Plan for success

The Strategic Transportation Plan for the Olympic Games was key to the candidacy of the city of Rio de Janeiro. The plan has the ambitious objective of deploying a set of mitigation measures that would prioritize Olympic Family travel yet allow the resident population to continue their daily activities. CET-Rio traffic engineering company commissioned Modelle Logistics and Engineering (Tectran Group) to analyze the deployment of measures to prioritize Olympic Family circulation during the event as part of the Strategic Transportation Plan.

As this project required multi-tier modeling, Modelle ensured maximum consistency by using the Aimsun traffic modeling software with its integrated macroscopic, mesoscopic, microscopic and hybrid micro-meso levels in a single platform.

Sharing is caring

As the preparations for the 2016 Olympic and Paralympic Games in Rio de Janeiro ramp up, **Eduardo Coelho** and **André Libânio** describe how modeling is helping to shape innovative lane-sharing strategies for transporting the Olympic Family

The 2016 Olympic and Paralympic Games will bring major mobility challenges to the host city of Rio de Janeiro. In fact, it's hard to imagine a greater storm of simultaneous large-scale events, with thousands of vehicles and pedestrians including international visitors, athletes and VIPs, many of them trying to travel along the same routes at exactly the same time. As well as the need to prioritize Games traffic, local traffic must also be given careful consideration.

6,500
fines totaling £845,000 (US$1.3m) were issued to motorists driving in any of the 30 miles of dedicated Games Lanes in London during the 2012 Games

Modelle Logistics and Engineering's initial analysis at the macroscopic level showed that Rio simply did not have the capacity to absorb the general vehicle traffic diverted from the lanes that would be reassigned exclusively to Olympic traffic, as outlined in the proposal. Even after reducing the number of non-Olympic trips with the imposition of staggered travel and other measures to contain demand, there would be a drastic deterioration in the level of service in some key links, causing the system to collapse.

A more detailed mesoscopic analysis showed that problems were particularly acute where the South Zone – a densely populated tourist area including the neighborhoods of Copacabana, Ipanema and Leblon – connects with Barra da Tijuca. Barra is the main venue hub of the Games and although Rio has invested in a new metro line linking Barra to the existing metro network, this alone will not be sufficient to eliminate the congestion. A major change of plan was in order.

A perfect match?

A key observation in devising an alternative strategy to meet that challenge was that the Olympic route network almost perfectly matches Rio's (current and future) Bus Rapid Transit (BRT) network. Olympic venues are spread over the areas of Barra da Tijuca, Copacabana, Deodoro and Maracanã; the city's hotels, Olympic Family residences and other key facilities are widely dispersed.

The next step was to analyze the rather bold possibility of sharing the Olympic reserved lanes with the BRT and other public transport vehicles. This is not a solution that has been attempted before and was met with considerable skepticism. But Rio is a special city calling for special measures.

Besides the microsimulation of the base scenario, used to confirm the model calibration, Modelle simulated various other scenarios: first the projected demand during the Games with Olympic transport using exclusive lanes and not the BRT network; then the projected demand with Olympic transport sharing the BRT network. These simulations showed that sharing the BRT exclusive tracks with the Olympic transport reduced the impact on the general traffic considerably, without penalizing the BRT system. Even so, the capacity of the system was not enough to absorb all the Olympic transport. Therefore a projected demand with a 20% reduction in traffic volume, because of the imposition of staggered travel and other measures to contain demand, was tested. Even then the separate, non-BRT Olympic lanes continued to penalize the general traffic. However the capacity of the BRT reserved lanes, where those existed, proved to be more than sufficient for both Olympic and BRT demand when running together.

Doing the math

Usually, the maximum number of buses assigned to a BRT system is limited by the service capacity of its passenger terminals, where a standard operation with four passengers requires a minimum headway of 20 seconds between the buses: 12 seconds to maneuver the vehicle (stop, open and close the doors, and accelerate) and two seconds for each passenger to board. Across two terminals (as in the standard set-up) this gives an average capacity of only 360 vehicles per hour. BRT tracks generally have a free lane or a stopping bay at the passenger terminals. That free lane has its capacity substantially reduced by the limited green time at signalized intersections. If green time is set to 60%, this gives a total capacity of 1,080 buses per hour (3,600 secs ÷ 4 secs per vehicle x 60% for two lanes).

It is therefore clear that the road capacity (1,080 buses/hour) far exceeds the number of buses operating on the BRT system (360 buses/hour), leaving plenty of space to absorb the Olympic Family vehicles, which are predicted to reach 200 vehicles per hour on the most loaded link, with more than 50% being cars.

The solution of sharing the BRT lanes means minimal incremental investment and rapid implementation, in addition to easy maintenance of the exclusive lanes, and simple measures, such as modular concrete lane dividers, to stop the general traffic from entering the reserved lanes.

CET-Rio is currently analyzing the results of the studies and the next stages of the project will be redirected according to its findings. ○

• *Eduardo Coelho is from Tectran Group and André Libânio is from Modelle Logistics and Engineering*

(Main image) **3D microscopic simulation of** (left) **the intersection at Avenue Visconde de Albuquerque**

> "The next step was to analyze the bold possibility of sharing the Olympic lanes with the BRT

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smart road sensors were deployed for bus priority (for both Games traffic and regular public transport) at intersections during China's Beijing Summer Olympics in 2009

Visualizing how the Olympic Route Network could be integrated with the Bus Rapid Transit System