# D7.2 Global innovative urban logistics R&D and policy trends report

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## Project
VIAJEO PLUS - International Coordination for Implementation of Innovative and Efficient Urban Mobility Solutions

## Date
**Contractual:** April 2016  
**Actual:** May 2016

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## Keyword list
Urban Logistics Practice, China, South America, Singapore, policy trends, R&D advances, transferability, joint distribution, urban freight flows

## Nature of deliverable
Report

## Dissemination
Public\(^1\)

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1 This is either: Public, restricted to other programme participants, restricted to a group specified by the consortium, confidential

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**Project financially supported by**

![European Commission DG Research](image_url)  
Project number 605580  
FP7- SST.2013.3-2
Document Control Sheet

Version history:

<table>
<thead>
<tr>
<th>Version number</th>
<th>Date</th>
<th>Main author</th>
<th>Summary of changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>March 2016</td>
<td>MR</td>
<td>First version</td>
</tr>
<tr>
<td>2</td>
<td>April 11 2016</td>
<td>All</td>
<td>China &amp; SA input</td>
</tr>
<tr>
<td>3</td>
<td>April 22, 2016</td>
<td>PA</td>
<td>Singapore</td>
</tr>
<tr>
<td>4</td>
<td>April 27, 2016</td>
<td>PA, PT, MR</td>
<td>Respond to comments, added executive summary and conclusions</td>
</tr>
<tr>
<td>5</td>
<td>May 12, 2016</td>
<td>MR</td>
<td>Final draft after peer review updates</td>
</tr>
<tr>
<td>Final</td>
<td>May 16, 2016</td>
<td>MR</td>
<td>Final version</td>
</tr>
</tbody>
</table>

Approval:

<table>
<thead>
<tr>
<th></th>
<th>Name</th>
<th>Date</th>
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<tbody>
<tr>
<td>Prepared</td>
<td>Mats Rosenquist</td>
<td>April, 2016</td>
</tr>
<tr>
<td>Reviewed</td>
<td>Flavio Grobbo</td>
<td>May, 2016</td>
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<tr>
<td>Authorized</td>
<td>Yanying Li</td>
<td>May, 2016</td>
</tr>
</tbody>
</table>

Circulation:

<table>
<thead>
<tr>
<th>Recipient</th>
<th>Date of submission</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC</td>
<td>24.05.2016</td>
</tr>
<tr>
<td>VIAJEOP PLUS Consortium</td>
<td>24.05.2016</td>
</tr>
</tbody>
</table>
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1 Viajeo PLUS Project Overview

The main aim of the Viajeo PLUS project is to identify and define clear implementation strategies for the successful deployment of innovative sustainable urban transport solutions in European, Latin American, and Asian (China and Singapore) cities and in Mediterranean Partner Countries (MPC), fostering collaboration between these regions on a global scale.

To meet the Viajeo PLUS vision, successful experiences of implementing innovative urban mobility solutions across the world are identified and shared. Experience and knowledge are exchanged through showcases, site visits, workshops and dissemination learning materials. The Viajeo PLUS consortium develops a ‘Virtual Solution Book’ providing a detailed description of these initiatives and executive implementation plans for greater uptake by cities intending to implement any of these solutions.

Viajeo PLUS also facilitates “cross-learning”, a two-way approach introducing innovative urban mobility solutions in European cities to both Latin American and Asian cities plus MPCs and vice versa, whereby European cities and industrial organisation gather first-hand experience of mobility solutions on the global stage.

The cross-learning process also develops a comprehensive understanding of state-of-the-art, R&D trends and policies in different regions, in order to empower European industry for future global competition and support European cities in their role to meet sustainable urban mobility objectives established by the European Union. The cross-learning process has also been extended to MPCs where European industry and researchers currently have limited knowledge and local contacts. Overall, Viajeo PLUS has significantly supported European industry to strengthen its competiveness in the global markets.

Finally, Viajeo PLUS will prepare the foundations for future collaboration with global cities. It will define clear implementation strategies for the successful deployment of innovative and sustainable urban transport solutions. It will also prepare recommendations for the EC on future collaboration with other global regions.
2 Executive Summary

The purpose of this deliverable is to contribute to summarize current R&D and policy development related to urban logistics in the different regions China, Singapore and Latin America. The deliverable covers societal challenges, policy trends and examples of R&D advances in the regions. The source in the deliverable is from within the Viajeo Plus project WP7 work, see D7.1 deliverable for innovative urban logistics solutions, earlier EU projects and from available public material from research and public.

The China section covers the overall societal challenges in the fast growing Chinese economy where e-commerce and urbanisation are strong drivers for urban logistics. It is expected that e-commerce by 2020 will be roughly equivalent to the collective size of today’s markets in the USA, Japan, the U.K, Germany and France. The Chinese Government has started to pay more attention to urban logistics and has released a series of Policies, Opinions and Notifications specifically on urban logistics.

The following main policy trends identified:

- Guiding Documents for Urban Logistics
- Organizing and Promoting Joint Distribution
- Gradually Regulating the Urban Logistics Vehicles

Singapore is one of the main logistics hubs in Asia and is considered as one of the Asian miracle economies. In the case of innovative urban logistics, the adoption of advanced technologies to support business and manage a sustainable urban system presents opportunities for urban logistics stakeholders to contribute to economic growth. Urban logistics challenges concern issues of effective land use is the main challenge for Singapore considering congestion, complexity of last-mile deliveries, stakeholder coordination, real-time data management, emerging urban development and synchronization of public/private information trading.

The main policy trends for Singapore is to focus on entrepreneurship and creativity driven by societal demands like aging, flexible land-use where contemporary consumption will be an integral part of good urban living in order to ‘do better with less’. The Concept Plan is another policy instrument to decentralize logistics facilities in relation to commercial centres and residential areas.
In Latin America Brazil, Peru, Mexico and Chile are examples. Freight transport is a generally strong economic sector in the region but has a variety of problems associated with economic instability and urban freight transportation shares these problems in general. There is generally a lack of research on the urban logistics topic, which makes it difficult to measure the specific problems and hence formulate the solutions required. The importance of urban freight transport is shown not only by its contribution to the economy, but also because it is an industry that involves a huge variety of stakeholders. Some examples of challenges in the region are:

- Roads appropriate for trucks
- Truck parking areas
- Specific routes for vehicles with oversized cargo and dangerous goods
- Dedicated areas loading / unloading
- Lack of facilities for consolidation and transhipment and storage of goods
- Cargo damage
- Safety and well-being of citizens
- Pollution
- Lack of coordination among the logistics actors
- Lack of transparency in the logistics flow from the traffic departments
3  Innovative urban logistics R&D and policy trends in China

3.1  Societal challenges

China’s growth has gradually slowed since 2012, signalling what President Xi Jinping has called the “new normal”\(^2\). In 2013 and 2014, growth has fallen from the 10-percent annual growth rate China averaged for three consecutive decades. Since the outset of the global financial crisis in 2008, China has been the largest contributor to world growth, and even its projected slower growth remains impressive by current global standards. Growth in 2015 is expected to be about 7 percent, in line with the government’s indicative target. Recent volatility in asset markets adds some uncertainty to the short-term outlook, but if it is contained at current levels, its impact on growth is likely to be small. Although China is the second largest economy in the world, it remains a developing country.

