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Public Perceptions of Urban Air Pollution with a Focus on Developing Countries

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Public perceptions of urban air pollution with a focus on developing countries

Abstract

Understanding public perception and attitudes toward air quality and regulation is critical for successful citizen involvement as shifts toward new technologies and management alternatives take place. While urban air pollution continues to be a major risk in most parts of the world, very few studies and surveys have been conducted to systematically study public perceptions related to air pollution. Even fewer studies have focused on developing countries. This gap is critical because of the complex interaction between poverty, livelihoods and sustainable development in developing countries. A Pressure-State-Response framework is used to review studies of public perceptions of air pollution and knowledge gaps are identified. The paper highlights unique characteristics of urban areas in developing countries in the context of air pollution related perceptions.

Background

The World Health Organization (WHO) surveyed air quality in cities around the globe (WHO 2006). The study found the highest levels of air pollution in mega-cities of developing countries, while air quality in developed countries, notably Japan and the United States, was improving. The harmful effects of economic growth often occur in the early stages of development. As a country makes initial investments in basic production and physical infrastructure, it pays less attention to the deleterious effects of that investment on environmental quality. As the country develops further, however, the structure of its economy shifts in ways that expand the size of the middle class. This

expansion may change consumer preferences and create attitudes favorable towards improvement of environmental quality. Together, these shifts may enable developing countries to afford the purchase of advanced and cleaner technologies from developed nations (Arrow, Bolin, Costanza, et al., 1995).

Understanding public perception and attitudes toward air quality and regulation will be critical for successful citizen involvement as these shifts toward new technologies and management alternatives take place. Most existing studies of environmental concern tend to be focused on North America, Europe, and Japan. In 1992, Dunlap, Gallup, and Gallup, conducted the Health of the Planet (HOP) survey, the most comprehensive study to date, interviewing 30,000 citizens in 24 countries with representative samples and back translation procedures. The HOP was one of the few studies that enabled cross-country comparison of results between developed and developing countries. The HOP study came to the following conclusion: “Environmental problems are salient and important issues in both wealthy and poor nations and residents of poor nations express as much concern about environmental quality as do those living in wealthy nations.” (Dunlap, Gallup and Gallup 1993). They used a very broad definition of environment “ your surroundings – both the natural environment - the air, water, land, and plants and animals – as well as buildings, streets, and the like.” The researchers concluded that environmental quality is no longer seen as a post-materialist value and that environmental degradation is increasingly recognized as a direct threat to human health and welfare (Dunlap, Gallup and Gallup 1993; Dunlap and Mertig 1997). However, this study did not

offer insights regarding the differences in perceptions and behavior between the poor and rich within a country.

Recent times have seen an increased research interest in the field of 'risk perception' (Slovic 2000). However, only few studies have studied the public perceptions of risk associated with urban air pollution (defined here as excluding issues such as climate change, indoor air pollution, noise and radiation). The earliest studies of people's perceptions and attitudes regarding air pollution were conducted in the 1950s-1960s in the USA using social survey techniques (for example, Smith, Schueneman and Zeidberg 1964; de Groot 1967; Shusky 1966, Johnson, Allegre, Burhrman, et al. 1972, Crowe 1968). These studies had a practical aim: to measure the level of awareness among people about air pollution. The methodologies used in these studies were highly quantitative – questionnaires and opinion polls. These studies did not examine if, for example, awareness varied across social groups and time. Therefore the studies revealed a high variability and inconsistency in findings. For example the awareness about the source of pollution differed depending on whether an individual had a direct perceptual experience or media exposure. During the 1970s and 1980s very few studies were conducted, perhaps because governments in developed countries had seriously begun to formulate policies and implement laws. The public and researchers began paying more attention to other environmental problems such as acid rain, global warming, pesticides, etc.

There was a renewed interest in research on air pollution related perceptions in the 1990s using qualitative methods. The approaches recognized the role of politics and culture in

influencing perceptions as well as the inconsistencies in how people act and think. During the same time new evidence had emerged about the effects of air pollution, especially fine particulate matter, on human health. Air pollution was back on the political agenda. However, at least in the more developed countries, the pollutants of concern had changed. The more easily sensible (visual and odorous) pollution associated with power plants and industries was replaced by a range of pollutants that were less sensible. A common policy response was expanding monitoring networks with highly sophisticated instruments. Information technologies such as the Internet and Geographical Information Systems (GIS) have greatly facilitated the communication of results and forecasts from these networks.

