

Decision-Making for Alternative Futures

Applying *Scenario Planning*
to create resilient strategies
in a time of rapid change

PART 1 – SCENARIO DEVELOPMENT

PART 2 – SYSTEM DYNAMICS

PART 3 – MODELLING



Foreword



Diverse trends are impacting the world we live in, creating complex and uncertain outcomes. These disruptive influencers include automation and digitization of industry, emerging business models, urbanization, changing generational behaviours, climate change and shifting global dynamics—all challenging our ability to make decisions today that will enable us to succeed into the future.

How do we make sound decisions in the midst of rapid change? How can we comprehend all the events affecting our planning capabilities? How will we reach the best decisions that address future realities?

Through Scenario Planning, we pose the profound questions that force us to consider the unexpected and examine trends from a multitude of perspectives to attain clarity. Scenario Planning creates a situational framework to apply expert human thought, utilizing quantitative and qualitative analysis of potential event impact. This process enables us to predetermine which actions will endure through a wide range of possible futures.

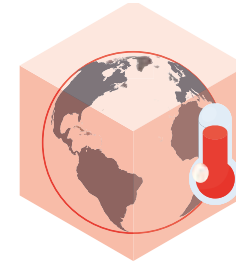
Rather than establishing actions based on historical outcomes, Scenario Planning harnesses our ability to think from a “what if” perspective. What if the trajectory of a trend deviates from what we already know and what we expect? Where will this new trend make the biggest impact? What major changes will result? Who will benefit from or be impacted by such changes? These and other key questions help us prepare today for tomorrow’s uncertainty.

We have already found that this Scenario Planning approach successfully informs new mobility challenges, as well as transport, business planning, urban planning and sustainability efforts throughout the world. Benefits of Scenario Planning include recognizing relevant strategic methods in the planning process, identifying impacts from the integration of connected and automated vehicles, developing plausible scenarios to inform city planners, and positioning communities to address issues related to economic growth and digitization.

As WSP continues to advance resilient thinking globally, we look forward to supporting your sustained growth towards both envisioned and unimagined futures.

We hope you have read our [New Mobility Now](#) report that provides the foundation for the WSP Scenario Planning Toolbox. If you are interested in learning more about our future-ready Scenario Planning process, please contact the WSP team at NewMobility@wsp.com.

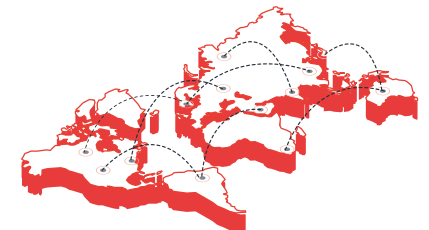
David McAlister
Global Director Transport & Infrastructure



A Changing Climate

What if climate change threatens the existence of the places where we live?

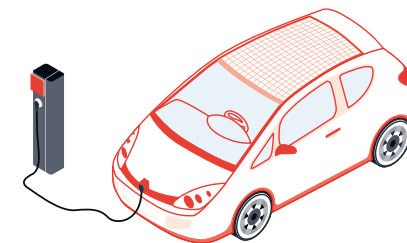
What segments of the population will be most vulnerable to the impacts of climate change?



A Changing Global Order

How will shifting global dynamics impact the way we conduct business?

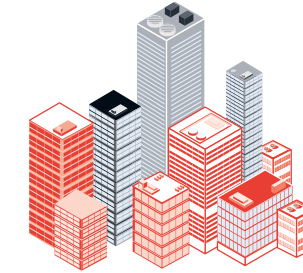
What does the changing global order mean for the competitiveness of our cities and regions?



A Push Towards Electric

How can we effectively use electrification to accelerate decarbonization?

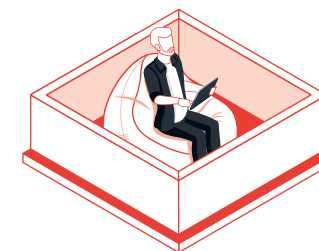
What if the road to electrification is stalled by dwindling battery production resources?



A Growing Urban Population

What does a growing urban population mean for disparity of wealth?

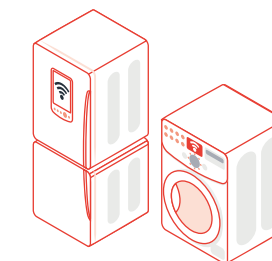
What if our infrastructure and services are unable to keep pace with the growing needs of this urban population?