As part of the global economy, China’s e-commerce industry has grown in accordance with the global ecommerce. China’s e-commerce market is expected to grow further. It is estimated that the market will reach 2.7 to 4.2 trillion RMB by 2020, which is roughly equivalent to the collective size of today’s markets in the USA, Japan, the U.K, Germany and France. (MA, 2014).

![Figure 1 China's e-commerce market 2006 – 2012, (MA, 2014)](image)

\(^2\) According to public statements by President Xi Jinping during 2014, China’s “new normal” growth signifies slower but higher-quality and more sustainable growth as the structure of the economy changes.
3.2 Policy trends

Three hierarchy decision levels make up the policy framework of city logistics in China.

Table 1 Policy framework of city logistics in China, (MA, 2014)

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<th>Decision level</th>
<th>Government</th>
<th>Roles &amp; main responsibilities</th>
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| National level | The central government | • Develop national development plans and guidance  
• Develop national policies and regulations  
• Arrange resources at national level |
| Regional level | Provincial governments | • Develop regional policies and plans within jurisdiction  
• Arrange resources at regional level  
• Coordinate local municipalities |
| City level     | Local municipalities  | • Follow and execute plans, policies and regulations of central government and provincial governments  
• Detail the local plans, policies and regulations  
• Arrange local resources to support the execution of detailed plans, policies and regulations |

Urban logistics is rarely been mentioned separately in the logistics policies issued by the Chinese Government in the earlier days. Only until recent years, the Government has started to pay more attention to urban logistics and has released a series of Policies, Opinions and Notifications specifically on urban logistics. Notably, in the Restructuring and Revitalization Plan for Logistics Industry issued by the State Council in March 2009, urban logistics was listed as one of the nine major development projects. The State Council of the People’s Republic of China formally released the 2014-2020 Mid-to Long-Term Plan for Logistics Development on 4 October, 2014. (PRC, 2014)

3.2.1 Guiding Documents for Urban Logistics

Since 2012, there have been various policies and documents issued by many relevant departments which addressed urban logistics. In January 2013, the Ministry of Commerce and the Shanghai Municipal Commission of Commerce issued the National Development Guideline on Urban Logistics. It promoted the construction of an urban logistics network, supported by logistics parks, public distribution centres and joint distribution end nodes, in order to upgrade the operations level of urban logistics. In February 2013, the Ministry of Transport, the Ministry of Public Security, the National Development and Reform Commission, the Ministry of Industry and Information Technology, the Ministry of Housing and Urban Construction, the Ministry of Commerce, and the State Post Bureau jointly issued the Opinions on Strengthening and Improving the Management of Urban Logistics. The Opinions aimed at solving the problems of traffic congestion, parking space shortage, vehicle loading and unloading hardship in urban logistics, and promoting mutual adaptation and coordination between urban logistics and social economic development.
3.2.2 Organizing and Promoting Joint Distribution

Joint distribution is an effective solution to enhancing the efficiency of urban logistics. In recent years, governments at all levels have been working together to promote the practice of joint distribution. In June 2012, the Ministry of Commerce issued the Guiding Opinions on Promoting the Utilization of Technology and Joint Distribution in Modern Logistics. It strongly recommended the application of technology and joint distribution by the logistics industry. In March 2013, the Ministry of Commerce and the Ministry of Finance issued the Notification on Organizing the Application of Urban Joint Distribution in Pilot Cities, which confirmed the implementation of pilot runs for urban joint distribution. Besides regulating the application principles, the conditions and implementation programs of urban joint distribution, the Government also provided certain financial support to those pilot cities.

3.2.3 Gradually Regulating the Urban Logistics Vehicles

Delivery vehicles in urban logistics are essential in enhancing distribution efficiency, ensuring cargo safety and reducing pollution. In 2013, the Ministry of Transport and other related departments promulgated a series of policies aiming at regulating the use of urban logistics vehicles. In June 2013, the Ministry of Transport released the Guiding Opinions on How Public Transportation May Help to Promote the Healthy Development of the Logistics Industry. It encouraged the standardization, cleanliness and specialization of urban logistics vehicles. Proposed by the Ministry of Transport, in November 2013, the General Administration of Quality Supervision, Inspection and Quarantine and the Standardization Administration jointly issued the Technical Requirements of Urban Logistics Vehicles. It clearly set forth the regulations on vehicle models, main technical parameters and technology for urban logistics vehicles, and was enacted on April 1st, 2014.

3.3 R&D advances

The R&D advances are presented in this report from four different cities; Beijing, Shanghai, Xiamen and Chongqing, (Contemporary Logistics in China, 2016)

3.3.1 Urban Logistics Practice in Beijing

3.3.1.1 Dedicated Projects Related to Urban Logistics

In recent year, Beijing City has built a number or urban logistics related projects. For example, it has invested in building a logistics distribution centre for the wholesale market of agricultural products and a logistics distribution centre with specialized cold storage facilities for serving the supermarkets and catering enterprises. In addition, Beijing has made use of several advanced information technology such as RFID, GPS and internet to enhance the efficiency of its urban logistics distribution.
3.3.1.2 Encouraging the Use of Environmentally Friendly Urban Logistics Vehicles

Beijing has regulated the use of urban logistics vehicles from the environmental protection standpoint. Since 2011, Beijing required all the urban logistics vehicles to be pasted or sprayed with unified logos for identification purposes. New energy vehicles are also being used increasingly. In April 2013, the Beijing Municipal Commission of Commerce and the Beijing Municipal Science and Technology Commission implemented the “Demonstration Project on the Operations of Pure Electric Logistics Vehicles.” It aims at setting up electric urban logistics fleets and related charging facilities, together with fleet dispatching management information platform, to be operated in the city. This is the first large scale application of pure electric vehicles for urban logistics in China.

![Electric Logistics Vehicles in Beijing](image)

Figure 2 Electric Logistics Vehicles in Beijing

3.3.1.3 Promotion of the “City 100” Urban Joint Logistics Pilot Project

In order to solve the “Last 100 Meters” problem in urban logistics and to further enhance the efficiency of urban logistics, the Beijing Municipal Commission of Commerce has worked with the Express Service Association to launch a “City 100” urban joint logistics pilot project. Building upon the existing excellent network of the express service in Beijing, and relying on joint distribution as the core, the project aims at creating a platform for providing end point logistics and social services. Collection points are set up at high schools and local communities, where the workers will pick up the goods dropped off by e-commerce enterprises and express service enterprises and carry out the “second leg delivery” to the consumers. In addition, there are some value added services such as selling of mobile phone SIM cards and paying off utilities bills. In March 2013, Shanghai also instituted the “City 100” pilot run with successful results.
3.3.2 Urban Logistics Practice in Shanghai

3.3.2.1 Formulating Supporting Policies for Urban Logistics
The Shanghai City government has issued a series of policies to support the development of urban logistics. In 2010, the Shanghai Municipal Economic Commission, Shanghai Traffic and Port Authority and Shanghai Public Security Bureau jointly issued the Opinions on the Implementation of Shanghai Urban Logistics Distribution System. The Opinions dictated to further apply urban logistics standards and technologies to improve the traffic flow of urban logistics in the city and to create a better business environment for the logistics industry. Urban logistics is listed as one of the four major development themes in the “12th Five-Year Plan” of Developing a Modernized Logistics Industry in Shanghai.

