AUTOMOBILE EMMISSONS AND THE ENVIRONMENT: THE MALAYSIAN POLICY RESPONSE

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Hydrogen Fuel Cells Alternatives in the Transport Sector: Issues for Developing Countries
Maastricht, The Netherlands
6-9 November 2005
Organization of the Paper

1. Introduction
2. Framework of Analysis
3. The Malaysian Automotive and Auto Parts Industry
4. Environmental and Energy: Issues and Governance
5. Energy Policy and Demand-Supply Trends
6. Urban Transportation System and Vehicles Emissions
7. Concluding Remarks
Objective of the Paper

- The development of the automobile industry
- Policies affecting Malaysia’s automobile industry
- Developments of automobile sectors and related environment and energy policy issues
- Environmental governance and energy needs
The Malaysian Automotive and Auto Parts Industry

- The Malaysian automotive industry – 20 years in existence.
  - Opportunities for local firms to supply P&E and services; and gain experiences in the automotive manufacturing industry.
  - But heavily protected by the government.
- AFTA and WTO provide little room for protection.
- Thus, firm performance becomes central to the issue of competitiveness since a firm’s ability to compete is determined by its own performance against the rivals.
The Malaysian Automotive and Auto Parts Industry

- Shifting from the assembly towards a full-fledged manufacturer of vehicles.
- The national automotive projects began with the 1\textsuperscript{st} national car (PROTON); Now, 4 national status automakers (PROTON, PERODUA, INOKOM and MTB) - produced about 80% of the total passengers and commercial vehicles.
- The government has given support for the development of the industry - direct investment, incentives, tariff and non-tariff barriers, the local content policy, the Vendor Development Programme (VDP).
- The VDP aims to link SMEs, large/MNCs, and financial institutions.
- The 1st VDP was introduced by PROTON through its Proton Component Scheme (PCS) in 1988 to provide opportunities for local firms, especially SMEs to be vendors of P&C and services to PROTON. In the early 1990s, PERODUA undertook a similar VDP.
- The PCS has brought about special impact on the industry:
  - Total number of vendors to PROTON increased consistently from 17 in 1985 to 134 in 1994 and 284 in 2004; about 50% were the members of the Proton Vendor Association; and about half of the PROTON’s vendors were SMEs.
Local content in Proton cars increased from 40% in 1987 to 70% in 1989 and 80% in 1992 – qualified for special export treatment in developed countries (e.g. the U.K) under GSP (requires at least 60% local content).

As a newcomer in the automotive industry, both PROTON and its vendors were dependent on foreign technology to survive.

Two types of technology transfer (Anazawa, 1997):

- **Inter-firm TT:**
  - PROTON to its vendors, esp. process technology
  - Foreign licensors to local vendors (licensees), esp. production technology.
• Intra-firm TT
  - MMC to PROTON
  - PROTON to its subsidiaries.
  - Lotus International (U.K) to PROTON
  - Foreign MNCs to its subsidiaries/foreign-controlled-joint-venture firms operating in Malaysia.
Variables

1. TURNOVER (sales volume for the financial year and a proxy to production)
2. MARTSHAR (market share where each firm’s market share is expressed as a proportion of the industrial total share of RM5.19 b in 2004),
3. PAS (profit attributes to shareholders),
4. NETDIVID (net dividend),
5. EBITTA (earning before interest and tax),
6. GPS (gross profit/sales),
7. CURATIO (current asset and current liability ratio),
8. PROFEMPL (profit per employer as a proxy of labour productivity), and
9. SIZEEMPLO (number of employees as a proxy for the employment creation capacity of the industry).
<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>LOCAL VENDORS MEAN</th>
<th>FOREIGN VENDORS MEAN</th>
<th>TOTAL MEAN</th>
<th>F</th>
<th>SIG.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TURNOVER</td>
<td>66.959</td>
<td>163.570</td>
<td>88.093</td>
<td>8.687</td>
<td>.004</td>
</tr>
<tr>
<td>MARTSHAR</td>
<td>1.296</td>
<td>3.148</td>
<td>1.701</td>
<td>8.578</td>
<td>.004</td>
</tr>
<tr>
<td>PAS</td>
<td>1.738</td>
<td>8.217</td>
<td>3.155</td>
<td>14.770</td>
<td>.000</td>
</tr>
<tr>
<td>NETDIVID</td>
<td>0.826</td>
<td>4.794</td>
<td>1.694</td>
<td>12.028</td>
<td>.001</td>
</tr>
<tr>
<td>EBITTA</td>
<td>0.074</td>
<td>0.220</td>
<td>0.106</td>
<td>13.636</td>
<td>.000</td>
</tr>
<tr>
<td>GPS</td>
<td>0.049</td>
<td>0.084</td>
<td>0.057</td>
<td>2.275</td>
<td>.135</td>
</tr>
<tr>
<td>SIZEEMPLO</td>
<td>1.60</td>
<td>1.75</td>
<td>1.60</td>
<td>.020</td>
<td>.889</td>
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<tr>
<td>PROFEMPL</td>
<td>0.027</td>
<td>0.302</td>
<td>0.028</td>
<td>.622</td>
<td>.432</td>
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<tr>
<td>CURATIO</td>
<td>6.327</td>
<td>9.830</td>
<td>6.992</td>
<td>.106</td>
<td>.745</td>
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</tbody>
</table>
Figure 3: Car Ownership Per 1000*, Selected Economies, 2003
Figure 4: Cars and Motorcycles Registered, Malaysia, 1983-2003
National Automotive Policy Framework

