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Necessity nudges Cuba towards a less transport intensive society

*When the SoViet Union collapsed in the early 1990s, a State of Emergency was declared in Cuba. Imports of oil and transport equipment suffered a steep decline and as a result there has been a transformation in how goods and people are moved, resulting in a number of innovative behavioural and technological outcomes. **Dr Marcus Enoch** of Loughborough University and **Dr James Warren** of the Open University report from Havana.*

In transport terms, the Caribbean island nation of Cuba is unique because for the past forty years it has been subjected to an economic blockade by its erstwhile dominant trading partner, the United States. Furthermore, this economic pressure was exacerbated in the early 1990s with the political and economic collapse of the Former Soviet Union, and the Eastern European Socialist countries which had replaced the United States as Cuba's principal trading partners. These events have led to a transformation in how goods and people are moved, not least because of a huge reduction in the amount of hard currency available to pay for fuel, vehicles and spare parts. This resulted in a number of innovative

behavioural and technological outcomes.

In short, the impact of the post-Soviet State of Emergency on travel patterns in Cuba meant that Cuban imports as a whole fell by 75%, from 8.1bn Cuban Pesos in 1989 to 2.0bn Cuban Pesos in 1993, while over the same period in the transport sector, fuel (ie oil) imports were cut by 76%, and imports of transport equipment fell by 86%.

One example of how this affected transport provision is illustrated by the bus sector. In Havana, by May 1993 the number of operational buses was only 500 compared to 2,200 before the collapse of the socialist block, while outside the capital the number of bus

routes operated at the end of 1992 had been cut by more than 80% compared with three years earlier. The average annual kilometres travelled on public transport per person declined significantly, from a peak of nearly 3000km/yr in 1986, to a low of 744km by 1995. Although by 2000 it had stabilised around 850km, this remains at early 1960's levels. Note that this analysis is only based on motorised values and as such does not consider the importance of pedestrian, bicycle and private car journeys. This mobility index is broadly comparable with the poorer Latin American countries. El Salvador (718km) and Ecuador (1245km), for example, exhibit similar motorised mobility levels to Cuba. These figures translate to a value in millions of passenger trips of 3.6 billion per annum at the peak in 1986 (or around 10m trips a day for a population of 11.2m) dropping to 0.5m trips in 1995, but increasing again to 0.8m five years later.

In the four years from 1989 to 1993 imports of transport equipment by Cuba fell by 86%, mainly because of the huge reduction in the amount of hard currency available to pay for fuel, vehicles and spare parts.



TRANSPORT RESPONSES TO THE ECONOMIC EMERGENCY

The response mechanisms to this situation can be categorised as being demand side or supply side.

Demand side responses

The economic downturn effectively cut demand for freight transport and the lack of transport supply has effectively forced many people to either make

fewer trips, or else made them 'trip chain' more efficiently. In other words, transport demand was severely suppressed.

Land use planning too has been used to control trip lengths, which is unusual in a developing country. Typically, Cuban cities deploy a strong green belt policy to prevent urban sprawl, and new developments are concentrated along public transport corridors whenever possible. In addition, mixed-use developments are encouraged so that where new housing is constructed for example, enough new schools and shops are also provided to maximise walking opportunities.

Data on how much travel was reduced through people moving house or job or by changing working patterns are difficult to find. However, it was realised that there were many non-specialised workers who had jobs far from their homes. A system was therefore put in place to allow people to exchange their job for one closer to their home, which resulted in over 10,000 people exchanging their jobs to reduce the time and resources spent on commuting. In the case of a person having to change their job location (in order to be closer to their residence) the government guaranteed an equal salary for the new job position, even if the work position should have been paid a lower rate. This state subsidy was felt by Government to cost less than the savings made on energy for transport and time under this scheme. In addition to this subsidy, the State of Emergency regulations allowed businesses and work centres to change their working patterns. In some cases where the business previously had been open six days a week, a more flexible pattern emerged, where only alternate Saturdays were staffed. Others reduced to a five day week with the same level of total hours worked. These changes had subtle effects on the demands for transport as the peak times were either condensed or smoothed out. The policy did not apply to rural areas, and no agricultural workers were transferred to work in urban areas. However, while moving jobs (and creating flexible working times) was made possible in Cuba, moving house is more complicated, involving a lot of bureaucracy and/or money. This has proven to be a key barrier, and as a result, the flexible working practices are not thought to have been a significant influence on the reduction in travel.

