



Compliance map and future requirements

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SUMMARY SHEET

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| Abstract | <p>The Compliance Map is a tool for policy-makers measuring the level of compliance of different regulatory schemes in enabling the societal, environmental and economic impacts achievable through the implementation of newly emerging disruptive innovations identified in WP1, while at the same time safeguarding adequate level of security, safety, data privacy, and social protection.</p> <p>The Compliance Map will be a practical synthesis of the similarities, differences, trade-offs and patterns across different regulatory schemes that share a common focus or goal</p> |
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PROJECT PARTNERS

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| FIT CONSULTING SRL | IT | FIT |
| UNIVERSITY COLLEGE LONDON | UK | UCL |
| POLIS - PROMOTION OF OPERATIONAL LINKS WITH INTEGRATED SERVICES, ASSOCIATION INTERNATIONALE | BE | POLIS |
| IRU PROJECTS ASBL | BE | IRU |
| RUPPRECHT CONSULT-FORSCHUNG & BERATUNG GMBH | DE | RC |
| CAPITAL HIGH TECH SARL | FR | CHT |
| ABO AKADEMI UNIVERSITY | FI | ÅÅ |
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LIST OF ACRONYMS

CAV – Connected and Automated Vehicles

KPI – Key Performance Indicators

MCA – Multi-Criteria Analysis

NMS – New Mobility Services

RC – Regulation Compliance

RR – Regulation Readiness

TNC – Transport Network Companies

NOTE To the reader:

In the previous deliverables case studies and mobility solutions have been used in an interchangeable way. From now on, we will only use mobility solution to describe CAV, drones for last mile delivery, Big data for transport and mobility, MaaS, Car-Sharing, Bike Sharing, E-scooter sharing/ Micromobility, Ride-hailing and TNC, On-demand ridesharing/Car-pooling.

The screenshots of the Compliance Map included within the present document have to be used just by way of examples and do not necessarily represent the final version of the online tool, which will be updated until the end of the project (i.e. after the release of this deliverable) to include as many new regulations as possible that could come up to the project's end and that could consequently change the analysis of indicators, barriers and potential scenarios underpinning the Compliance Map.



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EXECUTIVE SUMMARY

The present document outlines the development of the Compliance Map reporting the work carried out in Work Package 3, “Impact assessment and prospects for new regulatory schemes”.

Section 1 describes the key features of the tool, by illustrating the three main functionalities developed in the Compliance Map. Then Section 2 goes into more detail illustrating the technical aspects explored during the development of the tool in order to find the most suitable solution to make the contents elaborated in the project easily accessible and user-friendly. Thereby the main layouts conceived have been illustrated in Section 3 together with the indication of the chosen ones. Finally, Section 4 has been dedicated to the description of the strategy to be adopted for promoting and maintaining the tool. As main conclusions, a closing chapter has been envisaged to depict both differences and similarities found among regulatory schemes to generate a holistic view of the Compliance Map.

Following a summary table of the conclusions chapter, which describes some good practices of regulatory frameworks from the Compliance Map (please refer to the 5 CONCLUSIONS chapter for a more in-depth description).

| Mobility Solution | Regulation Compliance (national or local) |
|-------------------------------------|--|
| Connected and Automated Vehicles | Singapore and Australia |
| Drone last mile delivery | Australia |
| Big data for transport and mobility | Singapore and the United Kingdom |
| MaaS and MaaS platforms | United Kingdom, Sweden and Finland |
| Car-sharing | Germany and Sydney |
| Bike sharing | Chicago and Toronto |
| E-scooter sharing/ Micromobility | Chicago and Lisbon |
| Ride-hailing and TNC | United Kingdom and Toronto |
| On-demand ridesharing/Car-pooling | France and the United States |

Table 1 Summary table of some good practices of regulatory frameworks from the Compliance Map

The document includes also three annexes: first of all, a list of reference documents is provided; Annex I is about a guideline, which is foreseen to be embedded within the dedicated Compliance Map page on the GECKO website, aiming at conducting the end-user through the features of the tool; Annex II reports the calculations details concerning the two indexes developed within the tool.

INTRODUCTION

GECKO (Governance principles and mEthods enabling deCision maKers to manage and regulate the changing mObility systems) aims at supporting authorities with tools and recommendations in order to create a new regulatory framework, suitable for the transition to a new mobility era.

