

2012

# NATIONAL RESEARCH GROUP on ROAD TRAFFIC

## Report

*“There are not many roads; there is a single road that extends across the length and breadth of our vast planet. Each of us is responsible for a segment of that road. The road safety decisions that we make or do not make, ultimately have the power to affect the lives of people everywhere.”*

**We are One Road – One World**  
**Rochelle Sobel**  
**President, Association for Safe International Road Travel, USA**



Mauritius Research Council



## ACKNOWLEDGEMENTS

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It is equally important to recognize the substantial contribution, commitment, dedication and support of all the NRG-RT member institutions and their respective representatives and without whom none of this would have been possible. These include:

Name of Institution	Representative
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Mauritius Standards Bureau (MSB)	Mr K F Ho Fong
Mauritius Research Council (MRC)	Dr G Gottoli Mr G White Ms K B Diop Mr K Narrain

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The NRG-RT is pleased to see that this initiative has been able to capture the views and opinions of the public at large and to raise awareness in relation to urgent matters pertaining to Road Traffic.

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## ABBREVIATIONS

CSO	Central Statistics Office
MEF	Mauritius Employers' Federation
MID	'Maurice Ile Durable'
MIH	Mauritius Institute of Health
MoESD	Ministry of Environment and Sustainable Development
MoTERST	Ministry of Tertiary Education, Research, Science and Technology
NEF	National Empowerment Foundation
NRG-ER	National Research Group on Energy Resources
NRG-FQHH	National Research Group on Food Quality on Human Health
NRG-HR	National Research Group on Human Resources
NRG-RT	National Research Group on Road Traffic
NRG-WR	National Research Group on Water Resources
NTA	National Transport Authority
TMRSU	Traffic Management and Road Safety Unit
UN	United Nations
WHO	World Health Organization

## EXECUTIVE SUMMARY

Over the years, Mauritius has witnessed dramatic changes in urban planning and industrial activity, in working practices, and demographic patterns. These changes have also fuelled a corresponding increase in mobility. The number of registered vehicles on Mauritian roads has increased from 244,018 in 2000 to 384,115 in 2010, representing a rise of almost 60 percent. This ever increasing motorized traffic is undoubtedly impacting on many facets of our society.

Receptive to these sentiments in early 2011, Dr the Honourable Minister Rajeshwar Jeetah of the Ministry of Tertiary Education, Research, Science and Technology (MoTERST) proposed the setting-up of a National Research Group on Road Traffic (NRG-RT). This initiative was specifically dedicated to forming a National platform for the identification of issues needing resolution in the area of Road Traffic in Mauritius. The NRG-RT engaged stakeholders with specific expertise in the field of road traffic as well as members of the general public and the media.

Six-months later the following outputs were achieved: the formation of NRG-RT comprising of 22 members; the consultative agreement on a title for the NRG-RT, i.e. *'Impact of Road Traffic on the Economy, the Environment and Health'*; the consultative identification of three focus areas of research on Road Traffic under the title of the NRG-RT, i.e. *'Road Traffic Accidents'*, *'Road Transport Sector in the Context of Maurice Ile Durable'*, and *'Road Traffic Congestion and its Societal Impacts'*; from which a final list of four Cross-Cutting Research Areas and sub-themes were identified, also in a consultative manner.

This report presents the four cross-cutting research areas identified. These are: (1) *'Sustainable modes of transport and efficient road use'*; (2) *'Costing the impact of Road Traffic'*; (3) *'Impact of Road Traffic on Health due to pollution'* and (4) *'Understanding the behavioural and psychosocial dimension of road users for behavioural change'*. These areas provide a basis for the launching of a Call for Solicited Research Proposals.



It is expected that the successful applicants of such Calls for Research Proposals will, through the executive of their research plans:

1. Demonstrate relevant expertise and propose the use of appropriate methodologies for the Cross-Cutting Research Areas to be investigated, and
2. Propose ways to formulate research-based, data-reliant recommendations which will inform policy making decisions in the Road Traffic space.

The NRG-RT is particularly proud to have, during this whole consultative initiative, not only engaged stakeholders with specific expertise in the field of Road Traffic, but also to have included the members of the general public and members of the media. We hope to have raised awareness on local Road Traffic issues, and through the activities of the NRG-RT to have aligned local competencies and resources towards the resolution of urgent Road Traffic issues.

## 1.0 INTRODUCTION

The National Research Group on Road Traffic (NRG-RT) is an initiative constituted under the aegis of Dr the Honourable Minister Rajeshwar Jeetah of the Ministry of Tertiary Education, Research, Science and Technology (MoTERST). It was developed with a view to specifically investigate the impact of Road Traffic on the National Economy, Environment and Health.

The NRG-RT is one of five parallel National Research Group initiatives proposed by Dr the Hon. Min. Jeetah. The others are the National Research Group on Water Resources (NRG-WR), the National Research Group on Energy Resources (NRG-ER), the National Research Group on Food Quality & Human Health (NRG-FQHH), and the National Research Group on Human Resources (NRG-HR).

Each of the aforementioned NRG initiative was conceived to identify important issues needing resolution in the following areas of national concern: Road Traffic, Water Resources, Energy Resources, Food Quality and Human Health, and Human Resources. The NRG initiatives relied on both public and private sectors knowledge and competencies.

### 1.1 Aim

The aim of the NRG-RT initiative was to initiate debate on the critical societal impacts of Road Traffic in Mauritius and provide a series of Research Areas on which research could be carried out to fill gaps in knowledge. It is believed that such research can lead to appropriate and practical recommendations by acting as a Needs Assessment for Research in Road Traffic Management.

### 1.2 Objectives of the NRG-RT

The principal objectives of the NRG-RT were to:

- take cognizance of past and current Road Traffic initiatives and their documented impacts through a comprehensive desk review of Road Traffic in Mauritius;
- connect, co-ordinate, and collaborate with relevant stakeholder institutions and experts and the public in general to share knowledge and competencies in the field of Road Traffic;
- identify Research Areas with the potential to inform the policy making process in Road Traffic through a consultative process. Key research areas include the Economy, the Environment and Health in Mauritius;
- sensitize and raise awareness among both the internal and external stakeholders of the NRG-RT on the potential socio-economic (inclusive of health) and environmental costs of Road Traffic.

### **1.3 Rationale for this Report**

According to a Central Statistics Office (CSO) report released in 2011, the number of vehicles on the Island of Mauritius in 2010 peaked at 384,115 for a corresponding resident population of 1,283,415 (CSO, 2011). These figures suggest that approximately more than 1 in 3 Mauritians (adults) is currently in possession of a vehicle.

Given that this alarming trend in Mauritius is unlikely to be attenuated in the near future, the establishment of the NRG-RT is a Government initiative that attempts to identify the most pressing issues related to Road Traffic in the country by drawing upon local competencies, local resources and the adoption of a clear scientific methodology.

In the paragraphs that follow the impact of Road Traffic on the Economy, the Environment and Health in Mauritius is presented via a concise literature review. This exercise has endeavoured, as much as possible, to take stock of past and current studies and reports

conducted on Road Traffic in order to give the reader a sense of the updated 'status quo' in Mauritius in relation to these matters. In essence the objectives of this report are to:

- To act as a Needs Assessment for Research in the Road Traffic space;
- To summarize the views of experts, the public and the research community; and
- To identify areas of research and projects with a view to inform local policy decisions in Road Traffic.

## 2.0 LITERATURE REVIEW

### 2.1 Impact of Road Traffic on the Economy

There is anecdotal evidence that Mauritian motorists spend as much as 600 hrs annually or an estimated 75 man-days (Menon, 2004) in Road Traffic congestion. Hence considering 600 hrs of idling time, the total amount of fuel spent inefficiently varies between 1200 litres to 3840 litres per year.

A study carried out in 2004 found that the estimated annual cost of Road Traffic congestion in terms of lost productivity, ranged anywhere between Rs 2.5 to 3.0 billion yearly (Menon, 2004). It is believed that these expenditures, going forward, will continue to increase as the numbers of vehicles increasingly take to the already clogged roads of Mauritius.

An MEF study carried out in 2007 found that 97.1% of the enterprises surveyed were adversely affected by traffic congestion, “with nearly 40% reporting a very high adverse impact”. 76.8% of the enterprises surveyed were affected by higher vehicle operating costs and fuel expenses due to traffic congestion. Moreover, in 63.8% of cases, business operations are negatively affected by lateness and absenteeism caused by traffic jams.

More specifically, the negative impacts on businesses due to traffic congestion were listed as follows:

- delayed deliveries, increased transport and distribution costs;
- loss of productivity and competitiveness;
- increased labour and overtime costs;
- decreased quality of service; and
- lower sales and higher inventory levels and costs.

Business activities were also affected by stress due to time lost by employees in traffic, uncertainty created by disruption to their daily schedule and difficulties in serving customers in certain regions of the country. “Furthermore,” the report warned that “according to

62.3% of enterprises, traffic congestion is a very important deterrent to future investment plans.”

## **2.2 Impact of Road Traffic on the Environment**

According to Gaines *et al.* (2006) and other data available to the MRC, vehicle engine idling commonly occurs during Road Traffic congestion. This is very common in Mauritius particularly during peak hour traffic. In fact, every 30 minutes of vehicle idling is estimated to cost at least 2/10 (0.2) of a gallon of gas (1 litre of fuel) and up to about 7/10 (0.7) of a gallon (3.2 litres of fuel) depending on the vehicle (LEaP 2010).

