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Examining economic development, environmental policy and transboundary pollution: The case of Iskandar Malaysia and air quality

This NTS Insight explores the possible effects of rapid development in Iskandar Malaysia for air quality on both sides of the Straits of Johor. It unpacks relevant regulatory structures in Malaysia, and reveals challenges in promoting and realising environmental health in the face of economic development imperatives. It then investigates Iskandar Malaysia's air pollution concerns more directly, and examines the prospects for cooperation between Iskandar Malaysia and Singapore in areas such as managing their shared ecosystem and mitigating the risks of development-driven pollution.

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Rapid economic growth in Iskandar Malaysia will cause the number of vehicles on the road to rise. Proactive efforts to develop and implement sound environmental policies are therefore imperative.
Credit: World Bank / flickr.

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Introduction

Air pollution is among the most inescapably shared environmental challenges impacting societies. At its core, the challenge is easily framed. Human activities cause emissions – some

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of which are pollutive – and these readily cross borders to affect neighbouring states. The challenge is not new. The need to respond to transboundary air pollution was present at the genesis of the modern environmental movement, with sulphur emissions from continental Europe during the 1960s causing the acidification of Scandinavian lakes representing an early rallying point.[1]

Similar scenarios would play out elsewhere over the following decades, with Soviet-era industries creating air pollution impacts for Europe to the west and Asia to the east, the US and Canada sharing air pollution across various parts of their border, and the growth of Asia's economies leading to pollution in cities and rural hinterlands both at home and abroad. Southeast Asia's experiences with haze from land-clearing fires have driven home the transferability of air pollution even more directly.

In this context, the possible ramifications of the rapid expansion of Iskandar Malaysia for air quality in Singapore and southern Malaysia are worth investigating. As one of Malaysia's five economic corridors – and one seen as an inextricable element of the vision of a fully developed Malaysia by 2020 – Iskandar Malaysia carries significant weight in Malaysian national development planning.[2] At the same time, the development of Iskandar Malaysia creates potential environmental stresses.

Environmental regulations are largely in place, but there are dynamics in Malaysia, political and institutional among others, that hinder the robust enforcement of environmental laws, and the prioritisation of development over the environment has translated to lax enforcement practices. Moreover, as Iskandar Malaysia's economic success is in the interest of both federal and Johor state governments, commitments to forward-thinking environmental protections may prove difficult to realise. Specifically, the projected economic growth and increase in the number of people, vehicles and industries will create pronounced environmental challenges and may deteriorate environmental quality both in Johor and Singapore if the situation is not closely monitored and regulated.

Responding to such concerns, the architects and operators of Iskandar Malaysia are encouraging more environmentally friendly developments through a 'green' agenda.[3] These actors have a strategic stake in presenting Iskandar Malaysia as an environmentally sound enterprise for reputational, cost and quality of life reasons. This green vision warrants review in light of both these supporting forces and those that may make it difficult to attain.

This NTS Insight conducts such a review by moving from the outside in, beginning with a broad analysis of the structural arrangements that give prioritisation to development over the environment in Malaysia. This paper then hones in on specific air quality concerns arising from Iskandar Malaysia's developments. It argues that significant threats to air quality in Singapore and southern Malaysia are unlikely in the short-term; but that over the medium- and long-term, attention is warranted. Addressing the causes of such future threats to air quality is an immediate strategic imperative on both sides of the Straits of Johor.

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Development over environment: A structural challenge in Malaysia

Malaysia has historically prioritised the development agenda over environmental protection. Malaysia is not unique in its desire to develop rapidly and engage with industries that can bring strong short-term returns. Similar outlooks and strategies can be found in states running the entire development continuum,[4] including many of its Southeast Asian neighbours. In Malaysia, such priorities manifest in a fragmented approach to environmental management and a tendency to regard the environmental effects of economic growth and industrialisation as inevitable consequences that need to be minimised.

