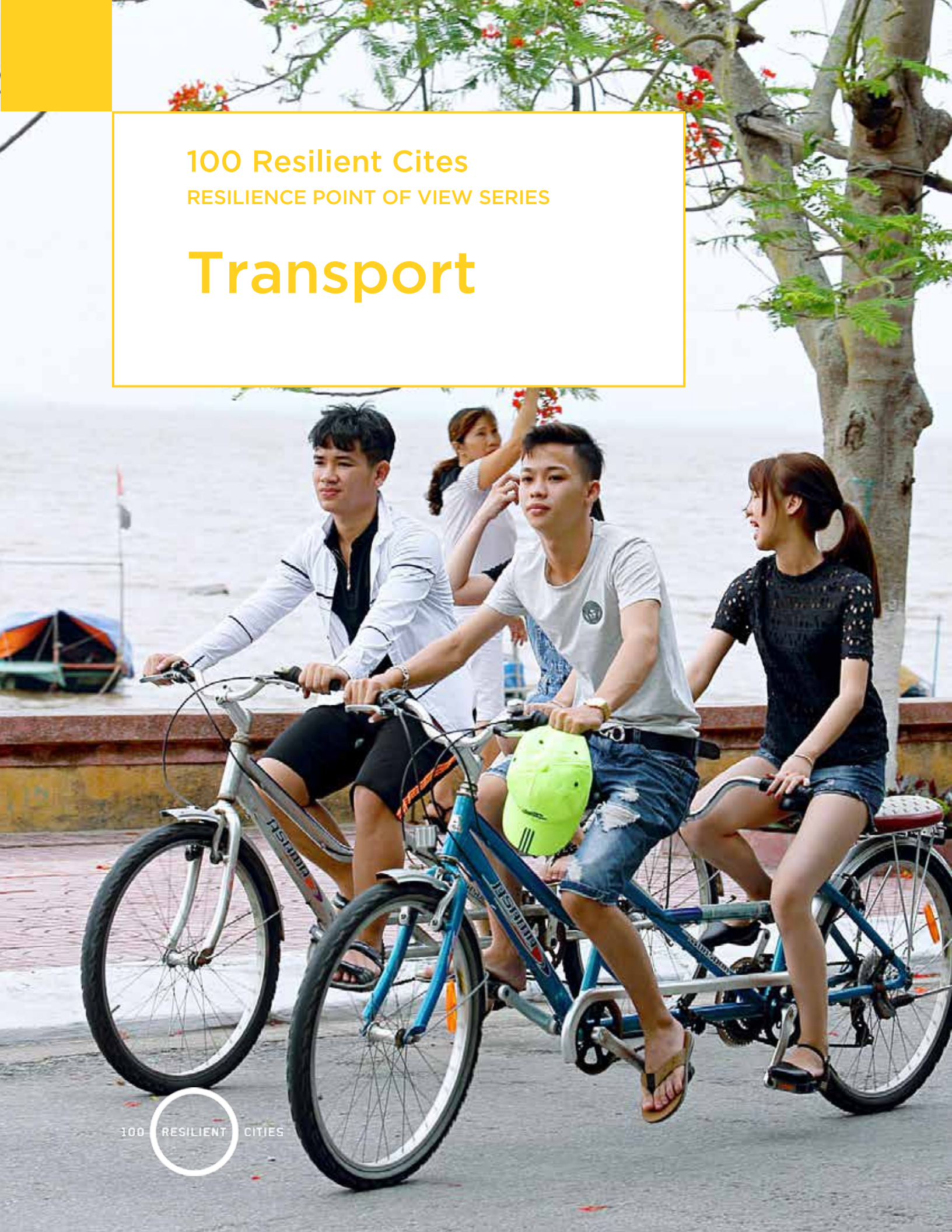
100 Resilient Cites

RESILIENCE POINT OF VIEW SERIES

Transport



100 RESILIENT CITIES

During its five years of operations, the 100 Resilient Cities program supported the participating city governments to prepare city-wide resilience strategies for each city. During these strategy development efforts, city governments and their stakeholders considered and prioritized a full range of urban risks and vulnerabilities, which spanned each city's diverse communities, places, economic sectors, and operations.

As the strategy processes established each city's resilience priorities and action areas, 100RC staff, together with 100RC's 115 Platform Partners and scores of Subject Matter Advisors, provided further domain specific support to the cities' relevant technical and managerial counterparts and stakeholders. These focused efforts led to the preparation of domain specific resilience frameworks and approaches. These approaches are now being summarized in this 100RC *Resilience Point of View* series.