This work has gathered the results coming from previous work packages WP1 and WP2, namely:

- Review of new mobility solutions and business models (WP1);
- Investigation of main political, social and economic variables (WP2);

Then, WP3 brought together WP1 and WP2 findings and assessed impacts and prospects for regulatory frameworks; in particular:

- Task 3.1, starting from the regulations collected in the GECKO Regulatory Framework Dashboard reported in D3.1, has identified Key Performance Indicators (KPIs) to assess the social, economic and safety impacts of regulatory schemes for the implementation of emerging and disruptive technologies in mobility;
- Task 3.2 has established metrics to assess the effectiveness of regulatory frameworks in enabling mobility disruptive innovations (detected within WP1) and defined a method to conduct the Multi-Criteria Analysis (MCA), reported in D3.2, in order to obtain an overall assessment of each regulatory framework from different points of view (Infrastructural, Political, Data, User/consumer awareness and acceptance, Safety, Completeness of pilots and contracts requirements, Environmental, Cooperation and Other).

The goal of Task 3.3, is then to illustrate these results as shown in the figure below:

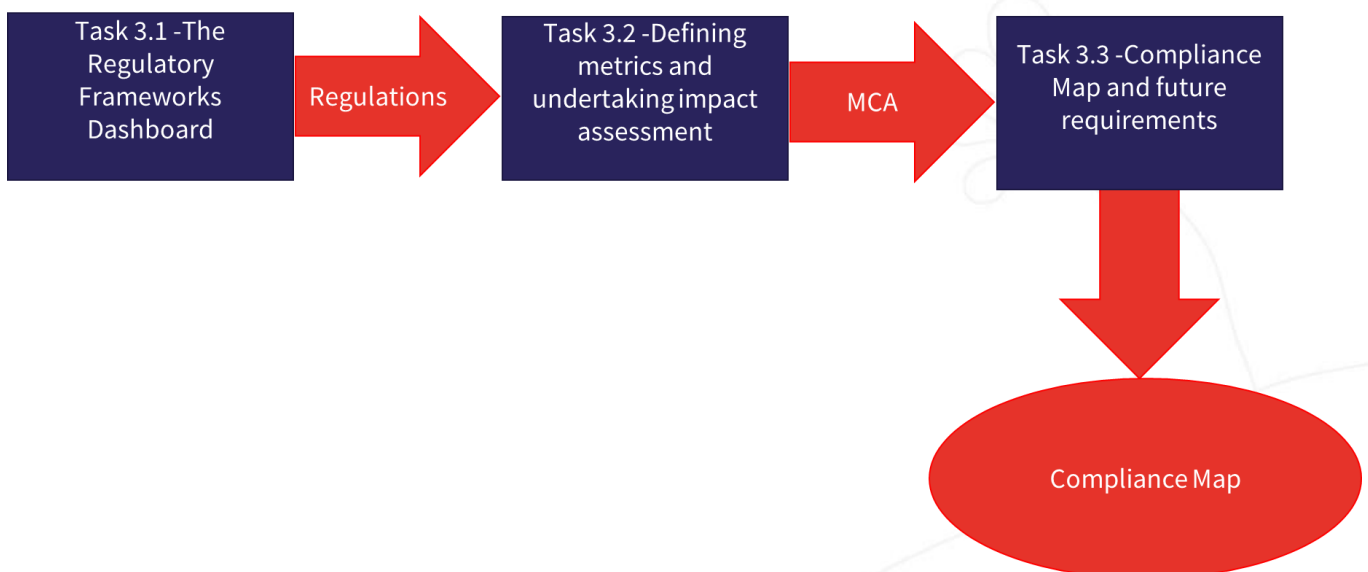


Figure 1 WP3 Tasks and workflow

In order to achieve this objective, an important building block of the project is the design and the development of regulatory supportive tools highlighting new approaches for the regulations of disruptive mobility solutions.

Among these tools, the Compliance Map allows to visualise the impact assessment findings generated by the Dashboard developed within the framework of T3.1 and T3.2 tasks, by also illustrating in an easily accessible way the level of compliance of regulatory frameworks with respect to current and future mobility market evolution and the main barriers to access to market of different mobility services, business models and technologies so predicting scenarios of possible evolution.