3.3.2.2 Standardization of Urban Logistics
Shanghai has been paying particular attention to the construction of standardized logistics technology. Notably, the Shanghai Institute of Standardization has formulated the Specification on Cold Chain Logistics Technology and Management, the Technical Specification on the Operations of Cold Storage Vehicles Used in Road Transportation and the Technical Specification on the Operations of Urban Logistics Vehicles. Such standards will initially be imposed on the vehicles of Grade 3A and above logistics enterprises to enhance the overall service level of urban logistics.

3.3.2.3 “Public Transportation for Freight”
The construction of “Public Transportation for Freight” is a main project of the Shanghai government in building up an urban logistics public service network. For this public network, a dozen of distribution centres and hundreds of distribution points will be built and distribution routes will then be chosen to reflect the actual demand. Standard pricing for the whole city will be adopted. Parcels will be delivered from station-to-station and then door-to-door. There are presently 2,200 public transportation vehicles...
for freight with permits in Shanghai. Only 79 small vehicles are allowed to transport parcels during daytime. In addition, all trucks in Shanghai must have a business license and equipped with mileage meter, GPS, and calling system, and be centrally dispatched by their headquarters.

3.3.3 Urban Logistics Practice in Xiamen

3.3.3.1 Promotion of Urban Joint Distribution Pilot Run
Xiamen has set up a model on the joint distribution of e-commerce logistics. It adopts a “distribution centres plus delivery end points” model by establishing distribution centres at land and airway transportation hubs and delivery end points in major communities. Currently, they handle more than 300,000 pieces of parcels in the city daily of which more than 60% are delivered through joint distribution. Xiamen has also constructed some more advanced and full functioned modern logistics centres to serve the urban joint distribution of FCMG, medicine, and fresh and frozen food.

3.3.3.2 Upgraded Level of Cold Chain Joint Distribution
Benefited by being designated as a pilot city of the Cross-Strait Cold Chain Logistics Cooperation, Xiamen actively brought in the advance technology and experience in urban joint logistics from Taiwan. The newly built Yuanxiang Logistics Park and Wanxiang Logistics Center form the cold chain joint distribution center of the city, covering more than 60% of the area. Yuanxiang Logistics Park is the largest cold chain logistics park in Fujian Province. There are more than 200 well-known domestic and international brands stationed in this park, providing joint distribution services to more than 500 supermarkets, chain convenience stores and chain restaurants in the city. Wanxiang Logistics Center possesses the most advanced facilities in the country. It is a combination of frozen, refrigerated and temperature-controlled cold storage facility. From it the whole distribution process is being kept refrigerated and monitored; it effectively meets the “great variety, small quantity, high frequency” requirement in urban joint distribution.

3.3.3.3 Construction of Logistics Information Platform for Visibility of Freight Vehicles
In 2013, Xiamen’s “Passenger and Driver Information Management Platform” was put into operations. By utilizing the GIS maps of the whole city and integrating related data, both the drivers and the passengers can share the information. This platform visually displays information on the transportation enterprises, the vehicles, the drivers, and the movements of the vehicles. For data interchange, the “Haixi Road Transportation Net” of Xiamen Xiangyu Urban Distribution Center gathers and disseminates information for more than 200 highway transportation enterprises, covering about 60% of the total highway transportation enterprises. The platform helps to solve the problem of “vehicle and cargo mismatch” and improve the scale operations, the regularities and refinement of the highway transportation transaction market.
3.3.4 Urban Logistics Practice of JingDong in Chongqing

JingDong (JD) is the second largest online retailer in China after Alibaba, specializing in B2C services and operating 97 distribution centres across the country. Considering their sale volumes and the scale at which they operate enables online retailers like JingDong to collect large amounts of market and consumer data. This data enables them to pre-position orders before they have taken place since demand can be forecasted more reliably. In addition to the benefit of further consolidating orders and using transportation assets outside peak demand, pre-positioning considerably reduces lead-time.

3.3.4.1 The Chongqing Parcel Sortation Center

In 2014, JD opened a distribution centre to service the metropolitan area of Chongqing, a major city of about 17 million people and a provincial level municipality that used to be part of the province of Sichuan. This distribution centre is located in a newly developed logistics zone named "Chongqing Highway Logistics Base", a 30 square km real estate project developed by the government of the Municipality of Chongqing. This logistics zone is located about 40 km from the central business district. The Chongqing distribution centre is a sorting and cross-docking facility where orders are grouped according to the destination. Most goods are stored on racks with a high level of inventory turnover, but the centre also acts as an E-fulfilment centre, in part due to the delays involved in moving cargo over long distances in China. On one side of the facility are receiving docks where inbound orders are received, deconsolidated to be stored and eventually distributed district along the major ring road surrounding the metropolitan area and thus provides a good level of regional road access, including smaller urban centres. The JD facility employs 200 people working in two shifts.

3.3.4.2 The Chinese Urban Last Mile

Boxed orders and storage bins are then assembled on docks and loaded into delivery trucks bound for urban logistics depots (deconsolidation centres) covering a specific market area. Depending on the size of the urban logistics depot, full truckloads are assembled. To maximize the load factor, trucks are usually floor loaded. Such vehicles are not adapted for city logistics, but designed to be used on highways between the main metropolitan distribution centre and local / urban logistics depots.

At the urban logistics depot, loads will be broken down for urban delivery routes usually covering a neighbourhood or an urban district. Depending on the destination and the condition for the delivery (availability of parking), JD is using adapted urban delivery vehicles such as small trucks or motorized cargo cycles. These vehicles are more suitable for the density and complexity of urban deliveries in Chinese cities. Due to the geography of the city of Chongqing, cargo cycles are not used.
3.3.4.3 The Urban Delivery Point

Direct home deliveries are rather uncommon in China. Orders are usually routed to a neighbourhood pickup location, which is owned or leased by the retailer. Delivery at a pickup location enables a consumer to pay cash for the purchase (COD), which accounts for about 40% of online transactions. The pickup outlet shown on the photo below is located on a university campus where many students do not have access to a credit card. Therefore, the prevalence of urban pickup outlets combines the benefit of a consolidated pickup location and the unique transactional (cash prevalence) characteristics of the Chinese consumer market.

