



POLICY Brief

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THE HEALTH COST OF CEMENT PRODUCTION - A STUDY OF AIR POLLUTION IN SRI LANKA

A new SANDEE study has found that air pollution from Sri Lanka's largest cement production plant is having a significant effect on the health of people who live close to it. The study finds that about 14% of the people who live in the vicinity of the Puttalam cement factory have respiratory illnesses linked to the pollution that it produces. By assessing the cost of these health problems, the study finds that, if the air pollution produced by the plant was reduced by 50%, locals would benefit by SLR 3 million through improvements in health.

The study is the work of Cyril Bogahawatte and Janaranjana Herath from the Department of Agricultural Economics and Business Management at the University of Peradeniya. It is one of the first attempts to understand the links between industrial air pollution and health in Sri Lanka. It not only provides a powerful argument for investment in pollution reduction technology at the Puttalam cement plant, it also highlights the need for a review of Sri Lanka's air pollution standards which currently allow air pollution from industrial plant to exceed levels allowed under World Health Organization (WHO) standards.

THE POLLUTION CHALLENGE

In Sri Lanka, as in most other developing countries, many people find themselves living close to factories and other industrial plants. They are often drawn to these locations by the promise of jobs, and form communities in the shadow of the places where they work. This is the case at the Puttalam cement factory, which was established in the northwest of the country in the 1970's. The population density of the area around the factory was low when it was set up. However, the population since then has increased due to infrastructure improvements and the growth in employment opportunities. According to the Department of Census and Statistics, population in the area has increased about 7 fold since the '70s. Today, 1,058 families live within a 3km radius of the plant.

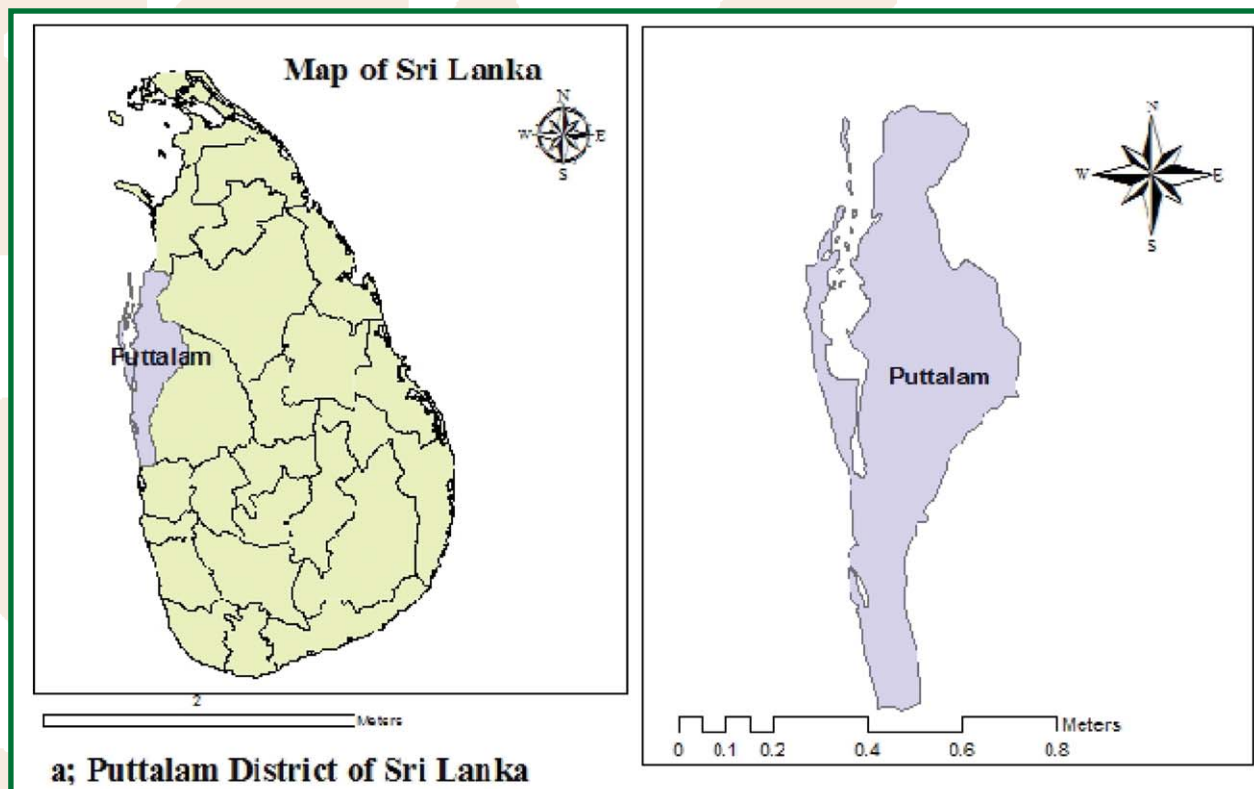
The factory, which is the bigger of the two functioning cement works in Sri Lanka, produces 80% of the country's total cement production of 542,000 MT. The plant is set to expand as the demand for cement in Sri Lanka is increasing; this is due to the rapid developments that are taking place in the service and construction sectors.