A More Isolated Population

What if future technologies and innovations contribute to further social isolation?

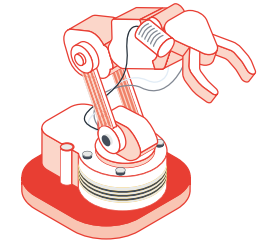
What if growing social isolation becomes the next major health epidemic?



An Internet of Things (IoT)

What if IoT can make our daily interactions seamless?

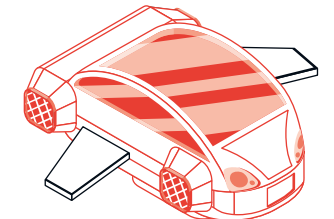
How can we ensure that increased connectivity does not mean increased vulnerability to cyber attacks?



A Race Towards Automation

What if automation leads to greater efficiency, but also quicker depletion of resources?

How can we ensure that automation results in employment shift, rather than employment loss?



A New Age of Aerial Transport

What if aerial transport can be leveraged to alleviate congestion and goods movement challenges?

How can aerial transport be safely and securely integrated into urban environments?



A Growing Gig Economy

How do we accommodate the movement of people through our cities and regions if the gig economy becomes the norm?

What if the gig economy erodes protections traditionally afforded to workers?

THE WSP TOOLBOX: PREPARING FOR UNCERTAINTY

In Scenario Planning, exploratory scenarios are used to help practitioners better understand the implications of emerging trends and plan for possible future conditions. The goal of these scenarios is to understand the potential impact of different plausible futures on actions and policies of today, rather than to select a desired outcome or an expected future.

In the past, Scenario Planning was predominantly used by the private sector to guide strategic business planning decisions. Increasingly, its use has expanded to governments and organizations of all types around the world. Scenario Planning is gaining recognition as a flexible means for exploring open-ended challenges, and as a way of thinking that can be applied to a variety of functions, including:

- Policy Development and Strategy
- Investment Decision Support
- Operations Planning
- Design
- Modelling and Simulation

Scenario Planning is intended to complement traditional planning processes, rather than replace them. Planning practitioners and strategists are accustomed to planning for where we think the future will go, or where we want the future to go—and those processes remain critical to setting the vision and basis for planning and investment decisions. Whether applied to new mobility, any other area in transport, business planning, urban planning or sustainability across diverse sectors, Scenario Planning introduces another dimension to the conventional approach, enabling us to prepare for changing winds that may blow us off course from the future we envisioned.

Looking forward while acting today, WSP firmly believes that Scenario Planning will better position us to prepare our communities, cities and regions for the future.

Our global network of forward-thinking professionals has worked collaboratively to develop a structured Scenario Planning process and set of tools for investigating changing trends, while crafting scenarios to better understand the interactive mechanics between trends. The WSP Scenario Planning Toolbox enables both qualitative and quantitative analysis of implications and can be tailored effectively and efficiently across a variety of geographies and contexts. The Toolbox is comprised of three parts, as follows:

1. Scenario Development aids in the identification and tracking of global trends, the development of exploratory and alternative future scenarios, and the formulation and selection of potential strategies and actions.

2. System Dynamics builds on scenario development to provide deeper exploration of trends, including quantification of interactions or causal relationships.

3. Modelling and simulation informed by parameters established by scenario development and system dynamics processes.

*In this publication, we focus on
part 1 – Scenario Development*

Fundamentally, Scenario Planning is a process, rather than an outcome. It is a process involving collaborative thinking to respond to future challenges and opportunities. WSP's approach is based on four key pillars:

THINK OUTSIDE THE BOX

Scenario Planning is about broadening perspectives; it provides an opportunity for practitioners to look beyond typical day-to-day problems. We take a structured approach to helping our clients think outside the box in order to explore a broader array of considerations.

BREAK DOWN SILOS

Problems affecting our cities are increasingly complex and require comprehensive responses. One core strength of Scenario Planning is that it provides a framework for cross-disciplinary collaboration. The scenario generation workshops that we have facilitated provide an open and creative space for collaboration.

MAKE SENSE OF THE ABSTRACT

Scenarios can be abstract and difficult to understand. Our Scenario Planning process has been developed to make scenarios more compatible with conventional analysis approaches and easier to understand. Our tools build on familiar quantitative and qualitative analysis tools in order to create a more seamless process.

