As cities continue to grow, both in terms of population and resource needs, they are running up against what will become one of the increasingly important questions of the 21st century: How to manage that growth sustainably. In this article, we discuss one key challenge of urbanization: how best to handle the increasing flow of physical goods into cities. A new focus on urban freight could be an opportunity both to remake cities—by reducing traffic, pollution, and noise—and to generate growth for industries such as third-party logistics and transportation, automotive OEMs, and information systems providers.

**URBAN CHALLENGES**

There are currently more than 800 cities with greater than one million inhabitants; every three months, another city surpasses five million people. Urbanization is a continuing trend, with 55 percent of the world’s population expected to be living in cities by 2050 (up from 51 percent today). Naturally, as population grows, so does resource demand (Exhibit 1): Cities are more productive than rural areas, and incomes are higher. In some areas, resource availability already falls well short of demand. For example, water demand in Mumbai equates to 135 liters per person per day, while the supply network delivers only around 90 liters (and just 25 liters in some areas).
Urban air pollution is another issue: in China, only one percent of city dwellers breathe air that is “safe” by European standards, while 60 percent of Americans live in urban areas where they are exposed to air pollution capable of causing health problems.

Further adding to this strain will be the need to adapt globally to the impacts of climate change—many of which will affect cities directly, such as coastal flooding, extreme weather, and water shortages. The likelihood of these impacts increases as it becomes clearer that the world will miss the goal of reducing greenhouse gas emissions by 50 percent versus 1990 levels (450 ppm) in the next 10 years, which would be needed to keep temperature rise within 2°C.

THE IMPACT OF FREIGHT

Cities’ need for infrastructure to support the flow of goods and people will increase in line with other resource needs. For example, road capacity demand in cities is projected to increase by a factor of four in the next 40 years. Road capacity already is and will become even more of a bottleneck not only for transport but for economic development as well. In many large cities, road speeds during daytime hours (7 a.m. to 7 p.m.) already have fallen by 50-65 percent in the past 10 years.

For many city authorities, the situation has become untenable—or will be so in the near future: More road capacity is required, but in most cases, space and funding is unavailable and the cost of maintaining existing infrastructure already too high. Alternative means of transportation, such as metro and bus systems, can help increase the density of passenger transport but cannot be expanded indefinitely. And although cities generally have integrated master plans for passenger transport, they often lack substantial planning for the other major type of traffic impacting infrastructure: freight.

EXHIBIT 1: REQUIRED PRODUCTIVITY GROWTH RATES FOR VARIOUS RESOURCES THROUGH 2032

Source: GDP: Global Insight; Water: IPCC; Oil: IEA WEO 2008 reference scenario; Power: IEA WEO 2008 (historic), Food/animal feed: FAO 2009; Oliver Wyman analysis
Every business and household in the city receives freight. A mall might receive 50+ trucks a day, a hospital 10-20 trucks per day, a grocery store 5-10 trucks. Each truck may drop off only a pallet or a parcel (the main difference being whether dry van or refrigerated). This is due to the fragmented nature of the industry and the norm of buying from multiple suppliers. Each truck takes up space on the city’s limited infrastructure. On major arteries, trucks may make up 25-30 percent of all traffic during the workday, essentially becoming “moving bottlenecks,” due to their slower acceleration/braking and overall speed than cars. Parking and unloading in the streets also takes up space, as unloading bays are limited and often nonexistent. Conversely, reducing the impact of trucks at critical times during the day increases capacity by more than just the length of the truck, as traffic also becomes more fluid (where truck lanes are not separated).

CITY LOGISTICS: HIGHER SPEEDS, LESS POLLUTION

Of course it isn’t possible—or desirable—to simply remove trucks from the city. But there is an alternative that could make city infrastructure more sustainable: namely, a more focused approach to city freight planning, similar to how cities currently plan and operate their transit systems, which is known as “city logistics.”

In the case of cities with advanced transit systems, passengers are discouraged from driving in with one person per car. Instead, passengers park in lots outside of the city and are consolidated onto trains and buses that run like a “conveyor belt” into the city, or encouraged to carpool to use HOV lanes, increasing the passenger load factor per vehicle.

Similarly, trucks on their own do not start off with 100 percent load factors and then make efficient “milk runs” through the city. Due to a fragmented supplier and receiver landscape (Exhibit 2), varying service level commitments, special needs goods (chilled/frozen), and the mostly unregulated use of roads, trucks generally start with load factors closer to 40 or 50 percent (in some cases, only 25-30 percent).