The recent studies can be categorized as a) those which have a practical aim to improve official risk communication (Howell, Moffat, Bush, et al. 2003; Beaumont, Hamilton, Machin et al. 1999; Cole, Pengelly, Eyles, et al. 1999) and b) those which focus on how social and cultural factors influence perceptions (Bickerstaff 1999; Bickerstaff and Walker 1999; Bush, Moffatt and Dunn, 2001a; Bush, Moffatt and Dunn, 2001b; Bailey, Yearley and Forrester, 1999).

Existing knowledge

The Pressure-State-Impact-Response framework (OECD 1993) is used to examine the literature on perceptions related to the air pollution problem (see Figure 1). Pressure represent the social, economic, ecological and institutional driving forces that cause the emissions. State represents physical, chemical and biological changes in the state of the

biosphere. Impact represents social, economic, ecological and institutional impacts of pollution. Response represents human interventions in response to the societal impacts.

‘Pressure’: Perceptions about the causes and sources of air pollution

Research findings have shown that people largely perceive automobiles as the major source of pollution (Jacobi 1994; Bickerstaff 1999; Howell, Moffat, Bush, et al. 2003). However, Bickerstaff (1999) has suggested that not all automobiles are viewed equally – more blame is assigned away from an individual to ‘other’ polluters such as buses and other commuters. Bickerstaff suggests that this is the way an individual absolves oneself (and his or her lifestyle) of direct blame. Industry is also often identified as a significant polluter (Howell, Moffat, Bush, et al. 2003; Bickerstaff 1999). The role of temporal and historical issues has been shown to be important. Also, the type of industry and past associations about an industrial area has been suggested as powerful determinants of perceptions. Winneke and Kastka (1987) observed a positive attitude towards a chocolate factory compared to a brewery or a tar oil refinery. Bush, Moffatt and Dunn (2001a) and Irwin, Simmons and Walker (1999) observed that perceptions were influenced by community memories of incidents sometimes passed over long periods of time. Perceptions about the main contributors to pollution were found to vary across socio-economic groups (Jacobi 1994). In Kuwait people identified air pollution to be the fifth most important consequence of traffic congestion out of eight possible consequences. But few parents were willing to use a free school bus service if provided (Koushki, Al-Fadhala, Al-Saleh and Aljassar 2002).

‘State’: Perceptions about the level of air pollution

Studies have stressed the role of practical everyday experience in how people perceive the quality of air. Most studies have highlighted the role of vision (Howell, Moffat, Bush, et al. 2003; Bickerstaff and Walker 2001; Bickerstaff 1999; Malm, Leiker and Molenaar 1980). These studies suggest that people are concerned about the potential for pollution to cross political, social and personal borders. Sensory visual perception of air pollution appears to increase with higher concentrations of suspended particulates within certain size ranges (Schusky 1966) and with greater dustfall (Stalker and Robinson 1967). In addition to vision, other forms of sensory awareness were important, such as olfactory evidence (Mukherjee 1993; Wakefield, Elliot, Cole et al. 2001; Clarenburg 1973) and the experience of physiological or psychic affects. In an Austrian study, although air pollutant levels complied with World Health Organization guidelines, there was a perception of a problem because of odorous fumes, visible dust, and preexisting symptoms such as fatigue, eye irritation, recurrent colds, etc. (Lercher, Schmitzberger and Kofler 1995).

It has been shown that people form perceptions about the level of pollution from the density of presumed sources (cluster of industries, congested road) or other observable effects of air pollution on the wider environment (color and growth of vegetation) (Howell, Moffat, Bush, et al. 2003; Bickerstaff and Walker 2001a). It has also been observed that local knowledges, as obtained through social interactions, play an important role in the shaping of perceptions (Howell, Moffat, Bush, et al. 2003). Studies have suggested that lifestyle factors such as time spent outdoors can influence

perceptions. Thus, younger people who have an active outdoors life have a greater concern for air quality than older people who lead comparatively sedentary lives indoors (as mentioned in Flachsbart and Phillips 1980).

