

Organizational Strategies to Manage Expatriate Worries about Pollution Levels in Megacities

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Abstract

The purpose of this paper is to analyse how a large European infrastructure developer responded to expatriate worries about high outdoor pollution levels in the Indian megacity Delhi. We present an exploratory case study obtained from a three months project with close university/company interaction, both with the head office in Oslo Norway and the Delhi office. Fact assessment showed that pollution levels are high and rising, with significant expected increase in asthma, cardiac diseases and mortality in the winter months. The results show that the employees compare home office environment with the Delhi office, and compare the company actions plans with other companies' problem solving initiatives. Cost considerations were not important in the development of the response plan but in the implementation phase (specific decisions) and the results further shows that the characteristics of the internal process are important. We present a company response plan to a real-life situation, and this plan could be used by other companies as well. From the company perspective, the paper points towards a challenging issue of similar or dissimilar handling of local employees versus expatriates. Destination characteristics such as air pollution have attained limited focus in expatriate research, and a major contribution of this paper is to present facts and possible solutions as well as comments on future research needs.

Keywords: Delhi, pollution, expatriates, health worries, outdoor environment, internationalization processes

1. Introduction

As early as 1996, it was assessed by Peterson et al. (1996) that approximately two million Americans work abroad for US companies at any time, while Price Waterhouse Coopers presented a report stating that the number of expatriates has been continually increasing in the past decades (PWC, 2010). The rising number of expatriates was also described in the Global Relocation Trends Survey by the Brookfield Global Relocation Services (2014). Colakoglu and Caligiuri (2008) stated that it existed 850 000 subsidiaries of multinational companies operating globally and Harvey and Moeller (2009) presented expectations of rising numbers of expatriates.

A high share of the expatriates live and work in large cities, and some of these cities experience high outdoor pollution levels. As an example, the New York Times published an article April 22nd, 2013 with the heading "In China, Breathing Becomes a Childhood Risk", describing extreme pollution levels, expatriates leaving China and widespread worries about health risks (Wong, 2013). The Wall Street Journal reported that "After Beijing's air-pollution readings soared in January, local executives for German auto maker BMW AG received bad news: several candidates for midlevel expatriate jobs withdrew their applications". This newspaper article further continue: "The European Union Chamber of Commerce in China says air pollution is a key challenge facing companies here, and is an underlying reason why many expatriate workers choose to leave" (Burkitt & Spegele, 2013).

The limited focus on destination characteristics described by Wagner and Westaby (2009) is further supported if evaluating the recent state-of-the art review by Dabic, González-Loureiro and Harvey (2013), which cover four decades of expatriate research. When they classify the literature and analyse keywords, health and safety issues in general or specific elements as the impact of pollution levels in megacities are not mentioned.

In this study, we contribute with insight on the role of destination characteristics, focusing on how high outdoor pollution level affects a company's management of expatriated employees. We will present a case study of how a multinational company (SN Power) within the renewable energy industry with expatriates in Delhi handled workforce worries about outdoor pollution and had a need to develop actions and strategies to handle such worries. Air quality is a significant factor related to human resource management in Delhi, as a study from 1,600 cities across 91 countries showed Delhi as having the world's highest annual average concentration of small airborne particles (WHO, 2013a). In addition, there has been a trend towards rising pollution levels in Delhi as described by Guttikunda and Goel (2013).

We will first present a brief review of relevant parts of the expatriate literature. In the methodology section we describe the case company and the industrial context it is working in, as well as information about the data collection. Thereafter, we present the case with detailed and partly technical information about air quality and we discuss the implications of the results. This paper has three major contributions: first, it focuses an issue where limited previous research exists and gives actual insight in how an industrial firm handled this challenge. Second, the data presented gives evidence of the rising importance of outdoor pollution for expatriate management and expatriate research. Third, a number of important questions of relevance for further research are identified and presented.

2. The Expatriates

An expatriate lives and works in another country for a limited time, in many cases working in the same organization or company, but with changes in work responsibilities and geographical location. Often, expatriates have management roles, and Harvey and Moeller (2009) expect that expatriate managers will have significant influence on the success of multinational companies. When companies expatriate when operating in markets distant from their home base, it may be caused by ambitions of transfer of knowledge or information sharing (Lee, 2007), lack of local candidates or for maintaining home office control (Nohria & Ghoskal, 1994).

A large number of studies have focused on expatriate performance. Walsh and Zhu (2007) concluded that many expatriates in China returned earlier than intended, and have a low job performance. In a study presented by Hill (2005) U.S., European and Japanese multinational companies operating in China was analysed. He defined a failure classification, and concluded that for 76% of the U.S. companies, the expatriate failure rate was between 10-40 percent. Further, he concluded that European multinational companies had a 5% higher failure rate than the U.S. companies. Other studies have described the challenges for expatriates including factors as different cultural norms and values, unfamiliar situations and for some also family separation (Wu, 2008).