THINK FORWARD, ACT TODAY

Scenarios are disposable and, like many projections, may inevitably be wrong. The alternative futures we create should be plausible, but they do not need to be correct. We need to understand which actions taken today will be the most resilient across a range of plausible futures.





SCENARIO DEVELOPMENT

The first of the three-part process, Scenario Development, features a flexible set of tools that can interact with a wide range of qualitative and quantitative data, depending on project needs, whether relating to new mobility, any other area in transport, business planning, urban planning or sustainability across diverse sectors. Perhaps the most fundamental challenge for any traditional modelling or simulation effort is understanding what should be modelled and what ranges of variables should be considered, given the scale of uncertainty and potential change. Scenario Development is one way to develop a clear set of parameters, enabling effective modelling and quantitative analysis. In what ways might the population change? How might prices fluctuate? How might various populations or consumer groups respond? WSP's Scenario Planning process relies on Scenario Development to help answer these questions and to provide the context, relationships and limits required as input into System Dynamics and Modelling analyses, which form parts 2 and 3 of the Scenario Planning Toolbox.

Scenario Development at WSP is conducted in five key steps:

1. Trend Analysis

Research and exploration of trends, according to likelihood, impact and certainty, in order to select appropriate starting anchor points for scenario generation.

2. Scenario Generation

Development of scenarios from anchor points based on known and perceivable trend interactions and relationships.

3. Implications for Action

Screening of scenarios for potential opportunities, challenges and associated actions across key project-specific areas of impact.

4. Validation with Experts

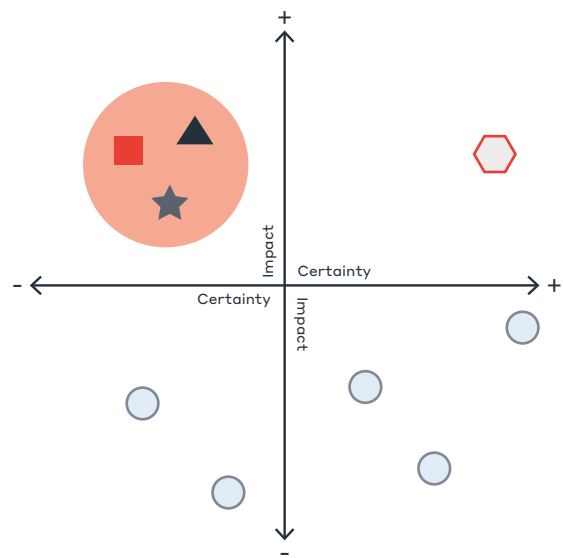
Consultation with a cross-disciplinary panel of experts to validate assumptions behind the internal logic and implications of the scenarios.

5. Resilience Analysis

Assessment of the potential effectiveness of proposed solutions in addressing implications posed by the scenarios, according to a combination of quantitative and qualitative measures.

A WALK THROUGH THE SCENARIO DEVELOPMENT PROCESS

■ Trend A ★ Trend B ▲ Trend C ◊ Trend D ○ Trend x



1

Trend Analysis

The first step is to analyze and sift through trends to determine appropriate anchors for the scenario. One approach we use is the "Impact and Certainty" analysis.

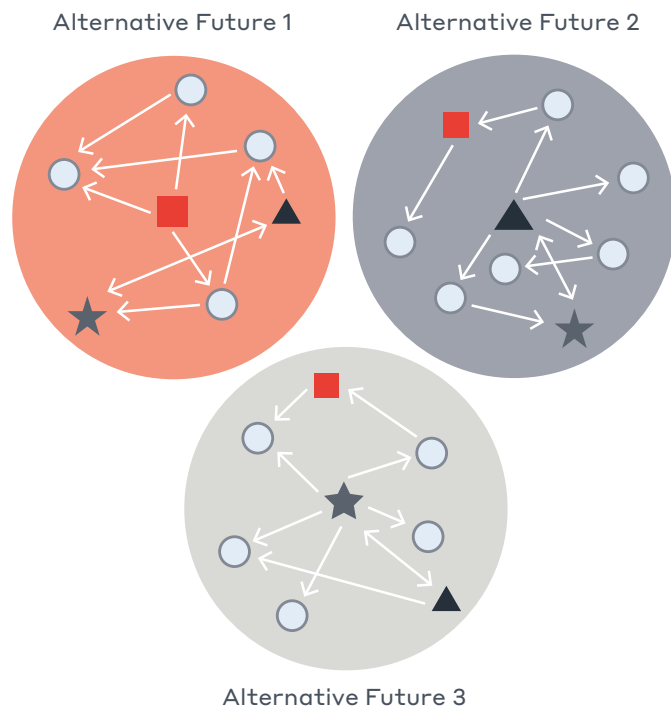
Different degrees of impact and uncertainty necessitate different responses. Trends that have high impact and high certainty should be considered as part of core assumptions in planning for the future. Trends that have high impact but low certainty could introduce variations in how to plan for the future, and are what we need to focus on exploring further through Scenario Planning.

