出國報告（出國類別：國際會議）

第四屆道路與高速公路研討會

服務機關：交通部高速公路局

姓名職稱：林炳松副總工程司

派赴國家：新加坡

出國期間：107年4月9日至107年4月11日

報告日期：107年6月22日

系統識別碼：C10700699

出國報告審核表

出國報告名稱：參加 2018 年第四屆道路與高速公路研討會		
出國人姓名 （2 人以上，以 1 人為代表）	職稱	服務單位
林炳松	副總工程司	交通部高速公路局
出國類別	☐考察 ☐進修 ☐研究 ☐實習 ☑其他(參加國際會議)	
出國期間：107 年 4 月 8 日至 107 年 4 月 12 日		報告繳交日期：107 年 6 月 22 日

出國人員自我檢核	計畫主辦機關審核	審核項目
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☑	☑	2.格式完整（本文必須具備「目的」、「過程」、「心得及建議事項」）
☑	☑	3.無抄襲相關資料
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☑	☑	（1）辦理本機關出國報告座談會（說明會），與同仁進行知識分享。
☑	☑	（2）於本機關業務會報提出報告
☐	☐	（3）其他_____
☐	☐	10.其他處理意見及方式：

出國人簽章（2 人以上，得以 1 人為代表）	計畫主辦機關審核人	一級單位主管簽章	機關首長或其授權人員簽章
副總工程司林炳松 林炳松		高速公路局總工程司陳國隆	副總工程司廖肇昌 廖肇昌

說明：

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二、審核作業應儘速完成，以不影響出國人員上傳出國報告至「公務出國報告資訊網」為原則。

公務出國報告摘要

頁數：17

報告名稱：第四屆道路與高速公路研討會

主辦機關：交通部高速公路局

連絡人/電話：林炳松/(02)29096141轉2022

出國人員：林炳松副總工程司

出國類別：國際會議

出國地點：新加坡

出國期間：2018年4月9日至11日

分類號/目：H0/綜合類（交通）

關鍵詞：交通、運輸、智慧車、收費

內容摘要

世界道路協會(IRF)於107年4月9-11日在新加坡舉行之第四屆道路與高速公路研討會，是屬於促進道路安全及智慧交通之國際交流會議，主要討論主題為道路的設計與未來發展趨勢、公路的永續經營與安全、ITS在交通管理的運用、如何運用收費政策來弭平財政缺口、資產管理等等，邀請馬來西亞、新加坡、泰國、菲律賓、澳洲及新加坡等地之交通專家學者，分享轄區道路運輸及維護管理經驗並作為本屆特色主題。

本次奉派主要參加為期三天之國際研討會，瞭解東南亞地區公路工程實務界近期之最新資訊與技術。研討會皆在演講廳進行，並無相關設施展示。演講廳為主題演講，另大會設置二個演講廳進行不同主題的演講，參與者可自由選擇聆聽，中午時段參與者可於餐廳享用大會提供之餐點並與各國學員交流。另安排第二天下午去新加坡的交控中心參訪，了解該中心的相關交管策略及科技應用。

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壹、前言

本次奉派參加107年4月9-11日在新加坡舉行之第四屆道路與高速公路研討會，除瞭解東南亞地區公路工程實務界最新資訊與技術，同時參觀新加坡交控中心，了解當地交通管理策略之運用及方向。

本次研討會相關主題包含專題講座(Keynote Sessions)、技術講座(Technical Sessions)、專題研討(Workshops)及交控中心參訪等活動，所發表之論文及講座議題則含括道路的設計與未來發展趨勢、公路的永續經營與安全、ITS在交通管理的運用、如何運用收費政策來弭平財政缺口、資產管理等實務及技術。

貳、行程紀要

一、行程

本次參加研討會及參訪行程，自107年4月9日至4月11日止共3天。4/8自台灣桃園國際機場出發後直飛新加坡，先下榻於當地飯店後，隔天一早即搭捷運參加研討會，除第二天4/10下午參觀新加坡的交控中心外，其餘時間均在The Grand Copthorne Waterfront Hotel 參加研討會議，會議完畢後隔日搭機返台，行程如下表1所示。

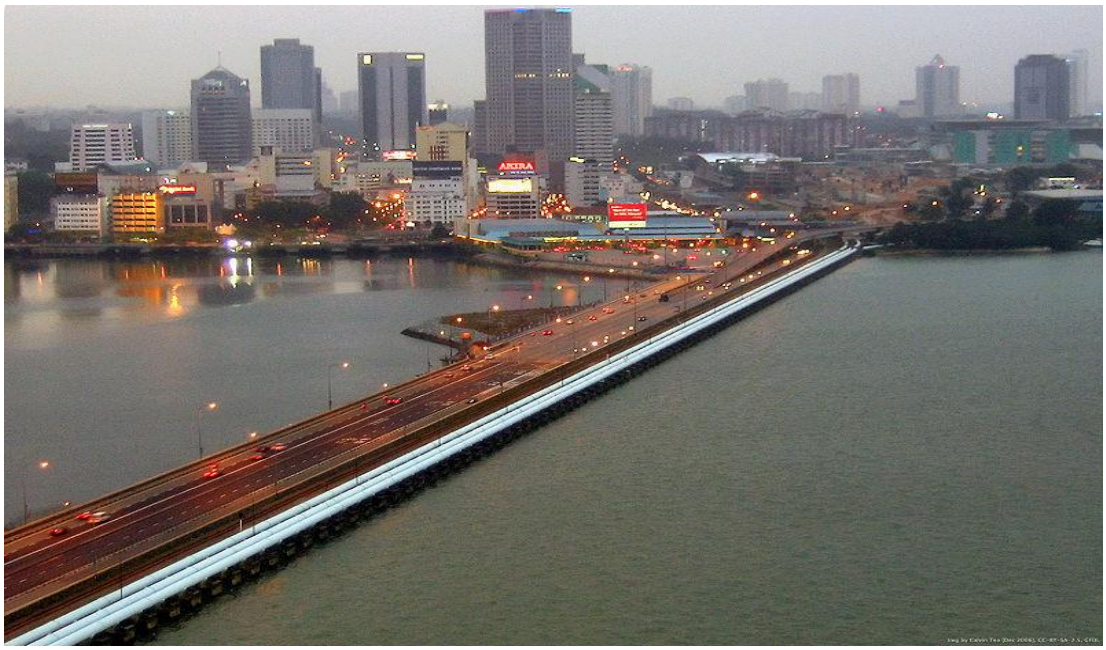
表1行程表時間	行程
4/8	台灣桃園/新加坡
4/9	研討會
4/10	研討會/參觀新加坡交控中心
4/11	研討會
4/12	回程/返抵台灣桃園機場

二、新加坡地理環境介紹

新加坡共和國（Republic of Singapore），通稱新加坡，又稱為新嘉坡、星架坡、星加坡、星洲、星島、星國、獅城、坡島、猩咖波、石叻、叻埠、昭南等，是東南亞中南半島南端的一個城邦島國，它不只是一個城市，同時也是一個國家。該國位於馬來半島南端，扼守馬六甲海峽最南端出口，其南面有新加坡海峽與印尼相隔，北面有柔佛海峽與西馬來西亞相隔，並以新柔長堤與第二通道等這兩座橋梁相連於新馬兩岸之間。新加坡的國土除了新加坡本島之外，還包括周圍數島，新加坡最大的外島為德光島。自新加坡獨立以來，大規模的填海已經為新加坡增加了 23%的面積，相等於 130 平方公里。1819 年，任職於英國不列顛東印度公司的史丹福·萊佛士與柔佛蘇丹簽訂條約，獲准在新加坡建立交易站和殖民地，經萊佛士的努力，逐漸發展成繁榮的轉口港。由於地理位置特殊，新加坡在第二次世界大戰以前一直是大英帝國在東南亞最重要的戰略據點。1942 年至 1945 年間，新加坡曾被日本占領三年半之久，其後回歸英國管理，並從海峽殖民地獨立出來，1959 年成立自治邦，1963 年加入馬來西亞成為一個州，稱為新加坡州（簡稱星州）。1965 年 8 月 9 日，新加坡退出馬來西亞並獨立建國。

自 1965 年獨立後，新加坡從一窮二白中，依靠著國際貿易和人力資本的操作，迅速轉變成為富裕的亞洲四小龍之一，同時憑藉著地理優勢，新加坡也是亞洲重要的金融、服務和航運中心之一。教育素質良好的國民也是亞洲政治和科學文化的紐帶，大多數的新加坡人都通曉至少兩種語言，分別是英語以及自己的母語。新加坡是個多元文化種族的社會，也是全球最國際化的國家之一，所以主要由華人組成的新加坡並非為單一民族國家，而是和一部分馬來人及印度人所組成的移民國家，其中華人文化以福建移民為大宗。在國內居住的居民有 38%為永久居民、持有工作簽證的外籍勞工以及持有學生簽證的學生，建築業和服務業的外

勞比例分別為 80%和 50%。整個城市在綠化和保潔方面效果顯著，故有花園城市之美稱。



新加坡本島的公路完善，擁有 10 多條高速公路貫穿全島。此外公共運輸同樣發達，以地鐵、公共汽車與計程車為主。目前開通了 5 條地鐵線路，另有一條正在建造中；公共汽車路線上百條，由兩家客運公司經營，分別為新捷運及 SMRT 地鐵有限公司。

私家車普及率在新加坡並不高，主要是由於政府的諸多限制措施。私人購車必須首先競標取得數量有限的擁車證，一張擁車證的價格就已經相當於一輛普通進口轎車的價格，而且擁車證的有效期只有十年。此外，新加坡也是全球第一個採用電子道路收費系統的國家，在進入市中心的道路上架設自動電子收費系統，在尖峰時段進入市中心的車輛將自動付費。由於購買私家車的成本太高，再加上完善、方便的公共運輸網絡，使得大多數新加坡人選擇不購買汽車，這也有效地解決了其他都市普遍存在的交通堵塞問題。

參、大會活動

本次大會活動主要為平台會議及參訪新加坡交控中心等兩大部分，說明如下：

一、 平台會議

大會宗旨為隨著新基礎設施的需求不斷增長，政府需要藉由管理手段及系統擴張以滿足公眾的需求。目前重點已轉向資助新基礎設施和現有資產的升級及優化，以提高營運效率。不僅可直接節省成本還能夠增加使用量、延長資產壽命，提高便利性和增加利潤。本次論壇將為公路行業和企業主等提供一個平台，藉以交流溝通以解決問題。討論的議題十分廣泛，主要包含道路設計與開發，道路延壽及交通安全、ITS應用在交通管理、公路收費及企業融資、工程及資產管理等。演講嘉賓包括來自政府、監管機構、特許經營商、工程建築、金融機構等地區及國際專家。第三天的議程主要是討論私人資本融資及如何投資政府基礎設施、構建民間金融高速公路等議題。(大會議程請參閱附錄一)

主要議題如下:

1. 泰國安全展望部門，制定國家安全道路策略，以因應亞洲發展中國家道路安全的挑戰。
2. 自主道路，通向自動駕駛汽車的現實之路，了解新車技術，奠定安全性，提高運輸效率，重塑城市景觀並確定交通運輸未來前景。
3. 簡要介紹地下公路隧道的施工方案
4. 高速公路現代化，實現更高的效率和可持續性，探討將IT科技融入公路全生命週期概念，提高施工效率
5. 再生瀝青路面技術，修復受損和老化的路面，促進再生公路材料的利用
6. 設計有效的交通網路以適應新興的交通情況，如將通過性車流與當地車流隔開，建立高速公路的高架環系統以減少地面上的交通擁擠。

7. 收費公路的系統性風險，國家有無擔保對於收費公路的影響
8. 馬來西亞公路運用GIS的簡介
9. 建立及評估民間參與公共建設的財務模式，並了解財務計畫的商業運轉方式。

肆、 心得與建議

一、有關無人車議題

1.多數的汽車大廠正與各界攜手發展無人駕駛技術，譬如 Google 這種小型汽車技術公司、主要的汽車零件製造商馬牌、博世、德爾福與特斯拉，以及汽車共乘領導者優步，甚至於蘋果公司。如今，幾乎所有的汽車大廠都在矽谷設置大型前哨基地，清楚表明未來主導移動性的是軟體而非硬體。在這種追求新技術風潮的背後，出現兩種截然不同的哲學：一種是消費者和汽車愛好

者能夠輕鬆接受的進化模式，另一種則是更具破壞力的革命性發展，能夠獲得更大的潛在成效。

2.汽車製造商計劃將這種系統視為最棒的混合模式，推出猶如現今汽車的車款，配備非常酷的高科技功能。這些功能可以提升行車安全，讓人開車時更為輕鬆且更有效率，同時讓人逐漸習慣自動駕駛，不會感受要將掌控權全部交給機器時那種油然而生的厭惡感。雖然駕駛遲早會被機器取代，但短期內還不至於發生，沒必要現在就推動全自動駕駛。如果滿街都是全自動化汽車，行車必將更為安全。機器不會酒駕、分神、打瞌睡、超速或偶爾超越道路中線，甚至看到停止標誌不停車或擅闖紅燈。最強大的自動汽車感應器是雷射雷達（lidar），這種旋轉裝置會以每秒近百萬次的速度發射閃爍的光，能從各種周遭物體反射回來，可創造出三維的機器視覺，測量出物件的高度、寬度、深度與距離，精確到沒有半毫米之差。有了雷射雷達，自動化汽車在距離偏離車道來車仍有一大段距離時便可計算出碰撞路線，然後平穩更換路徑，不掀起任何騷動。人們開車時，各種蠢事都會發生，但自動化汽車是行車安全的終極保證。