In addition, Integrated National Transport Strategy Study initiated by the Government in 2001 the MRC estimates that 1 gallon of fuel (approximately 5 litres) releases around 19 pounds of CO<sub>2</sub> (approximately 8.6 kg). Hence, the carbon footprint of the idling of just one vehicle in Road Traffic congestion is estimated to correspond to 2,064 to 6,605 kg of CO<sub>2</sub> emission. One can only imagine the compounded carbon footprint from the thousands of vehicles that transit to and from Port Louis alone during the working week in Mauritius!

It is generally agreed that the following gases are Nitrogen Dioxide, Sulphur Dioxide and Ozone and other substances like particulate matter (PM<sub>10</sub> and PM<sub>25</sub>) are also emitted in the atmosphere during vehicle idling.

## **2.3 Impact of Road Traffic on Health**

Road Traffic has a significant impact on the health of our national population. On average, fatalities and injuries due to road accidents have been high for a small island like ours. For the 2000 to 2009 period there have been a total of 19,725 road accidents, of which 3053 casualties, resulting in an average 144 deaths per year during that time frame (CSO 2010). Road Traffic is well known to be a cause of air and noise pollution and the cause of increase in stress levels of vehicle drivers. This makes an especially lethal combination with the health challenges prevailing in Mauritius. According to the WHO (2009), Mauritius is facing

problems associated with an ageing population and the resulting Non-Communicable Diseases (NCDs) associated with such a population. This appears to be confirmed by information readily available from the Ministry of Health. Hence Diabetes Mellitus, Hypertension, Cerebrovascular Diseases, Cancer (Malignant Neoplasms), Mental Illnesses and Cardiovascular conditions are on the rise.

The exhaust gases Nitrogen Dioxide, Sulphur Dioxide and Ozone and other substances like particulate matter (PM10 and PM25) are responsible for numerous health problems including respiratory diseases (airways inflammation, Bronchitis, Bronchial asthma) and cardiac diseases.

From the above literature review, one can already make sense of the numerous issues one could engage in the area of Road Traffic, especially when considering its impact on the National Economy, Environment and Health. The NRG-RT was conceived as a National research platform with the purpose of engaging local talents in relevant discussions for the definition of research areas that can provide practical solutions to the critical Road Traffic issues requiring immediate attention in Mauritius.

## 3.0 PROCESS

### 3.1 Introduction

The establishment of the NRG-RT was conducted in a highly structured manner. The MRC's role in the NRG-RT's formation was that of coordinator of all the activities relating to the development and execution of the NRG-RT's research directions with regard to the issues relating to Road Traffic. More specifically, the MRC's responsibilities vis-à-vis the NRG-RT were to:

- (1) assist in the identification of key stakeholder members;
- (2) provide guidance towards the general focus and outcome(s) of the exercise;
- (3) offer administrative and secretarial support;
- (4) give supplementary input and methodological advice;
- (5) follow targeted objectives & milestones for the efficient completion of suggested actions and;
- (6) encourage as wide a consultative process as possible within the field of Road Traffic.

The NRG-RT, during its six-month operational period conducted its activities based on a well-defined Research Framework. These included, amongst other activities, the facilitation of several meetings and workshops culminating towards the organisation of three consultative events i.e.: the NRG-RT official launching, brainstorming session and final consultative events.

The major outputs from the NRG-RT exercise were as follows:

- (1) the establishment of an 'umbrella' title for the operation of the NRG-RT, i.e. *'Impact of Road Traffic on the Economy, the Environment and Health'*; (2) the identification of the key research areas to be tackled under the title of the NRG-RT, i.e. *'Road Traffic Accidents'*, *'Road Transport Sector in the Context of Maurice Ile Durable'*, and *'Road Traffic Congestion and its Societal Impacts'*. From these titles a final list of four Cross-Cutting Research Areas were identified i.e. (i) *Sustainable modes of transport and efficient road use*; (ii) *Costing the impact of Road Traffic: congestion & accidents*; (iii) *Impact of Road Traffic on Health due to*



*pollution and (iv) Understanding the behavioural and psychosocial dimension of road users to instigate behavioural change.*

It is to be noted that at every stage of the process, i.e. from the decision of the name of the NRG-RT team, to the final four cross-cutting areas identified, that the NRG-RT undertook a consultative exercise whereby both internal and external inputs were duly considered.

### **3.2 Synopsis of Meetings 1 - 4**

Four preliminary meetings were organised at the MRC, in Ebène, prior to the official NRG-RT launching event during the period of June to August 2011. Representatives of various institutions were called to discuss and brainstorm on issues pertaining to Road Traffic in Mauritius. Representatives of relevant NGOs were contacted but were not present at those meetings. The highlights of each of these meetings carried out at the MRC in Ebène are found in Annex-1.

### **3.3 National Research Group on Road Traffic (NRG-RT) Official Launching:**

*“Cross-Collaborative Research Exercise on the Impact of Road Traffic on the Economy, Environment and Health in Mauritius”*

This section summarizes the presentations made by the group members at the official launching event of the NRG-RT held on August 25th 2011, at the Bonâme Hall, Mauritius Sugar Industry Research Institute (MSIRI), Réduit. The keynote address was given by Dr the Hon. Rajeshwar Jeetah, Minister of TERST. The presentations from the NRG-RT group members covered the following topics:

- *“Past findings on Road Traffic Studies in Mauritius”;*
- *“Situation of Road Traffic in Mauritius”;*
- *“The Impact of Road Traffic on the Environment”;*
- *“The impact of Road Traffic on the Environment, Health & Economy”;* and
- *“Impact of Road Traffic on Productivity”.*

### ***3.3.1 Presentation 1: Past Findings on Road Traffic Studies in Mauritius: Investigating Local Problems for Local Solutions***

***Presented by: Dr G Gottoli, Research Officer***

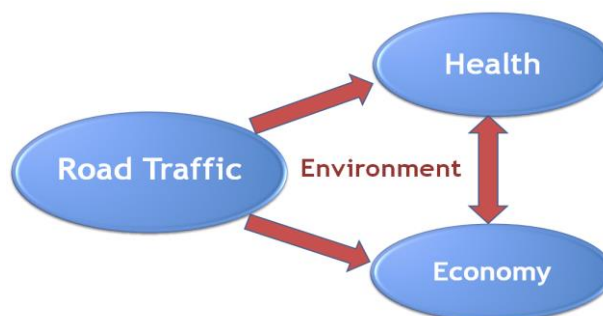
***Mauritius Research Council***

***Ministry of Tertiary Education, Science, Research & Technology***

As noted in section 1, the MRC was requested by the Minister of TERST to set up five National Research Groups (NRGs) in response to important challenges that Mauritius is currently facing. The NRG-RT aims to specifically provide a platform for the Research Community to extend its network to the public and private sectors to collaborate on the resolution of key Road Traffic issues in Mauritius. More specifically, the purpose of the NRG-RT is to take stock of the situation and studies done previously and to determine the course of action and expected outcome(s) of research projects.

#### **3.3.1.1 Research Framework**

It was explained that the 4 meetings which had been organised led to the official establishment of the NRG-RT. The title and focus areas of the NRG-RT initiative were also decided as a result of these interactions. The Research Framework shown below has been adopted by the NRG-RT members in all their meetings.



**Figure 1: A schematic representing the NRG-RT Research Framework.**

### **3.3.2 Presentation 2: Situation of Road Traffic in Mauritius**

**Presented by: Mr P Gooljar, Engineer**

**Traffic Management and Road Safety Unit**

**Ministry of Public Infrastructure, National Development Unit, Land Transport & Shipping,**

Different aspects of Road Traffic are managed by different entities within the Ministry of Public Infrastructure, National Development Unit, and Land Transport & Shipping. For instance the NTA and the TMRSU are responsible for land transport. The RDA on the other hand is responsible for public infrastructure works in Mauritius.

#### **3.3.2.1 Facts and Figures on Road Traffic in Mauritius**

- The total length of the road network of Mauritius is 2028 km (CSO 2011);
- The number of registered vehicles have increased from **276,371** in 2003 to **400,900** (CSO 2011, NTA 2012) in 2011;
- The proportion of vehicle types is as follows: 41% are two wheelers, 46% are cars while the remaining 13% are made up of Buses, Lorries and Vans (CSO 2011); and
- The age of vehicles on Mauritian roads can be summarized as seen below in Table 1.

**Table 1: Age of Vehicles in Mauritius.**

<b>Age Group (Yrs)</b>	<b>Cars (%)</b>	<b>Buses (%)</b>
< 5	42.3	27.7
5 >10	23.7	32.8
10 > 15	10.2	19.3
15 >18	0	20.2
<b>&gt;15</b>	<b>23.8</b>	<b>0</b>

### **3.3.2.2 Traffic Congestion**

By definition, traffic congestion occurs when vehicle density exceeds road design capacity. Consequently, either additional road capacity or lowering of traffic volumes is required. Some key features of Road Traffic congestion in Mauritius are outlined below.

- Traffic congestion is a daily occurrence along some roads;
- Traffic flow is not homogenous throughout the day;
- Congestion is worse in Mornings (7hr to 9hr30) and Afternoon peaks;
- Traffic from the South accounted for 46,319 vehicles (on average per day) to Port-Louis, traffic from the North to Port Louis accounted for 31,551 vehicles (on average per day) (CSO 2011);
- Consequences of traffic congestion are deemed to be:
  - Societal;
  - Environmental;
  - Economic (estimated cost Rs billion/annum);
  - Smoke emissions hamper visibility for drivers; and
  - Spill-over effect.