2

Scenario Generation

Scenarios are then generated from a shortlisted number of trends, used as anchor points for different alternative futures.

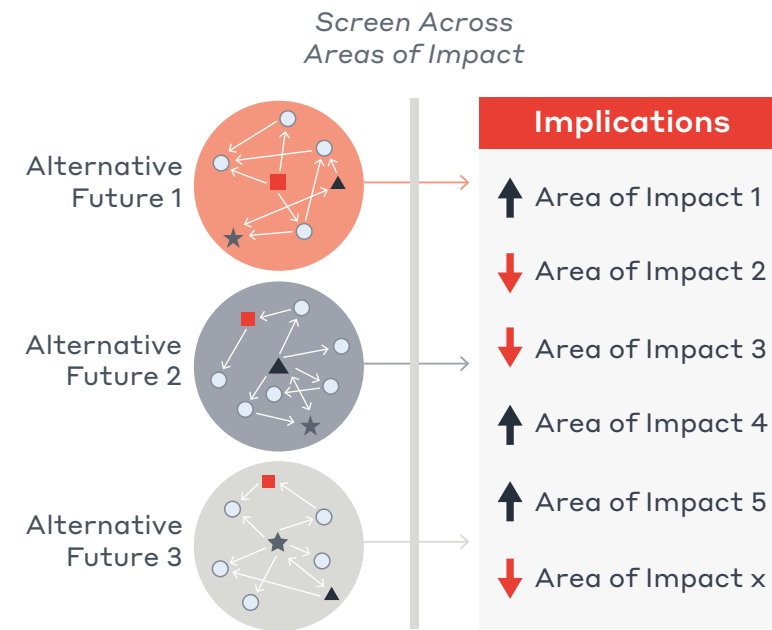
Scenario generation relies on an understanding of interrelationships between trends and other areas of impact. It provides a preliminary mapping of the dynamics within each alternative future ecosystem, and serves as a precursor to System Dynamics in part 2 of the Scenario Planning Toolbox.



3

Implications for Action

The alternative future scenarios are then screened through a series of areas of impact to identify key implications. This step is two-fold: the first task is to identify opportunities and challenges that warrant a response; the second is to determine necessary changes to model parameters where quantitative analysis is involved. Considering both opportunities and challenges posed by each of the alternative scenarios, strategies can be developed to address and leverage specific implications.



4

Validation with Experts

Consultation with a multi-disciplinary panel of experts is conducted to ensure that the assumptions around the various alternative futures and their respective implications are sound.

WSP employs and works with a broad range of experts and can help to assemble the expertise required to facilitate this validation process.