3.在這種情況下，傳統的汽車所有權沒有任何意義。如果你開私家車去市中心，那得擔心如何找到停車位，而且還得付錢停車，而無人駕駛的汽車就像行人一樣四處巡遊。此外，你還得面對普通汽車的低效運用：它會整天閒置，無法提供任何生產力。相較之下，你可以像吃自助餐一樣，訂購無人汽車方案來購買乘車分鐘數。或者，費用是以搭乘的里程數來計算。此處的關鍵在於，汽車可能屬於他人（共享服務、汽車租賃公司或汽車製造商），消費者只需支付使用費。

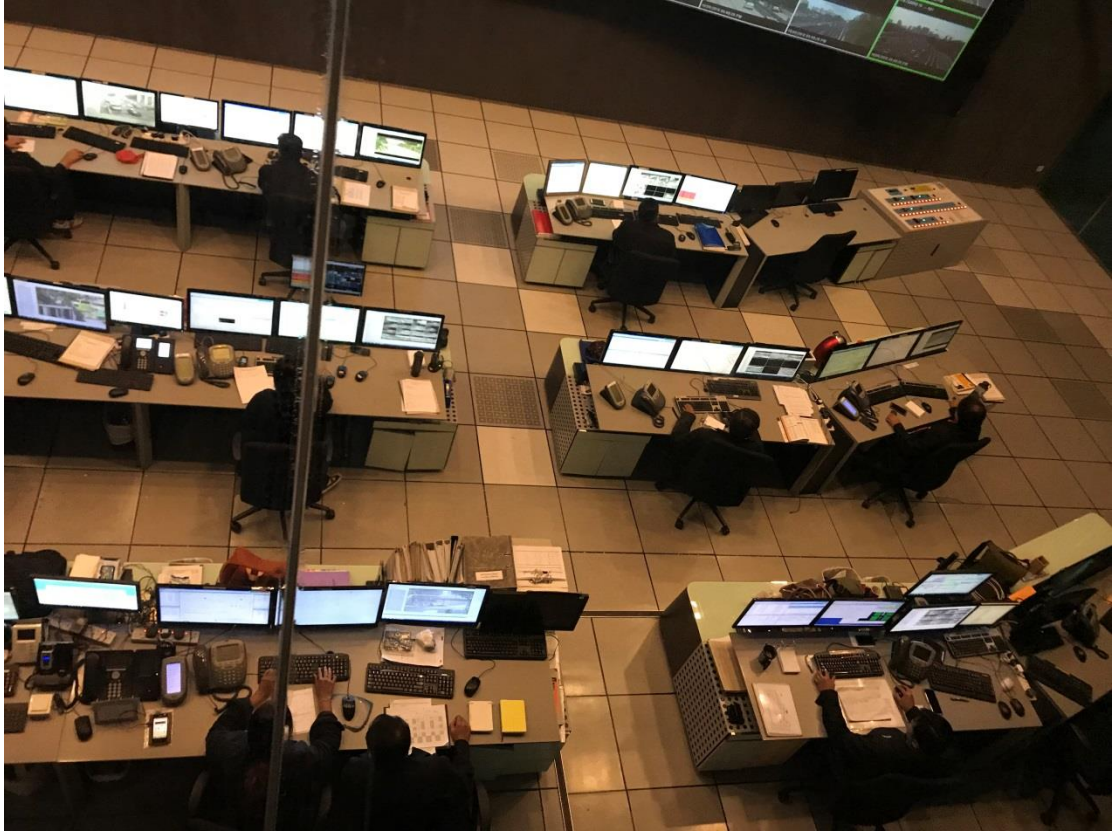
4.交通壅塞將成為昔日的惱人歷史：不再需要擴建車道，更不必為了避免人類駕駛犯錯而將車道維持十二英尺寬。停車場都將改成綠地。高速公路會更

窄、街道會更小，各城、各州與聯邦政府編列的運輸預算也將大幅減少。挪出來的公帑可用來維護與修復既有的基礎設施。

二、新加坡交控中心參訪心得

在會議第二天下午，主辦單位安排參訪新加坡的交控中心，了解新加坡的車

流管理及交控策略，會議一開始先聽簡報，再由與會人員提問。新加坡島東西向最長約49公里，南北向最長約25公里，公路系統總長度約3453公里，其中高速公路約164公里。以下是參考相關文獻及當天參訪所見所聞，整理新加坡的交管作為、設施及相關資訊科技如下表所示:



新加坡 ITS 發展策略主要特色

1. 著重在實現創新及永續的智慧移動解決方案:強調蒐集資訊的全面性與精確度，運用智慧大數據分析技術作即時與後台運算以利決策。
2. 積極投入智慧創新:
    - - 發展及採行開放性車輛與車載資標準與架構，積極與國外頂尖學校與公司發展連網車輛及車聯網基礎建設，執行試運轉計畫；
    - - 積極發展自駕車運行所需相關技術、環境、法規、測試等，創建開放的自駕車測試平台。
3. 積極推廣強化公共運輸競爭力，持續增覆涵蓋率，路線與班次。
4. 實施先進道路使用需求管理，發展基於距離的壅塞收費方式以抑制私有運具成長。
5. 強化整合公眾運輸與道路運營：透過中央整合管理平台強化政府主管單位與關鍵利益相關者的資訊溝通、急難救助協調。
6. 善運眾包與社群網路媒體蒐集、分析、發布與運用交通資訊。
7. 發展綠色交通運具與建設。

新加坡 ITS 試運轉計畫(pilot projects)主要特色

1. 2015 年 4 月成立的智慧移動測試平臺，以帶動 V2X 科技發展，NXP 支援整個測試網路，協助連接汽車、交通號誌和基礎設施等建置工作。
2. 自 2016 年 8 月份開始，擁有麻省理工學院（MIT）的團隊背景的新創公司 nuTonomy 開始在新加坡試測試無人駕駛計程車，這是全球第一個向大眾開放的無人駕駛測試專案。
3. 新加坡於 2017 年 2 月推出「通勤服務實驗室」（Mobility-as-a-Service Lab，簡稱 MaaS）計畫

新加坡 ITS 重點發展項目

1. 先進交通大數據資訊收集、處理、分析、整合、智慧決策與運用。
2. 自駕車發展及運營環境。
3. V2X 車路通訊。
4. MaaS

新加坡與台灣 ITS 建設計畫差異處

新加坡發展基於距離的壅塞收費方式(依當天交通車流量調整收費標 準)、提高擁車證(10 年期)費用、賦稅與車價以抑制私有運具成長。

新加坡 ITS 發展值得引入台灣的內容

1. 著重在實現創新及永續的智慧移動解決方案
    - - 強調蒐集資訊的全面性與精確度，運用智慧大數據分析技術作即時與後台運算以利決策。
2. 積極投入智慧創新
    - - 發展及採行開放性車輛與車載資標準與架構，積極與國外頂尖學校與公司發展連網車輛及車聯網基礎建設，執行試運轉計畫。
    - - 積極發展自駕車運行所需相關技術、環境、法規、測試等，創建開放的自駕車測試平台。
3. 積極推廣強化公共運輸競爭力

- - 持續增覆涵蓋率，路線與班次。
- - 鼓勵與推廣提供友善公共運輸最後一哩路轉乘運具：包括租賃共享運具與個人代步工具，如無樁式 GPS 共享單車、電動腳踏車、折疊式腳踏車及電動滑板車等。

4. 抑制私人運具的配套方案或措施
   - - 提高擁車證(10 年期)費用、賦稅與車價以抑制私有運具成長。
5. 交通壅塞對策

- - 發展基於距離的壅塞收費方式(依當天交通車流量調整收費標準)。

三、其餘議題心得

1.巴基斯坦未來30年的公路建設及願景，主要係大幅度仰賴中國的支援及一帶一路政策，但該國工程人員的素質及相關資訊科技仍有待提升。

2.GIS在公路規劃設計及施工的應用

GIS的範圍最早先由在軍事方面開始受到注目，在波斯灣戰爭中，美軍就以GIS系統 測定飛彈發射的目標地。至此GIS開始受到其他政府及民間組織的注意。台灣地區GIS 的應用，則是從1975年開始萌芽，以1991年由內政部資訊中心推動的「國土資訊系統計畫」為高峰。隨著技術與應用階層的變遷，GIS日漸生活化，出現如網路電子地圖之類日常生活中的GIS應用。 其他GIS的應用範圍還包括有：環境品質資料庫管理、消防水源系統、車輛導航與監 控、都市計畫及土地測量管理、網際網路應用以及森林林務系統管理等等。在民間工商管理範疇中，諸如商業區位的選擇與分析、進出貨物的路線規劃、工廠店面選址、投資商圈的發展、倉儲內之空間規劃等，都可以藉由GIS都可以得到資料豐 富且分析完善的服務。

目前國內公路總局已建置「公路防救災GIS 決策支援系統」，該系統從「雲端概念」出發，以Google Earth 虛擬地球儀，來整合政府機關「山水路橋人災」等地理資訊圖資於共同展示平台，該系統現已是該局暨所屬各區養護工程處（含32 個工務段）防汛期間公路防救災之效率工具。

所以有關GIS科技運用在靜態圖資及動態資訊的運用，是未來交通界可以大力發展地一個方向。

3.東南亞未來30年的公路建設願景

依據簡報統計，未來30年東南亞國家總計將投入1.7兆美元在交通相關建設方面，其中每年以7-8%成長，辦理方式主要係與民間合作的方式進行，這塊市場值得國內相關顧問公司及營造廠商注意。譬如:泰國政府將在未來八年投入各項公共基礎建設，至少3兆多泰銖（約台幣3兆元），興建高鐵、高速公路等。另外，東部經濟走廊（EEC）是更為具體的「泰國4.0」計劃，訂定了詳細投資金額。率先要大興土木的包括串連曼谷廊曼機場、素汪那普機場、羅勇府武打拋機場的高鐵、貨運與客運雙線鐵路、蘭查邦碼頭第三期泊位擴建、數位產業園區開發等。

四、工程技術日新月異，本次參與國際研討會除透過各項演講主題或研討，瞭解東南亞各國交通管理實務界近期最新資訊與技術，並可同時參觀展示會場及演講廳佈置，未來國內辦理類似國際研討會時可作為參考及借鏡。而目前國內亦有辦理類似國際交流會議，可透過相關會議使國內各工程單位與國外作經驗交流，當能使國內相關工程技術持續，並提升國內基礎建設的水準及工程人員素養。

Intelligent Transport Systems Centre

(Singapore)

Land Transport Authority

Technology as a Key Enabler in Land Transport Management

We live in an age where information technology has filtered into every aspect of society. Increasingly, Singaporeans are relying on advances in technology to enhance their quality of life. The Land Transport Authority (LTA) regards technology as a key enabler in land transport management.

Dedicated to maximising the road network efficiency and improving road safety for the benefit of all road users, LTA has deployed advanced traffic management systems called Intelligent Transport Systems (ITS).

The Intelligent Transport Systems Centre

The Intelligent Transport Systems Centre (ITS Centre) is the heart of all Intelligent Transport Systems (ITS) managed by LTA. The core functions of the ITS Centre are performed by the Operations and Maintenance Sections. The ITS Centre operates 24 hours a day throughout the year, monitoring and managing traffic flow, as well as maintaining our ITS infrastructure.

Currently, the ITS Centre operates the Expressway Monitoring and Advisory System (EMAS), the Green Link Determining (GLIDE) System for traffic lights, Junction Electronic Eyes (J-Eyes), traffic.smart and the Central Expressway (CTE) Tunnel's Plant Monitoring and Control System (PMCS). Other smaller systems include the Electronic Regulatory Signs (ERS) system.

At the forefront of the daily operations, the Operations Section uses these systems to monitor traffic as well as manage ad-hoc incidents and pre-planned events on our roads. The scope of operations includes the 8 open expressways, the CTE tunnels and about 1900 signalised traffic junctions. This Operations Section keeps traffic smooth-flowing by responding to incidents promptly, informing motorists of real-time traffic situations, and adjusting traffic signals to meet varying demands of traffic conditions. They also attend to reports of faulty equipment detected through the various ITS.

Equally important is the Maintenance Section which is responsible for the maintenance of the various ITS, computers and site equipment. They attend to faulty equipment and ensure that they are repaired promptly. This team strives to achieve minimal downtime of our traffic systems to provide road users with a safe and smooth journey.

EMAS

Expressway Monitoring and Advisory System

The Expressway Monitoring and Advisory System (EMAS) is an intelligent incident management tool that manages traffic along our expressways, including the CTE tunnels.

The EMAS comprises 3 sub-systems, namely:

a. Detection Camera System that collects real-time traffic data;
b. Surveillance Camera System that provides visual verification of incidents; and
c. Information and Dissemination System that updates motorists on traffic situation to help them make informed travel choices or plan their route.

HOW DOES EMAS WORK?

Strategically located detection cameras detect incidents and congestion as soon as they occur and alert the operations staff at the ITS Centre. The operations staff use surveillance cameras to verify the incident. If necessary, they will activate the recovery crew to the site. Once the recovery crew reaches the site, the crew members help the motorists to remove their vehicles in order to restore the flow of traffic to normalcy.

The operations staff inform approaching motorists of incidents and traffic conditions through message signboards located along the expressways and their entrances. The traffic information on the expressways is also given to radio stations for broadcast.

There are three types of EMAS signboards:

TRAFFIC INFORMATION DISPLAYS (TID)

These overhead TID signs along the expressways show messages to forewarn motorists of incidents, planned maintenance works and events. Where appropriate, they also show messages to advise motorists of expected traffic conditions during their journeys.

TRAVEL TIME DISPLAYS (TTD)

The TTD signs are located near the entrance ramps. They show the estimated travel time to major destinations from the entrance. The travel times are estimated based on the prevailing traffic conditions on the expressway. The TTD signs also alert motorists to adverse traffic conditions, so that they can decide whether they want to enter the expressway.

TRAFFIC SIGN DISPLAYS (TSD)

Electronic messages on the TSD signboards inform motorists of the traffic situation ahead. These signs are located along the centre median of the expressways. They are used when TIDs cannot be installed due to site constraints.

