

ITEM FOR FINANCE COMMITTEE

CAPITAL WORKS RESERVE FUND

HEAD 710 – COMPUTERISATION

Transport Department

New Subhead “Development of the Traffic and Incident Management System”

Members are invited to approve a new commitment of \$100,000,000 for the development of the Traffic and Incident Management System in Transport Department.

PROBLEM

The Transport Department (TD) needs to further improve its efficiency and effectiveness in managing traffic and transport incidents and in disseminating traffic and transport information to the public by taking advantage of the advancement in technologies.

PROPOSAL

2. The Commissioner for Transport, with the support of the Secretary for Transport and Housing and the Government Chief Information Officer, proposes to create a new commitment of \$100,000,000 to develop a Traffic and Incident Management System (TIMS) in TD to facilitate traffic and transport incident management and dissemination of real-time traffic and transport information.

JUSTIFICATION

Limitations of the Existing Traffic and Transport Incident Management Facilities

3. TD set up the Emergency Transport Coordination Centre (ETCC) in 2000 to monitor and handle traffic and transport incidents on public roads.

/Currently

Currently, ETCC handles about 3 000 traffic and transport incidents per year. Such incidents grow at an average annual rate of 2-3%. The ETCC has the following limitations –

- (a) a large proportion of the incident management processes from incident detection to incident recovery is manually operated, thereby limiting the incident management capability of the ETCC;
- (b) the Traffic Control and Surveillance Systems (TCSS) are designed and controlled as discrete elements, covering tunnels and control areas. There is no linkage between the systems to allow comprehensive, effective and efficient traffic and incident management on a territory-wide basis; and
- (c) there is no data sharing platform to allow efficient dissemination of real-time traffic and transport incident information to the public.

Need for the Proposed TIMS

4. The proposed TIMS is a computerised system to perform automatic incident detection, generate suggested traffic and transport contingency plans, provide a common view of traffic information to all stakeholders, streamline the dissemination of traffic and transport information to the public, and coordinate existing and future TCSS. It will also include a common data platform for interested parties to acquire TD's traffic speed and incident information for developing value-added services. The proposed key functionalities of the TIMS are summarised below –

- (a) it will fuse different available real-time traffic information, such as images from closed-circuit televisions, journey times, traffic speed and density data, to perform incident detection;
- (b) it will include a Knowledge Based Expert System (KBEST), which is a sub-system to generate incident responses to help optimise and expedite response activities. The sub-system will identify the impact of an incident on both the road network and the public transport services, and generate traffic and transport response plans based on pre-defined strategies and experience gained from previous incidents of a similar nature. These plans will assist TD in deciding how best to respond to an incident;
- (c) it will include another sub-system for all relevant stakeholders such as Hong Kong Police Force (HKPF), Highways Department (HyD), public transport operators, on-site incident response team, etc. to report, view and update information of an incident;

/(d)

- (d) it will have the capability to coordinate all TCSS so as to facilitate the management of incidents and, in the long term, efficient dissemination of traffic information through variable message signs on a territory-wide basis;
- (e) it will provide tools to issue electronic press releases and special traffic news to stakeholders such as the media and the public more efficiently; and
- (f) it will disseminate real-time traffic and transport information direct to the public through traveller information kiosks to be installed at strategic locations. It will include a data platform to facilitate private companies and relevant parties to extract traffic speed and incident information for the development of value-added traffic related services.

Anticipated Benefits

5. The proposed TIMS will bring about the following benefits –

- (a) More effective and efficient incident management

The functionalities described in paragraph 4 above will meet the imminent needs of the ETCC for more effective and efficient incident management. In the long term, TIMS may be expanded to integrate dynamic traffic modelling¹, which is a promising but as yet consolidated technology for incident management.