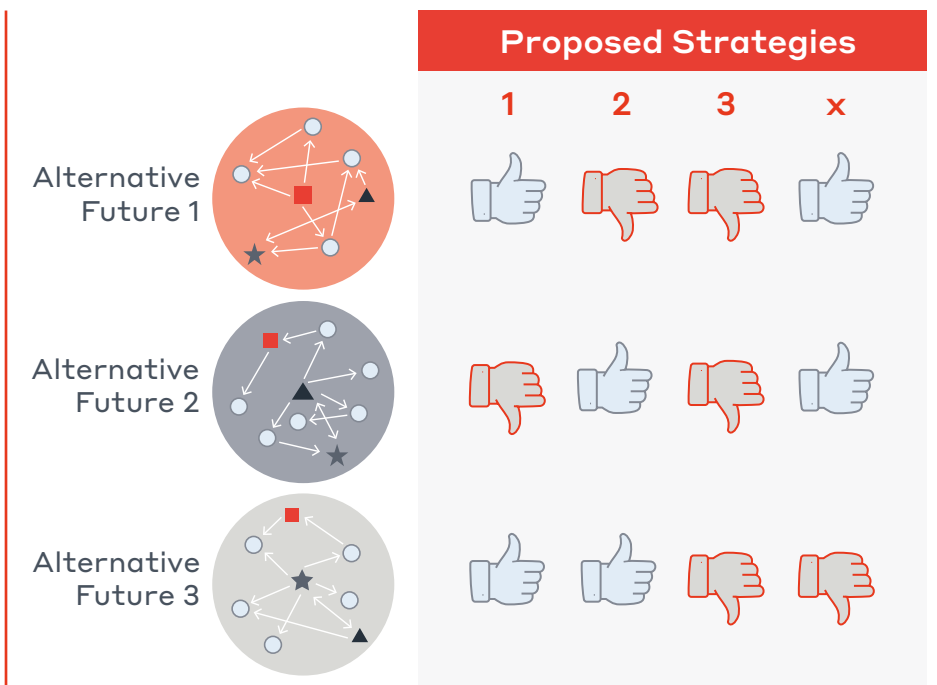


5

Resilience Analysis

Relying on a combination of quantitative and qualitative analysis outputs, the alternative future scenarios are used as a lens through which proposed strategies are evaluated.

WSP has developed a resilience analysis framework to aggregate the results of this evaluation into a combined assessment of resilience. The framework highlights proposed strategies that are most suitable for making plans that are effective regardless of what the future brings.



SCENARIO DEVELOPMENT IN ACTION

Around the world, WSP is actively working with clients to navigate the opportunities and challenges of emerging trends, while identifying actions that can be taken today to help develop resilience in the face of an uncertain future. Here we present several examples of key projects and use cases from the transport sector, and more particularly new mobility, where WSP has put the Scenario Planning Toolbox into action and has applied the Scenario Development process—part 1 of the Toolbox.

CANADA

“The Greater Toronto and Hamilton Area is undergoing a period of rapid population growth. Metrolinx, the regional transportation agency, has been working with its local partners to plan and implement projects, policies and programs that meet the region’s evolving needs. In support of the agency’s update to the regional transportation plan in 2016-2018, WSP guided Metrolinx through a Scenario Planning process to help ensure that the actions put forward are resilient to a number of different alternative future scenarios. Drawing from trends identified alongside Metrolinx through workshops and validated by a thought-leader panel, WSP crafted a set of six scenarios, anchored on themes of an on-demand economy, extreme climate change, concentration of growth in select core areas, rapid adoption of emerging technologies and economic decline. By applying WSP’s Resilience Analysis framework, we were able to help elevate the importance of strategic approaches to the regional transportation plan that would have otherwise received less attention, such as investment in improving operational performance and land use integration.”

Kitty Chiu
Transportation Planner – Urban Mobility
WSP Canada

UNITED STATES

“Recognizing the rapid changes in technologies emerging out of the transportation sector, the Minnesota Department of Transportation (MnDOT) has initiated a Connected and Automated Vehicles (CAVs) Strategic Plan to identify key strategies for addressing opportunities and challenges arising out of the connected, automated, shared and electric vehicle space. Using a selection of Scenario Development tools out of the Scenario Planning Toolbox, WSP is helping to identify possible futures for how CAVs might affect the Minnesota transportation system. In addition to providing a better understanding of a range of potential CAV futures, the scenarios also support decision-making on current and future long-range planning, regulatory, programming, design, operations and business planning efforts. WSP will focus on developing CAV recommendations with key actions to address questions associated with nine major topics: Statewide Approach, Long-Range Planning, Immediate Capital Investments, Research and Development, Regulation, Operations, Strategic Staffing, Multimodal and Communication.”

Scott Shogan
Vice President and Connected/Automated Vehicle Market Leader – Advisory Services
WSP USA

UNITED KINGDOM

“In the UK, WSP has been using Scenario Planning to inform medium and long-term transport and mobility challenges. These have ranged from examining the impacts of disruptions—such as automation and electrification—on investment priorities at a local level through to examining scenario levers, such as regulation, technology cost and the willingness to use shared mobility services, and how they impact wider trends. Through the use of Scenario Development tools from the WSP Scenario Planning Toolbox, underpinned by robust trajectory evidence, we have developed plausible scenarios to inform decision-makers and planners. Scenario Planning is a central part of our approach to future mobility and provides the opportunity to help move beyond reactive methods towards a more visionary approach to mobility planning.”