### **3.3.2.3 Road Projects & Traffic Management Initiatives**

#### ***Completed Road Projects***

- Phoenix-Beau Songes Road;
- Triolet Bypass; and
- Goodlands Bypass.

#### ***Current Road Projects***

- Terre Rouge-Trianon Road;
- Port Louis Ring Road (Ph1);
- Third Lane from Phoenix to Caudan Roundabout;
- Grade separated Junction at Caudan Roundabout; and

- Extension of M2 from Pamplémousses to Sottise.

#### ***Future Road Projects***

- East Coast road;
- East West Link;
- Harbour Bridge;
- Port Louis Ring Road Ph 2;
- Estimated cost: Rs 25b;
- Projects fall into the short and medium term perspectives and aim to improve overall road access & connectivity; and
- Public Transport: (Long-term) – LRT (Light Railway Transport) & modernization of Public transport.

#### ***Traffic Management Initiatives***

- Road Marking and traffic signs (yellow lines);
- Junction control design (traffic lights);
- Bus lay-by;
- One- way system; and
- Parking control.

### ***3.3.3 Presentation 3: The Impact of Road Traffic on the Environment***

***Presented by: Mr Amarsingh Allock, Environment Officer***

***Ministry of Environment & Sustainable Development***

The MoESD is responsible for the cleanliness of the island and coordinates litter collection in public places. It is mandated to perform the following roles and it offers the following services:

- Processing of PER/EIA reports;
- Advise industrialists & the public on appropriate pollution abatement measures;

- Attending to complaints made by the public regarding environmental pollution;
- Raising public awareness & environmental education (EE);
- Infrastructure upgrading and enhancement of the environment;
- Rehabilitation and preservation of our national heritage sites;
- Funding of environmental projects through NEF;
- Providing access to environmental information; and
- Offers an NGO Desk.

Environmental complaints and requests for Environmental Awareness can be filed online via the Ministry's website.

### **3.3.3.1 Emissions from Road Traffic**

It was explained that Exhaust and Noise emissions are major causes of nuisance and pollution originating from diesel driven vehicles, motorcycles and auto-cycles. The problems worsen with the increase in the number of vehicles on our roads (384,115 at Dec 2010 v/s 244,018 Dec 2000, CSO 2011). The results of these emissions can be seen in Table 2 below.

**Table 2: Road Traffic Emissions Noxious Gases & Green House Gases.**

<b>Road Traffic Emissions</b>	
Oxides of Sulphur (SO <sub>x</sub> )	Volatile Organic Compounds (VOCs)
Oxides of Nitrogen (NO <sub>x</sub> )	Ozone (O <sub>3</sub> )
Carbon Monoxide (CO)	Hydrocarbons
Carbon Dioxide (CO <sub>2</sub> )	Thermal emission

### **3.3.3.2 Environmental impacts**

#### ***Noxious gases***

- Affects ambient air quality;
- Human health;
- Plants & Soil;
- Soiling of infrastructure, hygiene;
- Creates discomfort for road users (may lead to accidents); and
- Wrong signal to our Tourist Industry.

#### ***Contribution to Global warming***

- CO<sub>2</sub> is a "greenhouse gas";
- Land transport accounts for 25% (844,800 tonnes) of the total carbon dioxide emissions (Digest of Environmental Statistics, 2010);
- Second sector that contributes most to CO<sub>2</sub> emission; and
- Land Transport is also the highest energy consumer with a consumption of 34.7 % of total energy produced (Digest of Environmental Statistics, 2010).

It was also mentioned that Road Traffic affects noise emissions as some vehicles, especially motorcycles with modified silencers, can produce sound levels which are deafening, hence affecting personal comfort by causing disturbance in residential areas, religious and public recreational places. Other impacts included hazardous waste produced from vehicle maintenance and accidental spills.

### **3.3.3.3 Current Legal Provisions concerning Road Traffic maintenance**

#### ***Regulations under the Road Traffic Act:***

- Control of Vehicular Emissions Regulations 2002 and
- Construction and Use of Vehicles Regulations 2010.

Enforcing Agencies:

- National Transport Authority (NTA) and
- The Mauritius Police Force (MPF).

Government initiatives to control vehicular emissions:

- **Procurement of Equipment** such as Smoke meters, for opacity tests, sound level meters for noise emission tests, etc;
- Agreement with UNEP for the implementation of “Low sulphur diesel and cleaner vehicles project”;
- Participating in the Global Fuel Economy Initiative (GFEI) (Global Project);
- **Fiscal initiatives such as:** Excise (Amendment) Act 2011, CO2 levy or CO2 rebate on motor cars & 50 % excise duty levied on Hybrid and Electric vehicles;
- **Initiating a Decongestion programme through:** new roads, maintenance, upgrading and rehabilitation of existing networks, increasing mobility; and
- **Fuel quality initiatives** such as the Introduction of unleaded petrol since Sep 2002, Introduction of 500 ppm sulphur content diesel in August 2010 (from previous consignment of 2500 ppm) and currently working towards the introduction of 50 ppm sulphur content diesel for the automotive sector.

**3.3.4 Presentation 4: The Impact of Road Traffic on the Environment, Health & Economy**

***Presented by Dr R. Ramyeed, Training Manager***

**Mauritius Institute of Health**

**Ministry of Health and Quality of Life**

The MIH was established in 1989 by an Act of Parliament as a parastatal body under the aegis of the Ministry of Health & Quality of Life. It was empowered to undertake training and research in the health sector and health related disciplines. Besides providing training and



consultancy services, it also carries out research on Health Systems and evaluations of health programmes.

#### **3.3.4.1 RT Congestion impacts on Environment and Health.**

It was explained that some of the effects of Environmental Pollution such as Noise may have the following detrimental effects on:

- Mental fatigue & stress;
- Aural communication: Speech, Hearing;
- Mental concentration; and
- Sleep.

It was shown by research carried out in Jaipur by the engineering team of Malviya National Institute of Technology, that Road Traffic was a distinct source of noise pollution. This survey showed that:

- 60-85%: of those surveyed saw Road Traffic a main source of noise pollution;
- 52%: suffered from frequent irritation caused by RT; and
- 67%: Suffering from common noise-related problems, like a headache, loss of sleep as a result of RT.

Table 3 below summarizes the potential effects of air pollution.

**Table 3: Summary of the Potential Effects of Air Pollution.**

Environmental Pollution	Health Effects
<b>Particulate Matter (PM)</b>	Chronic exposure contributes to risk of developing: 1.Cardiovascular diseases 2.Respiratory diseases 3.Lung cancer
<b>Nitrogen dioxide</b>	At concentrations > 2000 µg/m <sup>3</sup> – a toxic gas = acute inflammation of airways
<b>Sulphur dioxide</b>	Respiratory system: <ul style="list-style-type: none"> <li>• Airways inflammation</li> <li>• Bronchitis, Bronchial asthma</li> <li>• Infections</li> <li>• Reduced lung functions</li> </ul> It may also be the cause of: <ul style="list-style-type: none"> <li>• Increase in admissions for cardiac disease</li> <li>• Irritation of eyes</li> <li>• Increased mortality on days with higher SO<sub>2</sub> levels</li> </ul>
<b>Ozone</b>	Health effects: <ul style="list-style-type: none"> <li>• Breathing problems (asthma) and lung diseases.</li> <li>• One of the air pollutants causing the most concern in Europe</li> <li>• Daily mortality rises by 0.3% and that for heart diseases by 0.4% per 10µg/m<sup>3</sup> increase in Ozone</li> </ul>

### **3.3.4.2 Road Traffic Impact on Health: Congestion**

The following elements of Traffic Congestion are interrelated:

- Travelling Time;
- Environmental pollution;
- Sedentarity; and
- Stress (also from Noise).

### **3.3.4.3 Way Forward**

- **Data collection:**
  - Monitoring;
  - Surveillance;
  - Research.
- **Intersectoral collaboration**
- **Accidents: avoidable (behaviour)**

An accident is seen as an unfortunate event, especially one causing physical harm or damage, brought about unintentionally...but knowingly.

- After accidents: already late/ too late;
- Prevention is crucial; and
- RT congestion:
  - Needs to be minimised;
  - Behaviour faced with RT congestion.

### ***3.3.5 Presentation 5: Impact of Road Traffic on Productivity***

***Presented by Dr Vishal Ragoobur, Senior Economist***

***Mauritius Employer's Federation***

The MEF is the largest umbrella organization of the private sector in Mauritius, with 1000+ enterprise members of all sizes, small, medium and large. It represents Mauritian employers nationally, regionally and internationally. It assists members in the professional management of their enterprises by offering a wide range of services in the fields ranging from Industrial Relations and Training, as well as Occupational Health & Safety.

### **3.3.5.1 Impact on Business Productivity**

It was explained that Road Traffic Congestion has an overwhelming impact on businesses and the services which they offer. According to an MEF survey, 97.1 % of enterprises surveyed were adversely affected by traffic congestion, with nearly 40 % reporting a very high adverse impact (MEF 2007). Other impacts observed included:

- Higher vehicle operating costs and fuel expenses;
- Increased transport/distribution costs:
  - Lateness and absenteeism;
  - Stress;
  - Uncertainty;
  - Disruption of planned activities and
  - Delayed deliveries;
- Difficulties in serving customers:
  - Increased labour/overtime costs;
  - Lower quality of service; and
  - Lower sales

### **3.3.5.2 What can be done?**

- Expanding road network and building new infrastructure;
- Decentralization out of Port Louis;
- Improving public transport;
- Alternative modes of transport;
- Park and ride facilities; and
- Flexible working time.