• Approved Permits – phased out
• Equity and Approval Permits: Listed Companies
• Designated Production Centers
• Exclusive Franchise Holders: Import vehicles Directly
• New Tax Structure for Motor Vehicles
Figure 2: Car Sales in the Domestic Market, Malaysia, 1985-2003

- Import on ASEAN CBU- reduced to 15% from 20%, non-ASEAN CBUs reduced to 30% from 50%
- 0% import duties from ASEAN CKD passengers cars and 10% on non-ASEAN CKD remains unchanged
- Excise duties on ASEAN and non-ASEAN CBU/CKD passengers cars reduced to 80-100% from 90-250% and for 4WDs to 55-160% from 60-170%
- Excise duties on motorcycles reduced to 20-50% from 20-60%
- CKD/CBU MPVs (ASEAN and non-ASEAN) raised to 55-160% from 40-170%
- Diesel cars-Passengers cars will enjoy duties and MPV/Van and 4WD higher duties.
Table 1: Industrial Emissions of Pollutants, 1987-97 (x1000 metric tons)

<table>
<thead>
<tr>
<th>Year</th>
<th>Particulates</th>
<th>SO$_2$</th>
<th>NO$_2$</th>
<th>CO</th>
<th>Hydrocarbon</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987</td>
<td>10.4</td>
<td>54.1</td>
<td>25.9</td>
<td>4.7</td>
<td>3.0</td>
</tr>
<tr>
<td>1988</td>
<td>32.6</td>
<td>62.8</td>
<td>23.5</td>
<td>3.0</td>
<td>1.9</td>
</tr>
<tr>
<td>1989</td>
<td>21.8</td>
<td>31.8</td>
<td>22.5</td>
<td>2.1</td>
<td>1.4</td>
</tr>
<tr>
<td>1990</td>
<td>25.2</td>
<td>39.3</td>
<td>27.2</td>
<td>7.7</td>
<td>1.8</td>
</tr>
<tr>
<td>1991</td>
<td>23.2</td>
<td>33.8</td>
<td>27.7</td>
<td>5.8</td>
<td>5.6</td>
</tr>
<tr>
<td>1992</td>
<td>89.0</td>
<td>40.0</td>
<td>29.4</td>
<td>3.1</td>
<td>1.5</td>
</tr>
<tr>
<td>1993</td>
<td>101.2</td>
<td>43.1</td>
<td>31.2</td>
<td>3.5</td>
<td>1.6</td>
</tr>
<tr>
<td>1994</td>
<td>166.2</td>
<td>46.3</td>
<td>34.3</td>
<td>4.1</td>
<td>1.7</td>
</tr>
<tr>
<td>1995</td>
<td>103.5</td>
<td>109.2</td>
<td>41.0</td>
<td>5.1</td>
<td>2.4</td>
</tr>
<tr>
<td>1996</td>
<td>104.1</td>
<td>117.0</td>
<td>44.5</td>
<td>7.3</td>
<td>4.1</td>
</tr>
<tr>
<td>1997</td>
<td>55.1</td>
<td>142.2</td>
<td>51.1</td>
<td>8.4</td>
<td>3.6</td>
</tr>
</tbody>
</table>
Table 2: Manufacturing BOD Load, 1979-93 (tons per day)