Like its North American, Japanese and European counterparts, JD is installing pick up lockers at specific locations. Customers are informed on their mobile devices when a parcel is ready to be picked up and are given a code (or a QR code to be scanned from their mobile device) to access their delivery. Such a system is still in its infancy in China, but is expected to grow substantially with lockers to be installed in new residential complexes in peripheral locations.

Figure 4 JD Pickup Locker Station
4 Innovative urban logistics R&D and policy trends in Singapore

4.1 Societal challenges
Singapore as the one of the Logistics Hub in Asia (see Viajeo Plus D7.1 (2015)) has been considered as one of the Asian miracle economies (the others are: China, India, Japan, Korea and Taiwan as defined by (Ang and Madsen, 2013)). The role of ‘domestic knowledge’ and ‘international knowledge spill overs’, towards economic growth in Organisation for Economic Co-operation and Development (OECD) countries has been the subject of research in economic productivity trends (Ang and Madsen, 2013). In the case of innovative urban logistics, the adoption of advanced technologies to support business and manage a sustainable urban system presents opportunities for urban logistics stakeholders to contribute to economic growth, nationally, regionally and globally.

Singapore’s globalisation process has been the subject of substantial analysis in economic terms (Ang, 2011) as well as in sociological terms (i.e. transmigration (Soh and Yuen, 2011) and ageing population (Wen, 2013)). However, one of the main obvious challenges for Singapore is the changing land-use spaces. This is especially true where the concept of global to local urban spaces are emerging towards the city/country vision as a global city. The Singapore land use zoning system Master Plan introduced in 2003 aimed to give businesses greater choice of locations and flexibility, thus leading to the country being ranked first among 181 countries for ease of doing business (Soh and Yuen, 2011).

Urban logistics challenges concern issues of effective land use. Despite being promoted as a good reference for other cities as a sustainable, safe and smart transportation system (Haque et al., 2013) with modern logistics activity approaches (O’Connor, 2013), a number of industry challenges were identified in Singapore through collaboration with local manufacturers, suppliers, logistics service providers, agencies and academics as reported in (de Souza et al., 2014):

- Exploring effective sustainable time managed solutions to freight traffic congestion in commercial zones;
- Addressing the implicit and explicit complexity of last mile logistics and the associated system level dynamics amongst cooperating agents – suppliers, service providers and customers;
- Coordinating multiple parties (agents) for overall system efficiency and cost effectiveness for the larger perceived benefits with the objective of higher productivity and greater resource utilization;
- Harnessing and harmonizing data and dynamics analytics for real-time decision support, efficient practices and fine-tuning business strategies for competitive advantage;
- Rationalizing urban freight movements in the context of emerging urban developments and planning in cities that are developing at fast paces; and
• Integrative synchronization through a public/private market for auctioning and exchange of traded information that leads to the satisfaction of multi-objectives.

4.2 Policy trends

At the top level of national economic policy, Singapore focusses on entrepreneurship and creativity as the country’s central underpinnings of urban competitiveness (Soh and Yuen, 2011). Policy changes in education, employment structure and pro-business urban planning strategies, have been introduced to improve flexibility in the land market. Additionally a number of policies in response to ageing are also emerging, including one about accessibility and infrastructure for the elderly (Wen, 2013). In many ways, Singapore’s urban development trajectory appears similar to many other global cities where contemporary consumption is increasingly planned as an integral part of good urban living (Soh and Yuen, 2011).

For urban transport policy, from the early 1970s, the great strength of Singapore’s approach was its unusual willingness to face up to the need for difficult trade-offs that prompted it to ‘do better with less’ approach (Barter, 2013). At about 100 persons per urban hectare, Singapore’s urban population density is high by Western standards, but only moderate relative to most large cities in Eastern Asia (i.e. Hong Kong, Beijing, Tokyo, Bangkok, Jakarta, and so forth).

Commercial decentralisation is an urban concept that is often used as a land use policy to encourage a better balance between the number of residents and workers, to minimise work travel costs, and to allow companies to utilise labour resources in suburban locations (Malone-Lee et al., 2001; Sim et al., 2001). The decentralisation development strategy in Singapore was introduced in the 1991 Concept Plan and diffuses commercial activities to a series of regional centres where each center covers up to 1.5 million m² of commercial space with approximately 50% take of that taken up for commercial use (de Souza et al., 2015). Figure 5 illustrates four regional centers proposed in the Concept Plan.

Alongside the Concept Plan, the location of service firms is also subject of interest in understanding the impact of land use in logistics activity in Singapore as reported in (O’Connor, 2013). Figure 6 illustrates the clustered location of logistics facilities in Singapore. The average size of these facilities is not necessarily small relative to the logistics industry in other countries but the big difference is the floor size (i.e. on average 4 floors). Additionally the 3PL Logistics operators, occupy buildings two or more times larger, demonstrating high density approaches to accommodating logistics activity (O’Connor, 2013).
Figure 5 Singapore Decentralisation Strategy Based on 1991 Concept Plan (source: (de Souza et al., 2015))

Figure 6 Logistics Facilities of a Singapore Real Estate Investment Trust (REIT) and location of Singapore Logistics Association (SLA) member firms 2001-2009 (source: (O’Connor, 2013))
4.3 R&D advances
A national funded study looking at city logistics solutions for a new development of a key commercial precinct/retail cluster (please also refer to D7.1 on Singapore solution: Retail Precinct Management), identified major logistics challenges including: unconsolidated orders from shops, unbalanced traffic density and inefficient mall distribution. Those challenges led to city logistics innovations and R&D advances in addressing city logistics using:

- Visualisation and analytics for freight flow;
- Real time delivery with multi-objective optimization and environmental impact considerations;
- Multi-party loading dock coordination via auction; and
- In-mall delivery consolidation.

4.3.1 Visualisation and analytics for freight flow.

The core of Big Data Visualisation is based on an innovative platform called A*DAX (illustrated in Figure 7). A* DAX is a scalable and open standards based platform designed to store, integrate and manage data for secure data exchange, analytics and visualisation. The platform incorporates data security and privacy features and handles both static and real-time data from the public and commercial sector. It allows translation and integration of data into actionable insights through machine learning and data analytics, so that citizens, businesses and public agencies can make informed decisions. See also Urban Systems initiative³

3 http://www.i2r.a-star.edu.sg/urban/programme-ul.html
4.3.2 Real-time delivery with multi-objective optimization and environmental impact considerations

To achieve higher efficiency and better service levels performance for delivery from suppliers’ locations to retail hotspots (e.g. mall, high street), a multi-objective vehicle route planning (MoVRP) using a novel multi-objective co-adaptive memetic algorithm (MO-CAMA) approach to search optimal delivery routes for freight vehicles by considering several objectives (i.e. travel distance, waiting time, delay time and eco-friendly indicator). Appropriate constraints such as soft time windows of deliveries are also built-into the developed models. Through the MO-CAMA approach, freight can be effectively collected from suppliers and delivered to shopping hotspots (e.g. mall, high street). MO-CAMA algorithms are also designed for fast response to real traffic information (e.g. traffic jam and vehicle breakdown) from visualisation and analytics approach (described in the previous section), order changes from customers (e.g. changing delivery addresses or time windows), and loading dock allocation from multi-party loading dock coordination approach (as described in the next section).