State-federal dynamics

The Constitutional arrangement which specifies different responsibilities across federal, state and local governments, particularly in relation to the use of land and natural resources, further pushes environmental management to the periphery. The state government is given authority over the management of forests, water resources, mining, wildlife and fisheries under its jurisdiction, a situation which provides opportunities for states to capitalise financially on those resource endowments. With scant funding and resources flowing from the federal to the state level, it has been highly tempting for state and substate actors to prioritise development and de-emphasise environmental concerns so as to boost state revenues.[5] The need to generate sources of income can be even more strongly felt in states whose ruling party differs from the party holding power at the federal level.[6]

Meanwhile, the federal government, despite having limited jurisdiction over the exploitation of natural resources, is responsible for the country's overall environmental management. The political tensions between the interests of growth-oriented, market-driven state governments and environmental policies emanating from the federal level are among factors that render environmental protection more

challenging.

The situation in Iskandar Malaysia has an added complexity. There, because the region is part of a larger national master plan to develop areas outside of the traditional economic hub of the Klang Valley,[7] federal and state interests have coalesced around development objectives. While this alignment of interests can be beneficial for Iskandar Malaysia's rapid growth, it may make it more difficult for environmental concerns to receive adequate policy prioritisation.

Environmental impact assessments (EIAs)

Malaysia, like many countries, relies on environmental impact assessments (EIAs) as a check on unfettered development coming at the expense of key environmental systems; and it has made EIAs mandatory for a range of activities.[8] The existence of EIAs, however, does not guarantee environmentally friendly developmental practices, as EIA reports often contain substantial weaknesses, such as poor impact-analysis, a lack of mitigation alternatives and pollution control, and an absence of alternative proposals for environmental monitoring programmes.[9] An investigation into EIAs of coastal resort developments in Malaysia, for example, found less than 30 per cent of the reports 'satisfactory' and the rest 'borderline or poor'.[10] The majority of the EIA reports did not employ sound methods and the data collected were at times inaccurate or out-of-date.[11] Such observations suggest that EIAs are sometimes conducted merely to placate environmental concerns rather than to prevent environmental problems.

Transparency has also proven to be a major concern. EIAs are conducted in two stages. The Preliminary EIA only involves officials and government agencies. It is only at the Detailed EIA phase that there is provision for the participation of the public and non-governmental organisations (NGOs). By then, certain major decisions, such as project siting, have already been made.[12] Additionally, approvals are often not made public, and the high prices charged for EIA reports make it difficult to access the documents and assess the veracity of EIA claims.[13] Even if an EIA points out several unsatisfactory conditions, that does not put an automatic stop to a development. Rather, EIAs serve as non-binding recommendations that projects may not even follow up on.

As the structures governing natural resource use and environmental management in Malaysia can undermine the creation of a robust environmental regulatory framework, the prioritisation of development over the environment is likely to endure, including in the aspiring green Iskandar Malaysia.

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Iskandar Malaysia and air pollution

Iskandar Malaysia presents itself as a model for an environmentally friendly smart city.[14] The Iskandar Regional Development Authority (IRDA), a statutory body established by the federal government, takes the lead in promoting and helping to achieve this vision. The IRDA incorporates sustainability in its Comprehensive Development Plan,[15] and in a number of its blueprints, including those for Integrated Public Transportation, Environmental Planning, Green Building Guidelines, Integrated Land Use, Drainage and Stormwater Management, and Renewable Energy and Energy Efficiency.[16]

Environmental initiatives in Iskandar Malaysia

The IRDA is in a position to promote environmentally responsible practices to potential developers as it helps facilitate application processes for Iskandar Malaysia projects and advises those businesses on obligatory environmental measures. Concurrently, the IRDA works to promote awareness on the benefits of sustainable projects to local governments and communities. As part of its commitment to a green agenda, the IRDA has collaborated with various stakeholders – including a local institution, Universiti Teknologi Malaysia (UTM), and foreign institutions such as the Japan International Cooperation Agency (JICA) and Kyoto University – to formulate a Low Carbon Society blueprint.[17]

However, the IRDA has neither the authority nor the capacity to enforce compliance. Its role is to facilitate, promote and coordinate the progress of Iskandar Malaysia by creating a strategic vision and various plans designed to lead to specific development outcomes, including those relating to the environment. The authority to enforce regulations remains in the hands of the Department of Environment.