<table>
<thead>
<tr>
<th>Year</th>
<th>BOD Load</th>
<th>% of Total BOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1979</td>
<td>124</td>
<td>na</td>
</tr>
<tr>
<td>1980</td>
<td>105</td>
<td>19.0</td>
</tr>
<tr>
<td>1987</td>
<td>20</td>
<td>4.6</td>
</tr>
<tr>
<td>1988</td>
<td>19</td>
<td>4.3</td>
</tr>
<tr>
<td>1989</td>
<td>21</td>
<td>4.6</td>
</tr>
<tr>
<td>1990</td>
<td>25</td>
<td>5.2</td>
</tr>
<tr>
<td>1991</td>
<td>25</td>
<td>5.1</td>
</tr>
<tr>
<td>1992</td>
<td>27</td>
<td>3.6</td>
</tr>
<tr>
<td>1993</td>
<td>77</td>
<td>7.5</td>
</tr>
</tbody>
</table>

*Source: DOE (1999)*
MALAYSIA: VEHICLES DENSITY RATIO

- 1994 - 46 vehicles per road km
- 1999 – 71 vehicles per road km
- 2004 – 184 vehicles per road km

MALAYSIA: TRIPS USING PRIVATE /PUBLIC TRANSPORT(%)

Private Mode
- 1985 – 47%
- 2004 – 71%

Public Mode
- 1985 – 35%
- 2000 – 16%
- 2005- 6%
Car Ownership: An Obsession

- 1990 - 247 per 1000
- 1996 - 540 per 1000
- 2002 - 994 per 1000
Laws On the Environment: Vehicles Emissions Standard

- Environmental Quality Act 1974 (Act 127)
- Environmental Quality (Control of Lead Concentration in Motor Gasoline) Regulations 1985 (P.U. 296/85)
- Environmental Quality (Control of Emissions from Diesel Engines) Regulations 1996 (P.U. (A) 537/94)
- Environmental Quality (Control of Emissions from Petrol Engines) Regulations 1996 (P.U. (A) 543/96)
- Environmental Quality (Clean Air) (Amendment) Regulations 2000 (P.U. (A) 309/00)
- Environmental Quality (Control of Emission from Diesel Engines) (Amendment) Regulations 2000 (P.U. (A) 488/00)
Table 3: Final Commercial Energy Supply by source, Malaysia, 1980-2005 (petajoule)

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude Oil &amp; Petroleum Products</td>
<td>344.4(87.9%)</td>
<td>520.2(71.4%)</td>
<td>888.4(53.1%)</td>
<td>1205.2(50.8%)</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>29.2(7.5%)</td>
<td>114.4(15.7%)</td>
<td>622.2(37.1%)</td>
<td>948.4(39.9%)</td>
</tr>
<tr>
<td>Hydro</td>
<td>16.0(4.1%)</td>
<td>38.2(5.3%)</td>
<td>73.0(4.4%)</td>
<td>81.6(3.4%)</td>
</tr>
<tr>
<td>Coal and Coke</td>
<td>2.2(0.8%)</td>
<td>55.5(7.6%)</td>
<td>90.4(5.4%)</td>
<td>139.6(5.9%)</td>
</tr>
<tr>
<td>Total</td>
<td>391.8(100%)</td>
<td>728.8(100%)</td>
<td>1674.0(100%)</td>
<td>2374.8(100%)</td>
</tr>
</tbody>
</table>
Table 4: Final Commercial Energy Demand by source, Malaysia, 1980-2005 (petajoule)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude Oil &amp; Petroleum Products</td>
<td>232.4(86.9)</td>
<td>414(74.8%)</td>
<td>804.3(68.9%)</td>
<td>1139.1(67.0%)</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>31.2(11.7%)</td>
<td>71.8(13.0%)</td>
<td>205.0(17.6%)</td>
<td>320.0(18.9%)</td>
</tr>
<tr>
<td>Hydro</td>
<td>1.5(0.6%)</td>
<td>45.7(8.3%)</td>
<td>120.0(10.3%)</td>
<td>184.8(10.9%)</td>
</tr>
<tr>
<td>Coal and Coke</td>
<td>2.2(0.8%)</td>
<td>2.5(3.9%)</td>
<td>37.8(3.2%)</td>
<td>55.9(3.3%)</td>
</tr>
<tr>
<td>Total</td>
<td>267.3(100%)</td>
<td>553.0(100%)</td>
<td>1167.1(100%)</td>
<td>1699.8(100%)</td>
</tr>
</tbody>
</table>
Table 5: Fuel Mix in the Transportation Sector, Malaysia, 1980-2005

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Petroleum Products</td>
<td>100.00</td>
<td>99.94</td>
<td>95.4</td>
<td>93.2</td>
</tr>
<tr>
<td>Gas</td>
<td>0%</td>
<td>0.06</td>
<td>4.2%</td>
<td>7.8%</td>
</tr>
</tbody>
</table>