**EXHIBIT 2: EXAMPLE URBAN FREIGHT DELIVERY CHALLENGES**

<table>
<thead>
<tr>
<th>TYPES OF COMPANIES</th>
<th>CHALLENGES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturers</td>
<td>• Making deliveries</td>
</tr>
<tr>
<td></td>
<td>• Single set of products to distribute</td>
</tr>
<tr>
<td>Distributors</td>
<td>• Regular replenishment (e.g., biweekly)</td>
</tr>
<tr>
<td></td>
<td>• Additional ad-hoc deliveries</td>
</tr>
<tr>
<td></td>
<td>• Limited product scope</td>
</tr>
<tr>
<td>Third-party logistics providers</td>
<td>• High level of fragmentation</td>
</tr>
<tr>
<td></td>
<td>• Service level requirements lead to frequent and inefficient deliveries</td>
</tr>
</tbody>
</table>

1 The OECD defines city logistics as "an integrated approach for urban goods distribution based on a systems approach. It promotes innovative schemes that reduce the total cost (including economic, social and environmental) of goods movement within cities.” Source: Delivering the Goods, Challenges for the 21st Century, OECD, 2003.
A city’s infrastructure capacity could be vastly increased simply by consolidating freight traffic outside of the city and ensuring only full trucks move through it. This concept involves:

• Consolidation centers are developed outside of the city, most likely close to major freight arteries.

• Consolidation centers are used primarily for cross-docking, with limited storage capacity (although storage could be an add-on if required, e.g., for quick replenishment solutions and 24-hour spare parts logistics).

• Consolidation centers offer dedicated compartments by type of goods, e.g., food, chilled, frozen, dry van.

• Initially, consolidation centers offer pure pallet cross-docking; breaking and re-palletting or even cage loading for delivery into the city may be desirable, depending on the specific situation and economics (e.g., trade-off between additional labor cost versus additional delivery cost).

• The concept includes IT capabilities that enable planning for multi-stakeholder, cross-docking (scanning, etc.) and daily route planning.

• Trucks to be used could vary from 1-7.5 tonnes for delivery in historic and narrow city centers to as much as 30 tonnes to outside malls, etc.

This concept of course is not new, and it has been tried before, with varying success (or lack thereof). What has changed, however, is the political environment: as cities face increasing pressure to boost infrastructure productivity and reduce environmental traffic impacts, they are showing a new willingness to play an active “market” role.

**THE OPPORTUNITY: B2CITY AND CITY2B**

Oliver Wyman believes that ex-urban freight consolidation is a workable solution to increase city freight efficiency. But this will require new thinking on the part of both cities and potential freight service providers. Providers will need to understand, for example, that cities are administrative units which often do not think in the same P&L and risk terms as businesses. Third-party logistics firms will need to develop products that target cities and incorporate city decision making processes and stakeholder structures. And automotive OEMs will need to build the right trucks: freight consolidation could make e-trucks viable delivery vehicles, since round trip from a consolidation center into the city and back would typically be less than 100 km; battery recharging or changeout could then take place during reloading.

Cities in turn may need to consider new ownership models for assets (land, facilities, trucks), ranging from the logistics provider as sole owner to partial or full city ownership. Similar to transit services, city logistics services would require a planning function to be put in place, both long-term and day-to-day, and backed up with state-of-the-art technology, particularly to manage delivery complexity and to provide sustainable delivery options (e.g., electric one-ton trucks). Finally, a consolidated delivery model would require regulation to enforce load factors, based on time of day, route, etc. and to determine which industries/goods or zones would be required to participate.
To put freight consolidation into action, cities would need to develop close working relationships with a limited number of solutions providers, e.g., third-party logistics firms that are specifically awarded contracts to consolidate freight outside the city and then deliver. Another option might be for consortia (made up of automotive OEMs, logistics providers, and information systems companies) to develop turnkey or “one-stop shopping” options for cities seeking to implement freight consolidation.

As is the case with many other city services, freight consolidation and delivery could be put out for competitive tender, for example, on a 5-10 year contract basis with service-level guarantees, and at least two providers serving each region/zone to enhance competitiveness, city scale permitting.

Companies that start looking at this opportunity now and gaining the relevant experience will likely create a large “first mover” advantage, with the potential to then add further market share at a relatively low cost. And it is worth the effort: For a start, there are those 800 mega-cities to consider. A number of third-party logistics providers, automotive OEMs, supply chain integrators, and industry-specific solution providers are already gearing up to ensure they are at the front of the pack when the city logistics market opens wide.

**WHAT CAN CITY LOGISTICS DELIVER?**

For cities, a freight consolidation solution could lead to an increase in average speed for all vehicles on major arteries of 30-40 percent, a reduction of 35-45 percent in CO₂ emissions from trucks, plus reductions in other vehicle impacts such as fumes and noise. In many parts of the world, truck consolidation centers could be 75 percent cheaper to build than additional traffic lanes, faster to build, and use less “premium” real estate (Exhibit 3). There would be additional work involved in managing logistics services providers, but cities usually have procurement and contract management processes already in place for other outsourced services that could be adapted.