To encourage buy-ins, the IRDA peddles soft incentives such as the Comprehensive Assessment System for Built Environment Efficiency (CASBEE), the Green Accord Initiative Award (GAIA) for construction companies, as well as ratings and commendations. Tax breaks are also given to businesses that comply with green measures.[18] While such incentives may influence key actors in Iskandar Malaysia, their voluntary nature renders the realisation of the wider green agenda uncertain and provides space for disparate approaches to environmental management.

The success of its green initiatives is particularly important for activities with high pollution potential. Iskandar Malaysia is set to further expand its manufacturing sector, notably its electrical, electronics, petrochemical and oleochemical operations, as well as services such as logistics.[19] This is in line with both the 10th Malaysia Plan (2011–2015) and the Third Industrial Master Plan (2006–2020). The 10th Malaysia Plan envisions that the manufacturing sector will contribute 26.3 per cent to gross domestic product (GDP) in 2015.[20] The plan

also identifies the oil and gas and electrical and electronic sectors – major sectors emphasised in the Iskandar Malaysia development plans – as key economic areas.[21] Complementing this, the Third Industrial Master Plan looks at sustaining the growth momentum of the manufacturing sector while promoting the service sector.[22] Given the ambitious plans for industrial growth, the number of sources of air pollutants is set to increase – including in the Iskandar Malaysia development corridor.

Growth of Iskandar Malaysia's industrial and transportation sectors

The electrical and electronics sector is a dominant sector in Iskandar Malaysia, accounting for USD1.5 billion of value-added production, and representing 38 per cent of employment in the zone's manufacturing sector.[23] Iskandar Malaysia seeks to develop advanced electrical and electronics, renewable energy, aerospace, security and defence, and medical devices technologies as part of its vision to be an electrical and electronics Centre of Excellence by 2025.[24] To support this goal and other manufacturing sub-sectors, several areas have been designated as industrial parks. Examples include the Senai Hi-Tech Park, the Johor Technology Park, the 527-acre Nusa Cemerlang Industrial Park, the 700-acre Sedenak Industrial Park and the 1,300-acre Southern Industrial and Logistics Clusters (SiLC Nusajaya).[25] Of these, SiLC is the only one designated for clean and green industrial activities;[26] this falls in sharp contrast with the overall green agenda that Iskandar Malaysia is promoting.

Rapid growth of the industrial and transportation sectors in Iskandar Malaysia will increase emissions of various types of pollutants.
Credit: Margareth Sembiring / Centre for NTS Studies.

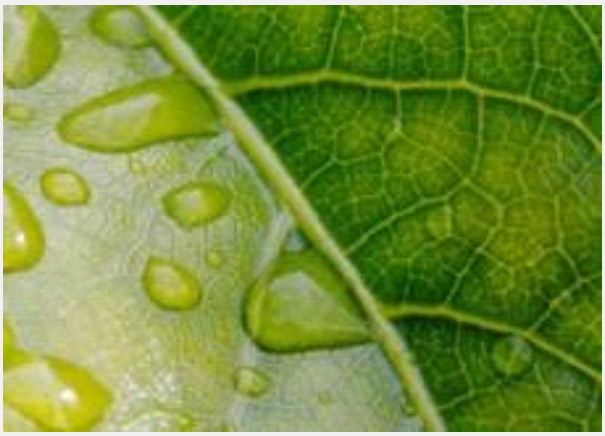
Expansion is also expected for the oleochemical sector. Investments in the sector on a country-wide basis have increased fourfold between 1996–2000 (USD26.2 million) and 2001–2005 (USD1.2 billion), and the sector is expected to receive the majority of the total investment of USD8.1 billion in the palm oil sector between 2006 and 2020.[27] As one of the biggest centres of palm oil and oleochemicals in Malaysia, Iskandar Malaysia will benefit greatly from the projected growth of the sector.[28]

