution on human health. Besides air pollution, the problem of waste is one of the major challenges which become intense with urbanization and changing lifestyle especially in developing countries. The problem of

solid waste has direct bearing on quality of life (Baud et al. 2001; Anand, 1999; Murad, 2007 and Afroz et al. 2009). Especially for India solid waste is a major problem (Dahiya, 2003). Similar case study has been conducted in ten European countries (Welsch, 2006a and Welsch, 2006b). It has been found that citizen having better environmental amenities enjoy better quality of life in comparison to those who have been suffering from high levels of atmospheric pollution, environmental disasters and traffic congestion (Smyth et al., 2008 and MacKerron 2008). These studies clearly show that there are differences in environmental qualities over space and such differences in environmental qualities or amenities have differential effects on quality of life.

The problem

The process of urbanization in Assam was initiated with shifting of the capital of Assam from Shillong to Guwahati in 1972. Guwahati is the main urban centre in the entire north eastern part of India. Since then Guwahati has been experiencing both horizontal and vertical growth. Guwahati has experienced tremendous growth of population over the last two decades. The population of Guwahati has increased from 1,23,785 persons in 1971 to 8,18,809 persons in 2001. Such exponential increases in population and unplanned growth of settlements over the years have created enormous pressure on existing land and infrastructural facilities. The rapid expansion of the city has led to haphazard growth of buildings on plains and on the hills. Such growth of buildings and houses has destroyed the natural water bodies often leading to water logging. Another major problem in the city is congestion of traffic. There is dearth of open space for citizen and decline in greenery in and around the city. As a result of increase in trade & commerce activities along with growth of vehicular population and rapid urbanization, level of pollution has also increased in Guwahati (PCBA, 2007). Slums have grown up in and around the city. Increase in solid wastes is another major problem in Guwahati. Besides all these, lack of adequate urban services such as water supply, sanitation, sewerage, lighting and transport are some major problems along with deficient recreational and welfare facilities in the city. The incommensurability between urbanization and development process has led to an uneven distribution of population and concentration of different kinds of activities. Such high increase in population coupled with inequitable growth of amenity and

infrastructural facilities in the city have resulted in congestion, over crowding and conflicting demand for space and utility services. Such dilapidated environmental condition undermines life quality (Ng, 2005). Therefore, this study has been conducted on quality of life in urban environment in Guwahati.

Objectives

This paper aims to study the environmental problems in Guwahati with the help of a case study. Moreover, the study will also explore the underlying dimensions of life in Guwahati. In pursuing this objective the article contributes in understanding living condition in Guwahati. These two objectives may help to find the important dimensions of environment that have to be taken care of while implementing policy decisions for improving living condition.

Methodology

In this study environment has been considered in a broader sense comprising physical, economic and social attributes of urban areas. These three types of environments coexist in a city, each of them explaining in part or in combination the existence and continuity of a city. They deeply interact with each other and generate advantages and disadvantages for the city. Therefore, they have to be considered together (Camagni et al., 1998). The attributes of environment have been selected in the context of the environment of Guwahati. To collect primary information, sample survey has been conducted in Guwahati city at household level. The period of the study is from April 2006 to October 2006. The study has been conducted in area under the jurisdiction of the Guwahati Municipal Corporation (GMC) which comprises 60 wards. Two stage sampling has been applied for collecting primary information. In the first stage 10 percent of the total wards i.e. 6 wards have been selected purposively to represent heterogeneity of the city and they are ward no: 18, 34, 29, 31, 13 and 42. In the second stage, after selection of wards to represent traditional, commercial and newly established residential areas, emphasis has been given on selecting some localities on the basis of observation and available secondary information to represent different income groups in each of the six wards. Then households have been randomly selected. In most of the cases, household head has

been interviewed. But in absence of the family head any other available adult member has been interviewed. The number of households surveyed is 379. While sampling, emphasis has been given on picking up houses which are not close to each other in a locality. The required information has been collected with the help of a structured questionnaire.