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The Transportation Resilience Challenge

Transportation is the backbone of the modern economy and society. The importance of transportation is reflected in the sheer scale of investment that the global economy dedicates to building transportation infrastructure, which the Organization for Economic Co-operation and Development (OECD) has estimated at approximately $2.7 trillion per year between 2016 and 2030. At its most basic level, transportation is the infrastructure and assets that cities provide to allow people to get to their jobs, to school, receive healthcare, and have access to social, political, and religious activities; and for goods to move from place to place as they are designed, components are assembled, delivered to a customer, and finally deposited for disposal. In other words, transportation enables mobility, via different modes of mobility – and the ultimate objective of mobility is not the ability to travel in itself, but accessibility, which is the ability to get to a final destination.

There have been both positive and negative sides to the progress made in transportation. While motorized modes of transportation have played a key role allowing cities to become industrialized, expand, and grow, and have fueled global prosperity by enabling international trade, they remain among the largest contributors to climate change, air pollution, and local health problems, and the growth of urban populations is placing serious pressure on many transportation systems. Moreover, as cities' and regions' transportation systems have grown, the governance and decision-making around transportation has fragmented, and for many cities there is a lack of alignment between the owners and managers of transportation infrastructure and those who make budgetary and policy decisions.

100RC believes that cities and their urban transportation systems could and should be better prepared to deal with the shocks and stresses of today and the future in order to provide their citizens, in particular the most vulnerable, and future generations with a high quality of life. 100RC posits that the main challenges to cities today can be grouped into three main issues: urbanization, globalization, and climate change.

Rapid Urbanization

The United Nations (UN) reports that today more than half the world's population lives in urban areas, and that is expected to increase to 68% by 2050. In many of the developed countries and cities where the urban population is growing, aging transportation infrastructure is facing the challenge of needing to modernize while keeping up with necessary maintenance and renewal to handle demand; citizens have demanded more accessible, people-centric transportation solutions rather than car-centric policies; and an aging population will mean that transportation systems will need to become much more inclusive and designed for many abilities. In many of the developing countries where urban growth is explosive, in particular in South-east and South Asia and Africa, much of the needed transportation infrastructure has not yet been built. The challenges faced there are to avoid the unsuccessful model of car-centric development in the developed world, which causes traffic congestion, contributes to air pollution and local health problems, contributes to growing economic and social inequality in cities, and is a major emitter of greenhouse gas emissions.

Globalization

The globally connected world presents both challenges and opportunities for the transportation sector and mobility in cities. The rise of the global economy, driven in large part by the availability of transportation modes, has meant more movement of people and goods internationally, relying heavily on air, shipping, and long-distance trucking which are major emitters of greenhouse gases. Locally, the rise of online shopping and convenient delivery services have meant more delivery vehicles on congested roads and challenges to already limited road space. It has also enabled new players in the field of mobility, data and technology to provide new solutions – some of which have promise such as remote working/communications software to reduce unnecessary commutes, but some, such as Uber and Lyft, have caused disruption to cities' established transportation systems.

Climate Change

The Fifth Assessment Report from the Intergovernmental Panel on Climate Change states that rising global temperatures and extreme weather events are clearly having an impact on cities and transportation systems as extreme storms and rainfall, tsunamis, and other natural disasters damage infrastructure and affect lives. In densely populated cities the physical impact of an event is exacerbated by the sheer number of people whose lives, homes, and livelihoods are at risk. And in the highly interconnected, globalized world the impact is not simply local on the infrastructure and people, but also global in terms of impact on the world economy and geopolitics. Damage to transportation is a key factor in amplifying the impact of a climate-related event, and therefore points to the need within the sector to create infrastructure that will provide protection and effective recovery.

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Defining Resilience

Defining Urban Resilience

In the context of these three mega-trends, 100RC's mission is to help cities chart a path toward building a more resilient future, one that takes into account the inevitable and unpredictable disruptions, as well as the known long-term risks, by helping cities plan and invest in a strategic way for the benefit of all their residents, in particular the most vulnerable who are the least resourced to recover from crises.

100RC defines urban resilience as the capacity of individuals, communities, institutions, businesses, and systems within a city to survive, adapt, and grow no matter what kinds of chronic stresses and acute shocks they experience. This definition lays out the complexity of cities and therefore the complexity of trying to build urban resilience:

- Cities are constituted by many different types of stakeholders.
- Cities are a system of systems such as water, energy, transportation, food, and buildings.
- Cities, and therefore their stakeholders and systems, are impacted by the unique context of the city – each city's unique geography, history, and the three trends described above – which in turn determine the stresses and shocks experienced.