Not much work has been done to study how human perceptions correlate with physical measurements of pollution. This is an important question, because it would explain why experts, who rely more on physical data, perceive problems differently from the general public. Malm, Leiker and Molenaar (1980) found a linear relationship, independent of demographic background, between human perception of visual air quality and physical indicators such as color and contrast in a landscape. Flachsbart and Phillips (1980) used physical data for a variety of air pollutants and weather indicators and, more importantly, for a variety of averaging times and tested the correlation with indicators of perceived and desired air quality. They discovered that as compared to other pollutants (for all time frames), levels of ozone and visibility were more correlated with perceived air quality. Their study suggested that people based their perceptions on the quality of air they experienced over a long period of time. Short term variations of all pollutants except ozone, carbon monoxide and visibility (as a surrogate indicator of pollution) were unlikely to influence perceptions. An important observation, consistent with previous studies and intuition was that human perception depends on baseline conditions. That is, people who are accustomed to relatively poor air quality may be less sensitive to further degradations of air quality. This is important to remember in the context of prevailing conditions in developing countries. This study defined four measures of human response to air quality – perception, preference, satisfaction and salience and examined the

relationships between the four measures. The study raised important questions such as “Does the preference for clean air influence one’s perception of reality, such that one begins to perceive clean air?” Finally, they observed that factors such as ethnicity/race and income influenced perceptions. Air quality was valued less by those with more pressing problems.

Despite the increased efforts by governments to provide air quality information services, recent studies show a) a very low level of awareness and use of these services and b) skepticism about the motivation of the information providers (Howell, Moffat, Bush, et al. 2003; Bush, Moffatt and Dunn 2001b; Bickerstaff and Walker 1999). Highly technical terms and jargons made the information seem irrelevant to people. The issue of spatial scale is important too – people cannot relate to regional or national statistics, but demand local statistics (Howell, Moffat, Bush, et al. 2003). Often data published by governments seems contrary to people’s own perception (Cole, Pengelly, Eyles, et al. 1999; Yearley 1999; Yearly 2000; Bickerstaff and Walker 1999; Bailey, Yearley and Forrester 1999). Based on a case study and survey in the north west region of the United Kingdom researches cautioned that the lack of well-grounded methodology and guidance for handling and representing spatial aspects (using tools such as GIS) of air quality data sets fosters ambiguity in public perceptions (Lindley and Crabbe 2004). Not surprisingly, air quality awareness programs had a greater impact on well educated people than on the less educated, implying the need to supplement such programs with special efforts directed at the less educated (Stieb, Paola and Neuman 1996).

Though it is recognized that perceptions about the general environment are being increasingly influenced by non-official modes of communication such as television, literature and the Internet (Bulkeley 2000; Hannigan 1995; Ungar 2000), not much of this research is specific to problems of urban air pollution.

A related aspect is how people perceive local versus regional air quality. Both early and recent studies have shown that people evaluate their local neighborhood differently from the wider region (Rankin 1969; de Groot 1967; Shusky 1966; Francis 1983; McBoyle 1972; Bickerstaff 1999; Bush, Moffatt and Dunn 2001a). Bush, Moffatt and Dunn (2001a) found that people did not feel that air pollution was a problem in their neighborhood but rather associated it with poorer communities living closer to industries. This is a way some people would disassociate themselves from the problem. However some research questions were still left unanswered: do residents always disassociate themselves in this way? If not, why not? (It is possible that in order to get governments do something in their neighbourhood, people may consciously or unconsciously exaggerate their perception of the problem, especially if they believe that pollution has crossed into their side of the 'border' from other sources). Similarly, social status and ethnicity have been linked to concern for air pollution, with white suburbanites having expressed more concern than inner-city blacks (Schusky 1966). This contrasts with the findings of another study in hispanic communities of El Paso, USA, where poorer people, as compared to wealthier people, perceived air pollution to be a greater risk (Byrd, VanDerslice and Peterson 1997).

While being aware of air pollution, people in an industrial area of India did not feel it was a matter of concern because of other problems they faced (Bladen and Karan 1976).

However differences across ethnic groups attributable to cultural, psychological and philosophical traits were observed. They used a modified version of a standard natural hazard research questionnaire.