Results and discussion

It has been found that about 85.6 percent of the household heads are male and 14.4 percent are female. Male-headed household is a common feature in most of the Indian societies except for a small number of regions only. Majority of the households, i.e. 36.7 percent are found to have 4 members in the family where as 27.8 percent are having 3 members, 10.2 percent are having 2 members, and rest of the families i.e. 25.3 percent are having 5 members or more. This clearly shows that most of the families in the city are nucleus in nature.

Table 1: Demographic information

Sex of the head of the household	**Percentage**	**Age group**	**Percentage**
Male	85.6	20-30	5.6
Female	14.4	31-40	32.5
		41-50	26.4
		51 and above	36.5
Number of family members	**Percentage**	**Education**	**Percentage**
2	10.2	Up to primary	16.9
3	27.8	Up to HSLC	10.0
4	36.7	Up to Degree	27.5
5 or more	25.3	Above Degree	45.6
Number of children below 10 years	**Percentage**	**Employment**	**Percentage**
No children below this age	49.4	Does nothing/housewife	7.2
1	41.7	Self employed in manual work	11.7
2	7.2	Retired	8.6
3	1.1	Business	25.6
Four or more	0.6	Service	46.9

Source: field work

Majority of the respondents i.e., 35.6 percent are more than 50 years old. But equally large number of respondents i.e. 32.5 percent belongs to the age group 31-40 years. 5.6 percent of the respondents are in the age group 20-30 years and 26.4 percent of the respondents belonged to the age group 41-50 years. In the survey none of the respondents

has been found to be illiterate where as 45.6 percent are graduate or more. 16.9 percent of the respondents have studied up to primary level, 10 percent has studied up to matriculation and 27.5 percent is under graduate. The high percentage of educated persons in the survey is due to the fact that the literacy rate in Guwahati is higher at 77 percent (Govt. of Assam, 2006) compared to India average and major occupation is service. So, higher percentage of highly qualified people does not mean that the sample size is not representative of the population. After having idea about some selected demographic features a frequency table has been prepared to see the percentage of respondents reporting different attributes of physical economic and social environment.

Table 2: Distribution of respondents: attributes of residential area

Ownership and type of houses	**Percentage**	**Sanitation**	**Percentage**
Rented *katcha* house	7.8	No toilet	0.6
Own *katcha* house	10.3	Pit	9.2
Rented *pucca* house	30.8	Toilet with a tank of ring	12.8
Own flat	4.7	Toilet with a common septic	11.1
Own independent house	46.4	Individual family septic	66.3
Source of water	**Percentage**	**Respondent affected by noise**	**Percentage**
Inside well	57.2	Industrial noise	3.9
Out side water supply	21.1	Vehicular noise	39.2
Outside well	5.0	Loudspeaker noise	1.4
Inside water supply	15.6	Neighbour's noise	2.2
Others	1.1	No noise	53.3
Water supply duration	**Percentage**	**Air quality**	**Percentage**
Not even once a week	1.7	More than one problem with air	3.9
Every alternate day	0.8	Ash & smoke	4.7
Once a day	32.8	Dust in air	34.2
Twice a day	3.6	Foul smell	4.7
24 hours	61.1	No air problem	52.5
Water cleanliness	**Percentage**	**Air effect**	**Percentage**
No such problem	57.8	Increased breathing problem	15.0
Not clear	13.3	Watering eye	7.5
Colour and odor	22.8	Reduced visibility	12.5
Pipe leakage	3.3	Increased cost of cleanliness	9.4
Combination of problems	2.8	No problem with air	55.6
Drainage system	**Percentage**	**Solid waste disposal system**	**Percentage**
Pucca drains	56.2	Streets and open space	8.9
Katcha drain	31.1	Irregularly cleaned bin	25.0
Pit	8.6	Backyard or burn	32.2
Drains stinks	1.9	Private agency	2.5
Stinking pits	2.2	Regularly cleaned bin	31.4