THE STUDY AREA

Puttalam district is in the northwestern province of Sri Lanka. The climate in the district is tropical with a marked dry season. The cement industry is the only one in the area that affects ambient air quality. A survey conducted by the researchers indicate that the average family size in the study area is four and that the mean age of residents is 32 years. Average educational attainment is grade four. Nearly 23% of the households have no schooling and 77% have only primary education levels. These education levels are low compared to many other districts and in relation to national averages.

The three main occupations in the study area are employment in the private or government sector, farming, and temporary sundry labour. Nearly 6% of the households have at least one individual working in the cement factory. Out of all the households, roughly 24% are employed in government or private sector enterprises, while the majority are engaged in agriculture.

The average monthly income of an average household in the study area is around SLR 10,910. Since the average household income in Sri Lanka for 2004 was SLR 15,405, this suggests that the households in the Puttalam area are relatively poor.



Study Area in Puttalam District of Sri Lanka

LINKING POLLUTION AND ILLNESS

Cement production at Puttalam generates a wide range of pollutants, including air dust particulates, fumes, and gases. These gases include nitrous oxide, nitrogen dioxide, sulfur dioxide and carbon monoxide. According to health experts, long-term exposure to this kind of air pollution can contribute to a wide range of health problems, especially respiratory diseases, lung cancer, heart diseases, skin irritations, fatigue, headache and nausea.

Local people who live round the plant have already raised concerns about the air pollution it produces. Between 2001 and 2005, there were a number of protests against the factory and the impact of the dust from the plant on people's health. Steps have been taken to reduce the level of visible dust in the air, through the installation of new 'clean up' technology. Despite this, local people still appear to be suffering from polluted air.

Bogahawatte and Herath's key aim was to investigate the true nature and cost of the health impact of air pollution from the Puttalam cement works. Their goal for the study was to provide information that will: 1) drive the development of more efficient pollution abatement policies; and 2) provide an economic rationale for such industrial pollution cleanup.

GATHERING THE EVIDENCE

To get the information they required for their analysis, the researchers gathered household and pollution data within a 3 km radius around the factory. 500 households were randomly selected for the study. Household members were interviewed using a pre-tested questionnaire and information was gathered on household characteristics, socio-economic factors and various health and medical issues. In particular the researchers looked for evidence of the key respiratory illnesses linked to the pollution produced by the Puttalam factory. Data was also gathered on the costs that people had to bear when they became ill.



Such 'mitigating expenditure' included doctors' fees, medical costs and the amount of money people had to pay to travel to a hospital or dispensary for treatment.

Pollution information was gathered with the help of the National Building Research Organization (NBRO). This is a government organization involved in measuring air pollution levels. The researchers used a measurement device, which was located and operated for 24 hours under the supervision of a NBRO staff member. This machine measured pollution levels of suspended particulate material (SPM), nitrogen dioxide (NO₂), sulphur dioxide (SO₂) and carbon monoxide (CO). Air quality was measured at over ten locations in the study area. This was done during the wet and dry seasons to capture any seasonal variations. This gave enough information to work out the pollution levels near the households that took part in the study – so allowing the impact of this pollution on their health to be assessed.