The Compliance Map can be considered as a practical synthesis of the similarities, differences, trade-offs and patterns across different regulatory schemes sharing the common goal of enabling the societal, environment and economic impacts thanks to the implementation of newly emerging disruptive innovations, while at the same time safeguarding adequate level of security, safety, data privacy, and social protection. More specifically, the map allows guided searches using specific filtering criteria (by region, by mobility solution, by category, etc.). For the development of the Compliance Map, GECKO makes use of a visual analytics platform able to offer data in a more accessible and understandable way through a dynamic visualization and an interactive panel.

Measuring the potential level of compliance will help policy makers early tackling regulations that may hamper deployment of business models, services and technologies, provides prospects at different level of adherence with specific regulatory framework conditions and anticipate policy actions and governance.



1 FEATURES

The Compliance Map has been developed using Tableau, which is a professional software (available at <https://www.tableau.com/>) that provides interactive data visualisation features. The software is free for public available data. By directly uploading an Excel file, it is possible to define links and relations among data, make computations and represent information with many different types of graphics. Data visualisations are organised in views, dashboards and stories.

More in details:

- Tableau's views consist of individual charts, in which data from multiple Excel sheets can be represented and related.

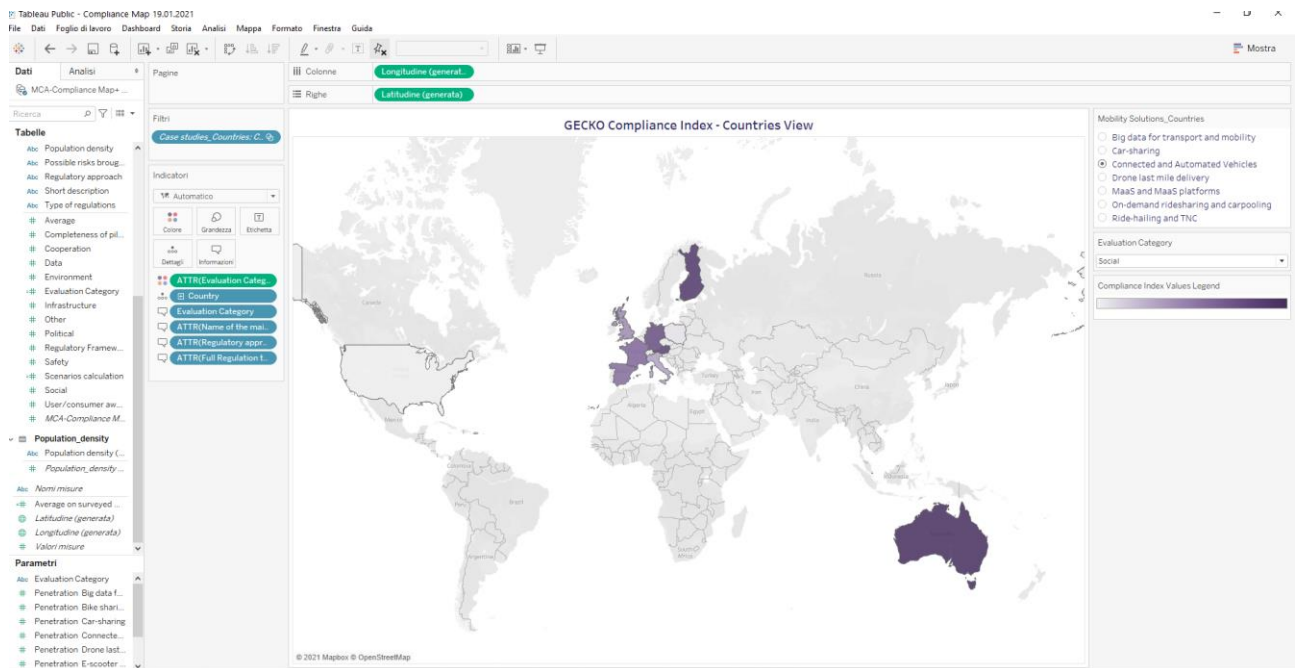


Figure 2 Example of Tableau's Individual Chart

- Dashboards are a way to present one or more views, often with filters, legends, and interactivity tying the views together. Dashboards can include sheets, text, images, and webpages.