- (b) Reduced incident duration and quicker recovery

It is estimated that TIMS can reduce the duration of a traffic incident by ten minutes on average, i.e. about 23%² of the duration of a typical incident. The reduction in incident duration is due to the capability of TIMS in achieving quicker detection and confirmation of an incident,

/more

¹ Dynamic traffic modelling is a traffic modelling technique which assists in simulating the traffic impact of incidents by taking into account real-time traffic conditions. With further application of dynamic traffic modelling in the KBEST system (mentioned in paragraph 4(b)), it can facilitate a more proactive analysis on a real-time basis in generating traffic forecast of incident impact and the proposed response measures according to current traffic conditions.

² About 98.5% of incidents in Hong Kong are minor ones with an average duration of 44 minutes while the remaining 1.5% are major incidents lasting for more than 44 minutes. Minor incidents typically include vehicle breakdown, road-side debris and minor collisions whereas major incidents are those which happen at critical locations or require prolonged handling process, e.g. natural disasters, fire, etc.

more efficient inter-departmental coordination among TD, HKPF and HyD, etc., earlier availability of response plan options for decision making, and more efficient mobilisation of recovery teams. As a result, it would enable affected roads to resume normal traffic quicker and reduce the number of vehicles caught in traffic queues.

(c) Earlier dissemination of incident information to the public

The earlier dissemination of incident information through the proposed TIMS can reduce the severity of traffic impact during an incident by alerting more motorists or travellers to use alternative driving routes or transport modes. In turn, it will relieve traffic congestion near the incident area, benefit the road network and reduce travellers' journey time as a whole.

Cost Savings

6. We estimate that the implementation of the proposed TIMS will enhance the efficiency and effectiveness of incident management, resulting in a net reduction of manpower resources for operating the ETCC, namely, a deletion of 12 Engineer and Technical Officer grade posts, off-set by the upgrading of three Transport Controller grade posts. This will bring about annual realisable savings of around \$7,295,000 from 2016-17 onwards, and will be used for covering part of the recurrent expenditure arising from the proposed TIMS as set out in paragraphs 19 to 25 below. A detailed cost and benefit analysis of the proposal is at Enclosure 1.

Encl. 1

7. In addition to achieving realisable savings, the proposed TIMS will reduce incident duration and save travellers' time, thereby giving rise to economic savings of about \$12,900,000 in 2016-17. Such economic savings will increase over the years with increase in the value of time. The total economic savings is estimated to be about \$359,400,000 in a ten-year period from 2015-16 to 2024-25. Detailed calculation of the economic savings is at Enclosure 2.

Encl. 2

FINANCIAL IMPLICATIONS

Non-recurrent Expenditure

8. We estimate that the implementation of the proposed TIMS will require a total non-recurrent expenditure of \$100,000,000 over a period of five years from 2011-12 to 2015-16, with the breakdown as follows –

/2011-12

	2011-12 \$'000	2012-13 \$'000	2013-14 \$'000	2014-15 \$'000	2015-16 \$'000	Total \$'000
(a) Hardware	-	3,000	5,000	1,500	-	9,500
(b) Software	-	4,000	5,500	1,500	-	11,000
(c) Communication Network	-	1,000	3,000	1,000	-	5,000
(d) Implementation Services	-	6,000	20,000	5,000	1,000	32,000
(e) Contract Staff	720	1,430	1,430	520	200	4,300
(f) Site Preparation	-	1,000	3,000	500	-	4,500
(g) Training	-	-	200	500	800	1,500
(h) Consultancy Services	2,000	10,000	5,500	2,000	500	20,000
(i) Contingency	400	3,700	6,000	1,800	300	12,200
Total	3,120	30,130	49,630	14,320	2,800	100,000

9. As regards paragraph 8(a) above, the estimate of \$9,500,000 is for the acquisition of hardware such as servers (web, applications and databases), storage farms, operator workstations for the ETCC and other relevant stakeholders, video wall and its controllers for the ETCC and other associated equipment including traveller information kiosks, etc.

10. As regards paragraph 8(b) above, the estimate of \$11,000,000 is for the acquisition of software licence for servers (web, applications and databases), network management and monitoring software, application development tools, etc.

11. As regards paragraph 8(c) above, the estimate of \$5,000,000 is for the procurement of handheld communications devices and network equipment such as routers, switches, cables, communication infrastructure for use by the ETCC and other relevant stakeholders, etc.

