Disruptive Innovation and Win-Win Strategies for the Sharing Mobility Economy

↘ Sharing cars, bikes and other transport can reduce environmental impacts and enhance sustainable development in cities

Sharing urban mobility can enable win-win strategies that provide short-term socioeconomic benefits and efficient longer-term sustainability solutions through mitigation and adaptation gains.

↘ Disruptive innovations like mobile apps can coordinate on-demand vehicle and ride sharing at unprecedented scales, transforming urban mobility

App-based platforms are reconfiguring relations between consumers, businesses, and labour within urban transport systems in revolutionary ways, creating new modes of transport, economic value and efficiencies.

↘ Although social and technological sharing innovations may address multiple urban problems, there is an 'adaptive lag' in governance which is fostering new environmental problems

Multiple forms of sharing—of vehicles, data, and responsibilities for maintaining a virtuous sharing environment—amongst businesses, users, and governments are needed to avoid stresses on transport infrastructure and public resources.

↘ A collaborative governance regime to support win-win sustainability strategies in the shared mobility sector can be achieved with improved trilateral sharing and value co-creation

New collaborative governance models can drive disruptive sharing innovations towards sustainable development goals for climate-smart urban transformation. Adaptive governance requires policy support for social learning, data sharing, and value co-creation between government, mobility service companies, and citizen groups.

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Sharing cars, bikes and other transport can reduce environmental impacts and enhance sustainable development in cities

What are disruptive innovations and how can they be harnessed for sustainability solutions?

Sharing is basic to human cultural development, exchange, and wellbeing. Until recently the sharing economy was largely an "informal" economy, not driven by standardized exchange and market pricing, but rather based on social values such as trust, altruism, and reciprocity. Parents collaborating to carpool their children to school, teenagers using a designated driver to chauffeur them to a social event, or friends borrowing or sharing bikes or other vehicles to satisfy their transport needs—these are examples of sharing mobility in the informal economy. The involved parties generally know and trust each other, and are willing to reciprocate sharing behaviour in a generalised or balanced way.

Such sharing has tended to be limited in scale and often driven by scarcity. While social sharing networks were traditionally small and often person-to-person, inexpensive apps have enabled sharing networks to expand rapidly. This in turn has enhanced economies of scale. A mobile phone user with a major market ride-hailing or bike sharing app and a credit card can locate and hire mobility services instantaneously in major cities around the world. Trust is no longer based on personal ties but on other mechanisms such as peer ratings, business and liability regulations and third-party verifications.

With billions of users of such apps, opportunities for sharing mobility to reduce environmental impacts are potentially transformative. Private vehicle ownership and solo use, with high running costs of insurance, parking, maintenance, fuel, etc. may be reduced by as much as 80 % in a decade, as some bold forecasts show.[1] This, in turn, can significantly reduce not only CO_2 and other climate-altering emissions from vehicle combustion, but also traffic congestion, and the material and environmental footprint of vehicle production, maintenance and infrastructure. For example, a recent report by Mobike and Tsinghua University shows that Mobike, the first introduced free-floating bike scheme, has helped to reduce 4.4 million tonnes of CO_2 emissions through providing 18.2 billion kilometres of rides for 200 million users in 200 cities across the world.[2] At the same time, sharing can promote positive social co-benefits, or social capital, between those who share.

However, these benefits depend on how sharing is enabled and mediated by the apps, and how city governments respond to these disruptive innovations and leverage them to support their

[1] *http://www.static1.squarespace.com/static/585c3439be65942f022bbf9b/t/59f279b3652deaab9520fba6/1509063126843/RethinkX+Report_102517.pdf*
[2] *China bike sharing and urban development report, Tsinghua Urban Planning and Design Institute (TUPDI), 2017, Beijing.*

commitments to climate and sustainability goals. Led by well-financed venture capital, the app-based shared mobility revolution is now well underway, but city governments are just beginning to grapple with its impacts and most have yet to examine carefully what needs to be shared by whom to achieve win-win sustainability goals, and how these relationships should be governed.

Disruptive innovations, like mobile apps can coordinate on-demand vehicle and ride sharing at unprecedented scales, transforming urban mobility

How do they gather and use data to promote shared mobility?