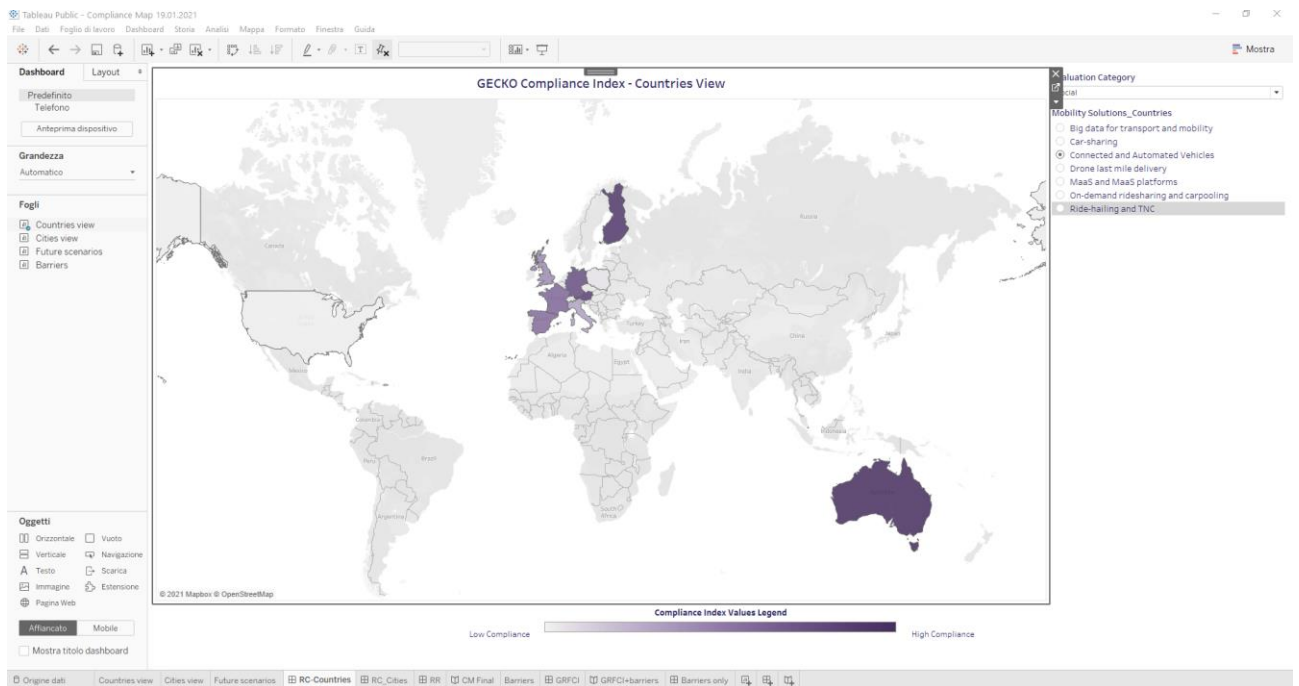


Figure 3 Example of Tableau's Dashboard

- Stories are narrated walkthroughs of one or more sheets or dashboards, for example leading the end-user through different aspects of the research carried out.