BENEFITS

EMAS brings these benefits to motorists:

- Provides quick response to motorists who need help along expressways
- Minimises congestion that may arise from incidents through the quick deployment of recovery crew and the display of messages to the public to avoid incident locations
- Enhances safety on expressways
- Allows motorists to make informed decisions / choose alternative routes

PMCS

Plant Monitoring and Control System

The Central Expressway's (CTE) Tunnel Plant Monitoring and Control System (PMCS) is part of EMAS. It ensures that all the electrical and mechanical equipment in the CTE tunnels, namely the Kampong Java Tunnel (0.7km) and the Chin Swee Tunnel (1.7km), are in working order to protect the safety of motorists travelling through these tunnels.

HOW DOES THE CTE'S PLANT MONITORING AND CONTROL SYSTEM WORK?

The Central Computer System (CCS) is the core of the PMCS. It monitors the state of the electrical power system, communications, drainage, fire safety, lighting and ventilation equipment within the two tunnels. The CCS automatically adjusts the lighting and ventilation according to the changes in the natural environment. It also operates pumps in the tunnels to remove excess water from rainfall and tunnel washing. The operations staff can use the Radio Broadcast & Break-In system to broadcast messages through car radios to motorists in the tunnels in the event of emergencies. The tunnels are fully equipped for fire detection, fire fighting as well as evacuation.

BENEFITS

- Ensures that all mechanical and electrical equipment are in operational conditions to provide a safe driving environment
- Safeguards lives and property in the event of tunnel emergencies

GLIDE

Green Link Determining System

The Green Link Determining (GLIDE) System controls all traffic and pedestrian signals and manages traffic along the arterial roads.

HOW DOES GLIDE WORK?

Detector loops in the form of thin metal wires are laid below the road surface at traffic junctions. Each time a vehicle moves over the detector loops, it causes a change in their magnetic fields. This change activates a response at a receiver in the local controller. The traffic flow information will then be updated to the regional computer in real-time via telephone lines. The local controller receives the commands from the regional computer to adjust the timing of traffic signals automatically so as to optimise traffic flow at the junctions.

The regional computer analyses information on traffic flow and the state of the local controllers. It sends commands to the various local controllers to adjust the start of green times to achieve linking between adjacent junctions. This will provide a "green wave" for the predominant traffic direction or for specified routes. In addition, the regional computer also records faults in the traffic signals.

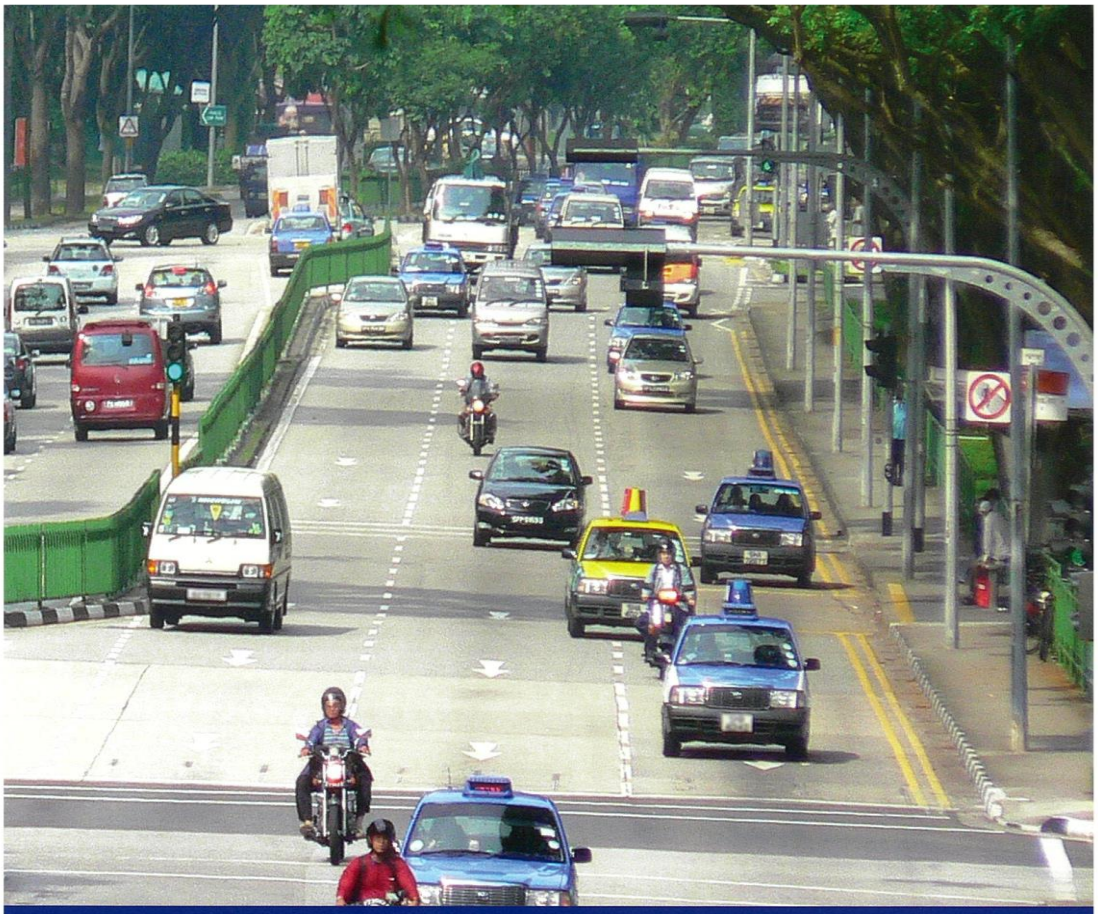
The central computer links the regional computers in a network to allow for centralised monitoring. System faults and alarms are sent from regional computers to the central computer for storage and analysis.

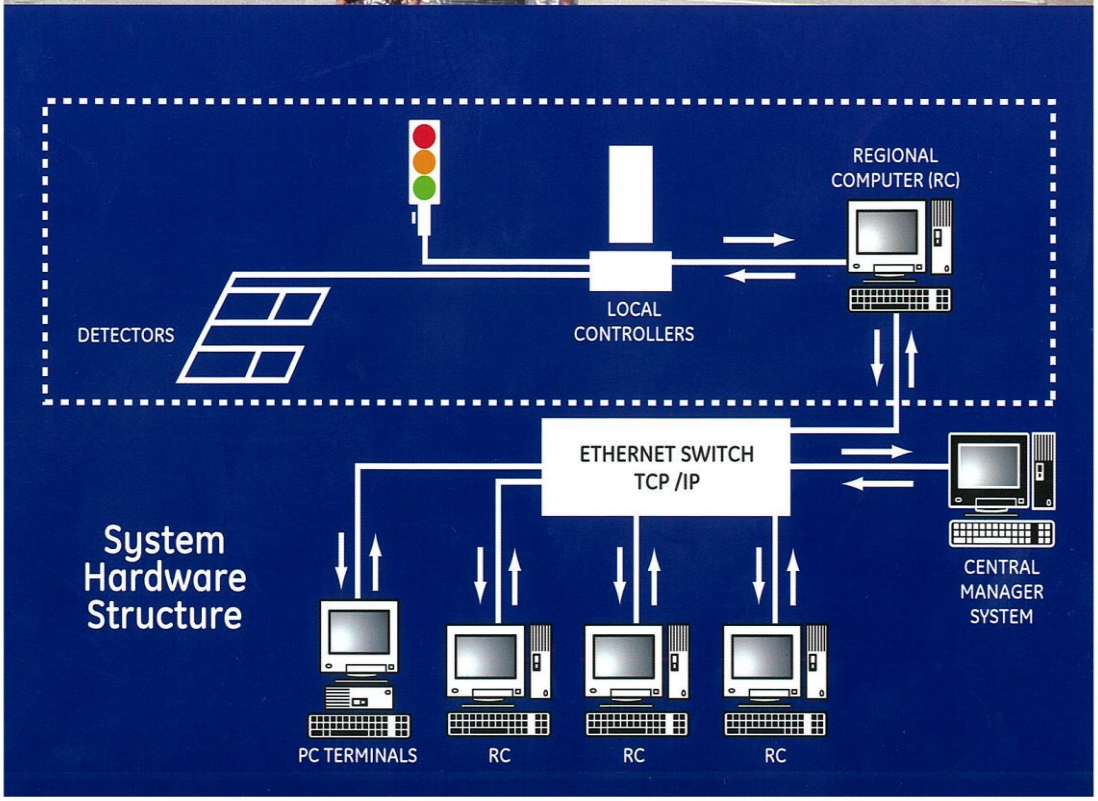
SPECIAL FEATURE

The fire stations in the city can alert the GLIDE system in an emergency to give priority to movement of fire engines at traffic signals near its vicinity.

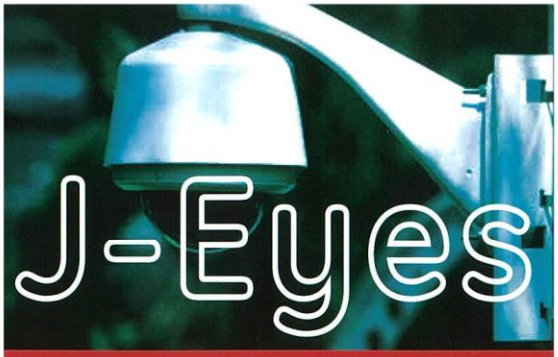
BENEFITS

- Allocates green time for motorists and pedestrians based on real-time demand
- Provides "green wave" link between adjacent junctions to minimise the number of stops by vehicles
- Allows traffic signal faults to be rectified quickly





System Hardware Structure



J-Eyes

Junction Electronic Eyes

HOW DO J-EYES WORK?

Surveillance cameras mounted on special mounting posts, street lamp posts and buildings capture video images of traffic flow at major junctions and transmit them to the ITS Centre for viewing on monitor screens.

BENEFITS

- Act as remote eyes for operations staff to spot and rectify causes of traffic congestion.
- Deter illegal parking and loading or unloading along major roads.

i-trans

WHAT IS i-TRANSPORT?

LTA has implemented many Intelligent Transport System (ITS) and more are in the pipeline. The i-transport platform integrates the various ITS to enable control through a single common interface.

The key ITS that are integrated under i-transport are: -
EMAS
GLIDE
J-Eyes

In addition, each ITS collects and generates vast amount of traffic data. The i-transport platform integrates such data under a single transport information hub, for the benefit of the road users and LTA.

HOW DOES i-TRANSPORT WORK?

The core architecture comprises five modules, namely the Operational Interface Module, Traffic Information Hub Module, Inference Module, Statistical Module and Simulation Module.

ERS

Electronic Regulatory Signs

Electronic Regulatory Signs (ERS) are light emitting diode (LED) traffic signs, which are switched on only at specific time periods to convey time-specific traffic instructions to road users.

HOW DO ERS WORK?

The ERS are switched on and off automatically at pre-set times of the day. Their operations are monitored by the ITS Centre.

BENEFITS

- Brighter and clearer than static traffic signs
- Ensure better compliance from motorists

sport

The Operational Interface Module acts as a bridge to enable a single point of control as well as access of data among all sub-systems.

The Traffic Information Hub Module manages data exchange across all modules. It aggregates real-time data from various ITS and serves as a traffic data warehouse. This module has extended the functions of the traffic.smart system and disseminates traffic information to external parties such as telcos and radio stations. In addition, traffic information is also posted on the Internet via the ONE.MOTORING portal (www.onemotoring.com.sg).

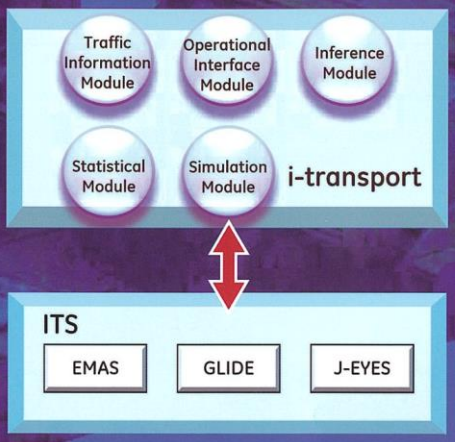
The Statistical Module serves as an easy means to access and retrieve traffic information for traffic analysis and reporting purposes.

The Inference Module is the intelligence of i-transport. The expert system within the module generates and recommends action plans to operators to facilitate traffic management functions. It also has an automatic incident detection algorithm to alert the operators to incidents.

The Simulation Module is an evaluation tool for traffic network performance under various control strategies as well as validating traffic action plans in the Inference Module.

BENEFITS

- Enables better management of incidents on all roads
- Standardises data transfers across various ITS
- Allows easy access to traffic information
- Provides a platform for future expansion and deployment of ITS



traffic.smart

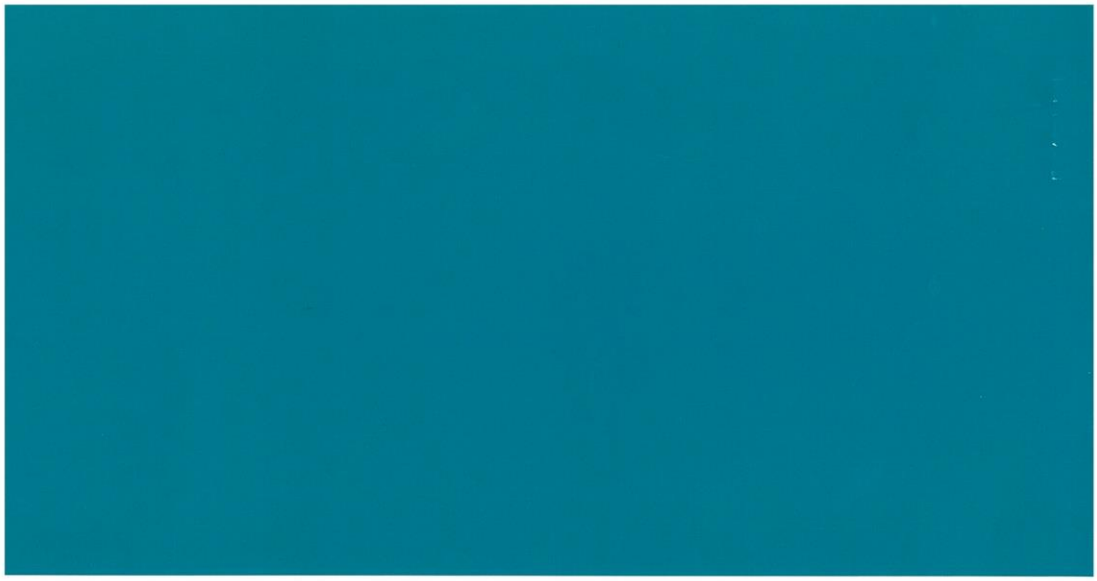
Integration of Traffic Information

WHAT IS traffic.smart?

traffic.smart is a part of the i-transport system that disseminates traffic data from various ITS such as EMAS, J-Eyes and GLIDE System. These various ITS provide traffic.smart with real-time traffic information such as traffic volumes, types of vehicles, travel time and incident occurrences. This traffic information is then processed, stored and made available to road users via the ONE.MOTORING website (www.onemotoring.com.sg).