### **3.3.5.3 Conclusions**

- Important to understand how business productivity is affected
- Reducing traffic congestion should become a national priority, otherwise it will develop into an important constraint for economic growth

### **3.4 Synopsis of Meetings 5 & 6**

Two additional meetings were organised at the MRC, in Ebène, prior to the Consultative Brainstorming Session in which group members discussed that upcoming event as well as the way forward for the overall exercise with regard to expected individual roles and outputs. The highlights of each of these meetings are found in Annex-2.

### **3.5 Consultative Brainstorming Session**

This section provides a summary of the presentations made by Group Members at the Consultative Brainstorming Session on the Impact of Road Traffic held on November 10th, 2011, at the Bonâme Hall, Mauritius Sugar Industry Research Institute (MSIRI), Réduit. Presentations from Group Members included, “Road Traffic and Accidents”, “Transport from a “Maurice Ile Durable” (MID) perspective and “Road Traffic and its impact on Society”.

#### ***3.5.1 Presentation 1: Road Traffic Accidents***

***Presented by Inspector G Veerasami***

**Traffic Branch**

**The Mauritius Police Force**

The Traffic Branch of the MPF is responsible for monitoring, implementing, enforcing laws and policies pertaining to road safety in order to protect the Mauritian population and maintain its comfort. The headquarters of the branch in Port-Louis also issues driving licenses and administers driving tests.

### **3.5.1.1 Road Traffic Accidents in context**

It was explained that “a road accident is defined as a rare, random, multi-factor event always preceded by a situation in which one or more road users failed to cope with their environment”.

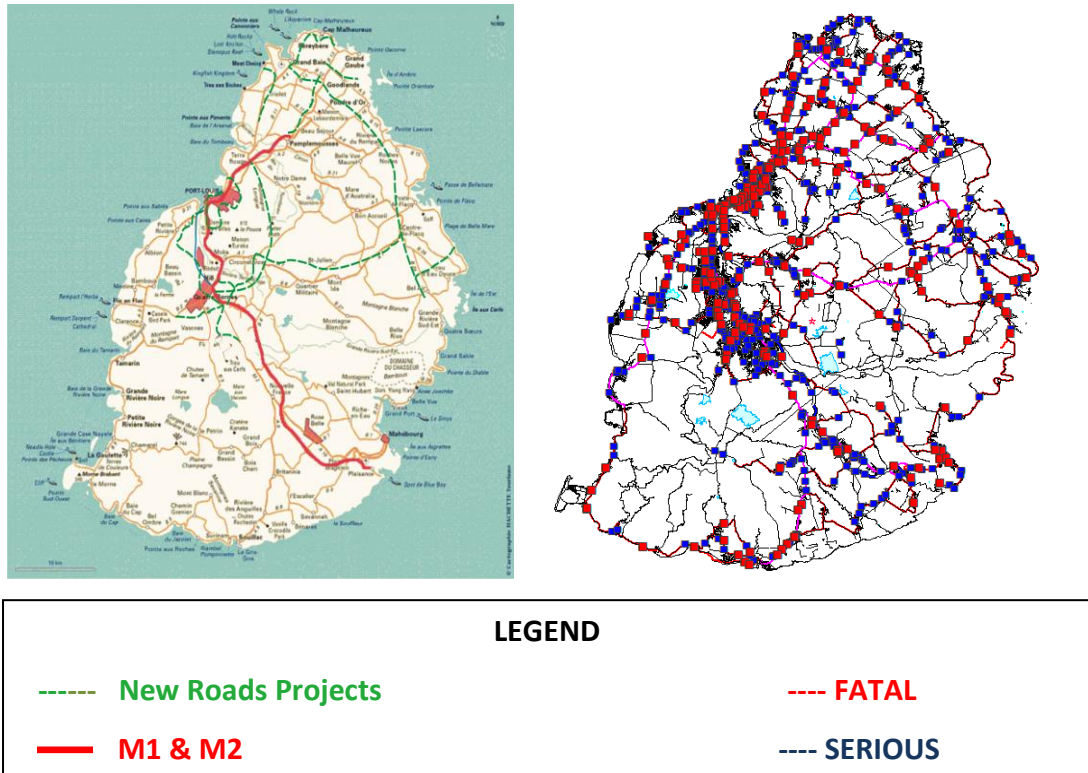


**Figure 2: The results of severe Road Traffic Accidents exposed.**

According to the World Health Organisation (WHO) there are 1.3 million deaths every year in the world, resulting in 3000 deaths on average per day and implying that every 6 seconds someone is fatally or seriously injured. It is thought that if no action is taken, these figures will increase to more than 1.9 million deaths per year by 2020 according to the ‘UN Decade of Action on Road Safety’. Of course, “Every life lost on our Roads is one too many”

### **3.5.1.2 Is Road Safety Important?**

It is important to note that projects under the Prime Minister’s Office - Special Road Safety Unit, the Ministry of Public Infrastructure, National Development Unit, Land Transport and Shipping (Traffic Management and Road Safety Unit & National Transport Authority) are done in conjunction with the Mauritius Police Force. Costs of accidents are worth between Rs 2.5 to 3 billion every year.



**Figures 3 & 4: Road Safety Projects (left) and Concentration of Fatal and Serious Road Accidents throughout the Island (right).**

Figure 3 (left) illustrates new road safety projects started by the Government and those in the pipeline, in reaction to the concentration of Road Traffic accidents throughout the island.

Figure 4 (right) illustrates fatal and serious accident locations on the island.

### **3.5.1.3 What Causes Road Accidents?**

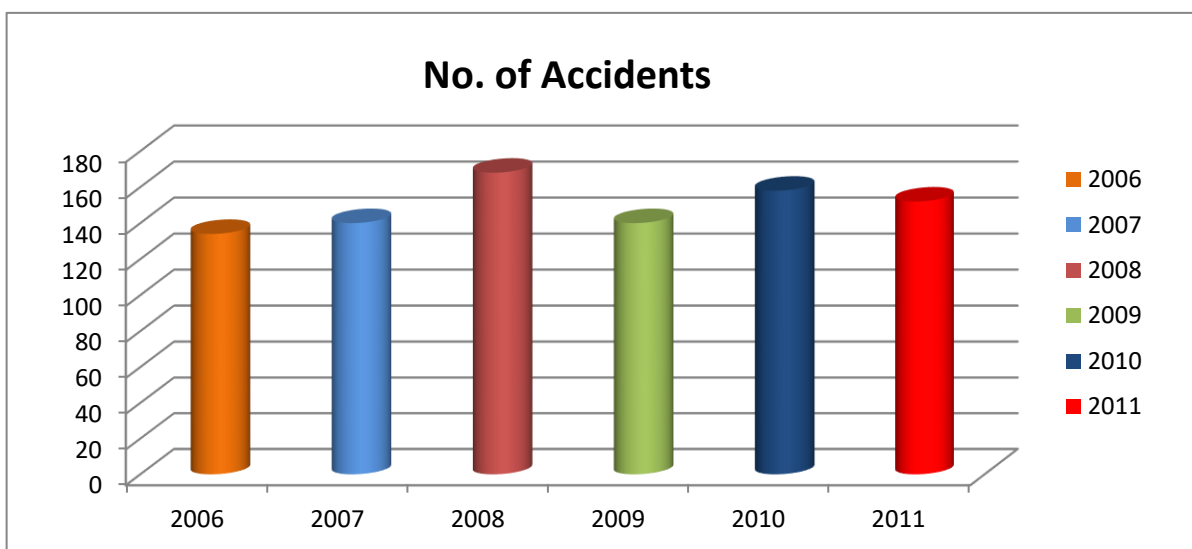
According to the Traffic Branch representative, it is generally agreed that road accidents fall in 3 broad categories, namely:

1. Human Factors (Road Users);
2. Road Defects; and
3. Vehicle Defects.

Out of the total 25 causes which are mostly behavioural, the 7 most common are:

- Speeding;
- Driver’s Exhaustion;
- Distractions while Driving;
- Driving while Intoxicated;
- Disregard of Road Rules;
- Inability to Manoeuvre; and
- Close proximity with other Vehicles.

**3.5.1.4 Persons Killed over the Past 6 Years**



**Figure 5: No. of persons killed in Road Traffic accidents from 2006 to 2011.**

**Table 4: No. of persons killed in Road Traffic accidents from 2006 to 2011.**

Year	2006	2007	2008	2009	2010	2011
Persons Killed	134	140	168	140	158	152



### **3.5.1.5 Road Safety Initiatives**

Road Safety initiatives are centred on three areas: Engineering, Enforcement and Education. For instance Engineering deals mostly with Road Infrastructures. The institutions involved are the RDA, the TMRSU and Local Government (Municipality/District Council). Enforcement on targeting of accident black spots within an *Intelligence-led Policy* consists of tracking speeding, drink driving, use of mobile phones, wearing of seat belts and other safety related offences. Table 5 illustrates the number of contraventions recorded in 2011 (CSO 2011):

**Table 5: Total number of fines in 2011.**

<b>Total No. of fines in 2011</b>	<b>193,577</b>
Speeding	62,709
Drink Driving	1,828
Seat belt	11,306
Use of Mobile Phone	6,684

Such transgressions suggest ignorance of the part of my spheres of the public. This is why in terms of Education, both the TMRSU & the MPF carry out sensitization campaigns via Lectures, Media Campaign (TV/Radio) and Billboards. 168 such events were carried out in 2010 and were attended by a total of 11,351 people. As of 2011, 192 events had been organised and had been attended by 16,721 people so far (MPF 2011).