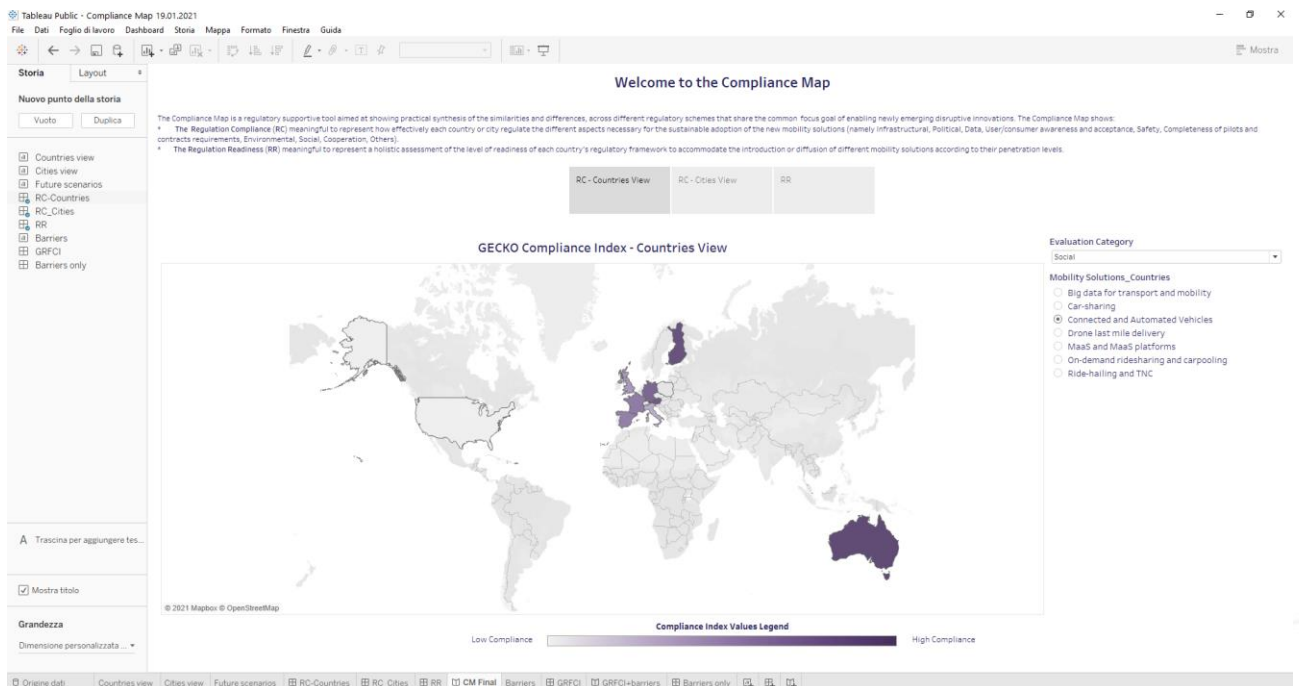


Figure 4 Example of Tableau's Story

This is the reason why, given its ease of use, Tableau has been chosen as the tool to host the Compliance Map. To this end, a version of GECKO's Regulatory Framework Dashboard, adapted

to Tableau's requirements, has been used as input database to provide stakeholders with a visualisation of the MCA results.

Once realised the Compliance Map in Tableau, the resulting views, dashboards and stories were embedded in the GECKO website (as shown in the next figure), in order to harmonise such contents with all project outputs and to provide a unified dissemination channel.



Figure 5 Compliance Map embedded in the GECKO website

1.1 Functionalities of the Compliance Map

The following subsections illustrate the functionalities of the Compliance Map i.e. the set of features that the tool is able to provide to the user. In particular, there have been developed two indexes for envisioning the level of effectiveness existing regulatory frameworks have in considering different dimensions of new mobility solutions adoption, and for appraising the level of readiness each regulatory framework has at country level to comply with the establishment or expansion of mobility solutions according to their penetration levels respectively. Moreover, by applying a PESTLE¹ analysis, the entrance barriers that may arise in mobility services uptake have also been included.

¹Political, Economic, Social, Technological, Legal and Environmental factors.

1.1.1 The Regulation Compliance – RC

Definition

The GECKO Regulation Compliance (RC) is an index specifically designed for representing to what extent the existing regulatory frameworks will enable the societal, environmental and economic impacts achievable through the implementation of each mobility solution studied in GECKO, while at the same time safeguarding adequate level of security, safety, data privacy, and social protection.

More specifically, the RC is a composite index meaningful to represent how effectively each country or city regulate the different aspects necessary for the sustainable adoption of the new mobility solutions, namely:

- Infrastructural
- Political
- Data
- User/consumer awareness and acceptance
- Safety
- Completeness of pilots and contracts requirements
- Environmental
- Social
- Cooperation
- Other

On the Compliance Map the end user will be able to view the overall RC indicator or one of its components listed above.

Please refer to the Annex for more information about how the index has been obtained.

Values

In general, a high value of either the overall RC indicator (or a single evaluation category score composing it) means that the related regulatory framework is effective in enabling the mobility solution (the former from a general point of view, the latter from a specific perspective) and vice versa.

To give an example, if in the Compliance Map we select the mobility solution " E-scooter sharing/ Micromobility" and the evaluation category "Completeness of pilots and contract requirements"

we see that Stockholm scores very low because the market is currently unregulated and no permit from the City is needed to put a fleet of shared e-scooters on the streets.