Source: Field work

Table 2 shows that a large number of respondents live in rented house and it reveals the fact that there is rise in demand for houses. It has been found that 42.8 percent of the

respondents use supplied water and the rests have indigenously built water supply facilities like tube well or well inside the premises. Those who are using supply water reports that only 3.6 percent gets water twice a day. Others i.e. 35.3 percent are having very erratic supply of water. Regarding water quality, 42.2 percent of the respondents report some or other kind of problems like leakages in the pipes, colour, odor, unclear water and combination of problems. The survey shows that both drainage and solid waste disposal systems are not efficient in the city. Almost half of the respondents have reported to suffer from noise and water pollution. It has been found that the society is characterized by low level of interaction. It is clear from the fact that 53.1 percent respondents have limited interaction covering only five to ten families and the remaining 46.9 percent interact with extended number of families in the neighbourhood.

The questionnaire also includes questions on household wastes system and drainage system in the campus. From the secondary data it has been found that 37.32 percent of the respondents do not have any drainage system (Govt. of India, 2001a). But Table 2 reveals that about 10.8 percent of the respondents are without any drainage system either *pucca* or *katcha*. They use pit which often smells bad. In the city 31.1 percent respondents are using *katcha* drain and 56.2 percent are using *pucca* drain. For disposing solid waste people use different means like throwing in the lane or backyard, dustbins, etc. Of course, some people have been using services provided by private agencies for collecting wastes. Only 31.4 percent respondents are using regularly cleaned bin in their locality. 8.9 percent of the respondents have the habit of throwing household wastes in the streets. The percentage of respondents who reports irregularly cleaned bin is 25. People who throw garbage in the backyard and burn when garbage piles up are 32.2 percent. The statistics reveals that the number of respondents who are not using dustbin at all is even greater.

From secondary information it has been found that 81.61 percent of the residents are having septic tank in their household in Guwahati (Govt. of Assam, 2006). Against this, it has been found from the survey that respondents having septic tank are 66.3 percent which is much lower. Respondents using pit toilet is 9.2 percent, 11.1 percent are sharing

common toilet and less than one percent do not have any kind of toilet. It has been also found that respondents using toilet with tank of ring is 12.8 percent. Using such tanks is not a healthy practice because the sewage often contaminates the ground water flow especially in the monsoon. The percentage of respondents who are affected by water logging is 38.9. It shows that although it is a severe problem, majority of them reports no such problem. It might happen because of non occurrence of water logging problem during the survey period. Due to increase in number of vehicles, 39.2 percent of the respondents have reported to be affected by noise. Noise from industries affects 3.6 percent, loudspeaker noise affects 1.4 percent and 53.3 percent of the respondents have reported that they are not affected by any kind of noise.

It has been reported that 48 percent of the respondents are affected by air problem. The major problem is dust pollution which affects 34.8 percent of the respondents. 4.7 percent of the respondents are affected by ash and smoke in the air, 4.7 percent are affected by foul smell and 3.9 percent are affected by combination of problems. At the same time, it has been reported that such dust pollution causes increased breathing problem to 15 percent and problem of reduced visibility to 12.5 percent. Respondents who have complained of increased cost of cleanliness are 9.4 percent and 7.5 percent of the respondents have been suffering from watering eyes.

Table 3: Distribution of respondents: financial condition

Monthly income of family	**Percentage**	**Use of credit by family**	**Percentage**
2000 or less	5.8	Do not use credit	68.9
2001 to 5000	13.9	Loan to maintain health cost	2.2
5001 to 10,000	29.2	Housing loan	13.6
10,001 to 15,000	22.8	For consumers durable	13.1
15,001 and above	28.3	Others	2.2
Additional Income of family	**Percentage**	**Consumer durable goods in household**	**Percentage**
No additional income	70.6	Nothing	10.0
Others	3.5	1 - 3 items	10.0
Subsidiary business	3.1	4 - 5 items	18.6
Part time job	2.8	Six items	52.5
Permanent asset	20.0	All goods	8.9
Saving of family	**Percentage**	**Income security at least for 45 days**	**Percentage**

No formal saving	20.0	No	25.0
Society saving	1.1	Borrowing	0.6
Insurance policy	2.5	Helps from relatives	5.2
Bank deposit	25.3	Past saving	57.5
Bank deposit and insurance	51.1	Permanent asset	11.7