Giles Perkins
Technical Director – Future Mobility
WSP UK



AUSTRALIA

“To support mass rollout of Automated Vehicles (AVs) and Zero Emission Vehicles (ZEVs) and to ensure greater connectivity associated with AVs, Infrastructure Victoria has engaged WSP to research and advise on potential Information and Communication Technology (ICT) infrastructure requirements to enable the operation of highly automated vehicles. Additionally, WSP has been engaged to respond to ownership and market models that may emerge as a result of the availability of highly automated vehicles, and to accommodate ZEVs as a high proportion of the Victoria market. WSP assessed and analyzed potential impacts on ICT infrastructure across seven future scenarios developed by Infrastructure Victoria, which included a combination of different times, driving modes, power sources and ownership/ market model options. Leveraging WSP’s breadth of experience in planning and analysis, and importantly knowledge of real world deployment, we provided input to ground the underlying assumptions and create a better understanding of the scenarios. This enabled us to effectively advise on minimal and optimal ICT requirements, gaps between existing and planned ICT infrastructure, as well as enablers, barriers, opportunities and risks within the scenarios. Additionally, infrastructure responses for potential AV uptake scenarios were identified for each scenario. This work is helping Infrastructure Victoria to be prepared for a range of futures and to position themselves to address the various conditions that may arise.”

Scott Benjamin
Technical Director – Intelligent Transport Systems
WSP Australia

SWEDEN

“WSP is currently leading the Future City Project for Sweden, which focuses on developing and analyzing a number of urban planning scenarios for 2030. Using tools from the WSP Scenario Planning Toolbox, three workshops were held to enable participants from the public and private sectors, such as municipalities, traffic agencies, consultancies and local businesses, to contribute to the Scenario Development process. Throughout the workshops, WSP guided participants towards determining the level of influence and certainty across a series of trends. Scenarios were developed through trend consolidation, taking into consideration the effects of economic growth and digitization. From the scenarios developed, possible implications characterized by the scale of impact (small/ medium/ large), the timing of impact (within the next 3 to 10 years/ 11 to 20 years/ 21 + years) and the scale of influence (individuals/ city/ municipality/ region/ society) were identified in order to prepare the participants for corresponding action. While the project is still processing results of the third workshop, this work will ultimately allow the participants to be better positioned to manage potential outcomes in the Future City, specifically as they relate to economic growth and digitization.”

Daniel Mattisson
Market Analyst – City Development
WSP Sweden

FIRST STEP TOWARDS RESILIENCE



The Scenario Development tools in our Toolbox are flexible and, as exemplified by our selection of project examples and use cases, are adaptable to different geographies and contexts. Our process gives structure to an otherwise complex environment, making it easier to think through what emerging trends might mean for the future and to kick-start the process of figuring out appropriate strategies and actions.

Scenario Development is an important first step on the path towards resilient strategies and plans for the future. The ability to make sense of complex interactions between trends enables us to better grapple with further analysis and exploration that needs to take place. Modelling and other forms of quantitative analysis are important to ensure that our thinking on future implications is grounded in sound science, research and mathematical mechanics. However, sophisticated modelling techniques tend to be resource-intensive and are also limited by the quality of the assumptions behind key inputs. A thorough understanding of potential scenarios and where the greatest points of uncertainty exist allows us to focus attention on unpacking the most challenging of trends and interactions, and dedicate resources towards analyzing conditions that provide the greatest insight into what needs to be done in preparation for the future.

Scenario Development. System Dynamics. Modelling. These three parts of the Toolbox are complementary and follow one after the other. Scenario Development begins the process of exploring potential future conditions. System Dynamics and Modelling take this further by injecting robust analytical techniques to provide further clarity and to allow us to be better positioned to identify resilient strategies and actions for the future.