On the other hand, if we look at Chicago, we see that the capital of Illinois obtains among the highest scores compared to other cities because it has launched a multi-year programme of pilots to evaluate how and under what conditions and requirements e-scooter companies can contribute to the pursuit of the objectives of accessibility, safety, sustainability etc.

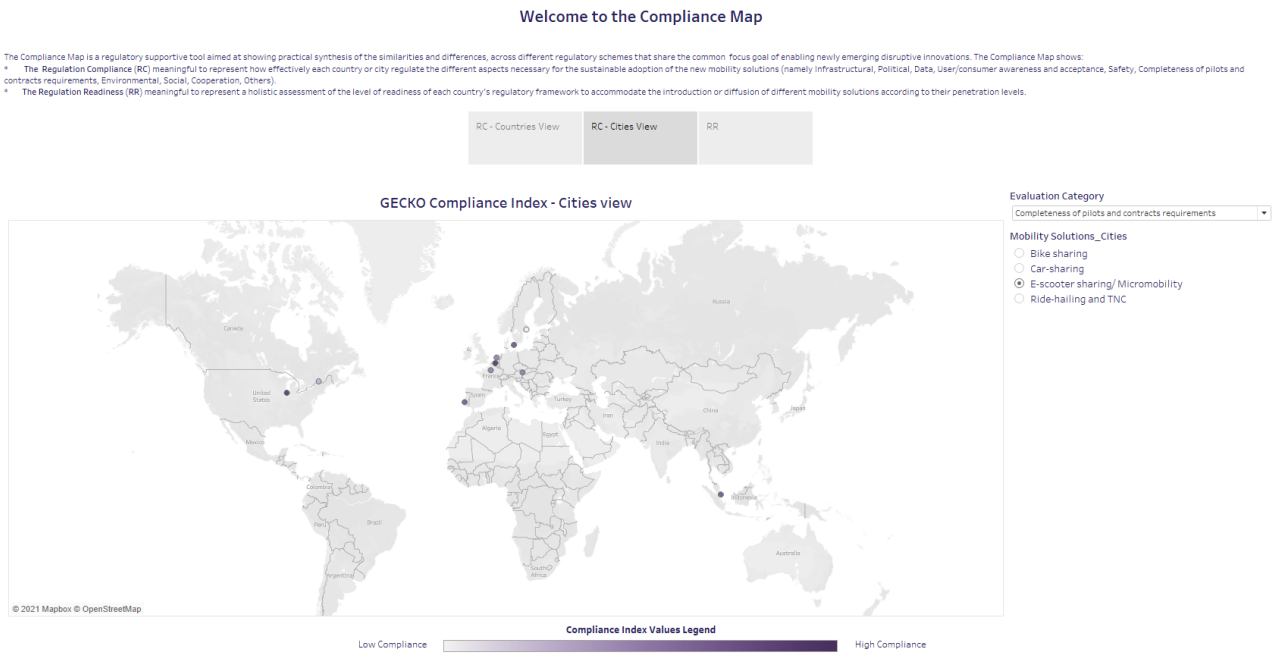


Figure 6 Example of low and high values of RC

Jurisdiction level

The RC is presented by making reference to two jurisdictional levels: Countries level and Cities level. For each of these views, mobility solutions relevant for that jurisdictional level are presented.

For countries:

- Big Data for transport and mobility
- Car-Sharing
- Connected and Automated Vehicles
- Drones for Last Mile Delivery
- MaaS and MaaS platforms
- On-demand ridesharing and carpooling
- Ride-hailing and TNC

For cities:

- Bike sharing
- Car-Sharing
- E-scooter sharing/Micromobility
- Ride-hailing and TNC

Role of the Stakeholder engagement process

In the process of developing the contents to be shown in the Compliance Map, a key role has been played by the stakeholders engagement process. Referring to Deliverable 3.2 where the methodology is presented in detail, this section briefly describes the type and contributions of the GECKO stakeholders.

GECKO stakeholders have been engaged according to their particular interest or experience with respect to each mobility solution to gain their qualified opinion on challenges, constraints and expectations about not only existing regulatory frameworks but also the foundational principles of future regulations and policy making processes.