Bickertsaff and Walker (20001a) observed that the tendency to rate one's neighborhood differently from a wider region depended on a) their sense of power to take action, and b) their attachment to the place. Where people are not strongly attached to their neighborhood their perceptions tend to be more negative about air quality and other attributes. Such a relationship between perceptions of air pollution and indicators of local social capital and place attachment were identified by Wakefield, Elliot, Cole, et al. (2001) in Canada. Thus perceptions that seem 'ignorant' or 'irrational' are very likely related to issues of place, identity, power and control.

Jacobs, Evans, Catalano and Dooley (1984) observed that in addition to actual physical levels, perceived smog was related to prior undesirable life events and psychological symptoms and stress. The more stressed people are the more likely they are to be irritated by pollution.

How people's perceptions change over time is a neglected area of study. In Toronto, Canada, it was observed that within a span of a decade air pollution declined as a public concern as other socioeconomic problems emerged (Dworkin and Pijawka 1982). Gould

and Golob (1998) studied how people's attitudes to cleaner vehicles change over time. In both these studies the role of mass media was found to be significant.

'Impact': Perceptions about the health effects of air pollution

There has been a realization in the recent times that health impacts are a major way by which people realize the extent of the risks associated with air pollution. However, it has been observed that here too people's perceptions tend to be influenced less by scientifically derived information and more by local and personal experiences (Howell, Moffat, Bush, et al. 2003; Bickerstaff 1999; Elliot, Cole, Krueger, et al. 1999). It is very likely that the 'invisibility' aspect of air pollution discourages people from drawing strong links between air pollution and health. Consequently, health problems are dismissed as being imaginary or causation is attributed entirely or partly to other causes – climate change, bad housing, pollen, etc. Improvements in public health services and changes in cultural attitudes towards health care have also been shown to influence perceptions about the link between pollution and health (Bickerstaff and Walker 2001a).

Perhaps the most interesting observation has been that, like perceptions about the neighborhood, people related air pollution to ill health in a general way, but only a few believed that health problems affected them directly (Wall 1973; Bush, Moffatt and Dunn 2001a; Bickerstaff and Walker 2001a). Byrd, VanDerslie, and Peterson (1997) observed that people across all socio-economic strata felt that air pollution pose a greater risk to the community as a whole than to the self and family. Thus most do not deny the risks, but deny its personal effects, possibly to avoid anxiety. Bush, Moffatt and Dunn (2001a)

observed that wealthier individuals felt that ill health associated with air pollution was mainly a problem for poorer individuals living near industries. It is not clear if wealthier individuals felt that they were less exposed or less vulnerable to exposure or both.

Chattopadhyay, Som and Mukhopadhyay (1995) found that individuals living in industrial areas complained more about respiratory problems, psychobiological stress and anxiety than those living in residential areas. This pattern had earlier been observed by Evans, Jacobs, Dooley, et al. (1987) and Zeidner and Schechter (1988). However, it is not known if the people themselves are aware that their mental stress can be attributed to air pollution and more importantly, whether this stress, affects their perceptions about other aspects of the air pollution problem. Navarro and Simpson-Housley (1987) noted that individuals in Santiago de Chile with high trait-anxiety were more concerned about air pollution problems. They suggested that 'visible' pollution provides an objective threat. They also observed that individuals with high trait-anxiety were more likely to personally undertake anti-pollution measures.

In addition to health effects there are the nuisance and aesthetics impacts of pollution- 'it dirties the house' (Jacobi 1994; Howell, Moffat, Bush, et al. 2003; Bickerstaff and Walker 2001; Bickerstaff 1999). Dwellers further away from the city center placed more emphasis on the dirtiness of dust and soot (Jacobi 1994).

“Response”: Perceptions about government actions and policies

Very few studies have attempted to assess people’s perceptions about governments’ interventions. Interventions mean either direct mitigative actions or data gathering efforts. Were these the right interventions? How successful were these interventions in terms of either process or outputs? McDonald, Hession, Rickard, et al. (2002) found that such perceptions were largely media influenced. Jacobi (1994) found that respondents felt that the both the public and private sectors had an equal responsibility to improve the air quality. However, a reluctance was observed to change individual or community behavior. No differences were observed across the socio-economic strata regarding beliefs of what actions need to be taken. In Istanbul respondents felt that local authorities had more responsibility than federal agencies to do something about the problem (Kurtulus 1992).