Source: Field work

A brief idea has been given about economic condition of the family in Table 3. When the respondents have been asked about saving habit, it has been found that 80 percent have savings either in the form of society saving, insurance policy, bank deposits or in combination. At the same time 20 percent respondents do not have any kind of formal saving. Along with saving habit, it is also important to know the extent of loan burden to assess the economic status of the family. The survey reveals that 31.1 percent of the respondents have loan burden. Mostly they borrow for construction of house (13.6 percent) and to buy consumer's durables (13.1 percent). Respondents also borrow for health expenses (4.4 percent) and a meager 2.2 percent takes loan for any other purposes including family function or so. When they have been asked about income security for at least 45 days, 57.5 percent respondents have reported that there is no insecurity during the period owing to adequate past savings. At the same time 11.7 percent has reported that permanent asset can help them in absence of income during that period. It has been found that 20 percent respondents possess permanent asset which generates additional income but it is adequate to meet unforeseen situation only in case of 11.7 percent. A marginal 5.2 percent have answered that they would take help from relatives and 0.6 percent would go for borrowing. This clearly reflects that credit is not so easily available in emergency which is a common characteristic in the society of developing countries. There is no income security for 25 percent of the respondents. Respondents have been asked about the possession of six minimum necessary consumer durable goods but a moderate 52.5 percent have access to all of them. The scenario depicted above clearly bears all the economic character of a society of a developing country.

A healthy society is represented by healthy respondents. Therefore, to have an idea about condition of health respondents have been asked how many times he or she had visited doctors in the last few months. Besides, frequency of visit to doctor gives an idea about

severity of the problems. Table 4 reveals that 2.8 percent have visited doctors more than two times in a month, 3.1 percent twice a month, 14.1 percent once a month, 26.9 once or twice in the last three months and the remaining 53.1 percent have not visited doctor in the last three months. Regarding the level of interaction, it has been found that the society is characterized by low level of interaction. It is clear from the fact that 53.1 percent respondents have limited interaction covering only five to ten families and the remaining 46.9 percent interact with extended number of families in the neighbourhood.

Table 4. Distribution of respondents: societal condition

No. of times respondent visits doctor	**Percentage**	**Availability of open space within 1 Km**	**Percentage**
More than 2 times a month	2.8	No open space	42.5
Twice a month	3.1	Private open space	12.8
Once a month	14.1	Public open space	8.3
Once of twice in the last three months	26.9	Playground	11.7
Never visit doctor in last 3 months	53.1	Park	24.7
Interaction with neighbours	**Percentage**	**Availability of shops**	**Percentage**
No interaction at all	1.9	No shop at all	4.4
Hardly 1family	4.3	Any one kind of shop	4.4
3 - 4 families	6.9	Any two types of shops	6.7
5 - 10 families	40.0	Any three types of shops	17.8
All most all families	46.9	All kinds of shops	66.7
Involvement with society	**Percentage**	**Frequently done leisure activity**	**Percentage**
No such involvement	7.5	Nothing specific/just stay at home	20.0
Cultural event	37.5	Watch TV/radio/music	6.1
Only club	12.8	Gardening	2.5
Social service only	21.4	Go to sports/club/cinema/theatre	11.7
Club and social activity	20.8	Go to parks/visit people	59.7
Insecurity at home	**Percentage**	**Efficiency of transport system**	**Percentage**
No insecurity	66.7	Traffic problems	59.4
Robbery	8.9	Inefficiency of public transport system	3.3
Threat	6.9	Can't board in the bus for rush	2.8
Theft	15.0	You get delayed	1.9
Others	2.5	Reach destination on time	32.5
Visit to police station	**Percentage**	**Mode of travel**	**Percentage**
Never visited police station	91.1	Public transport at an interval of 10 minutes and above	5.8
Complaint was ignored	2.2		
FIR was lodge but nothing was done	1.7	Public transport at an interval of 5 - 10 minutes	19.2
Problem was solved by police	3.1	Public transport at an interval of 5minutes	31.1
Complain was against the	1.9	Walk	12.8