Lee (2007) classifies the expatriate literature in three major groups. The first group of research focuses on the selection of expatriates (Zeira & Banai, 1985), the second group of research focuses on cross-cultural training programs and the third group is focusing on spouse and family issues. Often, these broad themes are combined with focus on expatriate failure or success.

In studies focusing on the willingness to relocate, motivational factors as career progress (Eby & Russell, 2000; Konopaske & Werner, 2005), age, number of children, the importance of the spouse career (Noe & Barber, 1993) and spouse support have been included. Wagner and Westaby (2009) state that few studies have investigated the importance of destination characteristics for willingness to relocate. They further present expectations "that destination safety is of particular concern" (p. 259) not least for citizens of the US due to international terrorism. Earlier studies support that a number of "quality of life" factors (as access to health care and housing conditions) predict attitudes towards relocation (Birdsey & Hill, 1995; Black & Gregersen, 1990).

Following Wagner and Westaby (2009) we expect destination health and safety issues to be important. They focus on safety in the meaning of terrorism. This is important when observing Australian expatriates killed in Indonesia (Carroll, 2005), different nationalities killed in Saudi-Arabia (Donovan, 2004) and 39 foreign hostages from nine different countries killed in the Algerian in Amenas oil facility attack in 2013. The outdoor pollution level factor is different from the fear of terror, but it has a common individual and family health and safety aspect.

Not surprising, studies have showed that individuals have a high valuation of safety (Morrow & Crum, 1998). This is part of the reason why organizations often pay a premium (increased salary/benefits) if employees relocate to dangerous locations, Martocchio (2001) states that this premium typically is about 15-25%. However, as early as in 1969 it was presented research suggesting that as the danger level of an activity increase, the effect of increased incentives rapidly decreases (Starr, 1969). In line with this, Wagner and Westaby (2009) presented an experiment among university students and focused on the effect of destination safety. Their results indicate that destination safety is a strong indicator of willingness to relocate and that financial incentives have limited

importance if the risk level is considered high.

Recruitment processes is only one part of these processes, work productivity when relocated is also important. Parent-Thirion, Macias and Hurley (2007) states that work related stress is among the most reported causes of occupational disease and illness. As described by Burton, Schultz, Chen and Edington (2008), health factors may result in suboptimal functioning of people on the job and from a company perspective be a significant source of productivity loss. Zweetsloot, van Scheppingen, Dijkman, Heinrich and den Besten (2010) describe a healthy workforce as an increasingly important asset for an organization. It seem reasonable to expect that health and safety worries as related to high pollution levels may decrease the work productivity and increase stress levels of employees.

Overall, it may be a triple factor human resource management issue. The first is the ordinary work related stress in all organizations, the second is the additional challenges for people moving and working in foreign cultures, and a third factor related to health and safety worries such as air pollution is also evident. In principle, this may influence both recruitment processes, failure in form of early termination of expatriate contracts or reduce the job performance for expatriates working in Delhi.

In our case, the Delhi office manager experienced expatriate worries about air quality issues. He contacted the main office health and safety department to get facts about the health consequences of the experienced high pollution levels in Delhi and possible mitigation. In order to understand the response from the case company, we will describe both the process they designed and the content (knowledge sources, actual pollution levels etc.) as these elements does represent the input to decisions and actions taken.

3. Methodology

3.1 The Case Company

We have selected SN Power as our case company. This selection is based on three criteria: first, they have an office in one of the most polluted cities in the world – the Indian megacity Delhi. Second, it was possible to define a process with in-depth interaction with the company in order to attain insight in their handling of expatriate worries. Third, SN Power's business is located in developing countries, and this does not enable gradual development or low commitment with focus on risk reduction and learning processes as often described in the internationalization literature (Johanson & Vahlne, 1977; Johanson & Vahlne, 1990). Large infrastructure development projects for hydroelectricity production is more in line with the "Big Step" process proposed by Pedersen and Shaver (2011), as they describe internationalization as a discontinuous process with large costs and investments levels rather than an incremental process. The ability to exploit opportunities when they arise is a key managerial element for this type of companies. As a consequence, the importance of handling expatriate worries will be especially important when the activity include large investments and specific deadlines.

Many industrial companies compete for access to licenses or large contracts, typical in sectors as telecommunications, oil and gas, hydropower or other infrastructure development areas. This industrial setting is important in order to understand the activities and priorities of the company also related to expatriate management.

SN Power was established in 2002 with joint ownership between Statkraft and NORFUND. Statkraft is the largest producer of renewable energy in Europe. Parts of SN Power, including the organization of relevance to this paper, were transferred to Statkraft in 2014. From 2001 to 2014, SN Power has experienced strong growth. At the end of 2013, they were present in 14 countries across three continents and have a total of 39 hydropower plants. The operating revenue of SN Power in 2012 was MUSD 260.