Building urban resilience requires a conceptual understanding that all these elements, systems, and context are interconnected, and that cities should focus on designing solutions that take into account all these different elements in order to deliver multiple benefits but also mitigate unintended consequences where possible. The foundational framework that 100RC uses to help maintain a holistic, comprehensive view when thinking about solutions is the City Resilience Framework, co-developed by the Rockefeller Foundation and global design firm Arup. It aims to organize everything that a city does into four "dimensions" of Health & Wellbeing; Economy & Society; Infrastructure & Environment; and Leadership & Strategy. Within each dimension are three "drivers" of a city's resilience that cities should be taking action on, and these are elaborated by a number of "sub-drivers." This framework is used together with 100RC's categorization of shocks and stresses and characterization of the "qualities" of resilient urban systems to help guide the organization's work with cities.

Defining Resilience in the Transportation Sector

Given the propositions above, the following definition of resilience in the transportation sector is offered to start a conversation about how resilience can practically be applied to this sector.

A resilient transportation system is one that promotes safe, equitable, and inclusive accessibility by providing sustainable, integrated, flexible, and robust mobility options – during normal times and times of crisis.

"Safe, equitable, and inclusive accessibility," refers to a system's key performance objectives. These should be to provide people and goods with the ability to plan a journey and reach their destinations safely, affordably, and using the most appropriate mode possible based on needs (e.g., families, people who use wheelchairs, people with hearing or vision loss). "Sustainable, integrated, flexible, and robust," refers to the qualities of the transportation infrastructure. Transportation is one of the most polluting sectors in the world, and infrastructure must draw upon sustainable energy and material sources to minimize its overall environmental impact. Transportation infrastructure should be integrated in three ways: i) all modes of transportation available in the city should be highly integrated, allowing for easy transfers between modes; ii) the system should be highly integrated with the operations of other urban systems such as energy, waste, and water management; and iii) the ongoing operations and planning of the transportation system should be integrated with ongoing strategic land use and economic development planning of the city. Transportation systems that are designed in a highly integrated way have inherent flexibility for their users, as travelers will have multiple options for planning their journeys. But transportation infrastructure can also provide flexibility in terms of multiple uses of transportation assets, especially during times of disaster. A multi-modal hub could provide somewhere to shelter in place during a storm, or a cooling or water center in times of extreme temperatures. Finally, "robust," means a system that is designed, operated, and maintained with known environmental, social, market, and demographic risks in mind, and therefore is able to fail safely, or minimize failure at all.

3 Resilience in the current transportation sector context

There is no commonly agreed upon definition of "resilience" in transportation, but there is a growing body of work on the topic of adaptation of transportation infrastructure and assets in the face of climate change and other risks. One important global body, the Global Facility for Disaster Risk and Recovery (GFDRR), managed by the World Bank, defines "resilient transportation" in terms of resilience against disaster or climate-related hazards. Their objective in tackling disaster risk management (DRM) and transportation is to "integrate the priorities and needs of both sectors – [establishing] robust resilient transportation systems…to reduce the risk of lost returns on investments and make strides towards long-term poverty reduction." Their approach embodies a best-in-class framework for ensuring the reliability of a robust transportation infrastructure through scientific understanding of current risks; systems planning to offer alternative routes and modes of transportation; engineering and design using innovative materials and design specifications; asset inventory, mapping, and integration of risks into future new investments to enable better asset management; and better emergency preparedness and response processes and systems. These principles are similar to the lessons learned by many cities whose transport infrastructure have been significantly impacted by natural disasters.

On the other hand, it could be argued that many cities in their ongoing efforts to manage their transportation, mobility, and accessibility needs are also building "resilient transportation systems." Cities are promoting principles of compact cities, smart growth or "transport-oriented development" (TOD) – reducing the need for travel by densifying land use, and mixing types of uses and residences, both market-rate and affordable, and ensuring easy accessibility to public transportation as the main mode of mobility. Some are experimenting with policies to reduce car use by creating car-free zones, shared streets, limiting parking, and promoting other modes. Cities are also simultaneously tackling air pollution and emissions concerns by promoting non-motorized modes where possible and converting to electric fleets or promoting electric vehicles. Some cities are providing free public transportation to some or all residents, as in the case of the city of Tallinn or the country Luxembourg. And others are planning for a future of connected and automated vehicles.