### **3.5.1.6 Legislations**

The following legislations and future projects were briefly mentioned.

- Road Traffic Act of 1963 ( Act 22 of 1962) and
- Roads Act .1967 ( Act 29 of 1966)

#### **Forthcoming Legislations**

- Penalty Points Management System and
- Probationary Driving licence.

### Future Projects

- Drivers Education and Testing Centre (under the PMO) and
- Road safety as part of the curriculum in primary schools.

### **3.5.1.7 Are Drivers Criminal?**

Comparing the number of deaths due to bad driving with the number of homicides raises questions: Are drivers criminal? Should they be prosecuted and judged more harshly? Are interventions not tough enough? One thing is certain though: roads and vehicles do not kill people, men do!

**Table 6: Comparing the Number of Homicides Recorded with Involuntary Homicides.**

Causes	2006	2007	2008	2009	2010
Homicides (Murder etc...)	41	35	42	41	35
Involuntary Homicides (Fatal Road Accident)	122	133	162	129	151

### **3.5.1.8 Way forward: Areas for Research and Food for Thought**

- Should we review our legislations? Some date back to just after the-independence!
- Should some of these laws be more repressive, perhaps?
- Is our drivers' testing system up-to-date with international norms?
- Tests are not carried at night!
- Are we spending enough on public education and on safety?
- Is road safety only the problem of the authorities?
- What is the role of the individual?
- Is dangerous behaviour related to our daily business or work?

### 3.5.2 Presentation 2: Transport from an MID Perspective

Presented by D Vithilingum, Environment Officer

Ministry of Environment & Sustainable Development

The MID concept was launched in 2008 by the Prime Minister of the Republic of Mauritius, Dr. the Honourable Navinchandra Ramgoolam, GCSK, as a long term vision for the sustainable development of our country. The main objective of the Mauritius Ile Durable (MID) concept is to make Mauritius a world model of sustainable development, particularly in the context of Small Island Developing States (SIDS).

#### 3.5.2.1 Facts and Figures

- Transport Sector accounts for nearly 30 % of the total energy imports;
- Traffic congestion cost billions yearly;
- The government is increasing mobility of cars and not of the mass population; and
- Old cars are still on roads and there is a lack of control in this sector.

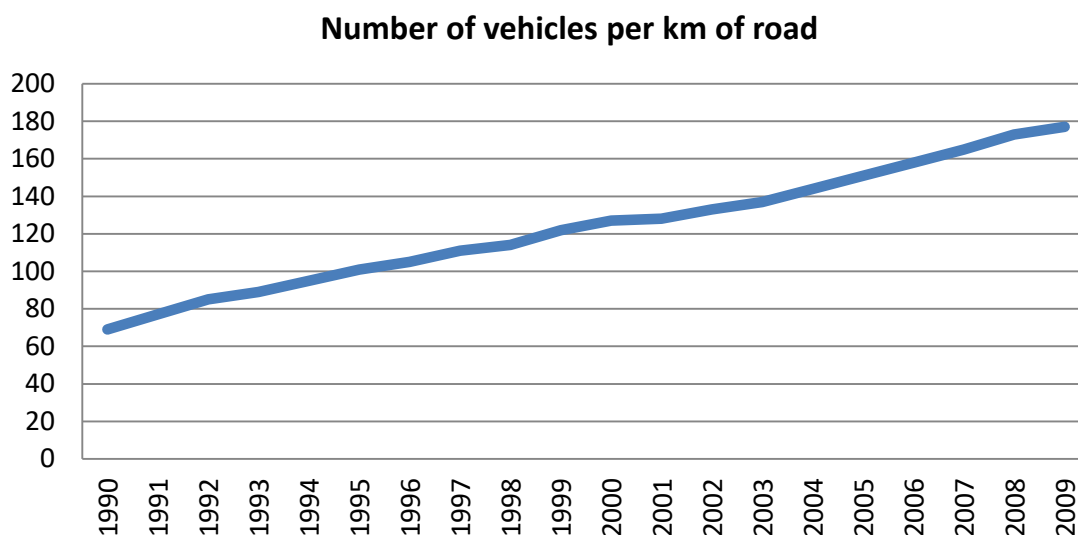


Figure 6: No. of Vehicles per km of Road.

### **3.5.2.2 MID Recommendations**

Following consultative meetings with a wide variety of stakeholders to ensure inclusiveness, the Maurice Ile Durable project proposed the following strategic principles:

- Road construction has to be considered as favouring the car transport system and as a generator of more traffic problems and therefore shall not be encouraged and
- If nonetheless any ring road/by-pass road has to be built, it shall therefore be thought of in a holistic manner.

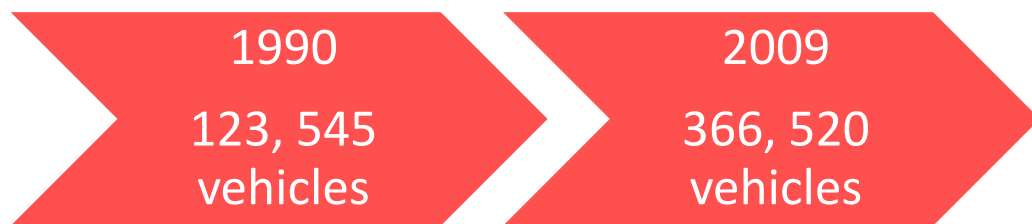
Since **More roads = More Cars**, while **More roads = Damage to the Environment**, therefore **More roads = Opportunity Cost**. This simple equation led to the following time bound recommendations.

#### **In the short-term:**

- Government and private companies with more than 200 employees should promote alternate vehicles for travel by providing company buses to 50% of its staff in 2015;
- Car pooling should be promoted by introducing a toll based on car occupancy by 2015;
- Awareness campaigns should be carried out on eco-driving using the funds available,
- Stricter regulations in the transport sector;
- Nearly 87,000 vehicles enter Port-Louis daily;
- Alternate travel vehicles should be promoted by consolidating taxes based on car emissions by 2015;
- The Government should provide quality and efficient public transport to the population;
- All renewable forms of energy should be considered for electricity production; and
- More resources should be allocated to institutions in the transport sector.

### **In the medium-term:**

- A study should be carried out to assess the feasibility of capping the number of vehicles in Mauritius and to assess the carrying capacity of the Mauritian road network by 2020;
- The WG recommends that a mass transport system should be introduced in the very Short-term and be operational by 2020; and



**Figure 7: Increase in the Number of Vehicles from 1990 to 2009.**

- Cycle and pedestrian paths should be introduced. Some roads can be converted for pedestrian use only in the Medium-Term.

### **In the long-term**

- Transport planning should be closely linked/integrated to land use planning;
- Any new large scale development should be mixed use in nature; and
- Delocalization and decentralization should be promoted if the mass transit system is not implemented.

#### **3.5.2.3 Potential research questions and relevant areas.**

These different fields included the following:

- What are minimum standards to be imposed on buses?
- What is the maximum capping on the number of vehicles in Mauritius?
- What types of vehicles should be promoted in Mauritius?

### ***3.5.3 Presentation 3: Road Traffic and Its Impact on Society***

***Presenter: Mrs S Lukea-Bhiwajee, Lecturer,***

***School of Sustainable Development and Tourism***

***University of Technology, Mauritius***

The School of Sustainable Development and Tourism (SSDT) caters for very specific areas of the Mauritian economy such as Tourism, Sustainable Development and Environmental Sciences. The School aims at producing graduates to work in the sustainable economic, social and environmental sectors of Mauritius.

#### **3.5.3.1 Land Transport in context:**

It was acknowledged that Land transport is a crucial component of modernity with the speeding up of communications, transport of goods, people and has led to a revolution in contemporary economic and social relations. Unfortunately, it has also had some unintended consequences, namely:

- Environmental contamination;
- Urban stress and deteriorating air quality;
- Rise in road accidents and premature deaths;
- Physical and psychological handicaps;
- Reduced worker productivity and trauma; and
- Taken a toll on the private lives of victims.

#### **3.5.3.2 Traffic Jams**

It was then mentioned that Traffic jams affect society by creating mental stress in motorists and higher fuel and maintenance costs following wear and tear and waste of fuel. The mental stress by Traffic jams can also become a cause for rash driving and road accidents

involving loss of lives. Motorists inhaling concentrated vehicular smoke emissions in a short period of time may also develop diseases.

### **3.5.3.3 Impact on Society**

The following forecast on disease and injury illustrates the projected severity of Road Traffic Accidents in the years ahead.

**Table 7: Forecasts of Disease and Injury for 2020.**

1990		2020	
Rank	Disease or injury	Rank	Disease or injury
1	Lower respiratory infections	1	Ischaemic heart disease
2	Diarrhoeal diseases	2	Unipolar major depression
3	Perinatal conditions	3	Road traffic injuries
4	Unipolar major depression	4	Cerebrovascular disease
5	Ischaemic heart disease	5	Chronic obstructive pulmonary disease
6	Cerebrovascular disease	6	Lower respiratory infections
7	Tuberculosis	7	Tuberculosis
8	Measles	8	War
9	Road traffic injuries	9	Diarrhoeal diseases
10	Congenital abnormalities	10	HIV

For the purpose of this presentation, “Society” was broken down into 4 main groups: “The public at large”, “Children”, “Employees” and “Employers”.