In India they had two production facilities, both organized as joint ventures with local partners. The head office of the activity in India was located in Delhi, the workforce being partly recruited from India and partly from the European part of the company. In addition to these two operating plants, SN Power was involved in development of new projects where contacts with the Indian government are highly important. This is a key reason for the location of the Indian head office in Delhi.

The market growth of renewable energy in the emerging markets is estimated to range from 10-18% per annum over the 2010-2020 period (BNEF, 2011). One consequence is international expansion of power companies like SN Power, and Weaver, Moen, Landstad and Standeren, (2014) presents a study of six of these companies documenting high investments levels and rapid growth. SN Power is one of several international high-growth hydroenergy producers involved in mergers, acquisitions and joint ventures with large investments in new production capacity similar to companies as Pacific Hydro, Verbund Enel and International Power.

3.2 Literature Search and Data Collection

We have performed a broad literature search in Abi/Inform, ProQuest, SCOPUS, Web of Science (ISI) and Google Scholar by using a combination of keywords as “megacities, employees, worries, expatriates, multinational companies, Asia, outdoor environment, pollution levels” without being able to identify any studies focusing the issue of how companies handle worries about outdoor pollution levels. Even though such studies may exist, our limited success in identifying prior studies indicates low attention to this issue from a research perspective.

Our approach is a case study. Yin (2009) define a case study as “...an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident” (page 18) while Barrat, Thomas and Li (2011) define it as “...an empirical research that primarily uses contextually rich data from bounded real-world settings to investigate a focused phenomenon” (page 329). We use a case study approach in order to explore and understand this emerging contemporary phenomenon. An important part is the emphasis of the real-world context as stated by Eisenhardt and Graebner (2007). The approach is basically phenomenon driven, where the researcher group had close interaction with SN Power, including a number of mails, phones and teleconferences both with representatives from the head office in Oslo and the Delhi office.

More specific, the initial contact between the university and SN Power about the study was made early in January 2013. This included establishing a formal project where the university should deliver a fact-oriented report about pollution levels, possible health implications and the effects of different actions as use of air cleaners, ventilations systems or face masks. The first telephone meeting including researchers, two managers from the head office in Oslo and two (Norwegian) managers from the Delhi office was organized January 15th. A new telephone meeting with the same persons plus one more employee (Indian) from the Delhi office occurred early in March. The final report was delivered in April 2013. Within this timeframe of 3 months there were about 60 emails going between the university and the case company (head office and Delhi office). This interaction provided direct access to discussions and processes within the company.

3.3 Validity and Reliability Considerations

In an exploratory case study, a system of action is often the unit of analysis. Considering SN Power, we focus on the handling of the expatriate worries within the Delhi office and the interaction with the main headquarter in Oslo. We triangulate information from different actors and groups of actors as well as external sources. Following Yin (2009) this use of multiple sources of information ensure construct validity while external validity is often based on theoretical relationships. In the discussion section we will comment on the results in light of recent research and generalization of the results to other companies.

4. Case Presentation

In order to fully understand the concerns and choices involved, the substance with regard to air quality, information sources and possible actions will be described followed by comments of how this have been evaluated by the case company. We will organize this in 6 distinct parts from initial problem definition to final strategies and the implementation of actions defined: I) Problem definition, II) assessment of information sources, III) mapping actual air quality, IV) assessments of health effects, V) assessment of ways to reduce exposure and finally VI) development of a company reaction plan.

4.1 Phase I: Interaction and Problem Definition

The process started as an area of concern among the expatriates in Delhi. The manager of the Delhi office contacted the Oslo main office, presenting employee worries related to high outdoor pollution levels.

A direct reaction was the establishment of a university knowledge integration project with an aim of systematic assessment of facts. One reason for this university contact was the need for knowledge, but an additional factor was the independent role of university researchers in discussions between the head office and the Delhi office managers. In this first phase, the terms and the problem were defined and this is briefly presented in the next sections.

The term “air quality” is focusing on the state of the air around us. Poor air quality is a result of a number of factors, including emissions from various sources, both natural and human-caused. Ambient air pollution consists of both particulate matter and gaseous pollution in air. Particular matter (PM) is measures in PM_{2.5} and PM₁₀.

PM_{2.5} particles are small particles with a diameter of 2.5 µm or less, small enough to invade even the smallest

airways in the lungs. $PM_{2.5}$ is more dangerous than PM_{10} since, when inhaled, they may reach the peripheral regions of the bronchioles and interfere with gas exchange inside the lungs. PM_{10} particles is primarily produced by mechanical processes such as construction activities, road dust re-suspension and wind, whereas $PM_{2.5}$ particles originate primarily from combustion sources. Based on a discussion between the university partners, the company head office and the Indian country manager, it was decided to focus mainly on particular matters, not gaseous pollutions such as SO_2 , NO_2 or O_3 .