12. As regards paragraph 8(d) above, the estimate of \$32,000,000 is for implementation services by the contractors in developing and delivering the TIMS as described in paragraph 4 above, including the necessary customisation of the computer systems of other relevant stakeholders to interface with the TIMS.

13. As regards paragraph 8(e) above, the estimate of \$4,300,000 is for hiring of contract staff to assist in the implementation of the TIMS.

14. As regards paragraph 8(f) above, the estimate of \$4,500,000 is for modification works to the existing ETCC to accommodate the TIMS such as server rooms, cabling work, installation of conduit, power sockets, fire extinguishers for computer equipment, etc.

15. As regards paragraph 8(g) above, the estimate of \$1,500,000 is for providing training in system development and operation to the TIMS duty officers and staff of TD or other parties involved in traffic and transport incident management.

16. As regards paragraph 8(h) above, the estimate of \$20,000,000 is for the hiring of consultancy services. The scope of the consultancy includes carrying out studies on intelligent transport systems standards, TCSS interface issues and use of traffic simulation to evaluate response plans, as well as gathering user requirements, carrying out the system design, preparing specification and tender documents for the implementation contracts, and administering the contracts.

17. As regards paragraph 8(i) above, the estimate of \$12,200,000 represents a 14% contingency on the cost items set out in paragraphs 8(a) to (h) above.

Other Non-recurrent Expenditure

18. A project team will be set up to oversee the overall planning and implementation of the TIMS. It will ensure good project governance in various aspects including procurement procedures, project quality, progress and expenditure. It will also facilitate inter-departmental coordination and monitor the performance of the consultants and contractors. The project team will entail a total non-recurrent staff cost of \$37,707,000 over a six-year period from 2010-11 to 2015-16. The cost will be met from within existing resources.

/Recurrent

Recurrent Expenditure

19. We estimate that the expenditure for operating and maintaining the TIMS will be \$14,422,000 for the first year (i.e. 2015-16) and \$19,230,000 annually from the second year onwards. Such requirements will be reflected in the Estimates of the relevant years, with the breakdown as follows –

	2015-16 \$'000	2016-17 onwards \$'000
(a) Hardware and Software Maintenance	600	800
(b) Communication	375	500
(c) System Maintenance	4,012	5,350
(d) Training	300	400
(e) Miscellaneous	150	200
Sub-total	5,437	7,250
(f) Staff Cost	8,985	11,980
Total	14,422	19,230

20. As regards paragraph 19(a) above, the estimated annual expenditure of \$800,000 is for the maintenance of system hardware and software.

21. As regards paragraph 19(b) above, the estimated annual expenditure of \$500,000 is for the maintenance of the communication network and Wide Area Network links.

22. As regards paragraph 19(c) above, the estimated annual expenditure of \$5,350,000 is for the on-going maintenance and minor enhancement of application systems.

23. As regards paragraph 19(d) above, the estimated annual expenditure of \$400,000 is for on-going staff training.

24. As regards paragraph 19(e) above, the estimated annual expenditure of \$200,000 is for purchase of consumables and miscellaneous expenses.

25. As regards paragraph 19(f) above, the estimated annual staff cost of \$11,980,000 represents TD's in-house staff effort required for providing on-going system support, maintenance and enhancement services of the TIMS.

26. After offsetting the realisable savings of \$5,471,000 in 2015-16 and \$7,295,000 from 2016-17 onwards as outlined at Enclosure 1, the net additional recurrent expenditure for implementing the proposed TIMS will be \$8,951,000 in 2015-16 and \$11,935,000 from 2016-17 onwards.