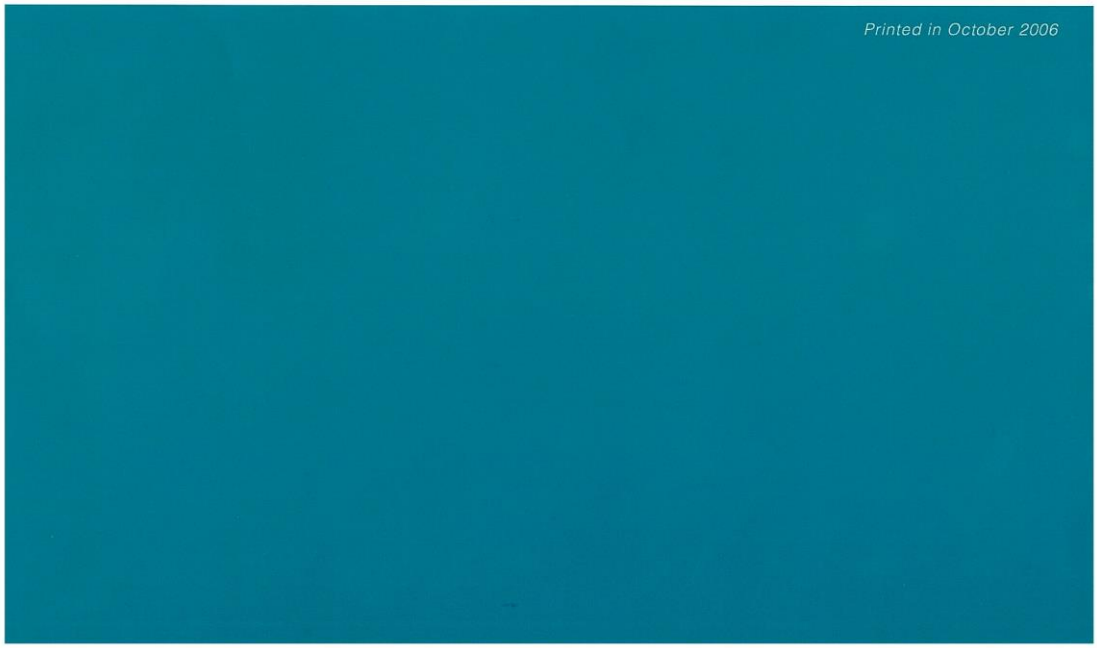
BENEFITS

- Provides real-time traffic information to the commuting public through the Internet.

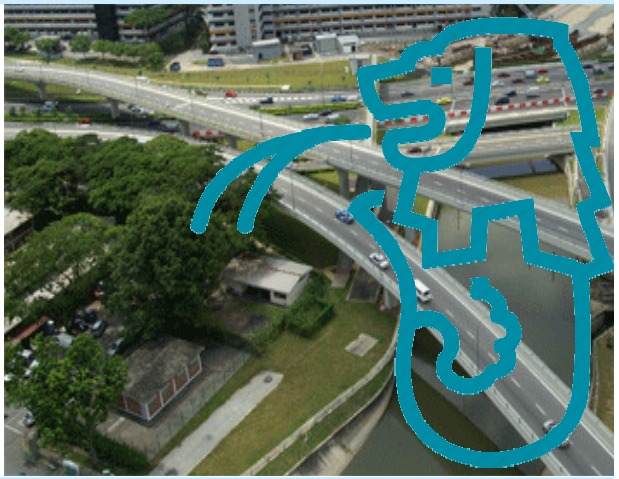


Land Transport Authority

Address ITS Centre 181 River Valley Road Singapore 179034
Hotline 1800-CALL LTA (1800-2255 582) *Fax* 6332 6967
Website http://www.lta.gov.sg and http://www.onemotoring.com.sg



Welcome to

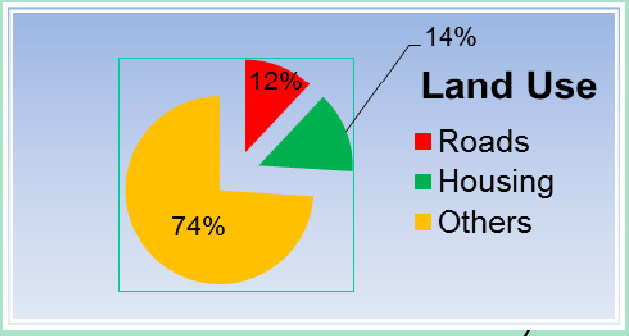


Intelligent Transport Systems Centre

Presentation Outline

1. Introduction
2. Overview of ITS
3. Incident Management
4. Tunnel Management
5. Events Facilitation

Singapore



Population: 5.5 million

Land Area: 718 sq km

Road Transport

3,453km
Road Network

164km
Expressway Network

956,000
Vehicle Population

631,000
Car Population

Land Transport Authority

Public Transport Modes

MRT
153 km
105
Stations

LRT
29 km
35 Stations

Bus
>4500
Buses
>300
Routes

Taxi
27,000

>3 million
Daily MRT/LRT trips

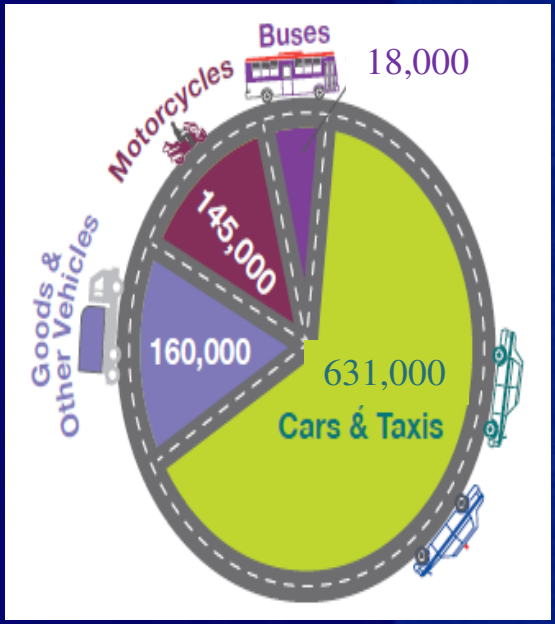
>4 million
Daily Bus trips

>1.0 million
Daily Taxi trips

Land Transport Authority

Our Challenges

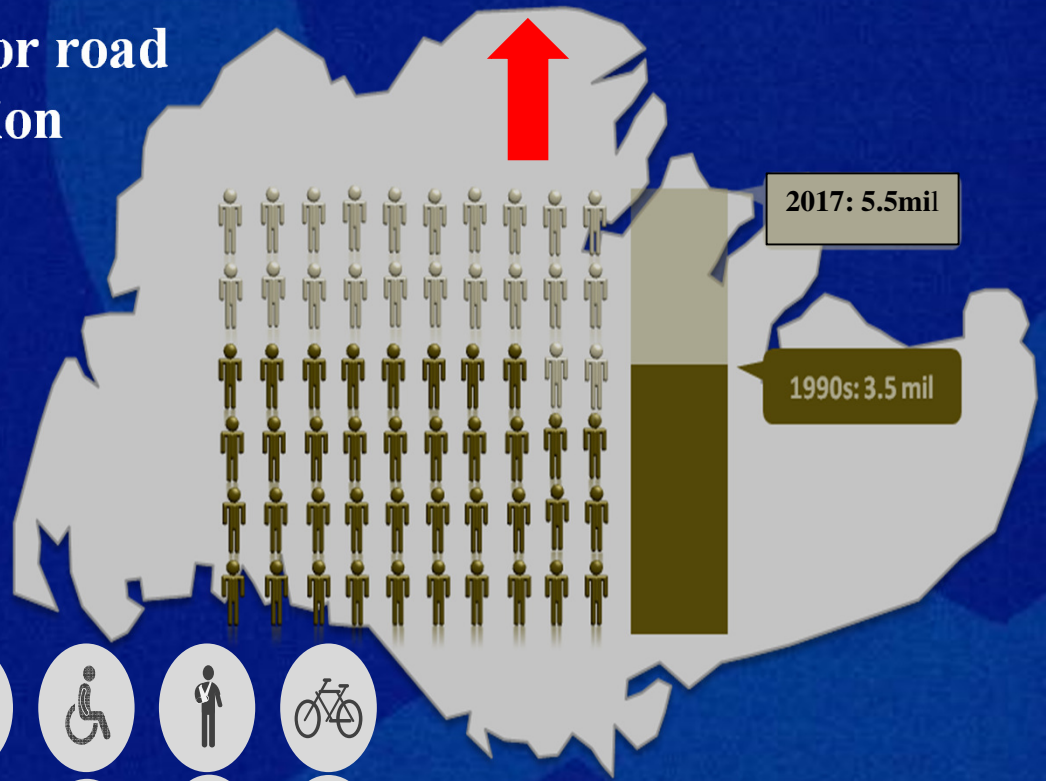
Motor Vehicle
Total Population : 956,000



Increasing vehicle population

Limited land space for road expansion

Increasing population



Meeting diverse travellers' needs

Our Aim: **75%**
of trips have to be on public transport in 2030, up from 67%

Land Transport Authority

Demand Management

Ownership Measure

1. Limit ownership → Vehicle Quota System
2. Increase ownership cost:
   - Additional Registration Fee (ARF)
   - Excise duty
   - Road tax

Usage Restraint

1. Electronic Road Pricing (ERP) (Formerly known as Area Licensing Scheme)
2. Petrol duty
3. High cost of parking

Land Transport Authority

Walk Cycle Ride Singapore

LTA has embarked on the **Walk Cycle Ride (WCR) SG strategy** to build a car-lite Singapore that is so well connected that:

- commuting needs can be met without having to own a car
- the commuting experience is more than just getting from point A to B; it becomes a meaningful part of the day and the community

Introduction-ITS Centre

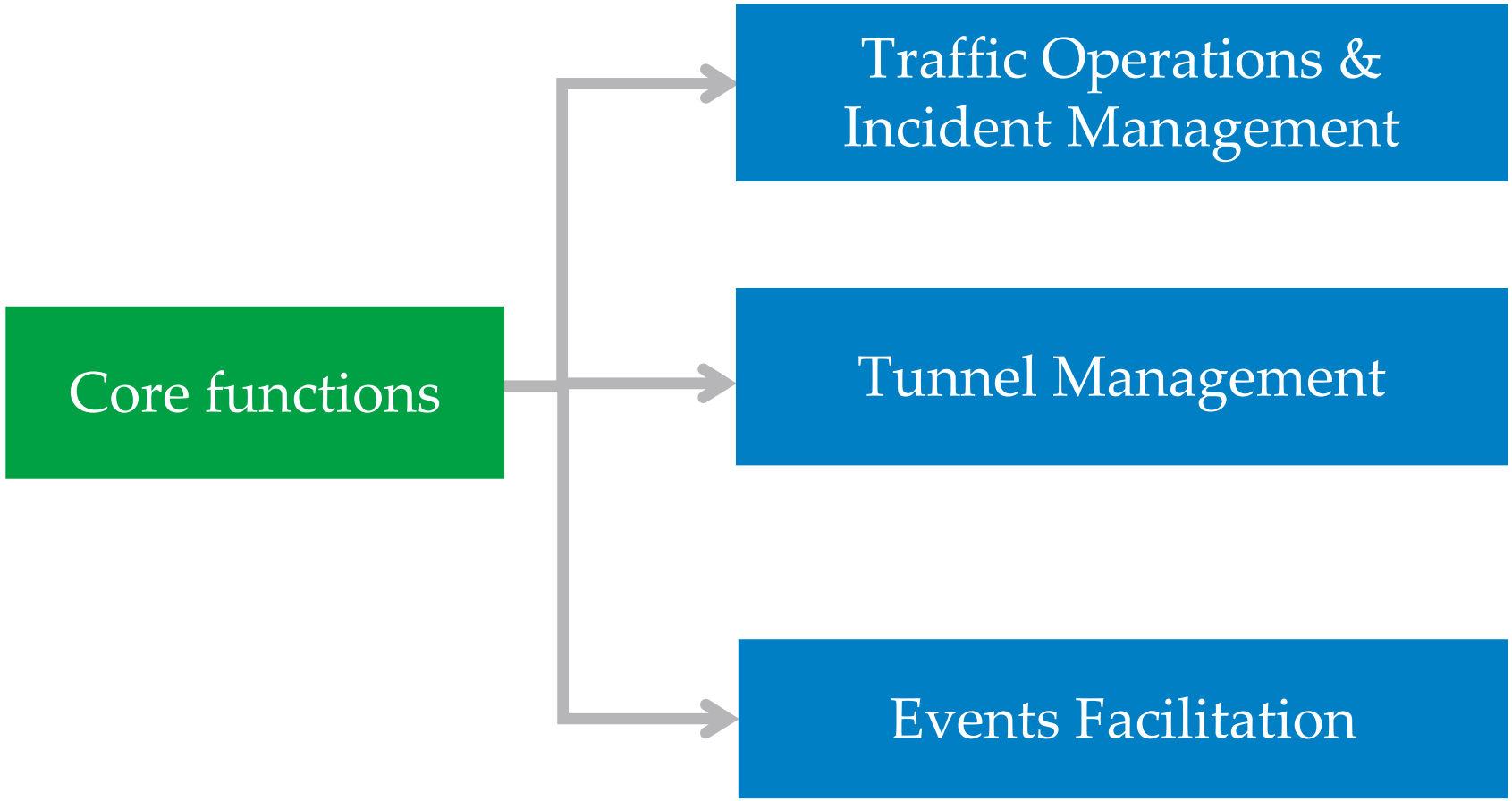
Land Transport Authority
TRANSPORTATION & ROAD OPERATIONS