The interaction was through phones and e-mails, but also included teleconferences and there was no disagreement of this focus on particular matters and the exclusion of gaseous pollutions. Further, the outline (content) of the process and time frame was defined. In order to evaluate the Delhi situation, it was also suggested by the expatriates to compare Delhi pollution levels with the levels in Oslo (Norway) where the company head office is located.

It should be noted that employees in Delhi had read a number of newspaper articles, or watched TV news broadcasts, performed web searches and discussed with each other, their families and other expatriates, which resulted in an increasing level of worry for possible health effects because of the pollution levels.

4.2 Phase II: Assessment of Air Quality Information Sources

After the establishment of the project, the first task was to identify pollution level information sources and evaluate their quality. This was regarded as necessary for two reasons: first, it would make it possible to assess the actual air pollution situation and the need for actions, and secondly to ensure the employees and company knew which data sources they should use and trust.

Different air quality monitoring networks do exist in Delhi. After an evaluation, it was decided that the Delhi Pollution Control Committee (DPCC) was presenting reliable online pollution measuring numbers from Delhi. In Oslo, the Norwegian Public Roads Administration and Norwegian Institute for Air Research cooperate about a set of monitoring stations with reliable results. We based this reliability assessment on open and transparent information about measurement methods.

As a consequence of these initial activities, a common definition of air quality was established and it was concluded which information sources that could be trusted and used by the company. It should be noted that the evaluations of different information sources were discussed between the head office in Oslo and the Delhi office, with no disagreement about the assessments made.

4.3 Phase III: Mapping the Actual Air Quality in Delhi with Reference to Oslo

Even though newspaper stories and web-forums did give attention to the pollution levels, the case company wanted to get information about actual pollution levels and development trends. Figure 1 show the annual mean values for PM_{10} in Delhi and Oslo compared to mean value for India and Norway with data from WHO outdoor air pollution database (data from 2008) (WHO 2013a).

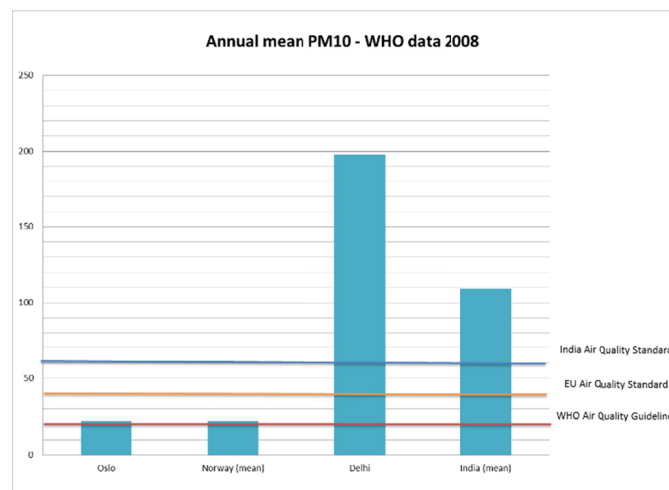


Figure 1. Annual mean pollution levels

As the figure illustrates, annual levels in average from measurement stations in India exceed the India, WHO and

EU air quality standards. When considering Delhi, the average pollution level is far higher than recommended. When comparing annual means, Oslo has PM_{10} values around 20, while Delhi is ten times higher.

A more detailed assessment was made with real time online data from the measurement station Anand-Vihar in Delhi with datapoints for each 0.5 hour. The Delhi office considered the location of this measurement station as closest and most relevant for the Delhi activities. The 24-hour average value exceeds the norm values almost every day during the winter period, and many days shows values far above the norms. Especially in the beginning of November the particle pollution in Delhi was extremely high. As an example, PM_{10} values may vary from about 100 in the middle of October to 800 in the first days of November (2012 values). Agricultural burnings in Punjab is likely to be the reason behind the high values in November. In contrast, the values from Oslo show less variation with values between 11 (September) and 32 (March).

The results indicate, as expected, that the variations between months are systematic and high. As a consequence, it will be possible to anticipate which months the pollutions levels are highest.

Recently Indian researchers have published annual mean values for PM_{10} showing an increasing trend since 2001 as presented in Figure 2 (Guttikunda & Goel, 2013).