A WORRYING POLLUTION PICTURE

Air pollution results show that the pollution levels around the concrete works are of concern when compared to WHO standards. The most worrying pollution findings were the SPM levels. These were found to be significantly higher than WHO standards in the wet season. This is significant because the SPM that is released during the cement manufacturing process remains in the atmosphere because of its low settling velocity. It can penetrate deeply into the respiratory system and cause upper and lower respiratory illnesses to humans.

The study of people's health found that bronchitis, pleurisy, high blood pressure, and heart trouble were all significant problems. Nearly 15 % of individuals had suffered from these diseases during the previous year. An assessment of symptoms and illnesses showed that nearly 10 % of the

people in the study area suffered shortness of breath, 11% cough/phlegm, 1.3% Asthma and 0.8% heart problems. Susceptibility to respiratory illness seemed to be highest in the wet season, probably due to higher SPM levels.

COUNTING THE COST OF POLLUTION

The research findings were analysed to try and isolate the impact of factory pollution on local people's health and on the health-care costs that they have to bear. To do this the assessment took the health impact of a large number of external factors, such as smoking and income, into account. It was found that SPM has a significant effect on all key respiratory illnesses; SO₂ levels were also shown to be important. Not unexpectedly, the assessment also showed that as SPM and SO₂ air pollution levels rise, so do the costs that people have to pay to have respiratory illnesses treated.

Welfare Gains to the Community (per year) from Reductions in Suspended Particulate Matter (SPM)

Distance from CF -Km	Reduction levels of current SPM (%)	Welfare gain on individual basis (SLR)	Welfare gain at household level (SLR)	Welfare gain to the community (SLR million)
0-1.5	25	523	63,806	0.25
	50	1048	127,856	0.51
	75	1,571	191,662	0.77
	100	2,095	255,590	1.02
1.5-3.0	25	349	326,664	1.30
	50	628	587,808	2.35
	75	942	881,712	3.52
	100	1,256	1,175,916	4.71
0-3.0	25	349	369,242	1.47
	50	699	739,542	2.96
	75	1,048	1,108,784	4.35
	100	1,398	1,479,084	5.91



SANDEE

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SANDEE's Policy Brief Series seek to inform a wide and general audience about research and policy findings from SANDEE studies.

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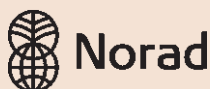
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These findings mean that, if the air pollution produced by the factory was reduced by a significant margin, this would reduce the incidence and cost of respiratory illnesses in the local population. This would in turn lead to welfare gains. To try and quantify the benefits that such action would bring, the researchers carried out a further assessment of their findings.

They calculate that, if the current SPM level was reduced by 50% a family living within 3 km from the cement factory would benefit by about SLR 2796 per year because of a decline in medical expenditure. This would bring a total benefit of about SLR 2.96 million per year to all the 1,058 households living within 3 km of the factory. Moreover, a reduction in SPM levels to meet WHO standards would lead to an annual gain per individual of SLR 1,398. This would bring an annual gain to the community of approximately SLR 6 million.

It should be noted that these assessments did not take into account any wages lost as a result of illness. This means that these results are conservative estimates of the potential gains from reduced air pollution.

WHAT SHOULD BE DONE?

Bogawatte and Herath's findings show that something should be done to help the people living around the Puttalam cement factory. Compensating affected individuals for their health losses would be one option. However, this would do nothing to solve the root cause of people's health problems. A more pro-active option would be to get the factory to bring in technology to abate its air pollution.

This could be done by improving existing emission-controlling systems or by introducing new eco-friendly technologies. Reducing emissions in this way would require investment and could result in an increase in the cost of production of cement. However, such costs could be off-set by improvements in labour and agricultural productivity as well as by improvements in the livelihood of the local population. To drive the much-needed improvements, the researchers suggest that further study should be carried out to assess pollution abatement costs at the cement works, so that an informed assessment of options can be made.

The study also shows that air pollution standards in Sri Lanka are not properly protecting the health of people in the vicinity of Puttalam cement works. In light of this important finding, Bogawatte and Herath recommend that Sri Lanka needs to revise its air pollution standards. This action would help to drive pollution clean up and improve health at the same time.