A LOOK AHEAD AT SYSTEM DYNAMICS

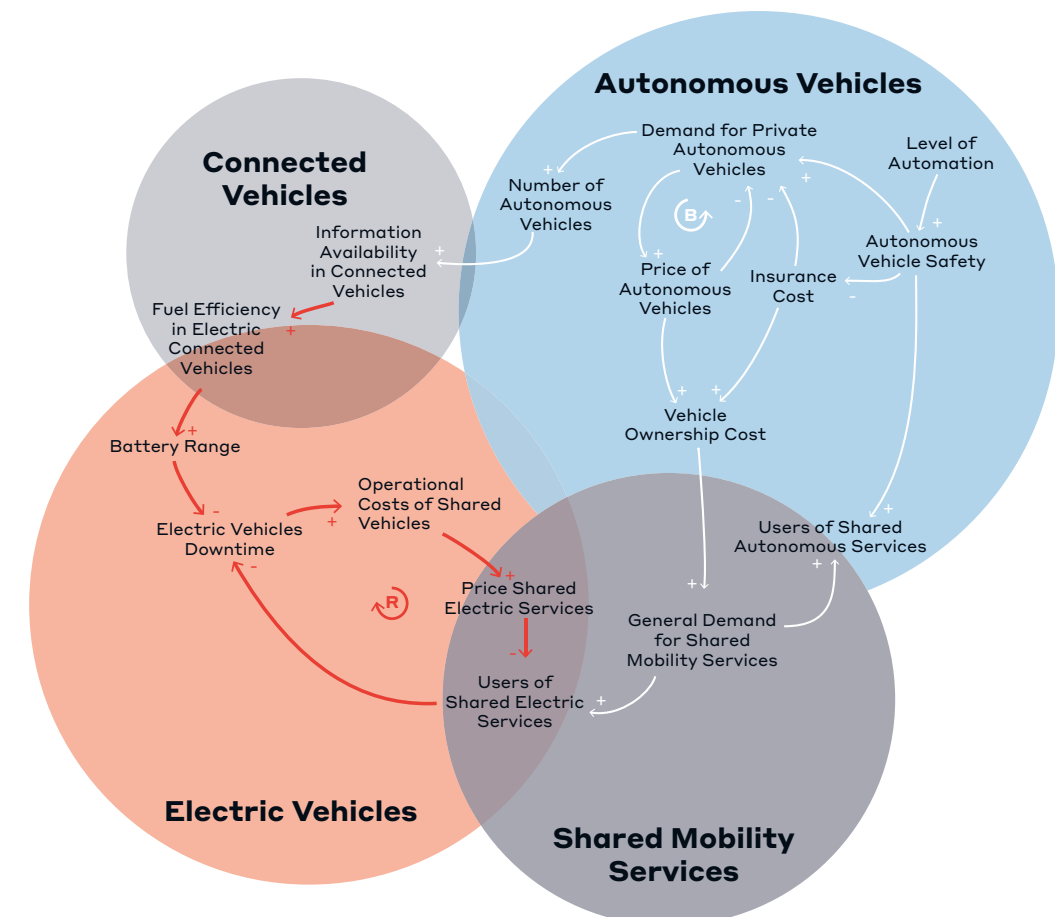
Scenario Development is just the first in WSP's three-part Scenario Planning Toolbox. Here is a sneak peek of the System Dynamics tools in part 2 of the Toolbox that we will present in a follow-up publication.

System Dynamics

System Dynamics is a modelling approach that relies on an understanding of interdependent variables to enhance decision-making from a holistic perspective. Built on the trend interactions explored in the Scenario Development process, relationships between key components are mapped out and solidified through mathematical algorithms. The illustration of this mapping, shown here in simplified form, is called a Causal Loop Diagram (CLD). As in the case of the Scenario Development process, the goal of System

Dynamics is not to predict an exact outcome, but rather to give new insights on the system properties and inner workings of alternative futures.

The CLD in the figure below highlights a sampling of interactions between technologies and other system components within the new mobility sector. In this example, the red arrows show how greater fuel efficiency could be achieved by making more information available through connected vehicle technologies. Applied to shared mobility services, this improved fuel efficiency could help to decrease operating costs and is one way to help improve the overall competitiveness of shared mobility against other modes, particularly private mobility, in the future.





Start a conversation with our Scenario Planning experts.



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ABOUT US

WSP is one of the world's leading engineering professional services consulting firms. We are dedicated to our local communities and propelled by international brainpower. We are technical experts and strategic advisors including engineers, technicians, scientists, architects, planners, surveyors and environmental specialists, as well as other design, program and construction management professionals. We design lasting solutions in the Transportation & Infrastructure, Property & Buildings, Environment, Industry, Resources (including Mining and Oil & Gas) and Energy sectors, as well as offering project and program delivery and advisory services. With approximately 43,600 talented people in 550 offices across 40 countries, we engineer projects that will help societies grow for lifetimes to come.

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