Supply systems effects

On the supply side, fuel and spare parts became increasingly scarce meaning

that formal public transport services in particular became less frequent and less reliable. Policies were therefore adopted to increase the efficiency of the vehicles available. This was done in several ways. Firstly, new informal public transport modes such as truck transport and employer-operated work buses were developed. Secondly, the occupancy of existing vehicles was increased through measures such as organised and informal hitchhiking and the encouragement of 'colectivo' taxi sharing schemes. Thirdly, technological developments in alternative fuel types were made. Fourthly, regulatory and fiscal instruments designed to limit the demand for the small number of private cars were adopted. Finally, walking and cycling were instigated and encouraged, as was the re-adoption of animal-powered traction.

New modes

With the reduction in usable buses available to serve passengers, public transport agencies were forced to consider developing new modes. In Havana, flatbed truck trailers pulled by ex-army lorry cabs were given sides, seats, doors, windows, and roofs so they could carry 220 passengers at one time. In 2002, there were ~180 'camellos' (called camels because of the 'hump' in the design) operating on seven core 'colour-coded' routes. The network operates as a surface metro system, with route distances of around 20-23km and an average distance between stops of 1.5 km, compared with around 400m for bus stops. Service frequencies range from four-minute to ten-minute intervals. The camello network currently carries around 250,000 passengers each day in Havana, compared with 374,000 by other public buses. Outside of the capital too, truck transport is important although the only concession to passengers may often be a plank of wood to sit on and in some cases not even that.

Prior to the State of Emergency, works buses had been used only where companies were not located on a bus route or where workers were required to work late evening or early morning shifts. But, the severe drop in service levels meant that by 2001 there were some 3,500 works buses carrying around 300,000 people a day. In general, these are older buses donated by or bought second hand from sympathetic public transport operators from across the world. These tend to cater only for commuter journeys and travel only 25km-50km a day, compared with 150km-200km driven by a public bus each day. Due to their age and condi-



tion they are less reliable and less efficient.

Coco-taxis carry up to three dollar paying passengers in a coconut shaped – hence the name – fibre glass shell that is bolted onto a 3-wheeled (Piaggio) motorcycle chassis, rather like Tuk-Tuks found in South East Asia.

In order to extend the use of bicycles through the tunnel linking central Havana with Habana del Este, a so-called 'cyclo-bus' service was introduced in 1991. This was originally operated using trucks with a trailer attached, but in 1992 these were replaced with buses donated by RATP in Paris. Currently, six vehicles operate at a time, with four spares. Each vehicle can carry up to 22 bicycles, plus cyclists and other passengers. The fare is ten Cuban Peso cents per passenger or 20 Peso cents per bicycle or moped for the 4km journey. Around 4,200-4,300 passengers are carried daily, on 105 vehicle trips.

Increasing vehicle occupancy

Given the lack of available transport, hitchhiking is widespread throughout Cuba. This usually occurs on an informal basis, with people waiting at road junctions or by the side of the road thumbing for a lift. However, hitchhiking is also officially encouraged through legislation that requires certain Government vehicles to stop and give lifts when they have space available. In addition, at busy road junctions on the edge of some major towns, 'amarillos' (yellow men) are employed by provincial transport departments to facilitate hitchhiking. There are usually about three amarillos per junction, each dealing with around 1,000 passengers a day, and the system operates seven days a week from roughly 6am to 6pm. As well as matching passengers to vehicles, the amarillos take notes on the buses that pass. They do not deal with fares or tariffs, as these are strictly a matter between the rider and the driver. Car sharing is seen as particularly useful for people with packages, who

Prior to 1990 there were virtually no bicycles in Cuba – by 1997 there were two million bicycles in the country. Usage has declined recently, partly because of a slight improvement in the bus service but also because of decline in services to cyclists in terms of repair shops, cycle parts etc.

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may find it very difficult to board a bus or a camello. Overall, Cuban officials estimate that there were 31.5m hitch-hiker trips made in 2000.