respondent's family		Own vehicle	31.1

Source: Field work

Respondents have reported that they participate in different kinds of activities in social life. Almost 37.5 percent take part in cultural events, 12.8 percent visits clubs, and 21.4 percent participate in social service. Some of them, i.e., 20.8 percent are involved with more than one activity where as 7.5 percent is not involved with any kind of activities. Regarding insecurity, it has been reported that 33.3 percent of the respondents have been suffering from some kind of insecurity like robbery, theft, threat and so on. Against this it has been found that 91.1 percent of the respondents have never visited police station.

The survey reveals that 42.5 percent respondents do not have access to open space. Only 24.7 percent have access to park and 21.1 percent have access to private or public vacant place which can not be called park. Only 11.7 percent have easy access to playground. But respondents are enjoying shopping facilities. Only 4.4 percent respondents did not have access to shops in neighbouring areas and the remaining respondents are having different kinds of shops in the neighbourhood. Respondents having access to all kinds of shops are 66.7 percent. In the survey, majority of the respondents i.e. 67.5 percent have reported traffic problem.

From the previous discussion it has been found that there are variations in these attributes from individual to individual. For better understanding of the situation, it is necessary to represent this diverse large number of variables by fewer new variables. That is, it is necessary to establish a pattern of variation among the variables for easy handing and interpretation. Therefore, the situation demands an investigation into the factors of environment which has influence in accounting for variation in living condiiton. This can be done with the help of factor analysis. The results have been shown in Table 5. Eigenvalue criterion gives 8 factors having eigen values greater than 1. The first factor alone explains 20.51 percent of total common variance.

First factor: The first factor comprises variables like number of consumer durable goods in the household, savings of the family, sanitation, income security at least for 45 days, monthly income, ownership of residence, frequently done leisure activity, drainage system and room per person. The first factor can be labeled as material condition of living which is inherent in financial condition of the family.

Table 5: Factor loading matrix for different dimensions of life

Factors / Variables	1	2	3	4	5	6	7	8
Consumer durable goods in household	.855							
Saving of family	.790							
Sanitation	.785							
Income security at least for 45 days	.749							
Monthly income of family	.711							
Ownership of residence	.699							
Frequently done leisure activity	.638							
Drainage system	.608							
Room per person	.590							
Air effect		.787						
Air quality		.763						
Respondent affected by noise		.707						
No. of times respondent visits doctor		.386						
Water supply duration			.879					
Source of water			.867					
Water cleanliness			.554					
Use of credit by family				-.595				
Involvement with society				.593				
Insecurity at home				-.566				
Visit to police station				-.561				
Additional Income of family				.517				
Availability of shops					.673			
Area affected by water logging					.667			
Mode of travel						.719		
Solid waste disposal system							.775	
Interaction with neighbours							-.578	
Availability of open space within 1 Km								.761
Efficiency of transport system								.634
Eigenvalues	5.74	2.37	2.02	1.59	1.47	1.19	1.12	1.10

Total Variance Explained	20.51	8.48	7.22	5.68	5.28	4.25	4.03	3.95

Source: Field work
Extraction Method: Principal Component Analysis
Rotation Method: Varimax with Kaiser Normalization.

Second factor: It is consisted of air effect, air quality and respondents affected by noise, and number of times respondents visit doctor. The third factor may be labeled as environmental quality representing pollution.

Third factor: The variables that have been found in this factor are water time, source of water and water cleanliness. The factor reflects on availability of clean water.

Fourth factor: The fourth factor comprises variables like use of credit, involvement with society, insecurity at home, visit to police station and additional income of the family. This factor represents to what extent the family is capable of facing socio economic challenges. It may be labeled as socio economic status.

Fifth factor: It consists of variables like availability of shops and area affected by water logging. This factor represents susceptibility to water logging problem. As the number of shops increases there is more congestion. The quantum of wastes generated increases which are mostly thrown in open drains. All these attributes increases the chance of having water logging problem.

Sixth factor: This factor represents mode of travel.