### EXHIBIT 3: EXAMPLE COST OF FREIGHT CONSOLIDATION CENTERS VERSUS ROADS

<table>
<thead>
<tr>
<th></th>
<th>Option 1</th>
<th>Option 2</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Add a 20km inbound lane to an existing road</td>
<td>Build a cross-dock facility outside of the city and consolidate deliveries</td>
</tr>
<tr>
<td>Initial investment</td>
<td>$30 M</td>
<td>$5 M</td>
</tr>
<tr>
<td>Km/h impact</td>
<td>+12</td>
<td>+8</td>
</tr>
<tr>
<td>Investment to increase speed by 1 km/h</td>
<td>$2.5 M</td>
<td>4x cost per km/h $0.6 M</td>
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<tr>
<td></td>
<td></td>
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<tr>
<td>Source: Oliver Wyman analysis</td>
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</tbody>
</table>
For shippers, delivery to a consolidation center could simplify planning and reduce assets and resources required for delivery, while receivers could see reduced complexity in terms of delivery and enhanced delivery windows, while dealing with fewer trucks per day. Less investment would also be needed for loading bays for large receivers such as malls.

For solutions providers, city logistics will open up a large new competitive market. Additionally, we believe that electric-truck makers will have an opportunity to realize scale, even for current vehicles that are not suitable for long-haul but that could easily distribute goods within city limits. Furthermore, OEMs could ride down the learning and cost curve, as city delivery is likely to be one of the first applications where total cost of ownership for e-trucks could be less than for conventional trucks (depending on the cost of electricity versus diesel fuel).

Of course, there are potential “cons” that must be considered, such as that consolidation would increase handlings and the complexity of route planning. In addition, small truck providers could lose out as the market would become professionalized and less truck capacity would be required overall. But critical needs to substantially reduce freight traffic into urban centers and reduce the burden on infrastructure are likely to outweigh these challenges.

In terms of who foots the bill for such a transformative process, several options are possible, including sharing costs among the city and shippers/long-haul providers, all of whom would realize economic benefits (e.g., avoided assets/resources for shippers, avoided infrastructure costs for the city). Depending on the cost of labor, capital costs, and land costs, even the additional expense of one or more consolidation centers (and associated handlings) could yield a positive business case in many countries.

OLIVER WYMAN’S APPROACH TO SUSTAINABILITY

In summary, leveraging existing (or soon to come) technologies and value chain collaboration to increase resource productivity will be a critical component of cities’ future prosperity. This will require a new level of cooperation between cities and corporations; while cities can take a lead role on some fronts (e.g., regulation and management), they will need to look to the business world as technological innovators and solutions providers. City logistics planning is a great example of the potential markets and opportunities that may underlie an enhanced focus on sustainability, and could be one of the first areas to offer a test for developing city-corporate cooperation and a positive business case.
Oliver Wyman is committed to supporting the public and private sectors in developing solutions such as this to increase resource productivity and sustainability worldwide. Oliver Wyman’s new Sustainability & Resource Productivity Initiative (Exhibit 4) has developed a quick-scan tool that can rapidly estimate the applicability and potential impact for various stakeholders of sustainability solutions such as city logistics planning, based on the assessment of key questions along dimensions such as:

- Transparency/metrics: Aspiration setting, stakeholder analysis, city benchmarking
- Strategy: Opportunity and barrier assessment, concept adaptation, potential implementation planning
- Transformation: Stakeholder alignment, performance management, financing

EXHIBIT 4: OLIVER WYMAN’S SUSTAINABILITY AND RESOURCE PRODUCTIVITY INITIATIVE

<table>
<thead>
<tr>
<th>We support our clients in capturing the value of sustainability...</th>
<th>... By consulting in a number of functional areas...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Companies: Unlocking further growth from sustainability; providing sustainability solutions</td>
<td>Waste</td>
</tr>
<tr>
<td>Cities/regions: Increasing sustainability to manage and ignite growth</td>
<td>Mobility/logistics</td>
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<td></td>
<td>Energy</td>
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<td></td>
<td>Infrastructure/buildings</td>
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<td>Land use/planning</td>
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<td>Water</td>
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... And providing state-of-the-art tools, knowledge and experts

- ~50 consultants with sustainability expertise at Oliver Wyman
- Global network of >200 professionals within Marsh & McLennan Companies with expertise in sustainability areas
- Ongoing investments into developing state-of-the-art tools and knowledge
  - Mobility 2.0
  - Value from waste
  - Sustainability transformation of companies
  - Energy Revolution 2.0
- Internal initiatives and policies to “practice what we preach” on sustainability

For more information on Oliver Wyman’s Sustainability and Resource Productivity Initiative, please visit www.oliverwyman.com/sustainability or contact Michael Lierow, Partner, at michael.lierow@oliverwyman.com or +49-175-290-5002.
Oliver Wyman's Sustainability and Resource Productivity Initiative operates globally and is dedicated to supporting clients across industries in understanding the challenges and opportunities arising from the need to create a more sustainable world. Oliver Wyman's sustainability team provides a holistic approach to strategy and product/service development for companies, cities, and regions seeking to maximize the benefits of more sustainable practices in the areas of energy, mobility, transport, waste/water management, construction, and infrastructure.

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