Multi-country studies

Though there are a few cross cultural studies of perceptions of risks, none had considered air pollution as a risk factor (Jacobs and Worhthley 1999; Keown 1989; Englander, Farago, Slovic and Fischhoff 1986). However, these studies do indicate that for most risks cultural factors are an important determinant of perceptions of risk.

Comparison with perceptions of other risks

A study conducted in Sao Paulo, Brazil, across six socio-economic strata showed that overall air pollution was rated the most serious among eighteen environmental related problems (Jacobi 1994). However, wealthier groups felt it was more of a problem than

poorer groups who tended to rate sewage disposal, water quality, etc. as greater problems. Perceptions regarding sources of pollution varied across socio-economic groups. In contrast to the Sao Paulo study, a survey in Istanbul ranked air pollution as the second most important problem after garbage and wastes problem (Kurtulus 1992). This is not surprising considering that Sao Paulo is one of the most air-polluted cities in the world – far more than Istanbul. Byrd, VanDerslie, and Peterson (1997) also found that, across all socio-economic groups in El Paso, USA, people perceived air pollution to be a lesser risk, to themselves and to the community, compared to other environmental and non-environmental risks (such as crime, drugs, AIDS, etc.)

The developing countries context

In light of the above review a few characteristics of developing countries are mentioned that would influence perceptions of air pollution risks and therefore which need to be kept in mind while designing studies.

In much of the developing world, the urban areas still witness extremely high levels of both visible (particulate matter) and invisible (gases) forms of air pollution. The high levels may well yield a ‘saturation’ effect, such that there is little variation in perception across social and demographic groups. Therefore the framing of right questions is a crucial task. Also, due to factors such as aridness, topography, etc. the levels of natural (background) dust are higher than those observed in more developed countries. Therefore one can speculate that people are more ‘accustomed’ to visible forms of pollution and any manmade increase in air pollution does not cause as much concern as in other countries.

Owing to poverty and literacy levels there is considerably less exposure to mass media. Therefore personal experiences and social interactions are more likely to play a greater role in influencing perceptions than the mass media, compared to more developed countries. Even those who are exposed to mass media may not find much information on air pollution issues, because journalists, reflecting society's preoccupation with non-environmental risks, do not provide adequate coverage.

Poverty, livelihoods and perceptions

Poverty and unemployment is rampant in urban areas of developing countries. Low-income residents tend to be among the most vulnerable to exposure from environmental health hazards, they are most susceptible when they are exposed, and the least able to cope with the consequences. Surveys that have used a broad definition of environment (not just air pollution) have shown mixed results regarding the relationship between level of affluence and environmental concern, perception, and response. The literature regarding urban air pollution has so far not addressed livelihood impacts in a comprehensive manner. However, the few studies that have examined these relationships indicate that factors such as socioeconomic status as well as race and ethnicity influence environmental perception and concern. Mukherjee (1993) sampled 1724 residents of Calcutta. Respondents with lower education and socio-economic status showed less awareness and concern in response to air pollution. In the United States, cross-cultural studies of risk perception and environmental quality have indicated a link between the social context of risk exposure and environmental concern. Baird (1986) found that

community tolerance for the risks presented by a copper smelter plant were influenced by knowledge, benefits, voluntariness, and environmental attitudes. Respondents showed variation in the perceived voluntary/involuntary nature of their exposure, with workers at the plant exhibiting the greatest level of denial in assessing their objective risk. In addition, people had a tendency to substitute informal risk analysis, based on their own or family members' experiences, for formal analysis based on scientific estimates by the EPA. And their factual knowledge of formal risk estimates or proposed standards did not reflect their own risk estimates or their desired level of regulatory control.

Early studies finding a positive relationship between income and environmental concern have suggested that the poor tend to be less concerned about air quality because of one or more of the following reasons: a) they are accustomed to dirtier environments, b) they feel they have more pressing problems to attend to, and c) sense of lack of control - they feel they have little influence over actions and decision makers. In contrast to these studies carried out in the late 60's and 70's, meta-analysis studies have suggested that response by poor or minority groups is both heterogeneous (Vaughan and Nordenstam 1989), and dependent on the sociopolitical context (Taylor; 2000). The poor will respond differentially to pollution risks if faced with real or perceived threats to their livelihoods as a result of laws, programs and actions that governments undertake to manage the air pollution problem.

