

Ask: NUS Economists

The haze's effects on cognition

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For The Straits Times

Q Does haze cloud decision-making?

A Singapore seems to have been spared this year, but each year, September and October bring the possibility of our environment being polluted by haze from burning in Indonesia's dry season.

We live in an urbanising world with unprecedented environmental contamination. The increasingly severe impact of air pollution on our lives is an unintended consequence of relentless industrialisation over the past centuries.

Evidence of how human activities can impact the atmosphere in the form of smog was first reported in Los Angeles and London more than 50 years ago. More recently, people in Asia, particularly China and India, have experienced episodes of extreme air pollution. Since the 1970s, particulate matters in the air have increasingly been implicated for their long-term adverse effects on physical health, including lung and heart diseases, and strokes.

More recently, PM2.5 (fine particulate matters about 3 per cent the thickness of human hair), which is chiefly responsible for the reduced visibility of haze, has been identified as a global risk factor for brain diseases such as dementia, Alzheimer's as well as reduced cognitive abilities.

Over the past 15 years, cumulative research has shown PM2.5 to be associated with long-term economic outcomes, for example, diminished cognitive performance and future earnings potential, decline in the financial performance of firms and lower housing prices.

Together with my co-authors, Huang Wei and Li Xun from Wuhan University, I conducted a first-of-its-kind natural experiment on ambient PM2.5 and decision making, observed in an incentivised laboratory setting in Beijing in October 2012, before PM2.5 was included as part of the air quality measure in China.

Using hourly PM2.5 data obtained from the United States Embassy in Beijing, we found that variations in ambient PM2.5 directly impact how subjects make decisions in a broad range of tasks without their being conscious of the level of haze.

Specifically, we found that PM2.5 tends to increase the degree of aversion to risk over gains. By contrast, they tend to be more risk seeking over losses. This finding provides the foundation for recent reports relating haze with performance in financial markets.

Increased haze tends to depress stock prices and, at the same time, exacerbate an important behavioural bias in investment behaviour – the disposition effect – in which people tend to sell winning stocks too early and hold on to losers too long.

In terms of decision making involving others, we found an overall decline in prosociality using behavioural economics games.

We also found that subjects give less in a dictator game, cooperate less in a public goods game and reciprocate less in a sequential dilemma game.

(In a dictator game, the subject decides unilaterally how much of something to give to someone. His decision does not affect others or himself in future. In a public goods game, he decides how much to give to benefit a group (or public good). In a sequential dilemma game, how much he gives will determine how much others may give to him subsequently.)

Yet, they become more demanding in being treated fairly in an ultimatum game, in which they are asked to split a pool of money with someone else.

At the same time, their capacity for strategic thinking becomes more clouded. Our combined findings have implications on societal level phenomena, including recreational activities such as movie attendance and anti-social activities like crime.

Might haze affect crimes?

Consider that for a potential offender, committing a crime would deliver an immediate and relatively

certain gain while the chance of apprehension is usually small and any actual punishment would likely be much deferred into the future. Each of these components would, according to our research, be exacerbated by an increase in haze, leading to a greater propensity to commit crimes. This is corroborated by recent findings relating short-term variability in PM2.5 and the incidence of crime using data in Chicago and Los Angeles.

In recent decades, the need to incorporate the social costs of

environmental pollution in public policy has been increasingly recognised. In this regard, policymakers have tended to focus on the direct economic costs.

Our research points to the need to reassess this picture and take into account the impact of air pollution on how people make decisions. The benefits of improving air quality go beyond the positive consequences on health and productivity.

An improvement in the quality of decision-making under risk could

enhance individual financial well-being, and facilitate innovation and entrepreneurship. People may enjoy a greater sense of societal well-being with an increase in prosociality, contributing to a more civil and gracious society.

Beyond the immediate horizon, our research raises what appears to be a thought-provoking question.

Might the cumulative impact of smog and other environmental factors from the incessant and increasingly intensive urbanisation worldwide give rise to a changed

human species in terms of how people make decisions?

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The writer says when looking at the social costs of environmental pollution, policymakers have tended to focus on the direct economic costs, but there is a need to take into account the impact of air pollution on how people make decisions.
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