Table 2 The improvement between real delivery route and MO-CAMA route in Jurong Gateway, Singapore (source (de Souza et al., 2015))

<table>
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<tr>
<th>$f_1$</th>
<th>$f_2$</th>
<th>$f_5$</th>
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<tbody>
<tr>
<td>No of vehicles</td>
<td>Distance (km)</td>
<td>CO$_2$ emission (kg)</td>
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<tr>
<td>40%</td>
<td>59%</td>
<td>59%</td>
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</table>

The benefit of using this approach can be illustrated by simulation results for the Jurong Gate retail precinct, as presented in Table 2. The solution found by MO-CAMA needs less number of vehicles to serve all the customers (i.e. 40% of number of vehicles in real delivery route as seen in Table 2); the total travel distance is decreased (59%); and significant decreased of CO$_2$ emission (59% of real delivery route).

4.3.3 Multi-party loading dock coordination via auctions

The use of Urban Consolidation Centre (UCC)/distribution centres in Singapore follows the rules and regulations set by the authorities, thus the UCC establishments run their own transport vehicles to provide last-mile delivery service at a charge. Carriers/shippers would not need to enter the city centre and therefore the use of large trucks for the economies of scale outside the city centre is a commonplace. These UCCs operate on a first-come-first-served basis with some fixed-rate mechanism. To address the increasing demand for the use of these UCCs, an auction mechanism with a profit – maximizing is proposed (Handoko et al., 2014).
The concept of multi-party loading dock coordination via auctions is a twofold proposed mechanism:

1) A UCC will conduct an auction and invite some shippers/carriers to submit their bids to be considered in utilizing the last mile delivery service offered; and

2) Winner determination with the highest bid, that then (the sum of the prices at which the winning bidders would pay the UCC) subtracted by the total storage cost and delivery cost over the planning horizon.

Although this solution is still a prototype and experimental, a simulated data of a UCC, which own 10 trucks with homogenous capacity of 100 parcels, to serve 10 district zones in the city centre, within a 3 day planning horizon. This demonstrated a plausible effective outcome, i.e. for small packages with sizes of up to one-fifth of the truck capacity would still enable the UCC to yield near-optimal profits (Handoko et al., 2014). Another experimental simulated model using this auction mechanism, considering multiple last-mile delivery destinations that spread across 5 district zones has also been proved cost-savings for the participating stakeholders (carrier/shipper) (Handoko and Lau, 2015).

Figure 8 Consolidation Results at the UCC (source: (Lau, 2014))
4.3.4 In-mall delivery consolidation

Using expected arrival times from multi-party loading dock coordinated approach (as described in the previous section 4.3.3) and MO-CAMA (described in section 4.3.2), in-mall distribution schedule and route can be generated. A capacitated travelling salesman problem with time windows (CTSPTW) can generate the schedule and route for in-mall distribution, which could overcome the typical setting of in-mall deliveries to optimise the in-mall delivery route (The Logistics Institute Asia Pacific, 2014 as cited in (de Souza et al., 2015)). This approach attempts to deliver as much as possible freight that have already been consolidated in the loading dock to be delivered to different retail shops in the same or different shopping malls by the same in-mall trips as long as operational constraints or the delivery time windows are not violated. Figure 9 demonstrates the simulated comparisons between typical delivery operation where a driver and a helper deliver the freight to the retail shops individually and the optimal time in-mall delivery operation using CTSPTW algorithm.

![Figure 9 Comparisons of total travel time (routing time) to serve retail shops (source: (de Souza et al., 2015))](image-url)
5 Innovative urban logistics R&D and policy trends in Latin America

5.1 Societal challenges

5.1.1 Brazil

As described in TURBLOG (2010a), the freight transport sector in Brazil in the year 2000 accounted for 4.4% of the country’s GDP, representing an annual addition of $42 billion to the economy, and generating 1.2 million direct jobs (Source: GEIPOT - Statistical Yearbook of Transportation, 2001). However, even though it is a strong economic sector, it has a variety of problems associated with economic instability. Urban freight transportation (as a sub-sector of the overall freight transport sector) shares these problems. However, the lack of research on the topic makes it difficult to measure the specific problems and hence formulate the solutions required. The importance of urban freight transport is shown not only by its contribution to the economy, but also because it is an industry that involves a huge variety of stakeholders. It follows that urban transport policy should include freight transport as a prominent factor alongside passenger transport, but this is typically not done in most Brazilian urban transport planning.

The document “Human Transportation - City with Quality of Life” (ANTP, 1999) presented problems associated with municipal public policies that are currently being implemented in Brazil:

- Use of ‘non-intercity’ roads in a city for the passage of trucks that are making interurban journeys with neither origin or destination in the city concerned;
- Use of routes whose physical characteristics are inappropriate for use by trucks;
- Accumulation of trucks parked near the locations that generate truck trips;
- Lack of specified routes for vehicles with oversized cargo and the transport of dangerous goods.

A similar set of problems was identified by Sanches Júnior (2008) in his doctoral (PhD) thesis, for which he carried out research to identify the vision with respect to urban logistics of those responsible for mobility in Brazilian cities. Sanches Júnior’s research concludes that, in general, there is an understanding that there is an excess of heavy vehicles in most cities and that it is believed that current rules/laws are inadequate or insufficient for urban freight logistics. Although public officials have shown an understanding of the conflict between the movement of people and the operations of urban freight logistics, cities are generally not fully prepared for solving such conflicts.
The major problems identified were:

- there are missing areas / places / parks to carry out the activities of loading / unloading;
- there are missing warehouses / depots / terminals for the activities of consolidation and transhipment of goods;
- there is a lack of infrastructure to accommodate the logistics activities of cargo;
- the logistics operations of cargo damage the on the roads.
- the activities of urban freight logistics endanger the safety and well-being of citizens, besides being a cause of pollution;
- there is a lack of coordination among the participants of the system of freight transport, for in spite of the cities having the knowledge of the location of economic activities, they often do not plan sufficiently for the local traffic that is generated by these activities;
- traffic departments do not know what is transported, who performs the transport, or the origins and destinations of freight flows in the city.

5.1.2 Peru

As described in TURBLOG (2010b), there is a particular issue in Peru due to the ‘informal’ nature of much freight movement. One such example from Gamarra in Lima is described in Box 1 below.
Characterization: The Gamarra area is the most important “Spontaneously Concentrated Urban Area” in Lima. Occupying 60 ha, there are 10 thousand micro-enterprises working in the area, involving 17 thousand stores in 144 shopping centers. (see map).

Gamarra is the largest urban shopping area in Peru. Yearly sales are approximately $800 million. The market price per square meter in the galleries is $14,000. The owners of the micro-enterprises are mostly from Andean migrant origin. A Lima University survey has concluded that 74% of buyers of Lima have preference to buy clothes on Gamarra.