Similarly, Malaysia's petrochemical sector is projected to receive USD10.5 billion of investments between 2006 and 2020.[29] The ambitious expansion of the oil and gas industries in Iskandar Malaysia will witness the development of the USD18.2 billion Petronas Refinery and Petrochemicals Integrated Development (RAPID) at the Pengerang Integrated Petroleum Complex, the largest investment in the downstream sector in the Asia-Pacific.[30]

As the above industries are known sources of air pollutants, concerns over increasing air pollution resulting from Iskandar Malaysia development are not unfounded. Nationally, industrial sources are the highest emitters of PM_{10} (particulate matter of up to 10 micrometres in diameter) and the second highest emitters of sulphur dioxide (SO_2). The 2011 *Malaysia Environmental Quality Report* records that the state of Johor has 3,787 such industrial sources, the highest in Malaysia.[31] Iskandar Malaysia's ongoing and planned developments will significantly increase these figures.

Iskandar Malaysia also plans to develop a world-class logistics infrastructure. It aims to increase the capacity and operations of its existing hubs, notably Johor Port, the Port of Tanjung Pelepas and Senai International Airport, by capitalising on land availability in their vicinity.[32] The plan to expand six priority subsectors,[33] including the zone's oil storage and trading hub, will boost traffic at ports, the airport and on the roads.

Increasing logistics activities alongside economic and population growth will impact emissions. The population of Johor is predicted to increase from 3.3 million in 2010 to 4 million in 2030.[34] In 2013, Johor had the second highest number of newly registered motor vehicles in Malaysia.[35] Vehicle ownership is predicted to grow from 500 cars per 1,000 population to more than 800 by 2025.[36] Vehicles are the primary source of mobile pollutants, the single biggest source of carbon monoxide (CO) emissions and contribute significantly to emissions of nitrogen dioxide (NO_2) and PM_{10}.[37] Ships are also sources of NO_2 and SO_2, and most of them operate at high temperatures and pressures with few emission reduction technologies.[38] The inevitable increase in the number of vehicles and ships creates more sources for air pollution.



While the rhetoric of a 'green' Iskandar Malaysia is pervasive, there remain questions as to whether the vision will materialise.
Credit: Doug8888 / flickr.

Addressing emergent air pollution concerns

The IRDA is attempting to address some of these emergent air quality concerns. Its Environmental Planning Blueprint aims to reduce air pollution from mobile and stationary sources, and seeks to maintain 'moderate' air quality 20 per cent of the time and 'good' air quality 80 per cent of the time.[39] To attain these targets, the Blueprint proposes several measures, including expanding the network of air quality stations, establishing an air emission inventory system, conducting a study on air emission limits and trade systems, reducing organic pollutant emissions, promoting carpooling in urban spaces, increasing usage of alternative fuels (biodiesel) in public transport, providing access to green vehicles for specific public transport routes, and including $PM_{2.5}$ (particles up to 2.5 micrometres in diameter) as part of air quality monitoring.[40]

The IRDA also spells out plans to manage the transportation sector in anticipation of economic growth and population increases. The Transportation Blueprint specifies measures to increase the use of public transport, arguing that the availability of more efficient options will reduce the current preference for private car ownership.[41] It also includes strategies to encourage low-emitting transportation, such as raising awareness about non-motorised transportation, employing integrated land-use and transport planning, and encouraging the use of renewable energy and the practice of energy efficiency.[42]

Laudable though these initiatives may be, questions remain about the IRDA's capacity to successfully implement its strategic vision of a green economic hub.[43] With hundreds of projects in sight, it may be stretched for resources to fully carry out and oversee its plans. It also has little influence over factors such as prestige, affordability and comfort, which drive preference for private vehicles. Further, encouraging non-motorised transportation through creating a network of pedestrian-friendly networks[44] is likely to work as intended only with strong public confidence in the security of the surrounding areas. Dealing with emissions from ship traffic at ports is even more problematic given that ships are not subject to air pollution control standards under the 1974 Environmental Quality Act, and the only regulation that applies is Annex VI of the International Convention for the Prevention of Pollution from Ships 2001.[45] The extent to which the IRDA would be able to manage emissions from ships is therefore less than clear. The ideal scenarios written in the blueprints may face significant challenges when it comes to implementation and sustainability.