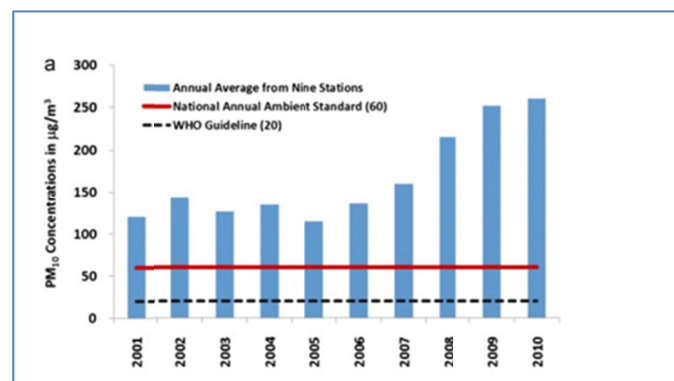


Figure 2. The pollution trend in Delhi

It was concluded that the pollution levels are high and rising in Delhi, significantly higher than the recommended international norms. Not surprisingly, this data lead to the conclusion that pollution level was an actual environmental factor affecting the workforce and needed to be handled with attention and seriousness. Still, no economic assessments or possible actions had been discussed in detail.

4.4 Phase IV: Assessment of Health Effects

From the employee perspective, the problem was the possible health effects, not the pollution levels in themselves. In general, the health effects of particulate matter are cardiovascular and respiratory diseases, increased risk of cancer, increased mortality and morbidity. Long-term exposure to $PM_{2.5}$ has been linked to atherosclerosis, adverse birth outcomes and childhood respiratory diseases (WHO, 2005; WHO, 2013b).

The health risk studies are divided in short-term risk (24-hour mean values) and long-term risk (i.e. three to four years based on annual means). Large international studies have been performed in order to study the relation between mortality and exposure to particulate matter given as $PM_{2.5}$ and PM_{10} . Based on these studies it is known that the health risk associated with short term exposure to PM_{10} is likely to be similar in cities in developed and developing countries, producing an increase in mortality of around 0.5 % for each $10 \mu\text{g}/\text{m}^3$ increment in the daily concentration above the WHO air quality guideline (WHO, 2005).

In Delhi, the daily mean in the period July to September 2012 was approximately $150 \mu\text{g}/\text{m}^3$. This level is associated with about 5 % increase in short-term daily mortality. In the period November 2012 to January 2013 the daily mean concentration of PM_{10} were above $350 \mu\text{g}/\text{m}^3$. This level is associated with about a 15 % increase of short-term mortality.

Recently, a health impact analysis of the pollution in Delhi in 2010 has been presented (Guttikunda and Goel, 2013). The estimated health impact per year is presented in table 1.

Table 1. Estimated health effects of pollution in Delhi

Condition	Estimated pollution effects
Premature mortality	7350-16200
Adult chronic bronchitis	53500
Child chronic bronchitis	391500
Respiratory hospital admission	24700
Cardiac hospital admission	6700
Emergency room visit	483200
Asthma attacks	6.0 million
Restricted activity days	51.2 million
Respiratory symptoms days	244.6 million

These numbers were discussed, and it was concluded that the worries expressed by the Delhi office was based on an actual challenge concerning the employees working in this location. A situation with a 15% increased mortality risk in the November to January period was assessed as an even more serious situation than expected.

As a consequence, the numbers raised increased awareness amongst affected employees and management concerning the health effects of working and living in Delhi. Further, discussions were initiated for example with focus on employers' duty of care for all employees irrespective of expat or local employment status. In consequence, the management of the case company also ensured that mitigation plans were made general to all the areas where the employer is responsible. This is in most cases limited to the work place (offices, production facilities, etc.) and for travel undertaken in relation to work assignment. Frequently, companies are also responsible for accommodation made available to expats and the case company included expat homes in the scope of its mitigation actions relating exposure to high air pollution. As duty of care extends to all employees, awareness training, information management and implementation of mitigation actions will also be beneficial to local employees.

These discussions directly influenced the next phase, where responsibility for the air quality in homes were included.

4.5 Phase V: Assessment of Ways to Reduce Exposure to High Air Pollution Levels

In the next phase of the project, two major ways to handle the challenges were identified. The first was information about pollution levels (use of an air quality index) in order to identify when it was necessary to take precautions for exposure, and the second was to use mitigation measures as air cleaners or face masks.

4.5.1 Development of an Air Quality Index

Air Quality Indexes is well known and often used regarding air pollution. It is based on recalculation of the concentrations of single pollutants (both particulate matter and gases) into an air quality index, and colour codes are used in the same way as for other types of risk evaluations. Internationally, the most accepted Air Pollution Index system is from the US-EPA, where the calculation methods and index classes are defined as shown in table 2.