### **3.5.3.4 Impact on Public at Large**

The impact observed on the stakeholder labelled public at large included the following:

- **Unsafe Living Environment**
  - Congested roads;
  - Contaminated air;
  - Noise pollution; and
  - Commuting Time.

- **Social Responsibilities affected**

- Less time spent with children and social obligations (early departures & late arrivals at home) and
- Psychosocial diseases including stress.

### **3.5.3.5 Impact on Children**

The impact observed in children was mostly found to be linked to time spent travelling to school.

- Security Issues;
- Sitting posture;
- Confined space;
- Road & travel safety;
- Health issues:
  - Asthma;
  - Wheezing;
  - Coughing;
  - Social issues;
  - Opportunity cost of travel time for students;
- Traffic exposure has been shown to be associated with asthma risk and lung function in children; and
- Psychosocial stress increases susceptibility to the detrimental effects of traffic exposure–mediated asthma risk in children.

### **3.5.3.6 Impact on Employees**

The following consequences of Road Traffic were mentioned:

Crashes involving vehicles on public roadways were the leading cause of work-related fatalities, and accounted for almost a quarter of all fatal work injuries (U.S. Bureau of Labor Statistics, 2003).



The most dangerous place on the road to drive is not typically in such high speed driving environments, but rather, the most dangerous driving situations are typically encountered during normal, everyday, driving at intersections.

### **3.5.3.7 Impact on Employers**

As a result of heavy traffic, employers are often faced with:

- Late arrivals to and early departures from work (affecting service delivery);
- Involuntary absences;
- Quality of work suffers; and
- Disturbing overall productivity.

### **3.5.3.8 Common Causes of Road Accidents**

It is believed that each Road Traffic accident has an associated causal factor which can be summarized in the following list:

- Inattentiveness while driving (mostly caused by talking on cellular phones or eating while driving);
- Speeding is frequently a factor in both fatal and injury crashes. Aggressive driving behaviours which include:
  - Following too closely;
  - Failure to yield the right of way;
  - Improper over-taking; and
  - Disregarding stop signs (slowing down rather than stopping, or even ignoring the signs completely), and driving on the wrong side of the road.

### **3.5.3.9 Lead Questions for Discussion**

- What are the opportunity costs of our travel time, as citizens, responsible parties, students, employees, employers?
- What are the societal impacts of early departures from home and late arrivals in the evening?
- How safe are our children when they commute to and from school?
- To what extent do our employers/way/nature of our work affect our behaviour on the road?
- What is the toll of traffic congestion on “human capital” i.e. Productivity & Psychology?

### **3.6 Synopsis of Meeting 7**

This particular meeting which was held at the MRC, post the Brainstorming session, focused on short-listing and discussing priority research areas resulting from the previous consultative brainstorming session for implementation in 2012. Four Cross-Cutting Research Areas were identified by group members during the meeting. A more detailed account of this meeting can be found in Annex-3 of the present report.

### **3.7 Final Consultative Meeting of National Research Groups: Session 2 on Road Traffic**

The purpose of this public session, held on 2<sup>nd</sup> February 2012 at Tower 1, in Ebène, was to present an overview of the report prepared by the NRG on Road Traffic (NRG-RT) under the guidance of the MRC. The question and answer session which followed allowed for clarifications while the suggestions made contributed to refining the present report. A more detailed account of this event and its outcomes can be found in Annex-4 of the present report.

## 4.0 DISCUSSION

### 4.1 Q & A Topics

The following topics were discussed during the Questions & Answer session of the Cross-Collaborative Research Exercise on Road Traffic, the Consultative Brainstorming Session as well as during Session 2 of the Final Consultative Meeting of the National Research Groups:

- The need for decentralization of administrative services in cities;
- Moving away from the international trend to blame the victims of road accidents; following the distinct psychological ramifications of such a mentality;
- The need to tackle congestion specifically following travelling times exceeding 90 minutes;
- The important role of education for road safety and the need to change mentalities at a very young age;
- Flexitime as a very important and straightforward means to decongest our existing road network which could be introduced without any legal constraints, but would require a clear change in mindset and work culture in Mauritius;
- Inconsistencies in the law e.g. speed limit fixed at 80km/h while it is 110 km/h for private vans;
- The contradiction between expanding our road network and the significant decrease of traditional fossil fuels in the next decade or two, which will result in less vehicles on our roads;
- It was found that new roads would still be required to address the issue of connectivity, e.g. all vehicles still have to go through Port Louis or Quatre-Bornes, for example, to access some locations;
- A system of approval of purchase for a car should be introduced, like it is the case in Singapore;

- A feasibility study on environmental friendly fuel has been carried out but would need follow-up. Ethanol would require modification of engine;
- More efficient vehicles at handling work and car pooling should be investigated to reduce consumption of fuel and vehicle costs;
- A more systematic review of the impact of our laws and legislation;
- Psychometric testing for drivers need to be introduced. These tests need to be adapted for the Mauritian context; and
- Means to remove old vehicles in Mauritius need to be explored.
- Delivery of driver's license should be more stringent.
- Society has evolved-people start work at 8am and end at 6-7pm: How do we add the value chain?
- There is a need for a vocational driver's license

#### **4.2 Identification of Potential Areas for Road Traffic Research**

- Driving test methodology – should categorise types of licenses according to the vehicle load (buses, vans, trucks etc);
- The psychosocial effects (behavior at work/home) of traffic congestion on human health;
- Should a feasibility study be carried out on using blended fuel namely, LPG with low sulphur diesel?
- Should we subsidise the transport system?
- Need to establish a policy to regulate the emission of air pollutants by two-wheelers;
- Need to establish policy/law for noise pollution, especially by vehicles;
- Introduction of bus services in companies of more than 200 employees like for MCB, Anglo Mauritius, etc;
- Conduct a feasibility study on the cost-effectiveness of the bus transport system; and
- Investigate the impact of road transport system on the eco-system.

## 5.0 RECOMMENDATIONS

The Cross-Cutting Research Areas identified by the NRG-RT as well as their respective sub-themes, are expected to lead to potential projects which are future-oriented and aim to produce data which can inform policy decisions. Sub-themes are included to guide potential researchers in developing their project proposals. These are expected to tackle issues which can lead to practical policy recommendations. Down the line, it is envisaged that a maximum of 1 year will be given to researchers to provide results in line with 'local solutions for local problems'. The research areas selected and sub-themes derived can be summarized in Table 8 below: Summary of Cross-Cutting Research Areas below.

**Table 8: Summary of Cross-Cutting Research Areas**

Cross-Cutting Research Areas	Potential Research Projects/ E.g. of Sub-Themes	Rationale
<b>1.</b> Sustainable modes of transport and efficient road use (long-term view)	<ul style="list-style-type: none"> <li>• Intelligent Transport Systems &amp; Solutions</li> <li>• Feasibility studies:               <ul style="list-style-type: none"> <li>-Less car-intensive lifestyle</li> <li>-Collective passenger transport</li> <li>-Cost of enhancing a mass transport system</li> </ul> </li> <li>• Holistic transport management and planning</li> <li>• Investigating changes in fuel composition</li> </ul>	Generate significant scientific data to inform policy decisions on: <ul style="list-style-type: none"> <li>• the reduction of Road Traffic in the main transport arteries</li> <li>• more appropriate use of resources</li> </ul>
<b>2.</b> Costing the impact of Road Traffic (short-term view)	<ul style="list-style-type: none"> <li>• Medical costs</li> <li>• Production loss</li> <li>• Loss of quality of life</li> <li>• Property damage</li> <li>• Commuting time and opportunity costs</li> <li>• Time wasted ;</li> <li>• Business time lost</li> </ul>	<ul style="list-style-type: none"> <li>• Generate scientific data to inform resource allocation in different areas of Road Traffic Management</li> </ul>
<b>3.</b> Impact of Road Traffic pollution on (Short-term to Medium-term view)	<ul style="list-style-type: none"> <li>• Quantifying the cost of the burden of illness from Road Traffic to the Health System, associated with Traffic Pollution</li> <li>• Health Benefits of Active Transportation</li> </ul>	<ul style="list-style-type: none"> <li>• Clarify health risks incurred by road users</li> </ul>

<p>4. Understanding the behavioural and psychosocial dimension of road use (Medium to long-term view)</p>	<ul style="list-style-type: none"> <li>• Investigating the task- capability interface model</li> <li>• Mapping commuters’ values, knowledge, attitudes and beliefs and how this translates in everyday behavior on our roads</li> </ul>	<ul style="list-style-type: none"> <li>• Significant decrease in risky behaviour and positive increase in knowledge, attitudes and beliefs towards road use</li> </ul>

### 5.1 Sustainable Modes of Transport and Efficient Road Use

Sustainable national development and its links to the transport system have been a theme of paramount importance throughout this exercise. This was documented in the presentations by the Ministry of Public Infrastructure and Ministry of Environment in particular, and discussed throughout the whole process from an interdisciplinary perspective, which encompassed the societal dimension as well. The increase in vehicles on our roads over the past 20 years is difficult to ignore, so is the dramatic increase in traffic congestion, the billions spent on road works and traffic management initiatives. It is generally agreed that in the next 20 years, a forever increasing number of cars on our island would lead to more noxious emissions, more traffic congestion and road work. These would be catastrophic both for the environment, our health and psychosocial well-being. The list of the research themes drawn by the focus group discussions at the Consultative Brainstorming Session showed the importance of sustainable and alternative modes of transport while the impact of the transport system on the eco system was discussed at the Cross-Collaborative Exercise on Road Traffic. In this context, we are proposing the following topics for research to prevent unnecessary road/land use and decrease expenditures on road traffic mitigation:

- Investigating Intelligent Transport Systems & Solutions;
- Feasibility studies:
  - Less car-intensive lifestyle;
  - Collective passenger transport e.g.: car pooling, accessibility and comfort of (public) transport;

- Cost of enhancing a mass transport system in comparison to new road infrastructures (To include both economic and environmental costs);
- Holistic (Green) transport management and planning in congested areas to decrease traffic; and
- Investigating changes in fuel composition to improving vehicle efficiency and emission. Reviewing and updating the Road Infrastructure System Management Framework.
- Quantifying the number of vehicles possessing damaged catalytic exhaust pipes and the effectiveness of catalytic converters in filtering noxious gases from engine exhaust, given local prevailing conditions.