Unfortunately, only a few studies have investigated the interface between threats to livelihood and attitudes and perceptions of air quality and air quality management

options. The few cross-national comparative findings on concern for environmental quality indicate that there is strong growing environmental concern in developing countries (Dunlap, Gallup and Gallup 1993; Brechin and Kempton, 1994). However, specific case examples indicate that this environmental concern is also tempered by perceived and real threats to jobs and livelihood. For example, in New Delhi, three people died in violent protests by factory owners and workers against new pollution controls after the Supreme Court ordered authorities to seal polluting industries in residential areas and cancel their licenses (Reuters, 2000). In a second example, a strike by tens of thousands of auto rickshaw and taxi drivers in the Indian capital, Delhi, caused travel chaos for the city's commuters. Office and factory workers had to find alternative means of transport as the striking drivers protested against new anti-pollution measures which, they said, were threatening their livelihoods.

The poor's heightened level of vulnerability in developing countries is expected to elevate the level of real or perceived threats to their livelihoods, either as a result of environmental hazard exposure or because of laws, programs and actions put in to place to manage the air pollution problem. Examples are mandatory closure or relocation of factories, taxi drivers giving up their occupation because they cannot afford to install new control devices or switch to cleaner fuels, daily wagers being affected by strikes provoked by air pollution regulations, roadside vendors having to relocate because of road widening projects, etc. In India, small and medium scale industries had to close down or relocate out of the cities of Agra (in the vicinity of the Taj Mahal) and New Delhi. In New Delhi, taxi drivers, and private bus operators were required by law to start

using natural gas instead of gasoline. Studies have indicated that mere threats to lifestyle (such as having to switch to car pools) are enough to influence perceptions about air pollution problems. In particular, future studies should examine the degree to which level of concern about air pollution changes as a function of the perceived impact of government regulations.

Threats to livelihoods, especially for the very poor, could mean either a job loss or increased expenditure. For example, air pollution related actions may result in a hike in mass transport fare. For the poor, even a minor increase in expense means hardship. The number of people who rely on mass transport is also very high – in developing Asian countries 37.8% (54% in Delhi) of workers use mass transit as compared to only 9.0% in USA (Kenworth and Laube 1999). Alternatively, there may be a belief that ill health associated with air pollution affects personal productivity at work leading in the extreme to absenteeism. These are the direct threats. Then there are the indirect threats: people, even those whose jobs are not threatened, may feel that air pollution programs affect the economy as a whole and therefore there must be some indirect negative effect on their well being. This would be most likely to occur if the public also exhibits low levels of knowledge about the health benefits of air pollution. Higher levels of knowledge by the public about the causes of environmental degradation are associated with both increased support for government initiatives and voluntary actions (O'Connor, Bord, Uarnal, and Wiefek 2002).

This review of literature suggests that past studies have not looked in detail at the relationship between livelihood and perceptions regarding air pollution. How do those who have lost their jobs/are likely to lose their jobs perceive these problems? How do people react when they have to pay more for buses, etc.? They may feel that the government exaggerates the problem. Instead of blaming the industry they may feel that government is more responsible for their plight because government forced the industries to shut down. As the examples cited in India suggest, this type of vulnerability threat can occur on a relatively large scale depending on the type of regulation.

Those who feel they are neither directly nor indirectly affected by job losses may sympathize with the 'victims'. But this may depend on whether they think that the person who lost the job is a 'source of pollution' or not. A rich person may sympathize with the poor workers who lost their job after a polluting factory was shut down, but may not sympathize with the driver of a smoke belching taxi who stopped his business because he could not afford to upgrade his taxi. A local authority's stated intention to prohibit certain types of new industries may be viewed as negatively affecting the economy. Bickerstaff and Walker (2002) in their study of public perception of urban air pollution in Birmingham, UK, identified a number of cognitive patterns in which the individual seeks to move responsibility for air quality onto other groups.