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Transboundary air pollution: Is there cause for concern?

Rapid developments in Iskandar Malaysia, along with the challenges of reining in potential sources of pollution, may create new air pollution concerns for both Johor and Singapore. Such concerns are no however immediately pressing despite recent vehicular and industrial growth.

Air quality trends and initiatives in Malaysia

While the number of vehicles in Malaysia increased 28 per cent in the four years between 2006 and 2010, an average of 6.3 per cent each year,[46] and there was a 94 per cent jump in power generation between 2000 and 2012,[47] the 2011 *Malaysia Environmental Quality Report* suggests that the growth did not lead to acute increases in PM_{10}, SO_2, NO_2 and CO.[48] Air quality trends to date initially seem at odds with the impacts one might expect given the increase in sources of manufacturing and transportation emissions. Indeed, current data suggest that Malaysia is faring better than many other Asian countries in controlling air pollution.[49] This may be because, aside from existing regulations to control polluting emissions, Malaysia also has several initiatives to address pollution.

The expansion of logistics activities will translate to higher traffic volume at ports in Iskandar Malaysia and increase the emission of air pollutants.
Credit: mepief / flickr.

Malaysia introduced Euro 2M, a cleaner fuel that reduces sulphur emissions to 500 parts per million (ppm), in 2009. With the use of better-quality fuel, SO_2 concentration dropped more than 70 per cent from 1999 to 2011.[50] The country aims to further reduce sulphur emissions with the adoption of Euro 4M by 2016.[51] It has also been promoting natural gas vehicles (NGVs) since 1989 and is giving various incentives, such as an Investment Tax Allowance, grants and a rebate on excise duty to encourage the use of hybrid and electric vehicles.[52]

Malaysia also plans to introduce more stringent emission standards for both heavy-duty diesel vehicles and vehicles using petrol.[53]

In the industrial sector, Malaysia's efforts to reduce emissions of pollutants were evident in the Malaysian Industrial Energy Efficiency Improvement Project (MIEEIP).[54] As industrial motors account for the major part of total industrial energy use, improving their energy efficiency can result in substantial emissions reduction.[55] A significant level of support was given to this project. The energy efficiency and conservation guidelines and the energy audit programme developed under the MIEEIP were implemented and overseen by the Ministry of Energy, Green Technology and Water;[56] and to support those measures, fiscal incentives and the Efficient Management of Electrical Energy Regulations 2008 were put in place.[57] As a result, electrical consumption growth in the industrial sector has dropped significantly, from a 238 per cent increase between 1990 and 2000 to a 44.2 per cent increase between 2000 and 2011.[58] These initiatives taken to control vehicular and industrial emissions could have partly contributed to the low overall concentrations of various air pollutants.

Iskandar Malaysia and Singapore: Understanding air quality impacts

In the state of Johor, as with the rest of Malaysia, air quality has generally been in the 'good' and 'moderate' ranges over the past decade.[59] The Department of Environment has installed air quality monitoring stations at Kota Tinggi and Muar, and within Iskandar Malaysia, at Larkin Lama, a suburb near downtown Johor Bahru, and Pasir Gudang, an industrial town also just outside the city centre. Throughout 2011, Pasir Gudang, the area of Johor Bahru with the most pollution, experienced 184 days of good API, 184 days of moderate API, and 1 day of unhealthy API (API, or Air Pollution Index, is the measure of pollution used in Malaysia). In Larkin, there were 214 days of good API and 151 days of moderate API. The readings show little fluctuation in the past 10 years,[60] with the exception of 2007 when haze from Indonesia enveloped the region.