## **5.2 Costing the Impact of Road Traffic**

As explored in the presentations by presenters from the MEF and UTM, the costs to the Economy associated with Road Traffic are as high as they are far ranging. Direct costs incurred by individuals due to Road Traffic would be additional costs of fuel following vehicle idling time during traffic congestion or property damage following vehicle accidents. Indirect costs to individuals would include time lost in traffic, loss of productivity, stress and greater health risks due to exposure to noxious gases and loss of quality of life, for instance. Direct costs to society due to Road Traffic would include lives lost in accidents, business time loss, cost of under-use of public transport, the billions spent on impact mitigation initiatives and construction of new roads to tackle the problem. Indirect costs to society would include the impact of road congestion on the environment. In light of these costs, the following research areas would be important to investigate in relation to both individuals and society. Thus, the focus of a potential study should be on the following sub-themes:

- Medical costs incurred following accidents;
- Production loss;
- Loss of quality of life (to include the impact on family);
- Property damage;

- Settlement costs;
- Analyzing citizens commuting time and opportunity costs;
- Time wasted of motorists and passengers;
- Business time lost, disciplinary action or other personal losses; and
- Whether a culprit driver should not bear half the cost of damages to the party involved.

### **5.3 Impact of Road Traffic on Health due to Pollution**

As discussed in detail by presenters from the MIH and UTM, the noxious gases released in the atmosphere during heavy traffic may impact on our environment and may very well lead to respiratory diseases. Moreover, excess time spent in traffic may also give rise to mental health issues. Unfortunately data currently available in Mauritius is scarce and inconclusive on such matters. It was, therefore, suggested that the following be investigated to portray a better picture of the impact of Road Traffic on the health of Mauritians:

- Quantifying and investigating the specific causes of air-related burden of illness from Road Traffic in Mauritius;
- Health Economic Costs associated with Traffic Pollution; and
- Health Benefits of Active Transportation.
- Assessing the feasibility of a national “Medical Fitness Programme” for drivers
- Investigating the extent of the damage caused by leaded fuel on catalytic pipes and the resulting impact of these exhaust gases on human health

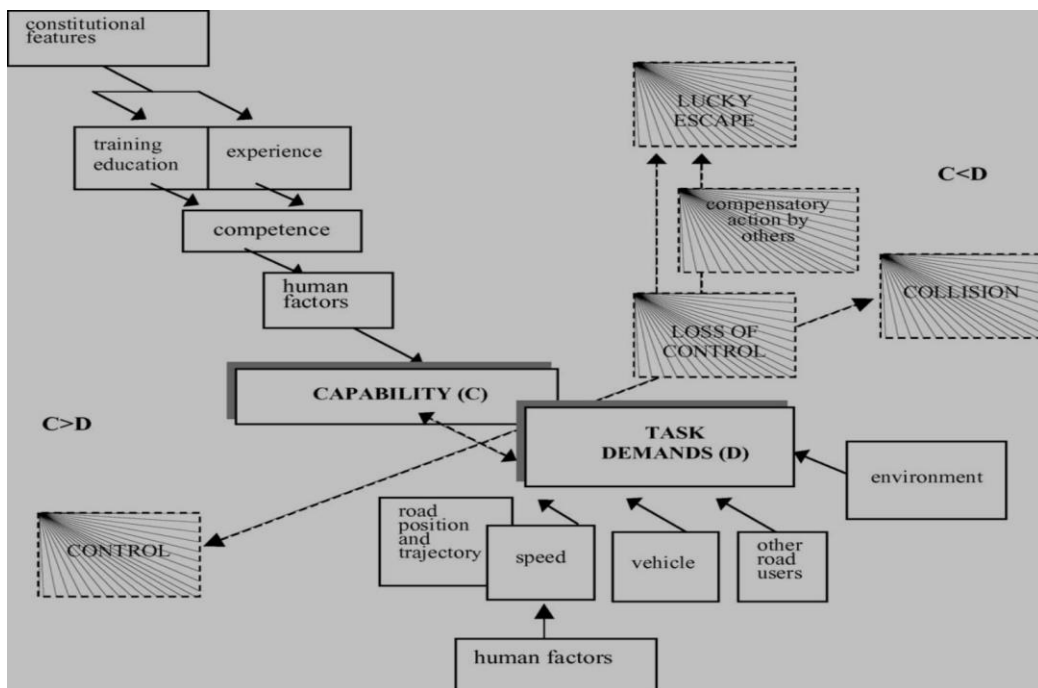
### **5.4 Understanding the Behavioural and Psychosocial Dimension of Road Use to instigate lasting positive changes in Behaviour**

The psychosocial dimension of Road Traffic in relation to accidents and congestion was extensively discussed during both the Cross-Collaborative Research Exercise on Road Traffic and the subsequent Consultative Brainstorming session. As a result, a distinct need for a



change in mentality among Mauritian citizens was felt and agreed upon. A good start would be finding out the underlying reasons for risky behaviour on our roads, especially among drivers. Equally important would be trying to understand ways to increase the appeal of public transport to the public at large. It is, therefore, with these aims in mind that we are suggesting the following:

- Investigating the task-capability interface model (*driver capability and task demand*) and what influences driver decision making in Mauritius, for e.g. via continuous monitoring and evaluation of driver testing methodology and



**Figure 8: Driver Capability-Task Demand Model which could be investigated and applied in the Mauritian Context.**

- Mapping commuters' values, knowledge, attitudes and beliefs towards public transport/car pooling in Mauritius and how this translates in everyday road use.

## 6.0 CONCLUSION

The rapidly increasing number of vehicles on our roads, an average of 4% p.a., is giving rise to dramatic increases in traffic congestion, noxious emissions, and funds spent on road works and traffic management initiatives. This multifaceted problem requires integrated and composite solutions. During the period of June to December 2011, the National Research Group on Road Traffic (NRG-RT), based on systematic consultative process, worked out a list of four cross-cutting research areas. These areas reflect current road traffic issues where a knowledge gap has to be filled.

It has been recognized that road expansion alone will not solve the Road Traffic congestion problem in Mauritius. It is essential that road infrastructure development be coupled with a multitude of other solutions such as e.g. the use of more sustainable modes of transport and a more efficient road use (1<sup>st</sup> Cross-Cutting Research Area).

It is a fact that less road congestion translates into fuel cost savings, reduced travel time and productivity gains. But, these direct and indirect costs have to be quantified in order to guide formulation of cost-effective road decongestion measures (2<sup>nd</sup> Cross-Cutting Research Area).

Similarly, the lack of data on the impacts of road traffic on the health on Mauritians suggested a need to carry out in-depth studies on the topic (3<sup>rd</sup> Cross-Cutting Research Area).

The general consensus is that a change in the mentality of Mauritian citizens and more specifically of road users is crucial, if not critical, and believed to have a positive impact on the other Cross-Cutting Research Areas. Accordingly, our 4th Cross-Cutting Research Area proposes to further research and understand the behavioral and psycho-social dimension of road use with a view to bring about lasting changes in road user behavior.

A Call for Solicited Research Proposals under these four Cross-Cutting Research Areas and their subthemes will be made, with a view to attract expert proposals for targeted

investigations on the impact of Road Traffic on the National Economy, Environment and Health. This Call for Proposals is envisaged to be launched by the MRC under the auspices of the MoTERST in 2012. As a result, successful applicants of such Calls for Proposals will, through the executive of their research plans, be able to provide local solutions in the area of Road Traffic, through collaborative engagements between relevant experts in the field. The outcomes of these research activities should help to make informed policy decisions in the field of road traffic.

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## 8.0 ANNEX-1

### 8.1 Synopsis of Meetings 1 - 4

Four preliminary meetings were organised at the MRC, in Ebène, prior to the official NRG-RT launching event, in which representatives of various institutions were called to discuss and brainstorm on issues pertaining to Road Traffic in Mauritius. The highlights of each meeting are presented below.

#### ***8.1.1 Meeting 1 (9th June 2011, 14:00hrs, MRC)***

The main objectives of the meeting were to get the stakeholders acquainted with one another and the Road Traffic initiative. To introduce the topic, a brief powerpoint presentation was given highlighting the following points:

1. The Mauritian Context : Road Traffic & Accidents;
2. Impact of Traffic Congestion on:
  - The Environment & other costs;
  - Health;
  - Productivity;
3. Previous Projects Encountered;
4. Suggested Framework; and
5. Way Forward.