60 thousand people work in Gamarra, and in periods of marketing campaigns there are more than 250,000 visitors, leading to an estimated 3m² per person circulating in the local streets. Streets are regulated as pedestrian ways. (see photo)

Currently, access to Centro Gamarra is a serious problem for shoppers and visitors. As can be seen in the photo, the massive concentration of people leads to heavy congestion in a radius of 500 meters around the area. In relation to urban logistics, some steps have already been taken to (partially) solve these problems. These steps have been taken with the cooperation and coordination between: a) the Municipality, who have implemented regulations restricting times for loading and unloading to between 20 hr at night to 10 hours in the morning; b) owners of establishments that organize their supplies; c) 400 hand carters who transport the goods from trucks to establishments. Carters are socially organized. The waste issue is partially solved. However, what is not solved is the transfer of merchandise by buyers from stores, exacerbating the high congestion in the area. Gamarra Centre needs further intervention on urban logistics.

Box 1: “Spontaneously concentrated urban area” of Gamarra, Lima (Peru)
Source: TURBLOG (2010b)
5.2 Policy trends

5.2.1 Brazilian Policy

As described in TURBLOG (2010a), the Brazilian Ministry of Cities was created in 2003, with responsibility for the coordination of urban policy at the national level. An important guiding concept of the ministry has been that of sustainable urban mobility, which includes the integration of the traffic management of goods with the management of movement of people. One of the first achievements of the newly created Ministry of Cities was the definition of a “National Policy for Sustainable Urban Mobility (PNMUS)” (Ministério das Cidades – Brasil, 2004). PNMUS, which was developed in a participatory manner between 2002 and 2004, includes certain aspects of relevance to urban logistics. PNMUS presents a general diagnosis and characterization of “Sector Integration, Institutional and Territorial Policies”, stating that "it is important to bear in mind the two-way relationship between land use and transport (including public transport), as each building generates different transport needs. On the other hand, the movement of vehicles, persons and objects interferes with the deployment and use of buildings."

One of the proposed objectives of the national policy is "to support projects and plans to organise the movement of goods in a rational and safe manner, especially in relation to dangerous goods." The role of the public sector in handling freight transport, unlike the movement of people, is not straightforward since freight transport is almost exclusively performed by the private sector. However, since the economy is essentially tied to the ability to move freight, the public sector has a strong interest in providing effective ways in facilitating such movement. Therefore, the public sector has a responsibility for the construction and maintenance of urban transport networks that support freight movement, involving activities such as transportation planning, traffic control and traffic engineering.

5.2.2 Example from Brazil: Supermarket delivery and online shopping

As described in TURBLOG (2010b), the Pão de Açúcar Group was the first Brazilian supermarket retailer operating on the internet with the release of Pão de Açúcar Delivery in 1993, expanding its presence on the internet with http://www.extra.com.br/, for sale of non-food, in 2001. After a purchase is made, there is a process involving: the verification of each delivery address; an allocation of orders per region and vehicle transport capacity; and the construction of a sequence of deliveries to be made (leading to vehicle routeing). Each vehicle has a capacity of 1,600 kg, optimizing the time for loading and unloading of goods. Furthermore, each vehicle is equipped with a refrigerator, so that the temperature of perishable items can be kept low.

Pão de Açúcar Delivery offers more than 15 thousand items (with photos and nutritional information) for home delivery, or in the location that the customer prefers. It currently operates in five state capitals (São Paulo, Rio de Janeiro, Brasília, Curitiba, Fortaleza) and
in other cities within the State of São Paulo (Osasco, Barueri and others). The price of delivery in São Paulo is R$ 11.90 (equivalent to €4.75) with discounts being offered for regular deliveries according to the values of purchase: purchases greater than R$ 750.00 (€300) are delivered for free.

Purchases completed before 13:59 are delivered on the following (working) day and purchases after 14:00 are delivered two days later (though the time may vary depending on overall demand).

![Figure 10 Pão de Açúcar delivery van (TURBLOG, 2010b)](image)

5.2.3 Recent developments in Brazil

In the last three years, the delivery of supplies of goods and documents to end users in large cities in Brazil has undergone a great innovation: apps for the localization of motorcycle couriers available to the sender (similar to apps used for calling taxis and Uber applications). This has reduced the delay in picking up products from the sender and has increased confidence in the services provided, since the records of the services are stored and it is possible the check on the progress of motorcycle couriers. For companies, accounts can be created that allow the payment of all deliveries contracted by the end of the current month.

This type of application increases the number of runs made by motorcycle couriers, raises their income, gives them more autonomy and at the same time reduces the cost of travel. For the customer, it is possible to know in advance, prior to engaging such a service, both the route, the price and the estimated time of delivery, thus giving more security for all.
An example of such an app, shown in Figure 11, is Moblyboy (http://www.moblyboy.com.br/), which is available in the cities of São Paulo, Rio de Janeiro, Belo Horizonte, Porto Alegre, Curitiba and Florianópolis.

Figure 11 Moblyboy - motorcycle courier location app

Another popular application in Brazil, is the Rapiddo (http://www.rapiddo.com.br), shown in Figure 12, which has better traceability of all procurement and delivery processes of goods for both companies and ordinary users.

Figure 12: Rapiddo - motorcycle courier location app
Since they provide a new type of service these apps, similar to taxi apps, various legal issues have arisen. Currently, most of the drivers making deliveries are in an irregular legal situation, not being registered or legally constituted either as company employees or as autonomous professionals. In general, when a driver working on a non-irregular basis for a motorcycle courier company crashes, it is guaranteed by law that they receive salary payments for 12 months if they are incapacitated by the accident. However, if a motorcycle driver working on an irregular basis suffers an accident the service requester may be liable for civil damages. Therefore, it is essential that companies of this type of application take extra care with the legal status of labor that they hire or permit to provide services, since it should only be performed by trained professionals and those legally entitled to exercise this activity. It is also important to take into consideration the safety and environment implications with increased motorcycle deliveries that need to be balanced with the benefits for the customer of lower costs and improved delivery time.

5.2.4 Chile

As described in TURBLOG (2011a), the Ministry of Transport and Telecommunications is the main national governing body with regard to freight transport. Other institutions that regulate freight transport in Chile are the Ministry of Public Works, the Ministry of Housing and Urbanisation, the Ministry of Health and the Municipalities. These national institutions are also responsible for the urban freight transport policies in the city of Santiago.

In 1996 the General Presidential Secretariat of Chile declared the metropolitan region of Santiago a “saturated and latent zone” due to the pollution that was found. This started a series of initiatives to regulate pollution. One of the main policies elaborated was the Prevention and Decontamination Environmental Plan for the metropolitan region, which proposes a set of strategies, action plans and measures that will achieve the targeted emission reductions. A second important policy document is the Urban Transport Plan for the City of Santiago (PTUS). The PTUS consists of eleven activity programmes, two of which are directly related to urban freight transportation. The principal measures under one of these programmes are circulation and access restrictions. The objective of the other programme is to regulate the operation of cargo transport in order to control its externalities and to create a hierarchy of the road transport network in Santiago.