IMPLEMENTATION PLAN

27. We plan to implement the proposed TIMS according to the following schedule –

	Activity	Target Completion Date
(a)	Invitation, assessment and award of consultancy	June 2011
(b)	System design and preparation of specifications and tender documents by consultants	December 2012
(c)	Development and installation of the TIMS by contractors	March 2015
	- <i>award of contract</i>	- <i>June 2013</i>
	- <i>site preparation, application development and system installation</i>	- <i>March 2015</i>
(d)	Testing and commissioning	June 2015

28. The implementation programme as shown in paragraph 27 above has taken into account various time consuming stages required throughout the project period, including the studies on interfacing with different TCSS, liaison with various stakeholders on operation of system such as graphical user interface, as well as numerous traffic simulations required in developing the KBEST.

PUBLIC CONSULTATION

29. We consulted the Transport Advisory Committee and the Legislative Council Panel on Transport on the proposal on 12 May 2010 and 28 June 2010 respectively. Members supported the proposal but expressed concerns on the long lead time required for the implementation. They considered that TD should expedite the implementation of the TIMS to realise the anticipated benefits early. We explained that the implementation plan had taken into account the complexity of the project. We also undertook to bring forward the implementation of some TIMS functions as far as practicable to reap early benefits.

BACKGROUND

30. On 9 May 2005, a number of fallen trees and scaffolding incidents due to inclement weather caused serious traffic congestions in extensive areas in Hong Kong. The Administration appointed a Task Force on Emergency Transport Coordination to carry out a review on the mechanism for handling emergency traffic and transport incidents, including the management and operation of TD's ETCC.

Encl. 3 31. The Task Force made 56 recommendations, comprising 44 short-term measures and 12 medium to long-term measures to improve the then incident management facilities and procedures. The Administration has implemented all short-term measures, a brief summary of which is at Enclosure 3. The recommended medium to long-term measures are related to the deployment of advanced technologies to collect, display, share and disseminate real-time traffic and transport information for incident management. These measures are summarised as follows –

- (a) harnessing advanced technologies such as automatic incident detection technology to strengthen emergency handling capabilities;
- (b) exploring the feasibility of developing a computerised expert-system based traffic and transport incident management system to monitor incidents and help select and implement pre-programmed contingency plans based on contingency scenarios and lessons learned from past incidents;
- (c) enhancing inter-departmental coordination through the development of a shared computer-aided system; and
- (d) disseminating real-time information to the public about prevailing road traffic conditions and emergency transport arrangement.

32. To take forward the medium to long-term measures recommended by the Task Force, a “Feasibility Study on Deploying Advanced Technologies in Incident Management” was completed in May 2010 and recommended the development of the proposed TIMS.

Transport and Housing Bureau
October 2010

Cost and Benefit Analysis of the Proposed TIMS

	Cash flow (\$'000)															
	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	Total
Cost																
Non-Recurrent																
- Expenditure	-	3,120	30,130	49,630	14,320	2,800	-	-	-	-	-	-	-	-	-	100,000
- Staff Cost	1,940	8,416	8,416	8,416	8,416	2,103	-	-	-	-	-	-	-	-	-	37,707
Sub-total	1,940	11,536	38,546	58,046	22,736	4,903	-	-	-	-	-	-	-	-	-	137,707
Recurrent																
- Expenditure	-	-	-	-	-	5,437	7,250	7,250	7,250	7,250	7,250	7,250	7,250	7,250	7,250	70,687
- Staff Cost	-	-	-	-	-	8,985	11,980	11,980	11,980	11,980	11,980	11,980	11,980	11,980	11,980	116,805
Sub-total	-	-	-	-	-	14,422	19,230	19,230	19,230	19,230	19,230	19,230	19,230	19,230	19,230	187,492
Total Cost	1,940	11,536	38,546	58,046	22,736	19,325	19,230	19,230	19,230	19,230	19,230	19,230	19,230	19,230	19,230	325,199
Savings																
Realisable savings	-	-	-	-	-	5,471	7,295	7,295	7,295	7,295	7,295	7,295	7,295	7,295	7,295	71,126
Total Savings	-	-	-	-	-	5,471	7,295	7,295	7,295	7,295	7,295	7,295	7,295	7,295	7,295	71,126
Net Shortfall	1,940	11,536	38,546	58,046	22,736	13,854	11,935	11,935	11,935	11,935	11,935	11,935	11,935	11,935	11,935	254,073
Net Cumulative Shortfall	1,940	13,476	52,022	110,068	132,804	146,658	158,593	170,528	182,463	194,398	206,333	218,268	230,203	242,138	254,073	