Despite the generally positive air quality trends in Malaysia and Johor, there is still a need to remain vigilant. For one thing, pollution numbers derived from averaging numbers from large areas on an annual basis arguably do not provide sufficient information to map air pollution in a developing urban environment. Concentrations of air pollutants are both time- and area-sensitive.[61] For instance, an investigation conducted at Pasir Gudang revealed that, during weekdays, industrial areas had higher SO_2, CO and NO_2 concentrations than commercial and residential areas, and that fluctuations in air pollutant concentrations were strongly influenced by traffic volume.[62]

A closer look at urban and industrial environments reveals further troubling patterns. In Pasir Gudang, there were instances where NO_2 and SO_2 levels went above ambient air quality guidelines.[63] Similar observations were made in the Klang Valley. There were times of the year when ozone (O_3) and PM_{10} concentrations went above the ambient air guidelines regardless of the overall low annual average concentration of O_3 and PM_{10}.[64]

Given such local variations and effects, assessing the transboundary impacts of the developments in Iskandar Malaysia would require the capacity to collect and analyse disaggregated and detailed data. In this respect, Singapore is already one step ahead. It has monitoring stations spread throughout its territory (14 ambient stations, 3 roadside stations and 1 survey station) and its Telemetric Air Quality Monitoring and Management System measures not only major pollutants (SO_2, NO_2, CO, O_3 and PM_{10}) but also $PM_{2.5}$. A common approach to air quality standards would also be important in efforts to achieve a better understanding of pollution effects on Johor and Singapore. At present, however, Singapore has tighter ambient air quality targets than Malaysia (see table 1).

Table 1: Air quality targets, Singapore and Malaysia.

		Singapore	Malaysia
SO_2	(24-hour mean)	50 µg/m^3	105 µg/m^3
PM_{10}	(Annual mean) (24-hour mean)	20 µg/m^3 50 µg/m^3	50 µg/m^3 150 µg/m^3
O_3	(8-hour mean)	100 µg/m^3	120 µg/m^3
CO	(8-hour mean) (1-hour mean)	10 mg/m^3 30 mg/m^3	10 mg/m^3 35 mg/m^3

Sources: National Environmental Agency of Singapore, 'Air quality and targets', *National Environmental Agency*, accessed 20 January 2014, http://www.nea.gov.sg/psi/; Department of Environment of Malaysia (DOE), *Malaysia environmental quality report 2011* (Kuala Lumpur: DOE, 2011).

To date, transboundary air pollution in Singapore and Malaysia has been overwhelmingly associated with haze. However, the proximity of Singapore and Iskandar Malaysia, along with the physical and meteorological characteristics that bind them, means that future air pollution resulting from the increase in industrial activity and number of vehicles in Iskandar Malaysia could become a transboundary concern. Cooperation aimed at monitoring and controlling air pollution may reduce the possible occurrence of such a scenario. This type of joint effort has been in practice in the Pearl River Delta between the Guangdong Provincial Environmental Monitoring Centre and the

Environmental Protection Department of the Hong Kong Special Administrative Region. A Regional Air Quality Monitoring Network was established as part of collaborative initiatives aimed at reducing and controlling air pollution in the area.[65] However, as information sharing can create sensitive issues, fostering inter-state cooperation on pollution control may not be straightforward,[66] and will require forward thinking on the part of both parties to pursue what is ultimately in their shared strategic interest.

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Conclusion

In Iskandar Malaysia, the much anticipated success of its development vision will bring attendant growth in the industrial and transportation sectors – two major sources of air pollutants. Taken together, Malaysia's relatively poor record in implementing environmental regulations and the transformational growth being wrought by Iskandar Malaysia create legitimate air pollution concerns.