5.2.5 Example from Chile: The Abertis Logistics Park (Santiago)

As described in TURBLOG (2011), a park project with the quality standards similar to those of European and North American parks is being implemented in Chile.
One such example from Albertis Logistics Park in Santiago is described in Box 2 below.

**Abertis Logistics Park (Santiago, Chile)**

**Brief description:**

The Abertis Logistics Park is the most comprehensive and modern logistics park in Santiago, with similar quality standards that the European and North-American parks have, in that they are considerably more demanding than those in place nationally, but adapted to comply with Chilean construction codes. The park is situated within the Metropolitan Region (near the International Airport) and has direct access to main highways of the city and routes to two major ports in the country.

**How it works:**

The Abertis Logistics Park is essentially a storage project, where the principal service is the rental of warehouses. However, the logistic centre will, in the future, also be equipped with multiple services such as a restaurant, high-ceilinged offices inside the warehouses, rest areas and restrooms for drivers and a modern automated security system which registers who enters and leaves and the time spent on the premises. The logistics centre will also offer the service of “keys in hand”, which consists of designing storage centres tailored to the client particular needs, with the same construction standards. Due to the features of this service the client must commit to a minimum rental period. Another service is the renting of offices. The Abertis Logistics Park encompasses a total area of 632,810 m², and will house 327,798 m² of warehouse space for rent and 13,056 m² for services.

**Main stakeholders involved:**

Logistics operators, logistics providers, government, clients (retailers, manufacturers).

Box 2: Abertis Logistics Park
Source: TURBLOG (2011a)
5.2.6 Mexico City overview

As reported in TURBLOG (2011b), the main public policy measures used in the Mexico City Metropolitan Area are related to restrictions for freight transport vehicles on certain roads or areas and programs for controlling emissions of pollutant and greenhouse effect gases for all type of vehicles (including freight vehicles). The following measures were identified:

- **Zero Emissions Corridor in the Central Axis**, restricting freight transport vehicles from circulating there (as described in 5.2.7);
- **Freight Transport Regulation Programme for Perimeter “A” of the Historic Centre of Mexico City**, restricting the movement of commercial vehicles greater than 3.5 tons, between 7:00 to 22:00 hours;
- **Vehicle Verification Program** for controlling emissions by requiring vehicle inspections every six months;
- **Restriction** on the circulation of freight transport vehicles on **Federal District Freeways**;
- **Restriction** on the circulation of freight transport vehicles on **Insurgentes Sur Ave.** in the Federal District;
- **Time restrictions** for inter-urban freight vehicles to circulate on certain roads that connect with Federal District exits towards tollways;
- **Restrictions** on loading and unloading operations on roads where Metrobus lines operate.

The business sector has also introduced several measures to make their logistics more efficient, from the development of innovative alternatives for order processing to technology innovation in vehicles.

5.2.7 Example from Mexico: Zero Emissions corridor in Mexico City

As reported in TURBLOG (2011b), the Metropolitan Commission for the Environment, through the II-UNAM and with financial resources from the Environmental Trust fund, performed the “**Integral Metropolitan Study on Freight Transport and the Environment**, with the objective of obtaining a precise diagnosis of the situation.

In the study, the Central Axis was identified as one of the ten roads most used by the freight transport services, as well as the main road that distributes the flow of freight transport towards the Queretaro exit and North of the Country.

The Transport Commission of the Confederation of Industrial Chambers (CONCAMIN) performed several exercises to assess the quality of traffic movements on the Central Axis, West 2 Axis and West 3 Axis during September 2007.
In May 2008, a collaboration and coordination Agreement was signed for implementing the Freight Transport Regulation Program in Perimeter “A” of the Mexico City Historic Centre to be effective as of 20 June 2008.

Among the immediate actions taken by the Government of the Federal District was turning the “Lázaro Cárdenas” Central Axis into a one-way avenue from South to North, with 6 lanes, into a “Zero Emissions” Corridor (SETRAVI, 2010) see Figure 13.

Figure 13: Zero Emissions Corridor: Alternate routes for Freight Transport
5.3 R&D advances in Latin America

5.3.1 Transferability research in Brazil and Peru (TURBLOG_WW)

As described in TURBLOG (2011c), the TURBLOG_WW project carried out transferability case studies in Belo Horizonte (Brazil), Cariacica (Brazil) and Lima (Peru). A ‘comparator’ case study was provided for Lisbon (see below for information about the role of this case study). The case studies selected good practice examples described in TURBLOG_WW deliverables from cities in France, Japan, Mexico, Chile and the Netherlands. The measures considered in the four case studies are shown in Table 3.

Table 3 Comparison of the measures from the package of measures from all case studies.

<table>
<thead>
<tr>
<th>Measures</th>
<th>Belo Horizonte</th>
<th>Cariacica</th>
<th>Gamarra</th>
<th>Lisbon</th>
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<tr>
<td>Abertis Logistic Park</td>
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<td>Logistic oriented masterplan</td>
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<td>City distribution centres definition</td>
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<tr>
<td>City distribution centres + last mile solutions</td>
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<tr>
<td>Incentives for the development of innovative solutions and businesses</td>
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<td>Off hour deliveries programme</td>
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<td>Utrecht beer boat concept + development of specific containers for the drink distribution</td>
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<td>Beijing Tobacco logistic centre</td>
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<td>Lorry routes definition</td>
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<td>Pedestrian routes definition</td>
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<td>Development of specific containers for the liquid transport</td>
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<td>Requirements of loading and unloading spaces inside companies with large traffic movements</td>
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<td>Freight regulation programme for historic areas + vehicle control of greenhouse gas emissions</td>
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<td>Signs</td>
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<td>Vehicle size restrictions</td>
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<td>Low emissions zone restrictions</td>
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<td>Agent identification</td>
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<td>Stakeholders consultation</td>
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<td>Collaborative distribution systems</td>
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<td>Enforcement of loading and unloading regulations</td>
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<tr>
<td>Loading and unloading parking spaces</td>
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Application scale:
- Metropolitan area
- City area
- City centre or neighbourhood

Each case study carried out a barrier analysis, identifying the various barriers that might potentially undermine the successful implementation of a transferred policy measure in a ‘receptor’ city. The following classification of barrier types was used:

- Financial (the financial cost of the measure in the receptor city is considered to be too high);
- Physical (the natural and/or built aspects of the receptor city make the transferred measure inappropriate);
Technological (the transferred measure has technological elements that are unavailable in the receptor city or are inconsistent with the technology currently operating in the receptor city);

Cultural (the traditional culture operating in the receptor city makes the transferred measure seem ‘strange’ and/or difficult to implement);

Political (the transferred measure has a perceived negative impact on one or more sections of the population, thus leading to political conflicts);

Legal (the national and/or local legal system operating in the receptor city makes elements of the transferred measure illegal);

Security (security problems hinder the implementation of the transferred measure).