Source: Ministry of Energy, Water and Communication, Malaysia
Table 6: Fuel Mix of Commercial Energy Supply, Malaysia, 1990-2005 (in ktoe)

<table>
<thead>
<tr>
<th>SECTORS</th>
<th>1990</th>
<th>1998</th>
<th>2005&lt;sup&gt;(E)&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial</td>
<td>5,885</td>
<td>10,121</td>
<td>14,564</td>
</tr>
<tr>
<td>Transport</td>
<td>5,387</td>
<td>9,793</td>
<td>13,674</td>
</tr>
<tr>
<td>Residential &amp; Commercial</td>
<td>1,646</td>
<td>3,315</td>
<td>6,451</td>
</tr>
<tr>
<td>Non-energy</td>
<td>299</td>
<td>2,093</td>
<td>2,985</td>
</tr>
<tr>
<td>Agriculture</td>
<td>0</td>
<td>307</td>
<td>967</td>
</tr>
</tbody>
</table>
CURRENT STATUS OF NATIONAL HYDROGEN AND FUEL CELLS DEVELOPMENT

FUEL CELLS

7th Malaysia Plan (1996-2000), MOSTE through the IRPA mechanism financed the first Malaysia fuel cell project (jointly run by UKM and UTM).

UNIVERSITI KEBANGSAN MALAYSIA

Fabrication of Membrane Electrolyte Assembly and Bipolar Plates
Hydrogen Production From Methanol,
Hydrogen Production From Solar Energy
Design and Fabrication of Fuel Cell Stack

UNIVERSITI TEKNOLOGI MALAYSIA

Fabrication Of New Polymer Electrolyte Membranes
Hydrogen Storage On Metal Hydrides
Control System and Power Conditioner.

The same team was awarded RM30 Million grant in the 8th MP from MOSTI through the PR mechanism to develop fuel cell technologies from 2002 – 2007.
# Malaysia: Government Programs to develop Hydrogen Fuel Cell Technology

<table>
<thead>
<tr>
<th>Programs</th>
<th>Short Term (2005-2014)</th>
<th>Medium term 2015-2026</th>
<th>Long Term 2030-2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial and funding</td>
<td>Incentive and technology supplier(2010)</td>
<td>Approved projects(2015)</td>
<td>Completion of all viable Projects(2026)</td>
</tr>
</tbody>
</table>
Current Scenario

- Current framework. Policy and systems not yielding the expected results/outcomes for R&D investments
- Not effective follow-through and accountability for research outcomes and commercialisation
- No mechanism in place such as technology assessors and brokers to bridge the research and commercialisation chasm
- Not strong in research management
- Research not market needs driven
- No mechanism to facilitate commercialisation and venture creation
- Low conversion rate of technologists, researchers technopreneurs and spin-outs from IHLs
Key Challenges & Objectives for Ninth Malaysia Plan/9MP (2005-2010)

- To catalyse and build a pool of technology-based entrepreneurs for development into a cluster of technology-based SMEs in strategic technology areas
- To create an enabling environment for development and growth of these technopreneurs
- To develop talent in strategic technology areas
- To source and mine potentially commercialisable projects from IHLs/RIs and Industry at large for venture creation
- To focus on ‘human centered talent build’ and convert technologists, researchers, scientists to technopreneurs
TECHNOPRENEUR DEVELOPMENT FRAMEWORK

UNDER 9MP

INDUSTRIES

Funding
Entrepreneur Development
Human Resource Development
Market – Inter Ministry Collaboration (Eg. MITI And MATRADE)

MALAYSIAN INDUSTRY
SCIENCE AND TECHNOLOGY RESEARCH
ORGANISATION (MISTRO)

ONE STOP AGENCY

Talent & HRD

R&D Technological Facilitation

COE

IHL / RI

COE

IHL / RI

COE

IHL / RI

CENTRES OF EXCELLENCE

CENTRES OF EXCELLENCE

UNIVERSITIES / RESEARCH INSTITUTION

Experts Council
Legislation / Mandatory Guidelines
Granting Body
Coordinating Role
Assessment – Market Driven R&D
Technology Brokering
Reference Centre / Showcasing Of R&D
Recognises COE / Distribute Funding To COE
Facilitate Collaboration Between IIHL And Industry
Facilitate International Linkages
Custodian Of Datasets
R&D Projects
Researchers / PhD
Current / Retired Experts
Brain Gain