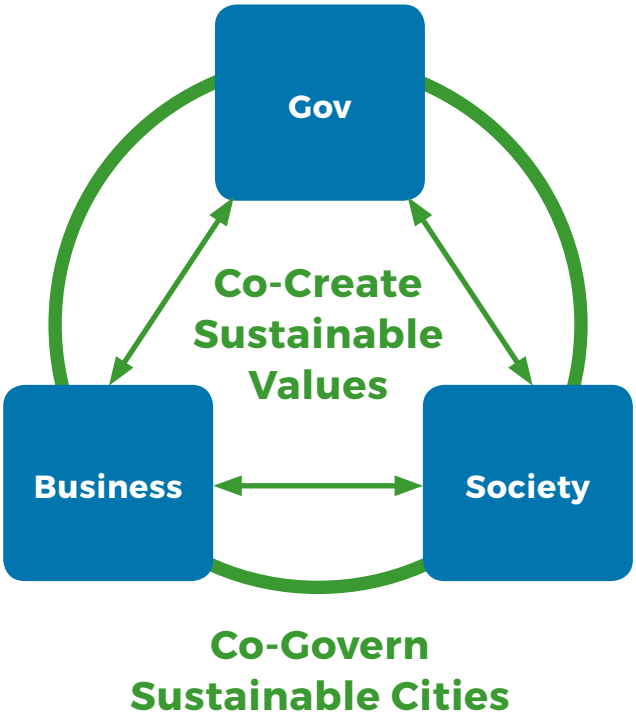
Disruptive innovations, like sharing apps, radically change the nature and scale of sharing. Experts predict the app-based economy will be worth more than €5 trillion by 2021.[3] Already, in major urban markets around the world these services include ride-hailing, free-floating bikes, scooters and cars, and micro-transit. In Shanghai, China, more than 10 million shared mobility customers and 1.5 million shared bikes are being linked to such services everyday through ICT (Information and Communications Technology) platforms hosted on mobile phones and computer apps. The ICT platforms that support them rapidly pool data and resources from suppliers and match it with users' needs in real-time. Beyond expanding the opportunity space for sharing, sharing apps disrupt traditional ties between consumers and brick-and-mortar businesses and reconfigure them into ICT-mediated peer to peer (P2P) and business to consumer (B2C) transaction networks. Uber is the most well-known ride-sharing company which has seen a meteoric rise based on investors' belief that this is a winner-take-all market. At one level, ride-hailing services like Uber are nothing more than agile taxi services which allow you to hire the available (private contractor's) car nearest you, based on real-time data, and to pay for it through the ICT platform-based app. No dispatcher or negotiation of the fare is needed. Similarly, dock-less or free-floating bike schemes eliminate the need for a rental station and simply embed GPS technology in the vehicle to allow users to locate nearby idle bikes and use their app to reserve, unlock and pay for them. In these and other ways technology effectively reduces the cost of access to transport.

What are the sustainability gains and trade-offs of the shared mobility revolution?

Strictly speaking the shared mobility vehicle or service is not 'shared' but rented, and personal data from users may be sold to other companies. Users realize the marginal benefits of vehicle sharing through reduced costs and increased availability. Figure 1 shows the potential collaborative sharing dynamics at work in the typical app-based shared mobility economy.

[3] *https://www.appannie.com/en/insights/market-data/app-economy-forecast-6-trillion-market-making*

Figure 1. Collaborative sharing dynamics



A number of systemic issues and trade-offs need to be addressed. First, while transaction costs of ICT platform-based apps are minimal, the model depends on the appropriate allocation of bikes to the level and locus of demand. Free-floating bikes or cars do not distribute themselves optimally. Staff, or in some cases consumers (e.g., through credit incentives), may be enlisted to move vehicles to areas of higher demand. A second issue concerns maintenance. Poor or non-functioning vehicles, apps or support platforms can create consumer frustration and distrust, so support personnel must be matched to servicing needs. Maintaining appropriate urban infrastructure to support shared vehicles, including road and parking space, and charging stations for electric vehicles is also important. Tackling these issues requires efficient data, monitoring and feedback systems. Significantly, increasing the durability of shared vehicles, though it may boost initial costs, can reduce long-term maintenance and increase environmental benefits because better-made vehicles need less frequent repair and replacement, ultimately reducing environmental, social, and economic costs.