Aggregating over the case studies, Cultural and Financial barriers were identified for more than twenty measures and are probably the most important barriers to remove in logistic actions. But Legal and Political barriers are also important and are associated with more than ten measures. Security barriers (eight measures), Physical barriers (six measures) and Technological barriers (three measures) seem to be the less important barriers.

The measures that are most likely to be adopted are those related to regulation. Indeed, these measures demand fewer financial resources and the cultural resistance is usually lower because generally the cities have already a tradition in implementing regulatory measures for street use. There is a problem that appears in the case of measures that need extensive financial resources: the investment responsibility of each sector (public/private) is not clearly defined. Cooperation between local authorities and stakeholders succeeds better in issues related to planning and master plans, regulatory measures and research related to urban logistics (data collection and information).

An analysis was made as to whether there was a significant difference between the results of the Latin American case study and those of the Lisbon case study. The following summary results were obtained:

- Congestion is seen as an important problem for all case study cities.

- In general there is a difference between the problems identified in the Latin American cities and those identified for Lisbon. Apart from congestion, the only problems in common between (one or more) of the Latin American cities and Lisbon are: lack of planned urban transport system / unclear road hierarchy; chaotic situation in land uses / demographic distribution encourages excessive movements; and lack of loading/unloading parking spaces.

- The three Latin American cities identify problems due to the number of trucks in the central area and the size of such trucks. In Lisbon, however, one of the main problems identified concerns the constraints to the circulation of larger and longer vehicles due to freight regulations.
5.3.2 R&D in Chile

As described in TURBLOG (2011a), Chile currently allocates 0.68% of its GDP to Research and Development (R&D). This puts them in second place in Latin America behind Brazil. 53% of the investment in this area comes from the public sector, 37% from the private sector and 10% from other sources and 46% of these resources are used for R&D by enterprises, 32% by universities, 10% by public organisations and 12% by private non-profit institutions. Of the total resources, 22% is currently spent on basic research and 78% on applied R&D.

Various public funds support the efforts of R&D in the country. Some of which operate using contestable schemes, assigning resources according to criteria of excellence, strongly responding to demand and contributing to the mobilisation of resources from the private sector. In this context, the system of the Development Corporation (CORFO) and the National Commission for Scientific Investigation and Technology (CONICYT) are very important. Within CORFO’s innovative component, there is a focus on areas of technological innovation in enterprise, technology transfer and dissemination, pre-competitive innovation in the public interest as well as innovative entrepreneurship. CONICYT aims at promoting and strengthening scientific and technological research, training specialised human resources and developing new areas of knowledge and in productive innovation.

Other sources of funding for constituent programmes are provided through loans from international institutions such as the World Bank and the Inter-American Development Bank (IDB), or foundations and organisations such as the European Union.

In particular, in the case of transport, the public institutions that focus on the allocation of resources to gather information related to this matter are the Ministry of Transport and Telecommunications (MTT), the Central Bank and the National Institute of Statistics (NIS). Through the sub-secretariat for Transport, the MTT is in charge of the development of various studies related to this issue. They collect data and information, which facilitates decision-making in “policy development, conditions and norms that enable the development of an efficient transport system, a safe and friendly environment, and provide fair access to different modes of transport, thus safeguarding the rights of users”. Also involved is the Department of Shipping and Inland Waterways, which predominantly provides statistics of Cargo movement at the state ports.

The Central Bank provides diverse studies on freight transport, related mainly to the associated costs of exports and imports. They also provide strong statistical databases on international transportation. The NIS provides monthly statistics for freight movement per mode of transport. Other organisations that provide international transport statistics (foreign trade) are the National Customs Service and the Department of Export Promotion (ProChile).
5.3.3 Recent R&D in Latin America: VREF CoEs

An important recent development has been the funding (starting in 2013) of two ‘Centres of Excellence’ (CoEs) for urban freight research by the Volvo Research and Educational Foundations (VREF) (http://www.vref.se/urbanfreight).

These two CoEs are:

- METROFREIGHT: The local/global challenge of urban freight – hosted by University of Southern California (METRANS Transportation Center, Sol Price School of Public Policy): https://www.metrans.org/metrofreight and http://www.vref.se/urbanfreight/ongoingprojects/metrofreight

These CoEs, which are ongoing, are concerned with urban freight and logistics issues on a worldwide scale. However, a significant amount of the research is directed at urban freight issues in Latin America. For example, the SUFS CoE currently has sub-projects on “Analyses of Freight Patterns in Medellin, Colombia” and “Freight Generation Study for Manufacturing Districts in Bogota, Colombia”. Furthermore, this worldwide scale allows international comparisons to be made, with respect to both problems and solutions, between Latin America and other continents.
6 Conclusions

In the different regions studied in this deliverable the general reflection is that policies for urban logistics is rather recent compared to urban mobility. Yet the importance to improve urban logistics is increasing and there are activities taken. In China there are policies in place to improve organisation and promoting joint distribution together with gradually regulation of urban logistics vehicles. In Singapore there is a focus on entrepreneurship and creativity driven approach in order to ‘do better with less’. In Brazil the freight sector is strong and important in general, but the urban logistics domain needs more research to meet the many challenges. Overall there are a number of innovative R&D examples of interest for potential collaboration and deeper studies of interest for European collaboration, see Table 4.

Table 4: Innovation R&D advances examples

<table>
<thead>
<tr>
<th>Region</th>
<th>Innovative R&amp;D advances examples</th>
</tr>
</thead>
</table>
| Beijing (China)       | • Dedicated Projects Related to Urban Logistics  
                        • Encouraging the Use of Environmentally Friendly Urban Logistics Vehicles  
                        • Promotion of the ‘City 100’ Urban Joint Logistics Pilot Project |
| Shanghai (China)      | • Formulating Supporting Policies for Urban Logistics  
                        • Standardization of Urban Logistics  
                        • ‘Public Transportation for Freight’ |
| Xiamen (China)        | • Promotion of Urban Joint Distribution Pilot Run  
                        • Upgraded Level of Cold Chain Joint Distribution  
                        • Construction of Logistics Information Platform for Visibility of Freight Vehicles |
| Chongqing (China)     | • The Chongqing Parcel Sortation Center  
                        • The Chinese Urban Last Mile  
                        • The Urban Delivery Point |
| Singapore             | • Visualisation and analytics for freight flow;  
                        • Real time delivery with multi-objective optimization and environmental impact considerations;  
                        • Multi-party loading dock coordination via auction; and  
                        • In-mall delivery consolidation |
| São Paulo, etc. (Brazil) | • National Policy for Sustainable Urban Mobility (PNMUS)  
                        • Supermarket delivery and online shopping, Pão de Açúcar  
                        • (São Paulo, Rio de Janeiro, Brasília, Curitiba, Fortaleza)  
                        • Localization of motorcycle couriers e.g “Moblyboy” and “Rapiddo” |
| Santiago (Chile)      | • The Abertis Logistics Park (Santiago)  
                        • Centres of Excellence’ (CoEs) for urban freight |
| Mexico City           | • Zero Emissions corridor in Mexico City |
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