Table 2. The air quality index

AQI	AQI Index	Actions to Protect Your Health From Particle Pollution
0-50	Good	Air quality is considered satisfactory, and air pollution poses little or no risk
50-100	Moderate	Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.
100-150	Unhealthy (sensitive persons)	Members of sensitive groups may experience health effects. The general public is not likely to be affected.
150-200	Unhealthy (all)	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.
200-300	Very Unhealthy	Health warnings of emergency conditions. The entire population is more likely to be affected
>300300	Hazardous	Health alert: everyone may experience more serious health effects

Different Air quality index providers do exist in Delhi:

- The Ministry of Earth Sciences (India Meteorological Department) presents an air quality index on their webpage. The index includes PM_{2.5}, CO, NO₂ and O₃, but no information is given according to the calculation method or the index classes.
- A new firm, Insdio (later change of name to Aqien), based in Beijing, China has developed a webpage with air quality indexes for a large number of Asian cities. They offer an Air Quality Index Widget that could be downloaded from the webpage. The input data comes from Delhi Pollution Control Committee and the calculated method and the index classes is taken from the US-EPA.
- The organization Urban-Emission has an air quality index calculator on their web page.

In order to assess the reliability of these different information providers, they were tested using different calculations and it was observed that the index by Urban-Emission and India Meteorological Department didn't give the same results as a manual calculation. However, the Insdio webpage seemed to be reliable and transparent with regard to data input and calculation method used. It was concluded that until the Indian/Delhi authorities offer a reliable air quality index two different methods was possible:

- Manual evaluation may be done by use of the real-time online measurements and the AQI calculator. Calculations could also be performed by use of the calculator on the Airnow webpage http://www.airnow.gov/index.cfm?action=resources.conc_aqi_calc
- Use of the private webpage with the Air Quality Index from Insdio.

In conclusion, frequent use of air quality indexes was recommended in order to take into account the air pollution level when planning personal behavior.

4.5.2 Mitigation Sources

This includes use of face masks, use of air cleaners and improved ventilation systems. Still, more drastic actions as relocation of the Delhi office were not considered.

4.5.2.1 The use of Face Masks

The challenge regarding face masks is that many different kinds of products are pronounced face mask. Filtering face piece respirators (FFRs) and surgical masks may appear similar in design, but are quite different when it comes to protection.

Surgical face masks are intended for protection against spread of disease. These masks are loose-fitting masks that cover the nose and mouth, and have ear loops or ties or bands at the back of the head. They will trap some particles but are much less effective than respirators, which are designed for this purpose (Langrish et al., 2009). Respirator masks are also called mechanical filter respirators, and they retain particulate matter when contaminated air is passed through a filter material.

Langrish et al. (2009) have shown that use of a highly efficient face mask (e.g. respirator mask) appeared to reduce symptoms and improve a range of health measures in patients with coronary heart disease. The study was performed in Beijing, China. The authors state that the use of respirator masks has the potential to reduce the incidences of acute cardiovascular events as well as improving patients' general well-being, in particular in developing countries where pollutant exposures are high and resources to reduce emissions are limited (Langrish et al., 2012).

In conclusion, using a respirator face mask is superior to surgical face mask, with differences also between classes of respirator masks.

4.5.2.2 Air Cleaners

Recently a study was performed in Copenhagen, where the health impact of installing a room air cleaner in old apartments was investigated for elderly people. The results showed that use of particle filters in the apartments resulted in an improvement in microvascular function, which is a biomarker for reduced risk of heart disease. The air filters recirculated a larger amount of air than the normal air exchange rate in the apartments, and were using HEPA filtration (Bräuner et al., 2008). Improved health effect by use of air filtration was also found in a Canadian study, where it was measured a 60 % reduction of PM_{2.5} by use of portable HEPA filters (Allen et al., 2011). The effect of particle concentration of free-standing air filters was also studied in bedrooms of children with asthma, and a reduction of PM concentration by an average of 69-80 % was found (Du et al., 2011).

The efficiency of the particle filter is expressed as a measure of the ability to remove particles from the air that passes the filter, often as a percentage. Ultra-low penetration air filters (ULPA) is the most efficient class of filters with a collection efficiency of 99.9995 or better according to European Standards EN 1882 (NS-EN 1822-1:2008). HEPA filters is the second best class, including two different HEPA filter classes ranging from 99.95 for EU 13 (or H13) and 99.995 % for EU14 (H14).

Some air cleaner units have no fan in order to have quiet operation. Units without fan are typically much less effective than units that have a fan. For units with a fan, the air flow might differ. The effect of the air cleaner increase proportionally with the ratio between air flow to room volume. Air flow rates through room filters is recommended to be at least several air exchanges per hour to obtain substantial PM reduction (Batterman, Godwin and Jia, 2005).

4.5.2.3 Ventilation System

A scientific study performed in Helsinki, Finland showed that PM_{2.5} would be reduced by 27 % in occupational buildings built after 1990 compared to older buildings due to ventilation improvements. Mechanical ventilation systems with supply air filters became standard in the 1990s (Hänninen et al., 2005). Jamriska, Morawska and Clark (2000) found that HVAC systems reduced particle concentration by 34 %.