Economic Savings Arising from Reduced Incident Duration

Potential ten-year period economic savings from 2015-16 to 2024-25

Year	2015 -16	2016 -17	2017 -18	2018 -19	2019 -20	2020 -21	2021 -22	2022 -23	2023 -24	2024 -25	Total
Economic savings from reduced incident duration¹ (\$ million)	42.3	43.0	43.8	44.5	44.9	45.7	46.4	47.2	47.9	48.3	-
Maturity factor²	0.1	0.3	0.6	0.8	1.0	1.0	1.0	1.0	1.0	1.0	-
Total (\$ million)	4.2	12.9	26.3	35.6	44.9	45.7	46.4	47.2	47.9	48.3	359.4

Typical example of calculation of economic savings in 2016-17

Incident parameters³			
(a)	Average incident duration	44	minutes
(b)	Average traffic queue length for incident	0.82	kilometre
(c)	Average number of motorists and passengers involved at traffic queue for incident	1 258	people
(d)	Average number of incident per year	3 000	incidents
Reduced incident duration after implementation of TIMS			
(e)	Average reduction in incident duration ⁴	10	minutes/incident
(f)	Average % reduction in incident duration = (e) / (a)	23	%
Calculated potential annual economic savings in 2016-17			
(g)	Value of time ⁵ (2016 value at 2008 prices)	1.14	\$/minute
(h)	Annual economic savings in 2016-17 = (c) x (d) x (e) x (g)	43.0	\$ million

Note -

- ¹ The economic savings vary with different values of time every year.
- ² To cater for deviation from assumption and other unforeseeable factors, a maturity factor has been introduced to the effect that the savings arising from the TIMS would gradually increase at a rate of 10%, 30%, 60%, 80% and 100% during the first five years, with full maturity achieved in the fifth year.
- ³ The incident parameters as listed in (a) to (d) above are based on figures cited in the "Feasibility Study on Deploying Advanced Technologies in Incident Management" completed in May 2010.
- ⁴ As outlined at paragraph 5(b) of the Paper, it is estimated that the proposed TIMS can reduce the duration of a traffic incident by ten minutes on average.
- ⁵ Value of time is a monetary valuation of time varying over time and is an opportunity cost of the time that a traveller spends on his journey.

**Key Short Term Measures Implemented
In Response to the Task Force Recommendations**

1. Developed contingency plans and conducted regular drills to test their efficiency.
2. Collated information collected from different sources on an incident map to assess the severity and spread of congestion.
3. Deployed mobile closed-circuit television (CCTV) to make the data collection process more effective.
4. Developed and launched an in-house web-based computer-aided inter-departmental communication system to facilitate the operation of the Emergency Transport Coordination Centre (ETCC).
5. Collaborated with radio stations to make more frequent broadcast of emergency traffic news including the information of alternative routes to facilitate diversion arrangement.
6. Established multiple channels for information dissemination such as uploading of emergency traffic and transport news onto Transport Department (TD)'s website, arranging TD's spokesman to give sound bites, etc.
7. Reviewed and fine-tuned emergency transport arrangements having regard to the experience gained on 9 May 2005, such as issuing the Handbook on Handling of Emergency Traffic and Transport Incidents.
8. Established designated communication links among different departments, e.g. Highways Department, Hong Kong Police Force, etc. to expedite remedial works.
9. Upgraded the facilities of the ETCC, e.g. set up a traffic information dissemination portal for information dissemination, procured computer equipment, 3G phones, etc.
10. Agreed with mobile network operators for the provision of CCTV images showing road traffic conditions and dissemination of special traffic news to their subscribers on mobile phones.
11. Installed Variable Message Signs at a number of strategic locations and junctions.
12. Improved the content of the messages issued to the media, especially radio stations, and provided clear indication of the degree of congestion and alternative routes.