- Two 24/7 Operations Control Centre (OCC)
  - ITSC OCC
  - KPE/MCE OCC

- Manages traffic across road network
  - 164 km of expressways (Including MCE & KPE tunnels)
  - Fort Canning, Sentosa Gateway Tunnel & Woodsville tunnels
  - >2,320 signalised intersections

- Leverages on intelligent transport technology to optimise throughput of traffic

Intelligent Transport Systems Operations



Overview of ITS

Land Transport Authority
TRANSPORTATION & ROAD OPERATIONS

EMAS (AID)

J-Eyes

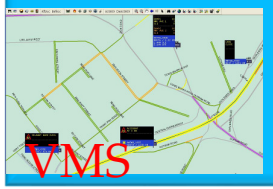
GLIDE

Green Man+

Traffic-Scan

PGS

i-transport System

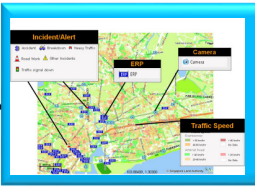


GIS

Equipment Maintenance Faults Management

Unified Maintenance Hub

EMAS (VMS)

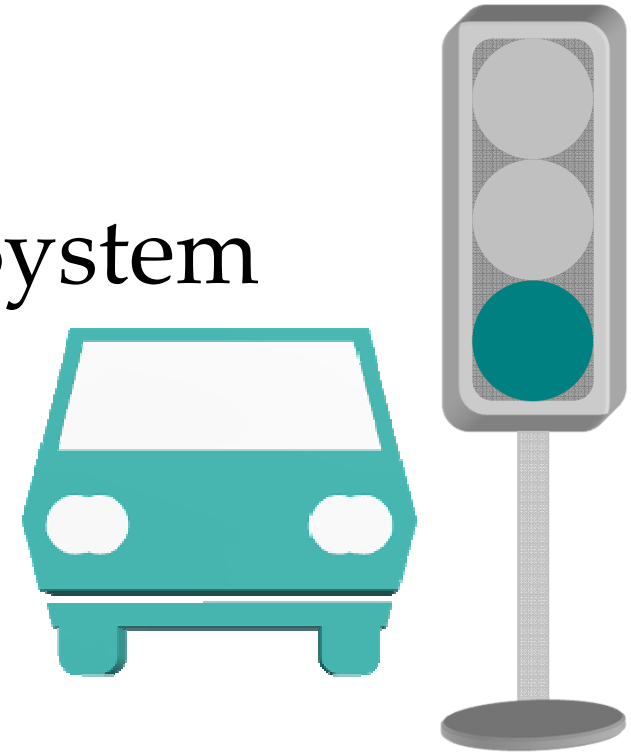


Traffic.Smart

Traffic Planning System
Statistical module
LTOC
Radio Channel
Data Mall

ITS

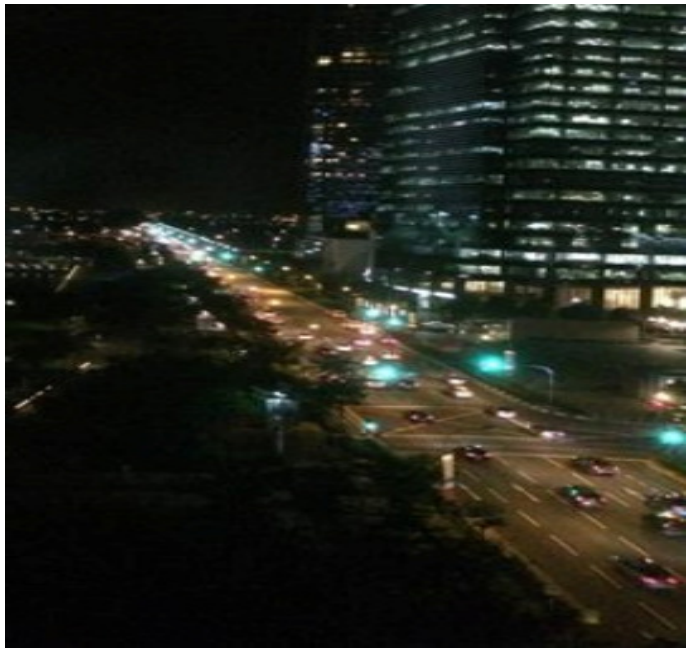
Area-wide Adaptive Traffic Light Control System (GLIDE)



GLIDE

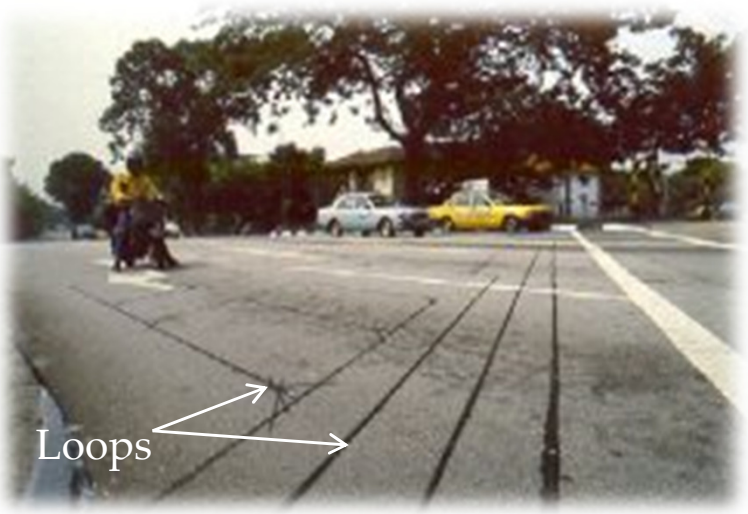
Land Transport Authority
TRANSPORTATION & ROAD OPERATIONS

- Allocates green time based on prevailing traffic flows
- Provide linking across junctions to give "green wave" along major corridors
- Centralised monitoring & fault reporting to provide prompt detection



❑ **System set-up includes**:

- Detector loops underneath road surface to collect traffic data
- Regional computers that generate green time based on the real-time traffic data



GLIDE

Land Transport Authority
TRANSPORTATION & ROAD OPERATIONS

Special Feature – "B"-signal for Bus Priority

- Allows buses to proceed ahead of other vehicles at signalized junctions

Bus Priority Signal

ITS

Green Man + (GM+)

Green Man +

- Provides more green man time (3 to 13 seconds) for elderly and persons with disabilities to cross the road
- To date, 500 pedestrian crossings have been equipped with GM+
- Another 500 pedestrian crossings to be equipped by 2018

ITS

Expressway Monitoring & Advisory System

(EMAS)

EMAS

Land Transport Authority
TRANSPORTATION & ROAD OPERATIONS

Displays messages & travel times on electronic signboards

Allows motorists to make informed decisions

Provides quick response to motorists who need help or information

Performs on-scene management for accidents with minor injuries

EMAS

Land Transport Authority
TRANSPORTATION & ROAD OPERATIONS

❑ Detection

- Collects traffic data such as traffic flow, speed & occupancy
- Detects incidents using video imaging technique

❑ Surveillance

- Verification of incidents
- Monitors traffic conditions using video cameras with pan, tilt & zoom capabilities

EMAS

- Dissemination of information

Provides real-time traffic information

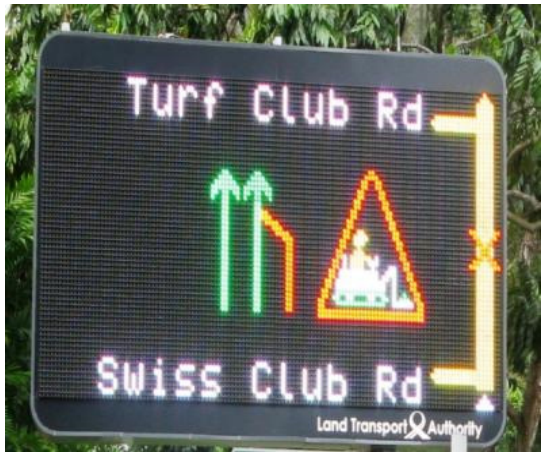
- My Transport SG
- Twitter
- OneMotoring.com.sg
- LTA Traffic News (4 languages over radio stations)

EMAS

❑ On-site Management

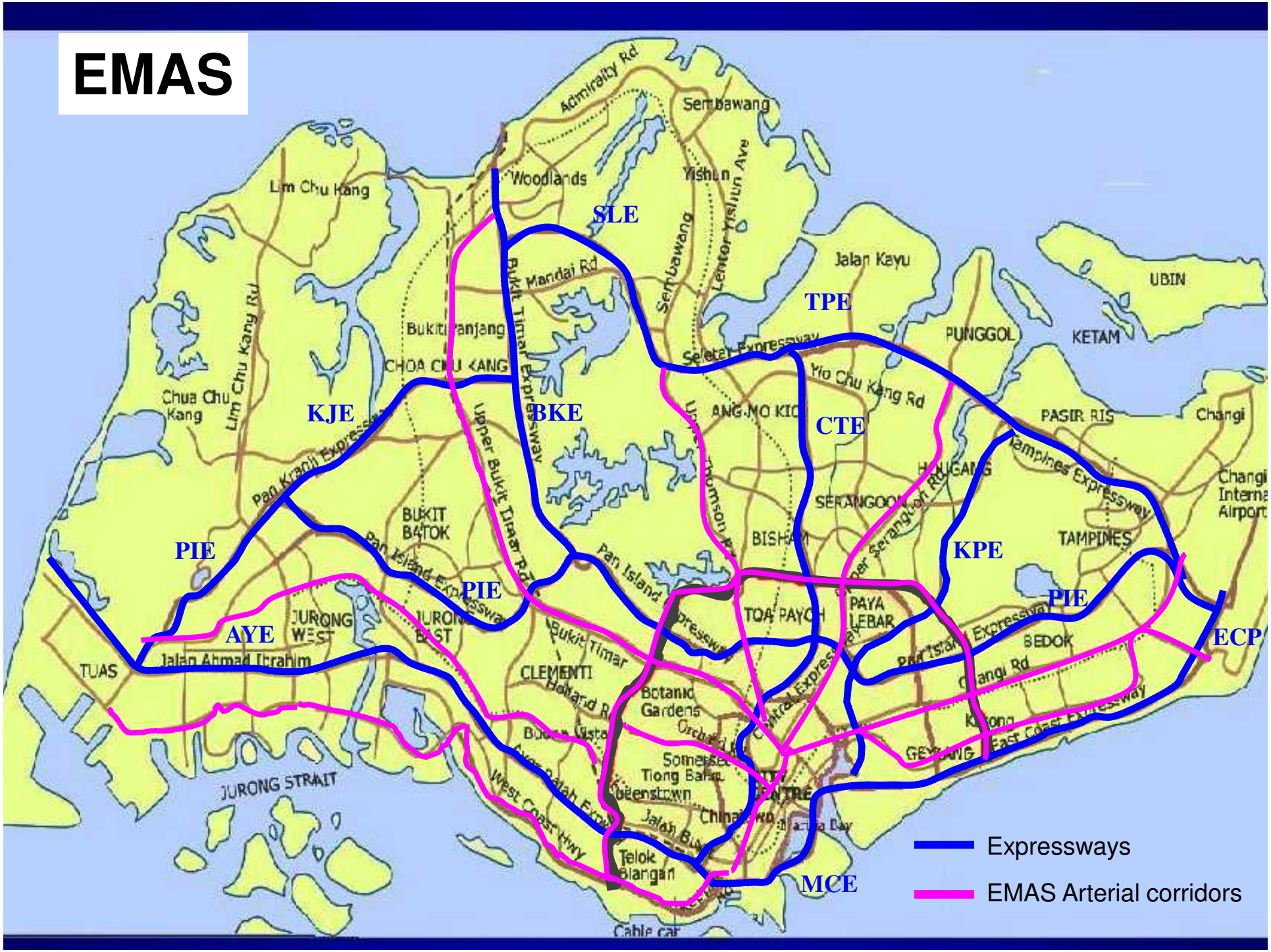
- LTA Traffic Marshals manage the incident on site
- Vehicle recovery crews tow away incident vehicles to nearest car parks

EMAS on Major Arterial Roads - EMAS Arterial



- Synergise management of traffic along both expressways & major arterial roads
- Expanded EMAS features to 10 major arterial road corridors (total length of 141.5km)
- Extension of EMAS coverage along major arterial road corridors to bring about better incident management, & traffic flow on road network island-wide