Recommended ventilation rates for HVAC systems in highly polluted areas like Delhi are not found. Most studies about ventilation rates and health is performed in the Nordic countries and in the United States where outdoor air quality is better than in some of the large cities in Asia. Any recommendations to increase ventilation must address the poor ambient air quality and not just assume that more outdoor air will necessarily improve indoor air quality (Sundell et al., 2011).

In summary, use of face masks outdoor on the days with highest pollution levels, combined with air cleaners in homes and the offices as well as improved ventilation systems might be possible.

4.6 Phase VI: Company Mitigation Plan

The results of the different parts of the information collection and analysis were presented and discussed in interaction between the university researcher group, the head office and the Delhi office top managers. Based on these discussions, the Oslo head office defined nine major recommendations as expressed in internal documents:

Recruitment of foreign human resources (expats):

- Air quality and health effects are a natural concern for employees considering international assignment to Delhi. Implications to existing policy and established procedures for recruitment and work and leave arrangements need to be discussed.
- The human resource department and other relevant parties need to consider alternatives, and where relevant bring forward change proposals.

Personal Health Advice:

- Forecast data on expected air quality (AQI) to be presented in the office/workplace and on intranet for use across offices together with benchmark values and associated mitigating actions (colour graded matrix with pollutant values as thresholds where each colour are associated with mitigation activities such as use of face mask, limitations to time outdoor, physical exercise outdoor etc.
- Staff training to be provided for people to acquire knowledge about the health hazards and how to protect themselves.

Homes & Offices:

- Offices and homes provided to personnel are the responsibility of the company and the company shall ensure that these properties meet required standards of indoor air quality as specified. The health aspect behind this recommendation is that the employees spend most of their time either in the office or in their home, and these measures will reduce the total exposure to air of low quality considerably.
- Interface with Emergency Response Plan (ERP)

The expatriate recruitment process increased focus on health aspects in the selection process for placement in Delhi or other megacities with pollution issues. Both employee (and families) asthma/allergies and hearth condition was included as a factor of high relevance. From a company perspective, this makes sense and may be defined as responsible practices. At the same time, this implies that certain employees will be without the possibility of foreign country work experience and removed early in selection processes. The second part focuses on information while the third part explicit defines responsibilities also for housing and development of checklists. In the last part, evacuation plans are mentioned and the country manager responsibility is also included.

Overall, the case company had organized a process with an ambition to reduce expatriate worries (and risk exposure) in order to continue their operations in Delhi.

Looking ahead one year after the recommendations were issued, the focus in the Delhi office has been on improving the indoor air quality through a new air filter system in the office, installing air cleaners in the office and expatriate homes and regular measurement of air quality. Health aspects of air quality issues are brought up in the discussions with candidates for recruitment to offices in cities with high pollution levels.

5. Discussion and Implications

This study gives insight on how an industrial company responded to outdoor pollution worries, which is relevant for many companies. The company response and the process presented points towards issues that need to be addressed is further research, and we give evidence of the relevance of the outdoor pollution issue as important when focusing on expatriates and expatriate management.

We have presented the key elements in the action plan developed by the case company. For companies experiencing similar challenges, it is possible to evaluate if some of these elements may be transferred and used. In polluted cities as Delhi, responsibility also for housing and arrangements as air cleaners and ventilation systems not only in the offices but also in the private/rented homes for employees may be necessary. A combination of this with information distribution as well as a redesigned selection and recruitment processes was the key elements in the action plan for the case company. Most likely, this is a strategy that may be followed by other companies as well. In addition, these points may be used to compare and benchmark activity across organizations. But the case also indicates other issues of relevance for companies and for further research.

5.1 The Process Design When Handling Worries among Expatriates Is Important

First, the process itself was important. In this case, the company systematically collected and analysed information, had close cooperation with the university but also a high degree of interaction and discussion between the head office and the Delhi office. It was expressed from the Delhi office that they had hoped that better solutions or actions would have been identified, but the process and discussions ensured the employees that the company did handle the worries seriously and did define the best available risk reduction actions.

5.2 Expatriates Compare Actions Taken by Different Companies

Second, expatriates compare living conditions with baselines as the home office locations and they compare company actions with other companies. If one company with expatriates in Delhi developed and improved its strategies for handling outdoor pollution, this might be communicated across groups of expatriates – not even only within one city but also between cities with similar challenges. One example is case company employees presenting that the US Embassy in Beijing granted additional holiday leave for employees due to pollution levels resulting in questions about holiday/leave arrangements in the most polluted times of year. From the company

perspective, this means that knowledge about strategies and actions in comparable organizations is important in order to keep the employees satisfied. As an example – if buying air cleaners, the employees would expect the highest efficient classes (ULPA) if they search for information and identify this as the best possible solution to air cleaning, not least if comparable organizations select the best possible solutions. The employee focus on comparing location characteristics with home base characteristics was a partly unexpected factor. However, from an employee perspective this makes sense, it may be the “negative difference” which is the key element. In further research the comparison between different location characteristics and its impact need to be addresses.