In particular, the contributions to the contents of the Compliance Map can be summarised as follows:

- Pre-workshop questionnaires – aimed at identifying the most relevant elements (KPIs) for each mobility solution and each evaluation category to be considered in the Multi-Criteria Analysis and assessment of the regulatory frameworks;
- Dedicated workshop sessions – aimed at identifying the biggest challenges and key focus for regulating each element (KPI) appropriate to each mobility solution;
- Online questionnaires – aimed at assessing some of the KPIs considered in the MCA and better understand the most effective strategies in regulating each mobility solution in different jurisdiction levels;
- Online interviews – aimed at assigning weights to be associated to each KPI belonging to each evaluation criteria.

1.1.2 The Regulatory Readiness – RR

Definition

The Regulation Readiness (RR) is an index meaningful to represent a holistic assessment of the level of readiness of each country's regulatory framework to accommodate the introduction or diffusion of different mobility solutions according to their penetration levels.

Values

Through the use of different sliders available on the Compliance Map, the end-user will be able to select every possible combination of mobility solutions penetration. As a result, the Compliance Map will automatically update the values of RR obtained for that combination.

In general, a higher value of the RR means that the related regulatory framework is more ready to accommodate the selected combination of mobility solutions penetration.

Jurisdiction level

The RR is referred to the country level. It combines all of the regulations (local, regional, national) and relative analysis pertaining to each country.

1.1.3 Entrance Barriers for different mobility services, business models and technologies

The entrance barriers that may occur in mobility services uptake has been studied using the PESTLE analysis and reported in the Compliance Map in order to provide a qualitative but structured methodology, representing all aspects influencing the adoption/deployment of the mobility solutions studied in GECKO from diverse, mutually interdependent, viewpoints: Political, Economic, Societal, Technological, Legal and Environmental. This analysis could in fact support the policy maker in better understanding the main difficulties faced by these innovations, supporting his/her decision on policies to be adopted to pave the way for a sustainable adoption of a particular innovation.

In this framework, the Compliance Map allows the end-user either to display a Mobility Solution at country level to analyse, for instance, more in depth the approach followed by different countries in regulating the selected innovation or to select a Mobility Solution at city level in order to discover the enacted regulation and to compare alternative solutions.



2 TECHNICAL ASPECTS

This chapter illustrates the steps carried out to:

- identify the most suitable tool to develop the functionalities identified in the previous chapter in terms of type and quality of information offered to end-users;
- Develop and analyse contents and functionalities of the Compliance Map;
- Include the Compliance Map into the GECKO website.

2.1 Design and data preparation

The Regulatory Framework Dashboard developed in T3.1 and reported in D3.2 collects all regulations and combines them for providing a comprehensive view (the framework) per city/country and per mobility solution. The Dashboard is an Excel file that served as input, duly reorganised and simplified where needed, for the Tableau software, implementing the Compliance Map. The final simplified data model feeding the Compliance Map is represented in the following figure.