At the conclusion of the powerpoint presentation, the stakeholders were given the opportunity to share their expectations of the Road Traffic initiative. Answers were provided to the questions raised regarding the purpose of this initiative and on other related matters. Some potential research projects were also proposed at this stage.

### ***8.1.2 Meeting 2 (30th June 2011, 10:30hrs, MRC)***

The purpose of this meeting was to, approve the minutes of the first meeting held on 9<sup>th</sup> June 2011 and to discuss and review the revised TOR document for approval. A brief brainstorming session was also conducted in an attempt to define a potential list of focus areas to be studied (see below).

#### **Initial Consultative Discussions on Key Research Areas on Road Traffic**

1. Environmental pollution due to Road Traffic and its impact on Health;
2. The causes of Road Traffic accidents (alcohol, speed, etc);
3. Reducing travel time;
4. Road use and its impact on “Maurice Ile Durable”;
5. Foresight (future-oriented) exercise on transport (health, productivity and mindset);
6. Road Traffic Congestion and its societal impacts;
7. Health Track/Park & Ride System (change in mindset); and
8. Impact of traffic on health, environment & the economy.

Finally, the Research Group discussed on the process to adopt and the way forward for this initiative.

### ***8.1.3 Meeting 3 (14th July 2011, 10:30hrs, MRC)***

During this meeting, each NRG-RT member ranked the three most important focus areas from the above list of 8 focus areas proposed in Meeting 2. Three main focus areas were determined through voting and these were reworded as per the suggestions of the group members. The 3 main focus areas chosen are listed below:

#### **Consultative Identification of 3 Focus Areas of Research on Road Traffic**

1. Road Traffic Accidents;
2. Road Transport Sector in the Context of MID; and

### 3. Road Traffic Congestion and its Societal Impacts.

The NRG-RT also agreed on the title of the research group as being: *'Impact of Road Traffic Management on Economy, Health and Environment'* with the three aforementioned focus areas to be used as main research themes under this title.

The NRG-RT official launching event was discussed and the presentations reviewed, during this meeting. It was agreed that the first presentation be given by the MRC and the remaining other four presentations on Road Traffic, the environment, health and productivity (the economy), would be given respectively by representatives of the Traffic Management Road Safety Unit (TMRSU), Ministry of Environment and Sustainable Development (MoESD), the Mauritius Institute of Health (MIH) and the Mauritius Employers' Federation (MEF).

#### ***8.1.4 Meeting 4 (17th August 2011, 10:30hrs, MRC)***

During this meeting, the five presenters from the MRC, the TMRSU, the MoESD, MEF and the MIH gave an overview of their presentations which were thoroughly reviewed, discussed and validated.



## 9.0 ANNEX-2

### 9.1 Synopsis of Meetings 5 & 6

#### ***9.1.1 Meeting 5 (30th September 2011, 10:30hrs, MRC)***

At this meeting, the format and logistics of the Road Traffic Brainstorming session scheduled for 10<sup>th</sup> November 2011 were discussed. Presenters, Chairpersons and Reporters for the brainstorming session were tentatively chosen. The deadline for the submission of the final report (21<sup>st</sup> December 2011) and the dates and times of the future events and meetings were presented to the group members. Finally, the outline of the final report was explained.

#### ***9.1.2 Meeting 6 (20<sup>th</sup> October 2011, 10:30hrs, MRC)***

The aim of the meeting was to discuss organisational matters in relation to the consultative brainstorming session. During this meeting an updated “way forward” document was discussed with group members. It established the remaining major milestones of the needs assessment exercise and showed the input required from members to produce the NRG-RT report.

## 10.0 ANNEX-3

### 10.1 Synopsis of Meeting 7 (17<sup>th</sup> November 2011, 10:30hrs, MRC)

This meeting focused on short-listing and discussing priority research areas and themes resulting from the previous consultative brainstorming session for implementation in 2012. Four cross-cutting themes were identified by group members during the meeting and these are:

- Sustainable modes of transport and efficient road use: e.g. Intelligent Transport Systems & Solutions;
- Costing the impact of Road Traffic: congestion & accidents, etc;
- Impact of Road Traffic on Health due to pollution: - e.g. noise, visual, air, etc; and
- Understanding the behavioural and psychosocial dimension of road users for behavioural change.

In addition the NRG-RT group members requested to propose sub-themes to fall under each of the above-mentioned cross-cutting themes which are specifically listed in the Recommendations section of this report.

## 11.0 ANNEX-4

### 11.1 Final Consultative Meeting of National Research Groups (NRGs): Outcomes of Session 2: NRG on Road Traffic

**Date: 02.02.12**

**Venue: 1<sup>st</sup> Floor, Tower 1, Ebène, Cybercity**

#### ***11.1.1 Background***

The purpose of this session was to present an overview of the report prepared by the NRG on Road Traffic (NRG-RT) under the guidance of the Mauritius Research Council. The report focused on the impact of road traffic on the environment, health and the economy, while recommending the following Cross-Cutting Research Areas for further research:

<b>Cross-Cutting Research Areas</b>	<b>Rationale</b>
Sustainable modes of transport & efficient Road Use	Reduction of RT and increase efficient use of resources
Costing the Impact of Road Traffic: Congestion & Accidents	Provide additional input for Resource Allocation
Impact of Road Traffic on Health due to Pollution	Clarify Health Risks incurred by Road Users
Understanding the Behaviours and Psychosocial dimension of Road Use	Understand how to trigger positive Behaviour Change in Road Users

#### ***11.1.2 Participants***

The audience was made up of Government Officials, representatives of the Private Sector, members of the scientific community, NGOs and other interest groups. NRG-RT members present included the Mauritius Institute of Health, National Transport Authority, University of Mauritius, University Technology Mauritius, Human Resource Development Council,

Mauritius Police Force, the Special Road Safety Unit under the Prime Minister's Office, Mauritius Standards Bureau, Traffic Management & Road Safety Unit, Ministry of Environment & Sustainable Development, Central Statistics Office, Ministry of Industry, Commerce & Consumer Protection, among others. Questions, comments and suggestions from the audience were encouraged in order to validate the report.

### ***11.1.3 General Comments, Questions & Comments***

- Our values as Mauritians translate into our behaviour on the roads. Our values should therefore be investigated;
- Delivery of driver's license should be more stringent;
- Road Safety should start as early as possible in primary schools;
- Society has evolved – people start work at 8am and end at 6-7pm: How do we up the value chain?;
- There is an inconsistency in the law with regard to the speed limit for vans;
- Need for a vocational drivers' license;
- Medical fitness programs for all drivers should be set up;
- NGOs not represented in NRGs;
- Too much money and focus on road projects; this can affect other sectors;
- Costing impact of congestion is crucial;
- Land use as compared to transport: What is the resource allocations around 'morcellements'? Have to address that!
- Medical fitness for heavy vehicles – have not been able to do that yet; and
- Bonus-malus: will be a deterrent to the society.

### ***11.1.4 Clarifications***

The following clarifications were provided by the Special Road Safety Unit under the Prime Minister's Office and the Mauritius Institute of Health:

- Road Safety will be in primary school curriculum (operational by mid 2013);
- A driving centre will be set up to assess driving methodology (operational by mid 2013);
- Road users have to be more careful as a general rule;
- Need for a monitoring system is acknowledged;

- Medical fitness of drivers – not discussed in drafting the NRG report but raised during launching;
- Suggest to have a system in place to assess fitness of drivers; and
- Impact of traffic on health can be in the form of accidents and injuries but environmental pollution also affects health. There is supporting evidence in international papers that pollution due to road traffic can affect health.

### **11.1.5 Way Forward for the Report**

<b>Comment/Suggestion</b>	<b>Action being taken</b>
Our values as Mauritians translate into our behaviour on the roads. Our values should therefore be investigated	A sub-theme on “values” will be added in the cross-cutting research area on “behaviour/psychology” recommended by the report
Delivery of driver’s license should be more stringent	Will be added in the “discussion” section of the report
Road Safety should start as early as possible in primary schools	See above in section 4.0: “Clarifications” in the present document
Society has evolved – people start work at 8 am and end at 6-7 pm: How do we up the value chain?	Will be added in the “discussion” section of the report
There is an inconsistency in the law with regard to the speed limit for vans	Already tackled in the “discussion” section of the report
Need for a vocational drivers’ license	Will be added in the “discussion” section of the report
Medical fitness programmes for all drivers should be set up	A relevant sub-theme will be added in the report in the recommended cross-cutting research area on health, concerning the feasibility of such programmes
NGOs not represented in NRGs	Will be acknowledged as a limitation of the process
Too much money and focus on road projects; this can affect other sectors	Already tackled– as part of the ‘Costing the impact of Road Traffic: Congestion & Accidents’ cross-cutting research area recommended by the report
Costing impact of congestion is crucial	Noted and already tackled in the same research area as above
Land use as compared to transport: What is the resource allocations around ‘morcellements’? Have to address that!	Already tackled in the report – as part of the ‘Sustainable Modes of Transport and efficient Road Use’ cross-cutting research area recommended by the report

This section takes stock of the feedback received and details the specific action being taken per comment/suggestion received, where applicable, following the established role of the NRG-RT and its objectives.