EMAS


SLE
TPE
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ECP
MCE
Admiralty Rd
Sembawang
Woodlands
Yishun
Lim Chu Kang
Jalan Kayu
UBIN
PUNGGOL
KETAM
Mandai Rd
Bukit Timah Expressway
Seletar Expressway
Yio Chu Kang Rd
ANG MO KIO
PASIR RIS
Changi
Chua Chu Kang
Lim Chu Kang Rd
Pan Island Expressway
BUKIT BATOK
SERANGOON
TAMPINES
Changi Airport
BISHAN
TOA PAYOH
PAYA LEBAR
BEDOK
JURONG WEST
Jalan Ahmad Ibrahim
TUAS
CLEMENTI
Bukit Timah
Botanic Gardens
Somerset
Tiong Bahru
Queenstown
JURONG STRAIT
West Coast Hwy
Telok Blangah
Cable car
Expressways
EMAS Arterial corridors

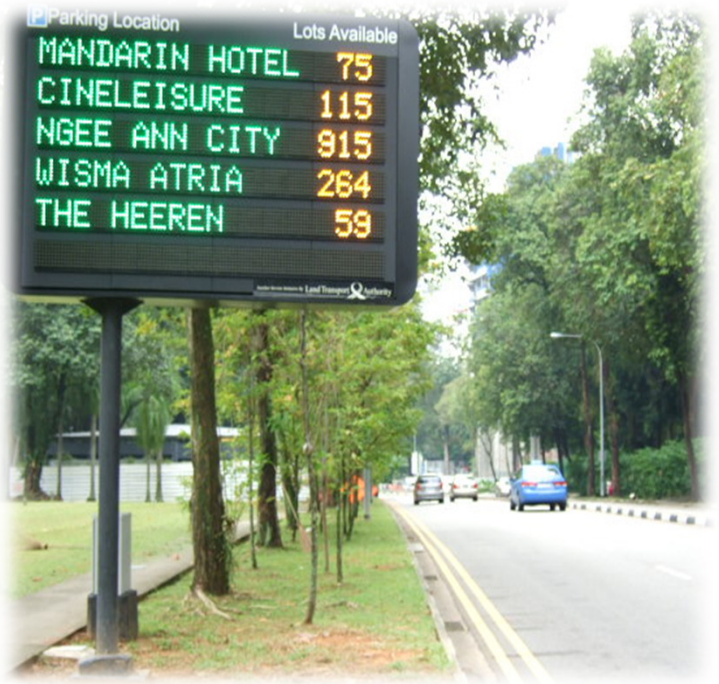
ITS

Parking Guidance System

(PGS)

PGS

- Real time parking space availability information from participating developments
- Help motorists to find available parking spaces faster and easier
- Help reducing unnecessary circulating traffic due to parking space search
- Implemented in 3 busy areas of Singapore: Marina, Orchard, Harbourfront



ITS

Junction Eyes

(J-Eyes)

J-Eyes

Land Transport Authority
TRANSPORTATION & ROAD OPERATIONS

- Surveillance system at signalised junctions
- Cameras with pan, tilt & zoom capabilities providing colour images
- Installed on existing traffic light poles & lamp posts

J-Eyes

Land Transport Authority
TRANSPORTATION & ROAD OPERATIONS

- Monitors traffic conditions at major signalized junctions
- Acts as remote eyes for operators to detect abnormal traffic conditions
- Facilitate traffic management and periodic fine-tuning of traffic light settings, or adjustments of traffic light timings during ad-hoc incident management to enhance traffic flows and public bus movements

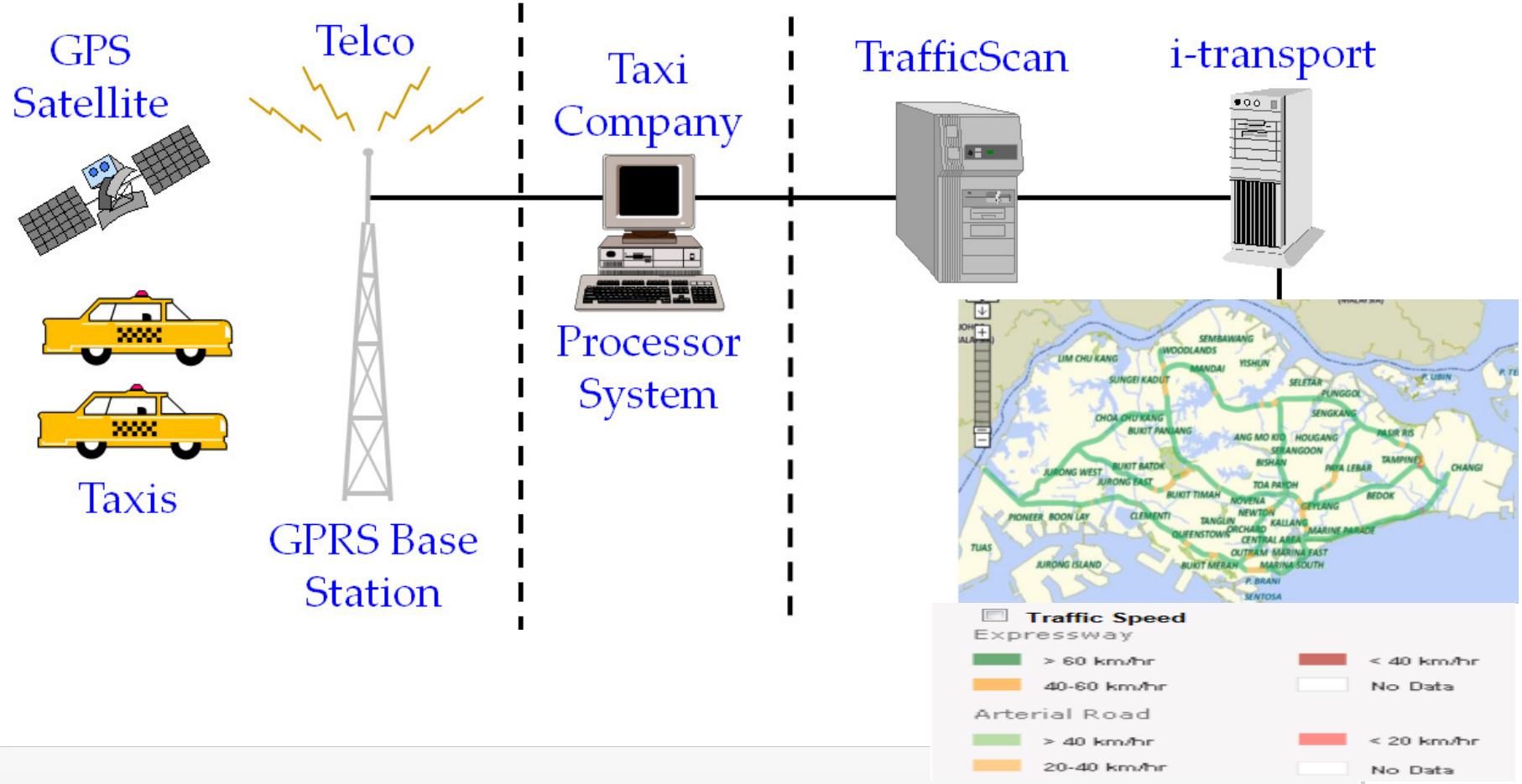
ITS

TrafficScan

Traffic.smart

TrafficScan

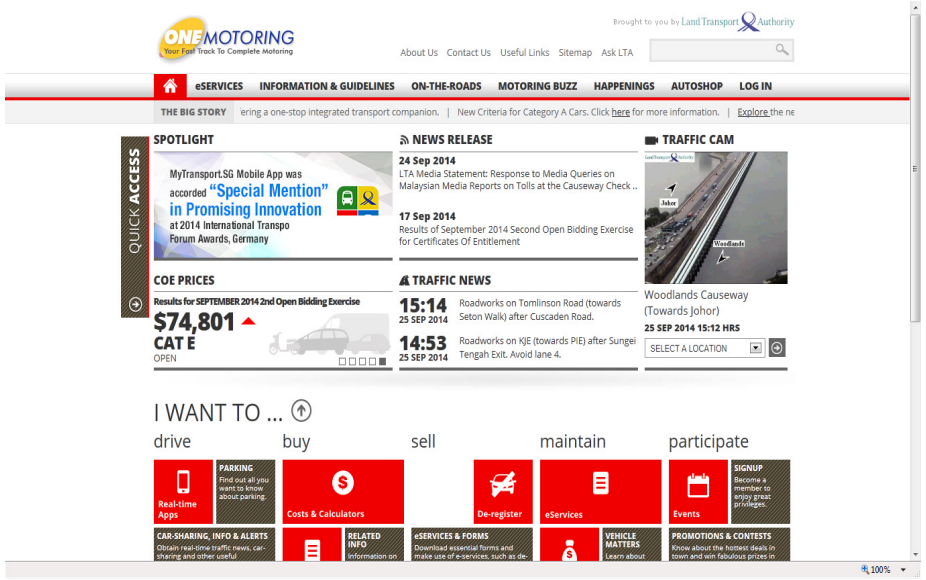
Land Transport Authority
TRANSPORTATION & ROAD OPERATIONS



- Computes average travel speeds of vehicles along expressways & major arterial roads

Traffic.smart

Land Transport Authority
TRANSPORTATION & ROAD OPERATIONS



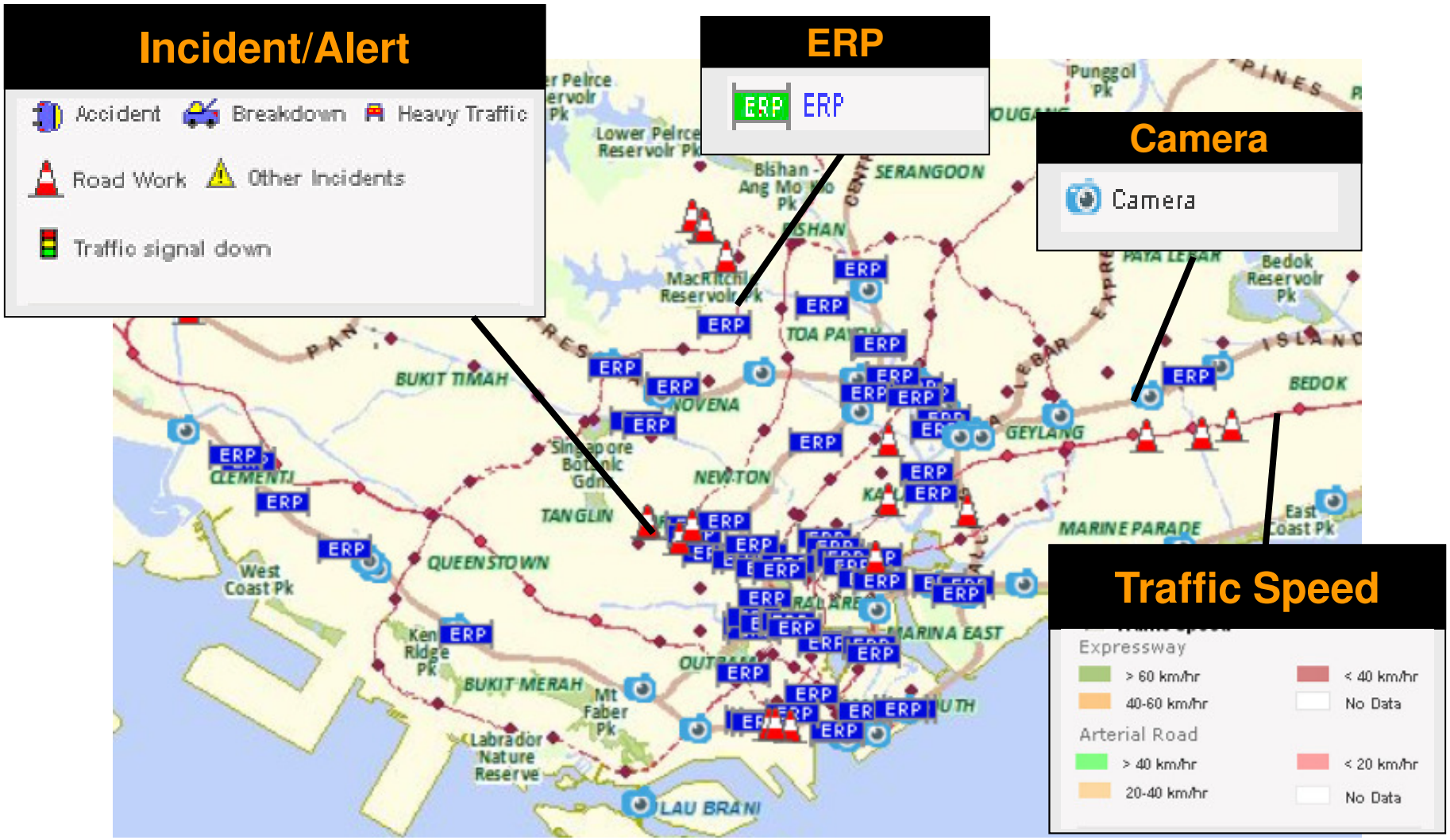
www.onemotoring.com.sg

Interactive Map

- Disseminates real-time information on internet via www.onemotoring.com.sg

Traffic.smart

Land Transport Authority
TRANSPORTATION & ROAD OPERATIONS



Interactive map from www.onemotoring.com.sg

Traffic.smart

Land Transport Authority
TRANSPORTATION & ROAD OPERATIONS

View from Upp Changi Flyover Towards PIE — 25/08/2014 10:18 hrs

View from Second Link at Tuas — 25/09/2014 17:49 hrs

View from Woodlands Causeway (Towards Johor) — 25/09/2014 17:49 hrs

View from Thomson Rd — 25/09/2014 17:54 hrs

View from KPE/PIE — 25/09/2014 17:56 hrs

Web camera images shown on ONEMOTORING Your Fast Track To Complete Motoring

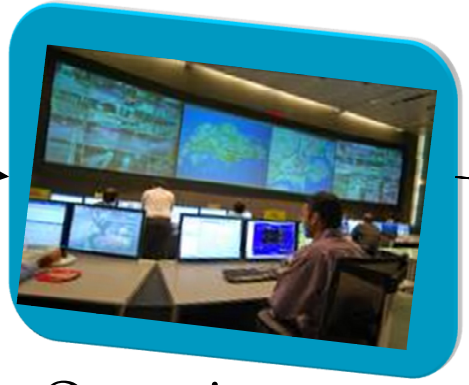
Incident Management

Land Transport Authority
TRANSPORTATION & ROAD OPERATIONS

Incident Detection

via traffic alerts/ cameras/agencies/public

Incident verification & assessment



Operations Control Centre

Activation of EMAS response teams

Inform other agencies / LTOC / inter OCC

Traffic news dissemination (signboards/radio/website/ Twitter/apps)