All things being equal, development has often been given priority over environment-related issues. Implementation of environmental regulations and assessments has often been uneven or hindered by transparency issues. The influence of states over the implementation of environmental regulations is likewise relevant given their interest in generating revenue from the use of their natural resources. In areas where the authority of the Department of Environment does not come into contact with state authority, such as in the control of vehicle emissions, the implementation of environmental regulations is less contentious. However, as vehicular use expands, it is possible that these regulatory efforts will be outstripped by the volume of emissions sources.

Acute air quality problems coming from Iskandar Malaysia are unlikely to manifest in the near term however. Trends in Johor suggest that air quality is not the most pressing environmental concern at present. Concerns about the representativeness of data and trends, particularly for a rapidly developing urban space such as Iskandar Malaysia, are worth noting, as the effects of growing number of air pollutant sources may actually be worse than what is reflected in the aggregated data collected, but anecdotal experiences also support arguments that air pollution concerns are not yet pressing.

That is not to say they will not become so, however, and current development trajectories will create or prevent air pollution challenges of the future. This decade represents a formative period of growth in Iskandar Malaysia, and an important time for the development corridor and Malaysia as a whole to improve environment-related regulatory practices. Whether this happens will depend largely on the extent to which it is recognised that it is in the country's and region's strategic interest to do so, and on the relative success of the IRDA platform. If the IRDA effectively compels key industries to green their operations, it may provide the foundation for more sustainable development paradigms across Iskandar Malaysia. Public opinion and civil society action also have roles to play, and there are signs that they are growing in force in social media and through a rise in environmental awareness.[67]

Singapore, as a neighbour within a shared ecosystem, can also influence development trends in Iskandar Malaysia. As the largest foreign investor in the economic zone,[68] there is the potential for Singaporean enterprises to be more active in mitigating the environmental consequences that their projects may bring to Singapore. Their leadership in protecting the environment by adhering to Malaysian environmental regulations could be critical. Singapore can also deepen its cross-strait collaboration on air pollution control and monitoring where possible; prospects of this happening are greater if this issue is addressed within high-level state-to-state discussions on Iskandar Malaysia's development. If such actions can proceed in concert, clear air on both sides of the Straits of Johor will be more likely for decades to come.

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Notes

1. This situation was formative for creating the UN's 1979 Geneva Convention on Long-range Transboundary Air Pollution.

2. The policies underpinning the growth agenda include the Ninth Malaysia Plan (2006–2010) and the Third Industrial Master Plan (2006–2020). See: Iskandar Regional Development Authority (IRDA), *Investing in Iskandar* (Johor Bahru: IRDA, 2007), http://www.iskandarmalaysia.com.my/pdf/brochures/Investing_in_Iskandar.pdf

3. The 'green' approach is present in a number of Iskandar Malaysia's blueprints, including the Transportation Blueprint, the Environmental Planning Blueprint, and the Renewable Energy and Energy Efficiency Blueprint. See: Iskandar Regional Development Authority (IRDA), 'Blueprint for Iskandar Malaysia', *Iskandar Malaysia*, 2013, accessed 28 October 2013, http://www.iskandarmalaysia.com.my/blueprint-for-iskandar-malaysia

4. A.A. Hezri and Mohd Nordin Hasan, 'Towards sustainable development? The evolution of environmental policy in Malaysia', *Natural Resources Forum* 30, no. 1 (2006): 37–50, http://dx.doi.org/10.1111/j.1477-8947.2006.00156.x

5. Steve McCoy (Environmental Consultant, Founder and Principal of Counterpoint Consulting), in discussion with author, 23 September 2013.

6. Gurmit Singh (Chairman, Centre for Environment, Technology and Development, Malaysia (CETDEM) and Director of Sustainable Development Initiatives), in discussion with the author, 25 September 2013.

7. The Klang Valley encompasses the capital city of Kuala Lumpur, its suburbs and parts of neighbouring Selangor state. It is at present the most developed area in Malaysia.