An assumed trade-off is that more shared rides (especially in electric vehicles) will correspondingly reduce private car ownership and overall traffic. However, recent studies suggest that in some cities ride-hailing services like Uber and Lyft may be adding to traffic congestion and reducing

public transit ridership, while private car ownership is not declining (Clewlow and Mishra 2017). Companies like Uber, Lyft, and Didi Chuxing claim to be reducing CO_2 emissions by providing more shared rides (incentivised by low fares), but this assumes that every shared ride is an individual ride not taken, ignoring Jevon's Paradox (also known as the Rebound Effect), which posits that reduced cost may stimulate more consumption (i.e. more rides taken). According to Uber, UberPool, its carpooling app, is carrying approximately half of the total rides in Los Angeles and San Francisco.[4] At present, however, there is no data platform or verification scheme to certify these claims or evaluate overall impacts on the sustainability of urban transport systems. An alternative approach, such as the one taken by the Chinese company EVCard, to put shared electric cars on the road, may be more promising for environmental sustainability but faces difficulties with the distribution of charging facilities. A more promising trend, as recent government data suggest, is that fewer young people are seeking driving licences in some developed countries (down 20% among UK under 25s, for example). This should result in lower private car ownership and fewer drivers on the road, though not necessarily in fewer rides taken. How these trade-offs play out is critical in evaluating the sustainability benefits of shared mobility, yet few comprehensive studies have been carried to assess these environmental costs versus benefits across the mobility sector.

Although social and technological sharing innovations may increase access to transport, there is an 'adaptive lag' in governance of sharing, leading to new problems

What are the key challenges faced by the shared mobility economy?

Synchronizing the existing yet under-realized low-carbon transport modes in cities with emerging technology-enabled sharing mobility business models can reduce traffic congestion, individual car and bike ownership, and parking demand. However, an initial problem with the app-based sharing economy was that little or no data, knowledge or other benefits (e.g., tax revenue) were shared with city governments. Data on rides and consumers has been considered proprietary by companies. Even when shared, there is also the question of how private data can be standardized, processed, and exchanged to provide insights for city planners and regulators at appropriate spatial and temporal scales and without violating individual privacy rights. To date, few platforms have evolved to facilitate such a public-private partnership in knowledge exchange, though Shared Streets (https://www.sharedstreets.io/) is an example of such an initiative. Without data sharing from the industry heavyweights on vehicle use patterns, it is difficult for cities to adapt to the rapid development of the sector and its impacts on traffic, road and parking infrastructure, other mobility services and the public good.

[4] *http://uk.businessinsider.com/uber-wants-uberpool-to-account-for-50-of-london-rides-2017-1*

Shared mobility innovations also have given birth to new spheres of commercial exchange in an evolving sociotechnical environment, leading to new roles for participants. Venture capitalists, traditionally not major players in transport, have been eager to finance app-based sharing business models that can efficiently capture the market of shared mobility services. To do so they have been willing to cultivate demand by flooding cities with an oversupply of vehicles and services, and by incentivising rides with subsidies. In the ride-hailing sector, this stimulation of demand, has leads to unnecessary, environmentally-harmful travel. Indeed, the most comprehensive study of this phenomenon to date suggests that a majority of Uber and Lyft rides would not have been taken at all--or taken by bike, foot, or public transport--if the app service was not available (Clewlow and Mishra 2017). These findings undermine claims that shared mobility leads to environmental sustainability gains.

Oversupply of both bikes and cars also creates material stress on public resources. City governments, in turn, have been slow and sometimes counterproductive in responding to these problems rather than incorporating technology-driven sharing benefits and needs into their planning and regulatory platforms. We refer to this governance gap as an 'adaptive lag.' The great cull of 300,000 free-floating bikes carried out by Shanghai's city government was a response to the abuse of public spaces as repositories for bikes, in a logic described by Garret Hardin (1968) as the 'Tragedy of the Commons' in which (un- or under-regulated) bike-sharing companies are motivated to put more bikes in the city commons because if they don't a competitor will.

At the same time, a rush of flexible labour has entered the shared mobility economy to meet this new demand, often as independent contractors in a growing 'gig' or freelance economy. 'Uberfication' has become synonymous with the casualization of labour in the era of neoliberalism in which workers in a range of sectors from transport to education become precarious "micro-entrepreneurs" with few employment rights, benefits, or public support (Hall 2016). Rapid growth of this precariat labour force in ride services leads to social, environmental and economic sustainability issues, and, at worst, a race to the bottom among freelancers trying to eke out a living amidst growing competition among drivers and service providers. Rather than a win-win strategy, this can quickly morph into a lose-lose prospect for the environment and society.

These social disruptions and adaptation challenges have raised fundamental questions about the new relations of production and consumption being fostered under the guise of the shared mobility economy. Transport for London's recent decision not to renew Uber's operating licence and concerns about vandalism, tragedies of the commons, and other anti-sharing behaviour accompanying the recent launch of free-floating bike-sharing schemes in major world cities, are emblematic of the security, civility, and sustainability concerns of the shared mobility sector in particular, but also of the technology-enhanced sharing economy more generally.

A collaborative governance regime to support win-win sustainability strategies in the shared mobility sector is needed between mobility companies, users and the public, and city governments

What adaptations are necessary to enable the new shared mobility sector to contribute to sustainable development goals, including climate mitigations?