Land Transport Authority
TRANSPORTATION & ROAD OPERATIONS

Incident Management

- Incident management for security emergency
- Maintains law & order
- Traffic control
- Security & Investigation

- Manages traffic-related incidents
- Provides initial response for emergencies before arrival of civil defence force/police
- Provides technical expertise
- Effects tunnel closure & traffic diversion

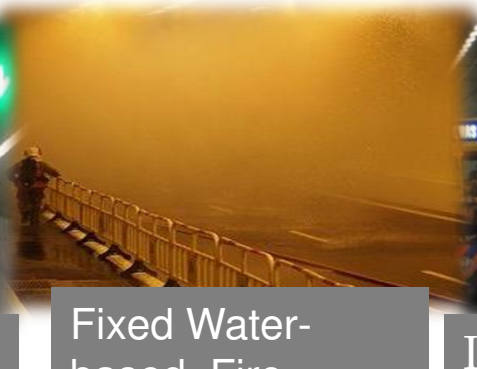
- Firefighting & rescue operations
- Paramedic services
- HazMat containment & recovery

Tunnel Management

- Operates & maintains road tunnels
- Manages equipment & safety facilities in tunnel
- Provides round-the-clock traffic tunnel monitoring
- Dedicated incident response teams for road tunnels


KPE/MCE OCC

Traffic & Lane-Use Signs


Fixed Water-based Fire Fighting System


Incident Response

Events Facilitation

Land Transport Authority
TRANSPORTATION & ROAD OPERATIONS

- Facilitating traffic during planned events on the roads
  - Road runs, Formula 1 race, road/construction works, opening of Transport Hubs, new flyovers, expressway
- Mitigating traffic impact & facilitating traffic diversion
  - Advanced notification to motorists
  - Customized traffic operations plans
  - Diversion of bus routes while ensuring connectivity
  - Set-up of dedicated traffic command post


Thank You

4TH ANNUAL

ROADS AND HIGHWAYS

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9th – 11th April 2018 | Singapore

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INTERNATIONAL ROAD FEDERATION
FEDERATION ROUTIERE INTERNATIONALE

JOIN OUR EXCLUSIVE DAY 3

PROJECT FINANCE AND PUBLIC PRIVATE PARTNERSHIPS (PPPs)

This post conference workshop is an overview and discussion of how project finance facilitates private capital investments and creates access to long term financing which results in a robust and diverse pipeline of sustainable infrastructure. Delegates will gain knowledge of structuring private finance highway projects, identifying and managing the risks, developing performance based operation and maintenance elements that are critical to highway projects.

Facilitated by a Project Management and Finance Expert:

Alberto Germani Director
PMF PROJECT MANAGEMENT AND FINANCE
PPP Team of International Expert Member
UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE (UNECE)

INTERACTIVE PANEL DISCUSSIONS & INNOVATIVE SESSIONS

ROAD TO SUCCESS
These thought leaders will discuss and share their experience on the One Belt One Road Initiative (OBOR)

SMART SEATS
Brain storming roundtable discussions to discuss driverless vehicles while analysing the impact of PPPs in the development of roads and highways

BRAINSTORM
An interactive crowd participation session on discussing a real life case study on refinancing a PPP project

> WHEN WE BUILD, LET US THINK THAT **WE BUILD FOREVER.**
>
> JOHN RUSKI

EXCLUSIVE SITE TOUR ON 10 APRIL 2018

Intelligent Transport System Centre (ITSC), Land Transport Authority

Join this exclusive site tour guided by senior representatives from LTA-ITSC, who will present on various technologies in place that help ITSC maintain smooth flowing traffic on the entire expressway and road networks in Singapore.

BENEFIT FROM KEYNOTE PRESENTATIONS AND DISCUSSIONS BY WELL RENOWNED INDUSTRY EXPERTS

John Endicott Executive Director
AECOM, SINGAPORE

Frederic Blanc-Brude Member – Advisory Council
WORLD BANK GLOBAL INFRASTRUCTURE FACILITY, SINGAPORE

Jonathan Spear Atkins Fellow, Director Transport Policy and Planning
ATKINS ACUITY, SINGAPORE

Oliver Redrup Director
PwC, SINGAPORE

Qamar Wan Noor Chief Operating Officer
SURUHANJAYA PENGANGKUTAN AWAM DARAT (S.P.A.D.), MALAYSIA

Kiran Kapila Chairman
INTERNATIONAL ROAD FEDERATION, SWITZERLAND

Dr. Siti Zaharah Ishak Acting Director-General
MIROS, MALAYSIA

Dr. Siriphan Jitprasithsiri Director – International Highways Development Division
DEPARTMENT OF HIGHWAYS, THAILAND

Zarith Sofia Magad Senior Transport Engineer
MOTT MACDONALD, SINGAPORE

Shoaib Ahmed Siddiqui Secretary – Planning, Development and Reform
CHINA PAKISTAN ECONOMIC CORRIDOR

SHOWCASING CASE STUDIES AND KEY INTERNATIONAL PRESENTATIONS BY DISTINGUISHED SPEAKERS

Ray Chan Associate Director
ATKINS, HONG KONG

Colin Henson Project Development and Planning Lead
SMEC, AUSTRALIA

Carel Snyman Senior Lead – Green Transport
SOUTH AFRICAN NATIONAL ENERGY DEVELOPMENT INSTITUTE (SANEDI)

Silvia Garcia Senior Analyst
EDHEC INFRASTRUCTURE INSTITUTE, SINGAPORE

Max Antameng Advisor – Directorate General of Highways
MINISTRY OF PUBLIC WORKS, INDONESIA

Dr. Ong Ghim Ping Raymond Assistant Professor
NATIONAL UNIVERSITY OF SINGAPORE

Akhilesh Srivastava Chief General Manager- IT & Highway Operations
NATIONAL HIGHWAYS AUTHORITY OF INDIA (NHAI)

David Ng Chew Chiat Executive Director
ONE SMART ENGINEERING, SINGAPORE

Assoc Prof Robert Tiong Lee Kong Deputy Director-Centre for Infrastructure Systems
NANYANG TECHNOLOGICAL UNIVERSITY, SINGAPORE

Senior Representative
AURECON

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INTERNATIONAL ROAD FEDERATION
FEDERATION ROUTIERE INTERNATIONALE

www.irfnet.ch

The International Road Federation, Geneva, a not-for-profit, non-governmental organisation, pursuing the mission of Safe Roads and Smart Mobility, in collaboration with Marcus Evans, is delighted to invite you to join us in Singapore where we will have the pleasure of hosting the IRF & Marcus Evans Forum, 4th Annual Roads and Highways between 9th – 11th April 2018.

With the demand for new infrastructure offering increasing capacity rising and governments grappling to find the right balance between managing their growing maintenance backlogs and delivering the system expansion to address the needs of the public, the focus has shifted towards funding of the expansion of new infrastructure and upgrading and optimisation of existing assets. Improved operational efficiency will lead not only to direct cost savings but also to increased usage, extended asset life, greater convenience and augmented profits.

This Forum will provide a global platform for all key stakeholders and leading players in the Roads & Highways industry to address the key issues facing them with excellent networking opportunities. The Conference programme, for two days, will cover a range of topics such as road design & development, road sustainability & safety, ITS to improve traffic management, tolling to bridge the funding gaps, financing alternatives, engineering & asset management, amongst others.

The speakers include best known regional and international experts from Governments, Regulatory Authorities, DFIs, Concessionaires, Engineering & Construction, Financial Institutions, etc. We look forward to meeting you in the beautiful city of Singapore! Regards,

Kiran K. Kapila
Chairman
International Road Federation, Geneva
11th December 2017

THE PROGRAMME - DAY ONE

monday 9th april 2018

0830 Registration and Morning Coffee

0900 Opening and Welcome Remarks from the Chairperson
Kiran Kapila, Chairman, **International Road Federation, Switzerland**

0915 **Plenary One: Unlocking Regional Trade Facilitation and Investment Potential through Efficient Road Infrastructure**
Dr. Siriphan Jitprasithsiri, Director, International Highways Development Division, **Department of Highways, Thailand**

0955 SAFETY SPOTLIGHT
Plenary Two: Devising a National Road Safety Strategy to Address the Challenge of Road Safety in Developing Asian Countries
Dr. Siti Zaharah Ishak, Acting Director-General, **MIROS, Malaysia**

1035 Morning Refreshments

1050 **Plenary Three: Leveraging Intelligent Transport Systems (ITS) to Enhance Mobility and Facilitate Intelligent Traffic Management**
Speaker to be advised

ROAD TO SUCCESS

1130 **OBOR: Assessing the Impact of This Mega Infrastructure Project on Asia**
Panellists:
Frederic Blanc-Brude, Member Advisory Council, **World Bank Global Infrastructure Facility, Singapore**
Akhilesh Srivastava, Chief General Manager- IT & Highway Operations, **National Highways Authority of India (NHAI)**

1210 Networking Lunch

STREAM ONE
DESIGN, DEVELOPMENT & PLANNING

1310 Chairperson's Opening Remarks

1320 **Autonomous Roads: The Road to Reality of Autonomous Vehicles**
- Understanding new vehicle technologies
- Laying out the prospects of improved safety, more efficient transportation, cleaner air and greater productivity
- Reshaping the urban landscape and defining the future of transportation

Carel Snyman, Senior Lead, Green Transport, **South African National Energy Development Institute (SANEDI)**

1400 **Incorporating Intelligent Models on Highway Tunnel Development in Urban Areas to Avoid Road Congestion**
- Briefly introducing the advantages on the use of underground tunnel for highways and the choice of methods on construction
- Improving underground excavation for highways using drill and blast method
- Case study on the use of AIM on optimising parameters on blasting design

Ray Chan, Associate Director, **Atkins, Hong Kong**

1440 Afternoon Refreshments

1510 **Adopting Safe Design through Appropriate Tools to Improve the Road Environment**
- Conducting a road safety assessment to reduce high risk road sections
- Adopting star rating systems to rate road attributes for their qualities
- Discussing the advantages of the measurement systems for road builders and road users

Speaker to be advised

STREAM TWO
ROAD ENGINEERING, MAINTENANCE & TECHNOLOGIES

1310 Chairperson's Opening Remarks

1320 **Highways Modernisation for Greater Effectiveness and Sustainability**
- Integrating IT in the highway project lifecycle to enhance the speed and quality of construction
- Performing a cost analysis to improve the economic benefits and maximise investment benefits
- Electronic toll collection to minimise congestion an ensure faster mobility

Akhilesh Srivastava, Chief General Manager- IT & Highway Operations, **National Highways Authority of India (NHAI)**

1400 **Ground Improvement Options for Highways Planning and Construction**
- Improving the engineering properties of the soil mass prior to construction
- Ensuring sustainability in highway construction
- Ground improvement techniques for different soil types
- Redesigning the structure according to ground conditions

David Ng Chew Chiat, Executive Director, **One Smart Engineering, Singapore**

1440 Afternoon Refreshments

1510 **Rehabilitating Distressed and Aged Pavements Through Reclaimed Asphalt Pavement (RAP) Technology**
- Promoting the use of recycled highway materials in pavement construction in an effort to preserve the natural environment
- Developing and implementing an environmental operating plan as a best practice guideline to minimise construction impacts
- Rehabilitating distressed and aged pavements through reclaimed asphalt pavement (RAP) technology

Dr. Ong Ghim Ping Raymond, Assistant Professor, **National University of Singapore**

1550 SMART SEATS
I - The Road Ahead: Moving Towards Driverless Vehicles
Moderator:
Carel Snyman, Senior Lead, Green Transport, **South African National Energy Development Institute (SANEDI)**

II - Discussing the Economic Impact of PPPs in the Development of Roads and Highways
Moderator:
Alberto Germani, Director, **PMF Project Management and Finance, Italy**

1650 BRAINSTORM
Resolving Problems as They Arise: Refinancing a PPP Project - Disputes and Intervening Events
You will be given a case study where half the audience will constitute counsellors for the government and the other half will be counsellors to the concessionaire. The concessionaire maintains that the road closure constitutes a Political Force Majeure situation, and that compensation to the concessionaire is required. You will have to discuss, debate and come up with suitable conclusions towards a dispute resolution strategy.
Moderator:
Oliver Redrup, Director, **PwC, Singapore**

1730 Chairperson's Closing Remarks & End of Day One

THE PROGRAMME - DAY TWO

tuesday 10th april 2018

0830 Registration and Morning Coffee

0900 Opening and Welcome Remarks from the Chairperson
Kiran Kapila, Chairman, **International Road Federation, Switzerland**

0915 **Plenary One: Urban Mobility: The Opportunities and Risks of Future Vehicle Technology and Implications for Cities**
Jonathan Spear, Atkins Fellow, Director Transport Policy and Planning, **Atkins Acuity, Singapore**

0955 CPEC SPOTLIGHT
Facilitating Greater Trade between South and Central Asia to Augment Socio-Economic Growth: A Case Study of CPEC
Shoaib Ahmed Siddiqui, Secretary- Planning, Development and Reform, **China Pakistan Economic Corridor**

1035 Morning Refreshments

1100 **Plenary Three: Developing Roads and Traffic Plans to Optimise Safety, Efficiency and Cost**
Zarith Sofia Magad, Senior Transport Engineer, **Mott MacDonald, Singapore**