The use of taxis is also maximised through the use of 'colectivo' shared private taxis. These perform as supplementary buses, by collecting passengers at established pick up points, and then dropping people off and picking people up along fixed routes.

Technological developments

One solution to the vehicle spare parts crisis was to take two Lada car bodies and convert them through a cutting and welding process into a single longer-bodied 'stretched wheel base' Lada 'Limousine' which could accommodate more people. This was a response to the lack of replacement engines for the vehicles – the motor represents the critical piece needed in Cuba.

There is still widespread use of steam-powered locomotives (approximately 290) for the sugar cane haulage industry and for steam train tourism. Although steam engines do have an inherently lower efficiency when compared to diesel locomotives, they do give acceptable levels of speed and haulage. Various government industries in a cross-ministry effort have un-

possibility which provides environmental benefits, is sustainable, and is locally sourced. This project is well under way with a single test locomotive already constructed and being tested.

Regulatory and fiscal instruments

Petrol rationing was until 1992-93 the favoured instrument for allocating fuel to vehicle users. Typically, vehicle owners (or their employers) were given coupons entitling them up to 20 litres a month. With the adoption of the US Dollar as a legal currency, rationing was dropped and owners must buy their fuel instead at the market rate. Officially there is no tax on petrol, which is sold in US dollars. But, the state-owned Cuban oil company Union del Petroleo (CUPET) charges drivers around US\$0.90 a litre, while buying crude oil at around US\$0.22 (although this crude oil must then be processed and distributed across the country). Currently, around 10% of the one million tonnes of petrol and diesel used each year by particular enterprises in the transport sector (eg for the police, hospitals, agricultural workers, public transport companies, etc) is set aside – ie effectively subsidised by the Government.

Ministry of Transport who uses it to fund road maintenance programmes.

Alternatives to motorised travel

With the reduction in bus service levels caused by the lack of spare parts and the fuel shortage, the number of walking trips in Cuba rose significantly as did trip walk length. As of 2002, the average length of walk trip is estimated at 5km, while more than half of walk journeys take longer than 40 minutes.

Prior to 1990, there were virtually no bicycles in Cuba, but with the State of Emergency a team of 25 planners was formed in March 1991 to design the various bicycle facilities that would be necessary for safe and efficient circulation of bicycle traffic. More than two million bicycles were bought from China and sold to Cubans for a fraction of the cost. Local factories were also established which produced some 150,000 bicycles a year during the mid-1990s. As of 1997, there were approximately two million bicycles in the country, half of which were in Havana. In addition, the bike road network (lanes, cycle routes and safety measures) was completed. Related to the increase in bicycle use, was the introduction of the cyclo-taxi – pedal-powered tricycles that can carry up to two passengers. In ten provinces in Cuba in 2000 (not including Havana, Matanzas, and Cienfuegos), they made 9.3m passenger trips. While the peak usage of bicycles was in 1994, by 1998 there were still 529,000 cycle trips per day in Havana. Bikes also accounted for 14.4% of commuting trips – ie more than were made by urban bus, camellos or works buses. The typical cycle distance was 4.4 km while the average travel time was 34 minutes¹. Based on a straightforward saddle for seat basis, to substitute the bicycles would require 128 buses, 57 more camellos or 300 more work buses. However, cycle use has since declined due to a number of reasons, including a slight improvement in the bus service and a decline in the services to cyclists (repair shops, cycle parks etc).

The use of animal traction for freight transport, passenger transport and agriculture increased significantly from 1991 onwards. This has almost exclusively been provided by the private sector. From 1998, owners of animal traction vehicles have been required to register with provincial or municipal offices of the State Traffic Unit for a Licence for Transport Operation. By 2000, there were more than 16,000 animal powered buses, carts, carriages and wagons. Interestingly though, the number of horses, mules and donkeys

With the usable bus fleet in decline, the authorities have been forced to consider developing new modes. Plans include running locomotives on sugar cane derived by-products.



dertaken a research programme to re-evaluate the use of steam for both passenger and freight transport using a lighter type of locomotive. The engine boiler can be run on various fuel types including coal, wood, fuel oil and biomass. The use of bagasse (the final crushed cane fibre which remains after milling) is currently an important part of the animal feedstock for cattle, but this could easily be utilised as a bio-fuel. Running locomotives on sugar cane derived by-products is a distinct