Human adaptation is greatly facilitated by our mobility, communication and exchange which have enabled our species to inhabit every continent on Earth. Technologies like app-based mobility services extend these fundamental adaptive capacities beyond traditional limits. Yet they can also exaggerate expectations and exacerbate problems of congestion, exploitation, and insecurity precisely because they transcend traditional human spheres of interaction, where other social (e.g., norms and values) and environmental (e.g., material or physical limitations) constraints limit such distortions. This mismatch between a technology-enhanced capacity (progressing rapidly) and sociocultural adaptation (lagging behind) produces tensions and disruption. Ultimately this 'adaptation lag' is a governance problem, which can best be addressed by cities enhancing sharing on all sides of the collaborative governance triangle (Figure 1) to create an enabling environment for sustainable sharing.

How can cities get there?

Currently, some cities facilitate sharing practices directly, while others cede control to the private sector, non-governmental organizations, or neighbourhood communities. In Barcelona, for example, a non-profit sharing economy has been set up between the "Associació Salut I Familia" (Health and Family Association) and community neighbourhoods to "bank time" for those sharing time to help neighbours in need with everyday tasks. This time credit for service then can be redeemed from the time bank when the giver is in need of such services, thus fostering values of cooperation, reciprocity and solidarity (Barcelona City Council 2018, WEC 2018). To ensure similar sharing values and positive urban systems transformation towards climate and sustainability goals, city governments should lead in strengthening the role of sharing technology in social learning through enhanced engagement with both shared mobility businesses and civil society.

On the Government-to-Business side of the triangle this means, in exchange for government's provisioning, supporting and regulatory services (public infrastructure, licensing, policing, etc.) in the sharing mobility ecosystem, businesses must work with government (or an appropriate designee) to co-create and co-support an efficient data sharing platform on ride patterns, safety, and other critical metrics to inform urban planning and policies for secure, equitable, and sustainable transport.

On the Government-to-Society side, in exchange for ensuring the public good and adequate support for shared mobility, citizens must be encouraged to abide by codes of sharing conduct, including the care of public resources which may be used to host shared vehicles.

Finally, on the Business-to-Society side of the collaborative governance triangle, shared mobility companies must provide accessible, safe and sustainable mobility services without exploitative monetizing of consumers or drivers, while the latter agree to abide by codes of conduct for shared mobility that include reporting problems in services or sharing behaviour.

In addition to strengthening reciprocal sharing relations among the three key constituents in collaborative governance triangle, we suggest that intermediary organizations are necessary to support continued adaptation of sharing governance through co-learning, co-evolution, and the co-creation of value. Such intermediaries – mobility services business associations, drivers associations (among ride-hailing providers), and shared bike user groups (such as "The Hunters" in China who re-park mislaid shared bikes and perform other services to maintain the shared mobility services—Figure 2) – can contribute to successful collaborative governance.

Figure 2. Shared-bikes re-parked by Shanghai citizen volunteer group, known as 'The Hunters', in an orderly 'Hunters' Shield'.

Recognizing the two main drivers that have fuelled the phenomenal rise of app-based shared mobility —convenience and cost—adaptive governance needs to protect these dimensions while leveraging apps' abilities to pool information and facilitate exchange in order to align the shared mobility revolution with urgent climate, social, and economic policy objectives to transform carbon-intensive urban transportation systems towards sustainability.

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Green growth and win-win strategies for sustainable climate action (GREEN-WIN)

The GREEN-WIN Project identifies, develops and critically assesses win-win strategies, green business models and green growth pathways that bring short-term economic benefits, while also supporting mitigation and adaptation goals within the broader sustainable development agenda.

Work programme

↘ At national levels, GREEN-WIN analyses win-win opportunities that arise through integrating policies across different sectors, and advances state-of-the-art macro-economic models in order to identify green growth pathways.

↘ At local levels, GREEN-WIN carries out action research case studies to develop green business models and enabling environments in the following three areas: i) coastal flood risk management in Jakarta, Kiel, Rotterdam and Shanghai; ii) transformations in urban systems in Barcelona, Istanbul, Shanghai and Venice; and iii) energy poverty and climate-resilient livelihoods with case studies in India, Indonesia and South Africa.

↘ Cutting across both levels, GREEN-WIN investigates financial products and policies, as well as financial system reforms that redirect financial flows towards sustainability and climate action.

↘ All of these activities are embedded in an open dialogue between research institutes, international organisations, business, and civil society that co-develops shared narratives around win-win strategies, business opportunities and green growth pathways

Project partners

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