1140 PPP TRENDS
Delving into Road PPP Project Structures in Asia and Current Tendering Trends
Oliver Redrup, Director, **PwC, Singapore**

1220 Networking Lunch

STREAM ONE
DESIGN, DEVELOPMENT & PLANNING

1320 Chairperson's Opening Remarks

1330 **Developing and Planning the Design and Construction of Underground Roads in an Urban Environment**
- Designing bridges and tunnels as part of road and highway infrastructure in opening up corridors
- Improving the sustainability, reliability and durability of road infrastructure

John Endicott, Executive Director, **AECOM, Singapore**

1410 **Road Masterplan As an Integral Part of Improving Physical Connectivity**
- Creating an integral road system masterplan to ensure highway accessibility from all destinations and reduce the transportation cost
- Developing a sustainable rural roads network to provide connectivity as well as serviceability
- Providing appropriate institutional frameworks to coordinate the rural roads construction and management

Max Antameng, Advisor- Directorate General of Highways, **Ministry of Public Works, Indonesia**

1450 **Designing Effective Road Networks to Accommodate the Burgeoning Traffic Conditions**
- Achieving ease of traffic movement by segregating "through traffic" from "local traffic"
- Building an elevated ring system of expressways to reduce congestion on surface roads to achieve faster turnaround times
- Integrating inner and outer ring roads to increase the efficiency of traffic flow

Colin Henson, Project Development and Planning Lead, **SMEC, Australia**

1530 Afternoon Refreshments & Proceed to Site Tour

STREAM TWO
ROAD ENGINEERING, MAINTENANCE & TECHNOLOGIES

1320 Chairperson's Opening Remarks

1330 **Adopting a Sustainable Approach to Road Asset Management**
- Addressing the current issues in road asset management in developing countries
- Evaluating the current approaches being trialled in the region to highlight the pros and cons of every approach
- Indicating the factors for the success of your road asset management system

Assoc Prof Robert Tiong Lee Kong, Deputy Director-Centre for Infrastructure Systems, **Nanyang Technological University, Singapore**

1410 **Systemic Risks in Toll Roads: A Surgical Examination of the Spanish Road Sector Collapse and Ensuing Renegotiations**
- The collapse of the Spanish toll road sector
- The impact of state guarantees on private debt restructuring
- A war of attrition and the final outcome

Silvia Garcia, Senior Analyst, **EDHEC Infrastructure Institute, Singapore**

1450 **Leveraging Intelligent Transport Systems (ITS) within your Cities to Enhance Mobility and Facilitate Intelligent Traffic Management**
- Discussing worldwide trends in Intelligent Transport Systems (ITS)
- Transportation and Technology: Can we do it smarter?
- ITS applications in developing countries and practical application of ITS

Speaker to be advised

EXCLUSIVE SITE TOUR

INTELLIGENT TRANSPORT SYSTEM CENTRE (ITSC), LAND TRANSPORT AUTHORITY

Powered by an Operations Control Centre (OCC) which runs 24/7, ITSC manages traffic flow on the roads and maintains the associated Intelligent Transport System (ITS) infrastructure. The ITS infrastructure spans over 161km of expressways and road tunnel systems, including the Kallang-Paya Lebar Expressway (KPE), Central Expressway (CTE) and Fort Canning Tunnel (FCT). The ITS centre keeps a close watch on traffic flow using data gathered by the various intelligent transport systems.

POST CONFERENCE WORKSHOP - DAY THREE

wednesday 11th april 2018

PROJECT FINANCE AND PUBLIC PRIVATE PARTNERSHIPS (PPPS)

Session 1
Introduction to Project Finance and PPPs
- Concept and forms of private involvement in road infrastructure projects
- Gaining an understanding on traditional methods of financing infrastructure projects
- What is project finance? An introduction to project finance and its basic principles
- Private financing and PPPs- what are the different types and structures of PPP and what is appropriate for each sector
- PPPs in the international context: The most commonly practised arrangements worldwide
- New trends from UN Agenda: Impact investing and people first PPPs for sustainable development

Session 2
Understanding Project's Business Cycle
- Managing project's business cycle from concept to delivery: The gateway approach
- How to assess and prioritise public projects: Principles of economic and financial analysis
- Project assessment tools: Feasibility studies

Session 3
Setting up and Evaluating a Financial Model
- Exploring the role of financial modelling in project finance
- How to setup a financial model
- Financial indexes and their assessment
- How to evaluate the outcomes of a PPP - tailored financial model
- PPP funding strategies
- Commercial and islamic finance: How to combine different sources to achieve the most effective funding structure

Session 4
Principles of Public Procurement
- Contractual options for procuring public projects: TP, D&B, Concessions and JVs
- Economic vs. social infrastructure: Understanding between the different PPP approaches
- Project risks assessment and allocation
- Solicited vs. unsolicited proposal: How to pick the best PPP procuring strategy

Session 5
Summary of Case Studies and Best Practices Worldwide
- Building on the lessons learned in failures and successes of previous project finance transactions
- Discussing the differences and similarities in infrastructure subsectors
- Reviewing recent trends in project finance in infrastructure projects

Final Wrap-Up Discussion
An overview and discussion of how project finance facilitates private capital investments and creates access to long term financing which results in a robust and diverse pipeline of sustainable infrastructure.

Workshop Leader:
Alberto Germani, Director, **PMF Project Management and Finance** PPP Team of International Expert Member, **United Nations Economic Commission for Europe (UNECE)**

TRAINER

Alberto Germani, Director, **PMF Project Management and Finance** PPP Team of International Expert Member, **United Nations Economic Commission for Europe (UNECE)**
Alberto Germani is a chartered civil engineer with an MBA who carries nearly 30 year of professional expertise in public infrastructure project delivery, of which 20 years in PPPs and project finance projects matured in government and private entities.Alberto is former member and chairman of the PPP (Public-Private Partnership) Task Force by the Italian Ministry of the Treasury. In this role, Alberto has lead the development of a large number of PPP projects in various public service sectors, such as local transport systems, highways, railways, the healthcare, water distribution, energy, totaling more than 20 billion Euros of capital expenditure. Most of the projects are already successfully completed and currently operational.

In 2009, he moved to the UAE to take on the role of PPP Advisor by the Abu Dhabi Department of Transport, leading the team entrusted with the bidding process of the 327 km-long Mafraq – Ghweifat Highway, a 30-year 3 billion USD investment road concession. While in the UAE Alberto has been also responsible of 400 AED Million, 5-year concession contract with Tadweer - Center of Waste Management for Abu Dhabi city municipal waste collection and management.

He is currently Managing Director of PMF, an international engineering consultancy specialized in worldwide PPP arrangements in public infrastructure sectors. Since 2006 Alberto collaborates with United Nations Economic Commission (UNECE) as member of its PPP Team of International Experts headquartered in Geneva, Switzerland. His lecturing activity includes running post-graduate courses on finance, engineering and public infrastructure projects delivery organized by prestigious academic institutions, public administration schools and training institutes. Alberto is the author of articles and essays on project finance published by international specialized press and sits as Member of the "European PPP Law Review" Editorial Board, published by editor Lexxion, Berlin (Germany).

BENEFITS OF ATTENDING THE WORKSHOP

- **Gain** comprehensive knowledge of financial and economical approaches to public projects
- **Understand** key requirements for private capital involvement in funding public infrastructure projects
- **Assess** the different types of contractual options for procuring public projects and discuss the advantages and disadvantages
- **Delve** into the principles of structuring financial models for PPPs and evaluate the outcomes correctly
- **Learn** from successful examples of projects worldwide in the field of infrastructure projects

SCHEDULE

0830	Registration and morning coffee
0900	Workshop commence
1030	Morning coffee and networking break
1045	Workshop re-commence
1215	Networking luncheon
1330	Workshop commence
1500	Afternoon refreshment and networking break
1515	Workshop re-commences
1700	Workshop concludes

marcusevans would like to thank all the world-leading visionaries, solution providers, associations, operators, end-users and delegates who have contributed to and supported the marcusevans **4th Annual Roads & Highways conference**. We would particularly like to mention our speakers for their help in the research behind the event and also our sponsors for their continued support and commitment. On behalf of marcusevans we hope you have a rewarding, enjoyable and productive time. We personally look forward to meeting you all and working with you at our future Large Scale Events planned in 2018. See you in April!

REGISTER NOW

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Email: NorimanA@marcusevanskl.com

MORE ABOUT THE EVENT

WHY YOU CANNOT MISS THIS EVENT

Roads and highways are of vital importance in order to make a nation grow and develop. Roads open up more areas and stimulate economic and social development by improving commute for citizens. Congestion is a major source of frustration for road users and has worsened over time in most cities in Asia. Therefore, it is now the time to redefine Asia's infrastructure through the creation of new designs of roads and highways for 2018 and beyond. It is crucial for governments to step up their investment in this sector to augment socioeconomic growth. Rapid development in roads and highways can contribute to significant growth and improve productivity. All stakeholders need a better understanding of the challenges, opportunities and risks related to infrastructure investment, how to integrate technical knowledge to construct projects and managerial knowledge required for the effective implementation and execution of large scale projects.

4th Annual Roads & Highways will create a one stop shop for all stakeholders to discuss and deliberate on the challenges facing them and brainstorm innovative ideas by generating sustainable practices that are proven in the development of infrastructure. This highly-interactive and information packed event will highlight case studies on all aspects pertaining to roads and highways from design & development, engineering, funding, road safety, smart mobility, new technologies to maintenance from some of the finest and at the same time provide an excellent networking platform for the public sector, global professionals and industry leaders who are all directly involved with the growth and development of road infrastructure, enabling countries to take themselves to the next stage of development.

Follow your own agenda with a choice of the following streams over two days:

Stream I: Design, Development & Planning

Stream II: Road Engineering, Maintenance & Technologies

ATTEND THIS 4TH ANNUAL ROADS & HIGHWAYS CONFERENCE AND GAIN INSIGHTS INTO

- **Re-defining** infrastructure through the creation of new designs of roads and highways
- **Emphasising** best practice strategies and techniques to reshape the urban landscape
- **Leveraging** traffic management systems to improve levels of safety
- **Establishing** a robust asset management system to effectively manage road assets
- **Exploring** innovative project management techniques for cost optimisation and effective delivery
- **Improving** the current road infrastructure management framework and approach through a well planned strategy
- **Enhancing** communication networks to improve traffic flow and congestion
- **Networking** opportunities to share and experience new and sustainable roads and highways engineering ideas

TESTIMONIALS

"Provision of event materials, content and speakers were good."
Asst Vice President, Asset Management, Manila North Tollways

"The speakers managed to deliver the message effectively well. It was a great event to build contracts for knowledge & business."
Senior Engineer, LTA Singapore

"Ways to achieve more forgiving highways."
Manager, Projects, Maldives Road Development Corporation Ltd

"The workshop was very informative and well planned that shed light on a lot of areas in planning, supervision and construction."
Resident Engineer, Ngandu Consulting

"Refreshment - good; Programme schedule – excellent."
Civil Engineer- Roads, JKR Sarawak

WHO SHOULD ATTEND

Director Generals, Mayors, Municipal Councillors, Commissioners, Presidents, Chairmen, CEOs, CMOs, COOs, CFOs, CIOs, MDs, Country Managers, General Managers, VPs, Directors, Regional Managers and Division Heads of:

- Tolling and Concessions
- Infrastructure Planning / Road Planning
- Operations and Maintenance
- Information Technology Development
- Quality and Process Improvement
- Asset Management
- Engineering
- HSE
- Project Management
- Finance, Economics and Accounts
- Revenue Management
- MRO
- Government Relations
- Communications
- Marketing and Sales
- Regulatory and compliance
- Human Resource, Training and Development
- Intelligent Transportation Systems
- Roads and Highway Projects
- Transportation
- Project Development
- Legal, Contracts and Procurement
- Asset Integrity and Reliability Management
- Strategic Planning and Development
- Design
- Infrastructure Risk Management
- Commercial / Distribution / Marketing
- Internal Audit
- Safety and Security
- Corporate Planning and Strategy
- Business Development
- International Affairs
- Shared Services

From and including

- Government Agencies – Federal, State & Local Councils
- Policy Makers
- Road Planning Departments
- Ministries and / or Departments, Municipalities of Finance
- Road and Highway Regulators
- Road Safety Associations
- Ministries and /or Departments, Municipalities of Transportation
- Private Sectors
- Road Operators / Developers
- Ministries and /or Departments, Municipalities of Public Works
- Road Planning, Design & Construction Companies
- Urban Planners, Designers and Developers
- PPP / PFI Units / Economic Planning Units
- Highway Infrastructure, Construction and Maintenance
- Tunneling and Tunnel Maintenance
- Banks, Financial Institutions, Institutional Investors
- Multilaterals & Specialised Agencies (UN Projects Office, WB, ADB or USAID funded projects)

Secondary Market

- Engineers Consultants and Contractors
- Turnkey / Technology Solution Providers
- Cement, Steel and Concrete Suppliers
- Access Control, Surveillance and Security
- IT, Computing and Software
- Lighting Solutions
- Parking
- Photo Enforcement
- Project Management and Consultancy
- Road Marking
- Safety and Work Zone Accessories
- Static and Electronic Signage
- Test and Measurement
- Tolling and Payment Systems
- Traffic Management
- Traffic Signal Pre-emption
- Fleet Management, Positioning and Tracking
- Detection, Classification and Vehicle Counters
- Bridge Building, Maintenance and Management
- Weather Management and Information Systems

BUSINESS DEVELOPMENT OPPORTUNITIES

Does your company have services, solutions or technologies that the conference delegates would benefit from knowing about?

If so, you can find out more about the exhibiting, networking and branding opportunities available by contacting:

Mark Christopher on **+91 22 6167 9600** or email **MarkC@marcusevansin.com**

REGISTER NOW

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