In terms of other fiscal mechanisms to limit car use, there are no purchase taxes on cars while the annual registration tax is nominal. In addition, there are currently two toll roads in the country, both in areas serving mainly tourist traffic. Drivers must pay a US\$1 fee at the entrance to the freeway to Varadero and on the road to Cayo Coco. These tolls began in 1996 and were specifically chosen due to their importance as major tourist centres. Money raised from the fees goes directly to the

in 1998 was only 55% of the number in 1977 – 464,000 compared with 849,000 – and this could be a constraint on the further development of animal traction. In 2000, animal traction accounted for 93.2m passenger trips in the 13 provinces outside of Havana. Further information is therefore required about how to more efficiently manage horses, mules and donkeys in urban and rural areas.

WHERE NEXT FOR CUBA?

Future transport policy in Cuba will be significantly influenced by whether the US Blockade is lifted or not. Assuming the Blockade is not lifted in the near future, policy will continue to focus on



increasing the service level provided by formal public transport (i.e. buses) through building more vehicles and through efficiency gains. Ultimately, this would also involve replacing the camellos with articulated-buses or electric trolleybuses (or even light rail systems in the longer term) within Havana, although this policy would be heavily dependent upon whether sufficient hard currency could be raised.

If the Blockade were reduced or lifted, there would be a rise in economic and hence transport activity. It is difficult to estimate what this growth would be in a country free of constraints, but Cuban Government sources anticipate an immediate increase in the number of tourists from around 2m a year currently to 4m-7m. To deal with this potential influx, plans are already in place to allow the transport systems in place to grow significantly. In addition to the proposed replacement of the camellos with trams or high capacity buses in Havana, parking controls would be put into place in

order to collect revenue along with appropriate land use policies. Meanwhile there would need to be investments in the maritime connections, including a programme to ensure that congestion around ferry ports (previously major entry points for American tourists) would not significantly increase. Cruise ships would also need to be catered for, while private car ownership would be reviewed after an initial period of unconstrained growth. One scenario would see the private vehicle owners being taxed heavily in order to discourage ownership and encourage the use of public transport systems and sustain non motorised means, eg bicycle usage. On top of this tourist influx, the increase in overall economic activity would certainly encourage increased

mobility – much of it by motorised modes and maybe the private car in particular.

In conclusion, the development of transport policy in Cuba has been heavily influenced by the condition of the national economy, which in turn has been dominated by the US Blockade and by the collapse of the USSR and the socialist regimes of Eastern Europe. This has led to a unique situation, whereby a fairly advanced country has been forced to curtail its natural economic development. This has had an effect at the national level as well as at the individual-personal choice level.

At the national level, the planning policy mechanisms have reduced the need for travel, while the lack of transport supply has ensured that only 'necessary' trips are made. On top of this, the lack of fuel and spare parts has meant that those trips that are made are carried out either on vehicles operating at very high capacity or by using less or non-polluting modes. At an individual level, citizens are extremely

aware of the cost of transport and as such tend to conduct those journeys that are necessary, and then by the most efficient means. As a consequence, in terms of energy use at least Cuba now has a relatively environmentally benign transport system, although the localised pollution can be very bad due to the poor fuel quality and antiquated vehicle fleet.

In reacting to an unprecedented set of circumstances the Cuban Government and people have devised a whole range of sophisticated and innovative responses in order to maintain necessary mobility. The current position is not likely to last for long, and as the Cuban economy grows the issue of suppressed demand will become increasingly problematic. While planners and policy makers in Cuba are clearly committed to keeping the car in check, the evidence from many other less developed nations suggests that even socialist countries such as China and Vietnam are now accepting their population's desires to own and use cars. However, with very careful preparation it may just be possible for Cuba to avoid many of the pitfalls of mass car ownership already experienced by other countries that had been unhindered by external and political forces. Higher transport use is inevitable, but America's blockade may have nudged Cuba towards a more sustainable and less transport intensive society than would otherwise have been the case.

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1 Interestingly this average journey length is less than that of pedestrians, while the average speed of 9km/hr is sedate to say the least. This may have something to do with the poor quality of the bicycles and road surfaces.

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