5.3 Cost Considerations Is Most Important in the Implementation Phase

Third, cost considerations were not brought in when the recommendations were issued. It was in the practical implementation phase costs were considered, for example when decisions were made about how to combine specific investments in office and home ventilation systems in order to achieve the best possible effect. The reasoning was based on the employer responsibility to ensure that expatriates do not suffer negative health consequences of working for the company. Our researcher group followed the entire process closely, with direct interaction both with the Oslo and Delhi offices. In the literature, calculations of cost and value for companies are often part of human resource management decisions as described by Zwetsloot et al., (2010). Our case study indicate the existence of health and safety challenges that just has to be solved as far as possible, where the costs does not represent a major issue. One interesting observation is the willingness both to make investments as air cleaners or ventilation system upgrading, but also to allocate manager time resources to air quality related issues. It should be noted that less resourceful companies like some SMEs may have challenges due to financial constraints. If they use expatriates, and these expatriates compare company policies with large multinational companies it may represent a source of dissatisfaction.

5.4 The Company Response will Be Influenced by the Type of Industry and Internationalization Process Characteristics

Fourth, the characteristics of the internationalization process may be important. As an example, speed is a key factor discussed in the internationalization process literature. How does the timeframe of opportunities (for example public tenders for infrastructure projects) influence expatriate management? In our case, the process was characterized by large steps partly with an external timeline (competing for licences or natural resources). This made it possible to use resources on different actions in order to reduce pollution exposure, but it also reduced the possibility of flexibility in terms of additional holiday leave in the most polluted times of year. The resource base would be different to for example small and new international firms establishing activity in a city such as Delhi. Following Dabic et al (2014) we recommend further research in order to address how different types of firms in different stages of the international development solve expatriate management challenges.

5.5 Equal Handling of Expatriates and Local Employees?

Fifth, the limits of responsibility is interesting and challenging for companies. This paper has focused on the health aspects of expatriates due to high outdoor pollution levels and the company’s responsibility for office air quality and for expatriate housing decisions. Local employees are exposed to the same high outdoor air pollution levels, and how far should a company’s duty of care reach for these employees? When it comes to office air quality and personal health advice, the case company has applied the same duty of care for the local employees as for the expatriates, and the two groups have benefitted from the same measures. There has been a differentiation as to decisions regarding air quality in homes. Homes are provided to expatriates by the company as a result of their work assignment in the country, and air quality in these houses has been the responsibility of the company. Further studies about the boundaries of responsibility and the similarity and differences in treatment of local employees and expatriates should be made.

5.6 Destination Characteristics should Be Focused in Further Research

In the theoretical part, we presented an expectation that “quality of life” factors would influence the willingness to relocate (Birdsey & Hill, 1995) and that destinations characteristics may be important (Wagner & Westaby (2009). None of these studies focuses on pollution and health issues, but the general arguments they present support that this may be an important factor in both the recruitment processes and when people are transferred to locations as Delhi. We further added some media headings about pollution levels and expatriates, these suggest relevance and importance of the issue. Through the case study, a consistent message was given from the case company expatriates in Delhi: this is an important issue affecting us and our families.

When evaluating current research, Dabic et al. (2014) describe two major streams of expatriate research originating from human resource management (HRM) and international business. They classified the research

and concluded that up to 25% of the articles (n=438) focused on training and development, 15% focused on selection and 14% focused on repatriation. From a theoretical perspective, underlying foundations are for example agency theory, transactions costs, theory of expectations or resource based theory. The lack of focus on more objective environmental factors as outdoor pollution levels may reflect an imbalance in research where this issue is important for companies in some of the major expatriate destinations but mainly neglected in research.

We will point towards a need for more focus on environmental factors related to health in expatriate management. This is not least important when examining the global growth patterns where large metropolitan areas in Asia are important expatriate destinations also having high reported pollution levels.

Based on the principles presented in prior studies and our results, it seems reasonable to expect that the results could be relevant also in other companies than SN Power. With the increasing number of expatriates (PWC, 2010) and the expected importance of expatriates for the success of multinational companies as presented by Harvey and Moeller (2009) the lack of studies focusing the pollution situation represents a knowledge gap needing attention. Looking ahead, expatriate research should include more focus on environmental factors in order to develop new insight of relevance both for expatriates and for managers handling expatriates.

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