Building resilience in the transportation system requires integrated thinking across these and other perspectives. Given the order of magnitude of transportation investments and the longevity of the infrastructure and technological "lock-in," it makes sense for cities to ensure that they take into account known and unknown future risks and are intentional in the ways these investments will contribute to delivering improved quality of life for citizens.

4 100RC's approach to delivering a resilient transportation sector

Resilience in a city's transportation system will look different from one city to the next, and there are two main ways of achieving this vision of resilience in transportation: by designing in resilience within the transportation system itself, and by finding ways to leverage the transportation system to deliver multiple benefits in a city. Both these approaches require engaging with diverse stakeholders in an inclusive process, integrating planning efforts, managing risk and uncertainty, continuously learning, and adapting to feedback. Project owners should ensure that solutions deliver reliable performance and minimize unintended consequences while also proactively creating co-benefits.

Creating a Vision and Strategy Toward a Resilient Transportation System

The first crucial step for cities that aspire to deliver a resilient transportation system will be to set out a coherent vision and strategy that looks at all infrastructure, assets, networks, modes, and users as a single system for a defined period. The vision should lay out what a future mobility system that provides safe, equitable, and inclusive accessibility by providing sustainable, integrated, flexible, and robust mobility options, during normal times and times of crisis, means for a city by identifying key priorities for the city's transportation system to deliver. Whether the priority is to increase the proportion of students who can get to school by public transportation, walking, or cycling; to increase the proportion of elderly who can access more public transportation modes; or to reduce commute times for the lowest 10% of earners, having a clear idea of what objectives – both transportation and broader – cities are trying to achieve will help focus cities' efforts to provide transportation systems that meet people's needs.

The vision should be backed by transparent data and evidence, align with a city's overall vision for growth and development, and be laid out in a resilient transportation strategy that includes:

- A comprehensive picture of the city's current transportation, mobility, and logistics assets and infrastructure. This could include all the modes that are used today, public and private, formal and informal; the associated infrastructure and assets (e.g., number of cars, buses, ferries, trains, taxis; length and geography of roads, railways, cycleways); and the geography/coverage of current modes.
- A picture of the city's current and potential future mobility and accessibility needs. This should include current and projected social, economic, and existing trip data and information, and identify major land uses, such as residential areas, business districts, or other health or social services. This should also include future scenarios as reference points.

- A risk assessment that identifies current and future known and unknown risks, such as climate, demographic, economic, and technological risks to transportation infrastructure and mobility patterns; and lays out the probabilities, vulnerabilities, and impacts to infrastructure and mobility patterns.

- A map of all the transportation stakeholders that operate within the city's transportation system, with defined roles for each in implementing the city's resilient transportation strategy. In the absence of a single transportation authority such as Transport for London or Singapore's Land Transport Authority with the mandate to roll out a single plan or policy across all modes, topical advisory committees could be established that are assembled members of different authorities and departments to get buy-in and develop a single or coordinated plans or policies that would be agreed upon across these entities.

- A performance management and data collection strategy – with performance indicators that align with the city's resilient transportation vision and objectives, and a plan for collecting different types of feedback to allow the system to learn and adapt to changing needs.

- A commitment to making priority investment decisions against this vision and strategy, and transparently communicating future investments to all stakeholders and the public.

- A commitment to reporting on a regular basis against the performance indicators in an accessible format, and updating the vision and strategy as needed.

Leveraging Transportation Investments to Deliver Multiple Benefits

Resilience can also be delivered through specific transportation projects. By incorporating risk assessments, innovative design specifications, better systems planning, contingency planning, and asset management into the scope of the investment a transportation project can provide reliable performance in the face of a natural disaster, which is of huge benefit to a city especially in the post-disaster recovery phase. In addition, transportation infrastructure investments themselves create new economic and social value, and by finding appropriate ways to capture this value a city can reap these benefits and redistribute them as necessary. Thirdly, transportation projects tend to be very narrowly defined and siloed, hence linking a scope of a transportation project more broadly with other city priorities – such as increasing public green space, redeveloping post-industrial neighborhoods, or supporting access to jobs – can enable the city to maximize the impact of this critical investment.

5 Conclusion

Resilient transportation is a key facet of building resilience in a city as a whole. A transportation system that can help build resilience will take into account a number of factors that allow the system to provide multiple benefits today, while also strategically making investments for the future.

This relies on having a clear vision and strategy for a resilient transportation system, inclusively engaging with a diverse range of stakeholders to deliver this vision, and executing the vision in a transparent and accountable way.

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