Seventh factor: The seventh factor comprises variables like solid waste disposal system and interaction with neighbours. Solid waste is a problem which can be solved at community level with cooperation of each other. It represents community participation in waste management.

Eighth factor: The eighth factor consists of availability of open space within 1 km and efficiency of transport system. This factor represents urban amenity services.

From a set of large number of variables relating to physical , economic and social environment factor analysis shows that financial condition of the family, pollution, availability of clean water, socio economic status, susceptibility to water logging problem, mode of travel, community participation in waste management and urban amenity services are the important dimensions of living in Guwahati. From the above findings following conclusions and recommendations have been suggested.

Conclusion and recommendation

The study shows that people have been suffering from different environmental problems like water supply, clean air, scientific waste disposal method and proper sanitation system. Economically, the society is characterized by the features of underdeveloped country. There is lack of open space, deficiency in transport system and lack of communication among different families in a locality. Such poor environmental condition of living has adverse effects on human well being. Because every individual's welfare depends not only on the individual's consumption of private goods and services produced by the government but also on the quantities and qualities each receives of non market goods and services from environment system like health, visual amenities and opportunities for outdoor recreation (Freeman, 1993). Therefore, while taking any policy emphasis should be given on improving economic scenario by facilitating investment as well as trade and commerce which will improve financial capability. At the same time measures should also be taken to provide basic urban amenities and to promote community participation to form a healthy service

References

1. Dahiya, B. (2003), "Peri-Urban Environments and Community Driven Development: Chennai, India", C*ities*, Vol. 20, pp. 341-352

2. Dasgupta, P. (1999), *"Valuation and Evaluation: Measuring the Quality of Life and Evaluation Policy*". Background Paper Prepared for the World Bank's Annual World Development Report, 2000, PDF Archive.

3. Freeman, A.M. (1993), *The Measurement of Environmental and Resource Values, Resource for the Future,* Washington D.C.

4. Govt. of Assam (2006), *City Development Plan, Urban* Development, Government of Assam. Available at www.jnnurm-nic.in/toolkit/CDP_ghy. Accessed on 29.9.07.

5. Govt. of India (2001a), *Census Report,* Tables on Houses, Household Amenities and Assets ,Govt of India
6. MacKerron,G. and S. Mourato (2008), "Life satisfaction and Air Quality in London", *Ecological Economics,* doi.:10.1016/j.ecolecon.2008.10.004

7. Murad, M. W. (2007) Willingness of the Poor to Pay for Improved Access to Solid Waste Collection and Disposal Services", *The Journal of Environment and Development,* Vol.16, pp. 84-101

8. Neumayer, E. (2001), "The Human Development Index and Sustainability- a Constructive Proposal", *Ecological Economics*, Vol.39, pp. 101-114.

9. Ng, S.L.(2005), "Subjective Residential Environment and Implications for Quality of Life among University Students in Hong Kong", *Social Indicators Research,* Vol.71, pp 467–489

10. Parikh, J. (2004), "Valuing the Health Impact of Air Pollution", in G. Kadikodi (Ed.) (2004), *Environmental Economics*, Oxford University Press, New Delhi.

11. Sagar, A. and A. Nijam (1998), "The Human Development Index: A Critical Review", *Ecological Economics*, Vol.25, pp. 249-264.

12. Smyth, R.; V. Mishra and X. Qian (2008), "The Environment and Well-Being in Urban China", *Ecological Economics,* Vol. 68, pp547-555

13. Veenhoven, R. et al. (1995), The Cross-National Pattern of Happiness; Test of Predictions Implied in Three Theories of Happiness, *Social Indicators Research,* 1995, Vol. 34, 33 – 68

14. Welsch, H. (2006a), "Environment and Happiness: Valuation of Air Pollution Using Life Satisfaction Data" *Ecological Economics*, Vol.58, pp. 801– 813

15. Welsh, H. (2006b), "Environmental Welfare Analysis: A Life Satisfaction Approach", *Ecological Economics*, doi:10.1016/j.ecolecon.2006.07.017.