8. Environmental impact assessments (EIAs) are mandatory for a list of 'Prescribed Activities'. The list encompasses a range of activities in agriculture, airports, drainage and irrigation, land reclamation, fisheries, forestry, housing, industry, infrastructure, ports, mining, petroleum, power generation and transmission, quarries, railways, transportation, resort and recreational development, waste treatment and disposal, and water supply systems.

9. Addinul Yakin, 'Implementation and enforcement of environmental policies in promoting sustainable development in Asia: Learning from Malaysia and Japan', in Asian Public Intellectuals Program, *Power, purpose, process, and practice in Asia: The work of the 2003/2004 API Fellows* (Kuala Lumpur: Asian Public Intellectuals Program, 2006), http://www.api-fellowships.org/body/international_ws_proceedings/year3.pdf

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11. Ibid.

12. Singh, discussion.

13. Ibid.

14. Najib Razak, quoted in: Fiona Harvey, 'IM – The green mega-city rising above Singapore', *Guardian*, 2 November 2012, http://www.theguardian.com/environment/2012/nov/02/iskandar-malaysia-green-megacity

15. Khazanah Nasional, *Comprehensive development plan for South Johor Economic Region 2006–2025* (Kuala Lumpur: Khazanah Nasional, 2006), http://www.iskandarmalaysia.com.my/comprehensive-development-plan-cdp

16. For the Iskandar Malaysia blueprints, see: IRDA, 'Blueprint for Iskandar Malaysia'.

17. Universiti Teknologi Malaysia, Iskandar Regional Development Authority (IRDA), Kyoto University, Okayama University, National Institute for Environmental Studies, *Low carbon society blueprint for Iskandar Malaysia 2025 – Summary for policymakers* (Johor Bahru: Low Carbon Asia Research Center, 2012), http://2050.nies.go.jp/cop/cop18/SPM_LCS%20Blueprint_Iskandar%20Malaysia.pdf

18. Boyd Dionysius Joeman (Senior Vice President – Environment, Iskandar Regional Development Authority (IRDA)), in discussion with the author, 12 September 2013.

19. Iskandar Regional Development Authority (IRDA), 'What is Iskandar Malaysia: Industry cluster', *Iskandar Malaysia*, 2013, accessed 29 October 2013, http://www.iskandarmalaysia.com.my/what-is-iskandar-malaysia-industry-cluster

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21. Ibid., 14.

22. Ministry of International Trade and Industry of Malaysia (MITI), 'Third Industrial Master Plan (IMP3)', *Ministry of International Trade and Industry*, 18 June 2010, http://www.miti.gov.my/cms/content.jsp?id=com.tms.cms.section.Section_8ab58e8f-7f000010-72f772f7-dbf00272

23. Iskandar Regional Development Authority (IRDA), *Invest electrical and electronics Iskandar Malaysia: Asia's next electrical and electronics Centre of Excellence* (Kuala Lumpur: Perpustakaan Negara Malaysia, 2011), 23, http://www.iskandarmalaysia.com.my/pdf/investment/IM-Invest-Electronic.pdf

24. Ibid., 24.

25. Ibid., 30–4.

26. Ibid., 32.

27. Ministry of International Trade and Industry of Malaysia (MITI), 'Oil palm-based industry', in *Third Industrial Master Plan (IMP3) 2006–2020* (Kuala Lumpur: MITI, 2010), 465–88, http://www.miti.gov.my/cms/documentstorage/com.tms.cms.document.Document_879bae59-c0a81573-1bef1bef-

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The Centre for Non-Traditional Security (NTS) Studies, based in the S. Rajaratnam School of International Studies (RSIS), was inaugurated by Association of Southeast Asian Nations (ASEAN) Secretary-General Dr Surin Pitsuwan in May 2008. The Centre maintains research in the fields of Climate Change, Food Security, Energy Security, Health Security, as well as Internal and Cross-border Conflict. It produces policy-relevant analyses aimed at furthering awareness and building capacity to address NTS issues and challenges in the Asia Pacific region and beyond. The Centre also provides a platform for scholars and policymakers within and outside Asia to discuss and analyse NTS issues in the region.

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