Past studies have suggested that prior stress and anxiety caused by non-environmental events can influence the perception of environmental risk. The loss, or potential loss of one's job is ranked as one of the highest stress experiences (Castro, Romero and

Cervantes 1986). Typically, increasing levels of stress would be expected to correlate with increasing perceptions of risk, but in this situation, the stressor - job loss - is actually (or perceived to be) due to air pollution control actions. This may influence both perceived risk and support for air control measures. Poor daily-wagers may view job threats due to air pollution as just one of many reasons for the temporary nature of their job and hence may have less of a negative attitude to the threat. People with more permanent jobs may tend to have more of a negative attitude. Satterfield, Mertz and Slovic (2004) found that increased perceptions of vulnerability and injustice resulted in higher risk rating across a range of hazards.

Knowledge gaps and needed research

From this review of studies it is apparent that much of the work has focused on perceptions of the state of air quality and the determinants of these perceptions. In the context of public participation and governance, there is a crucial gap related to public perceptions of government and policy responses (either past, current or anticipated). Very few studies have been conducted by inter-disciplinary teams comprising of social and physical scientists. Cross-cultural comparisons are lacking. If mass media is important, as some studies have suggested, it is necessary to know how journalists themselves perceive air quality issues. Longitudinal studies – repeating the same set of questions with the same individuals regularly over a period of time – have not been conducted. Barring a couple of studies, there is no information about people’s perceptions to specific pollutants. It is possible that people view air pollution in an ‘aggregate’ sense, while experts like to design pollutant specific solutions. While a few studies have studied

the variation of perceptions across demographic and socio-economic groups very few have examined the differences across various stakeholder groups (citizens, small and big industry, government, unions, activists, journalists, non-governmental think tanks, etc.)

Future studies of perceptions of urban air pollution in developing countries should focus on sources (e.g. motorcycles, buses, refuse burning, small industries) and pollutants (e.g. dust) that are comparatively unique and of greater concern in their setting. More importantly, the effect of poverty and livelihoods related variables on public perceptions needs greater research attention.

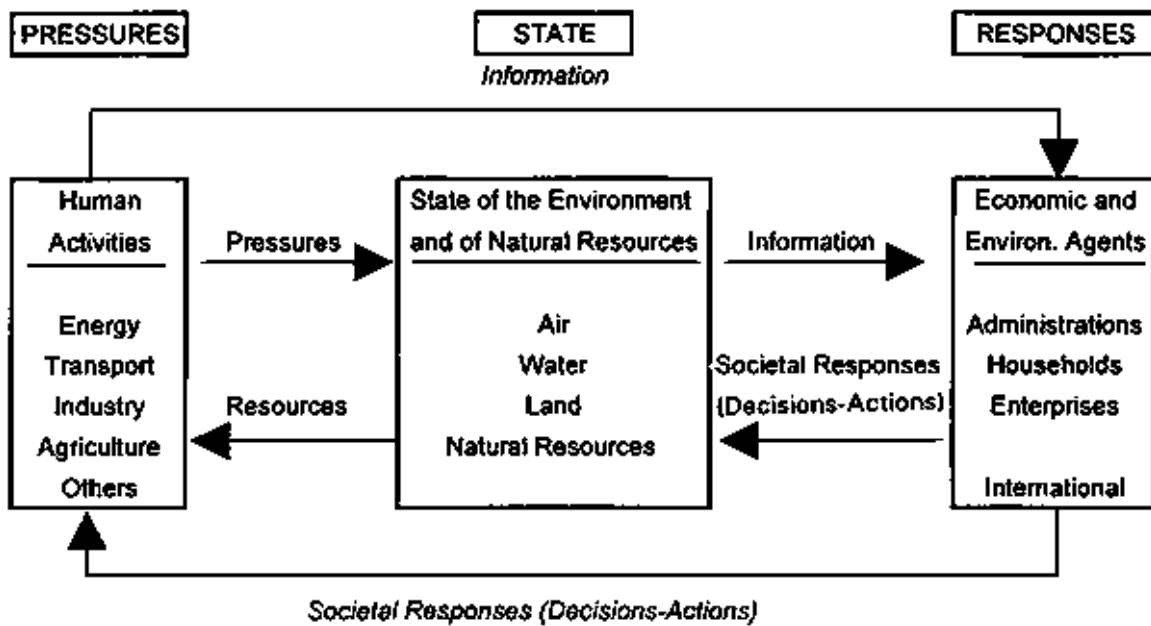


Figure 1 Pressure-State-Response Framework

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