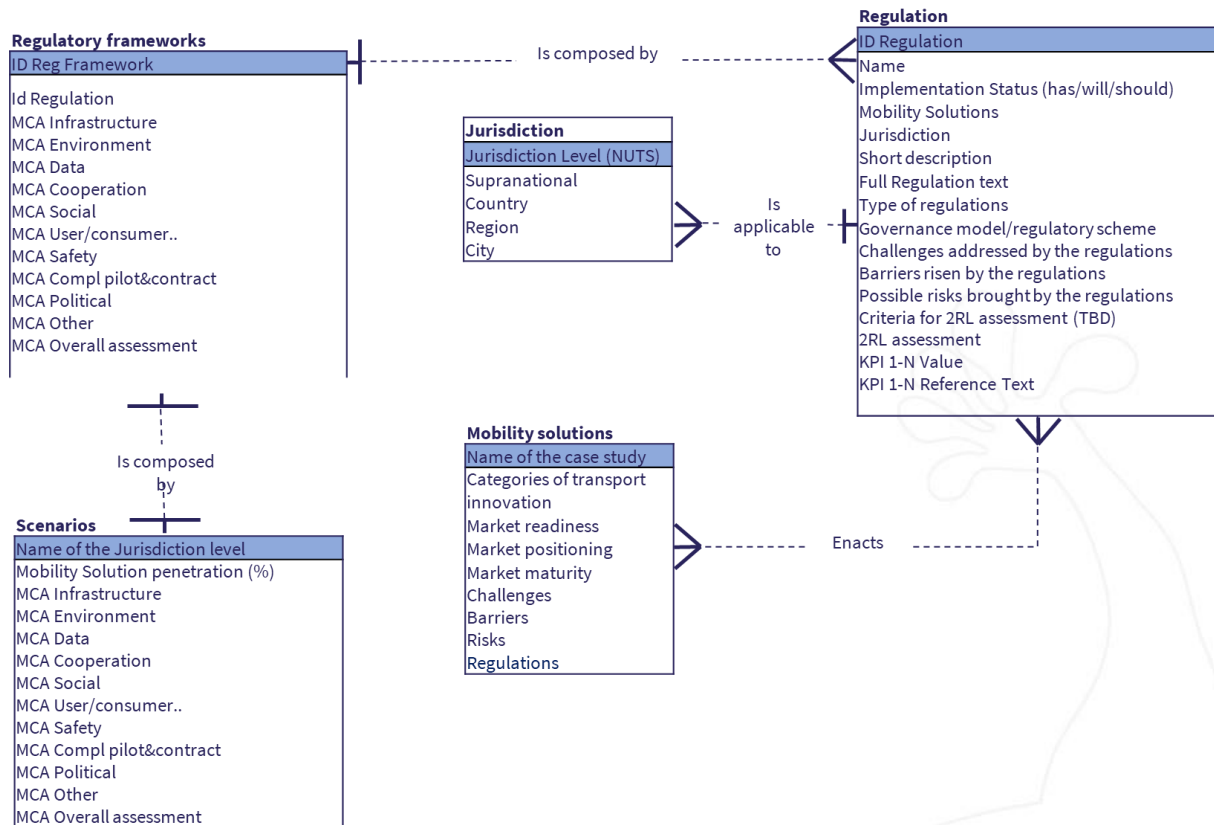


Figure 7 Data model used in the Compliance Map

The data model describes a set of relationships that make possible all elaborations reported in the Compliance Map, in particular:

- The jurisdiction level defines where a regulation is in force (city, regions, country, more countries);
- the selected GECKO Mobility Solutions have been mapped in each jurisdiction level where a related regulation has been enacted. Thus, a Mobility Solution may have many linked regulations (one or even more per city/country) and a regulation may apply to one or more than one Mobility Solution;
- one or multiple regulations are grouped per jurisdictional level and build a regulatory framework;
- Mobility Solutions penetrations, variable by the user per each Mobility Solution, affects the generation of different Scenarios.

Both tools, the Regulatory Framework Dashboard and the Compliance Map will be made available in the project website to the end user: the first one functions as a database of the main regulations influencing the adoption of the mobility solutions studied by GECKO; while the second one, thanks to the MCA methodology, reports the holistic evaluation of the regulatory frameworks according to the evaluation categories described.

2.2 Development

2.1.1 Representing the results of the MCA through a geo-referenced visualisation - RC

As introduced in the previous section, the Compliance Map shows in an intuitive mode of the overall RC (per single evaluation category or cumulated) per mobility solution, per jurisdiction level and RR per market penetration scenario: to access these different views, the end-user can use specific commands and have visibility of results related to the chosen filters.

This location-based representation was developed thanks to the Tableau software that contains a library of geographic place names such cities, countries, or regions, identified by their geographical coordinates able to link the respective records (regulations, regulatory frameworks, RC, RR) contained in the Regulatory Framework Dashboard.

2.1.2 Methodology for projecting MCA results on future market penetration scenarios - RR

As will be shown in the following chapter, some commands shaped as sliders allow the end-user to modify the penetration rates of each mobility solution: the map will visualize the different

regulatory frameworks each one with their resulting RR related to the scenario generated by the combination of envisaged penetration of mobility solutions. As shown by the tool legend, darker colours of a country or city mean a higher level of readiness.

The calculation behind this processing can be summarised as follows:

- Input: the end-user modifies, using the sliders, the penetration level for each use case as he/she wishes, generating a future mobility scenario deriving by a specific composition of mobility solutions that may occur in the future.

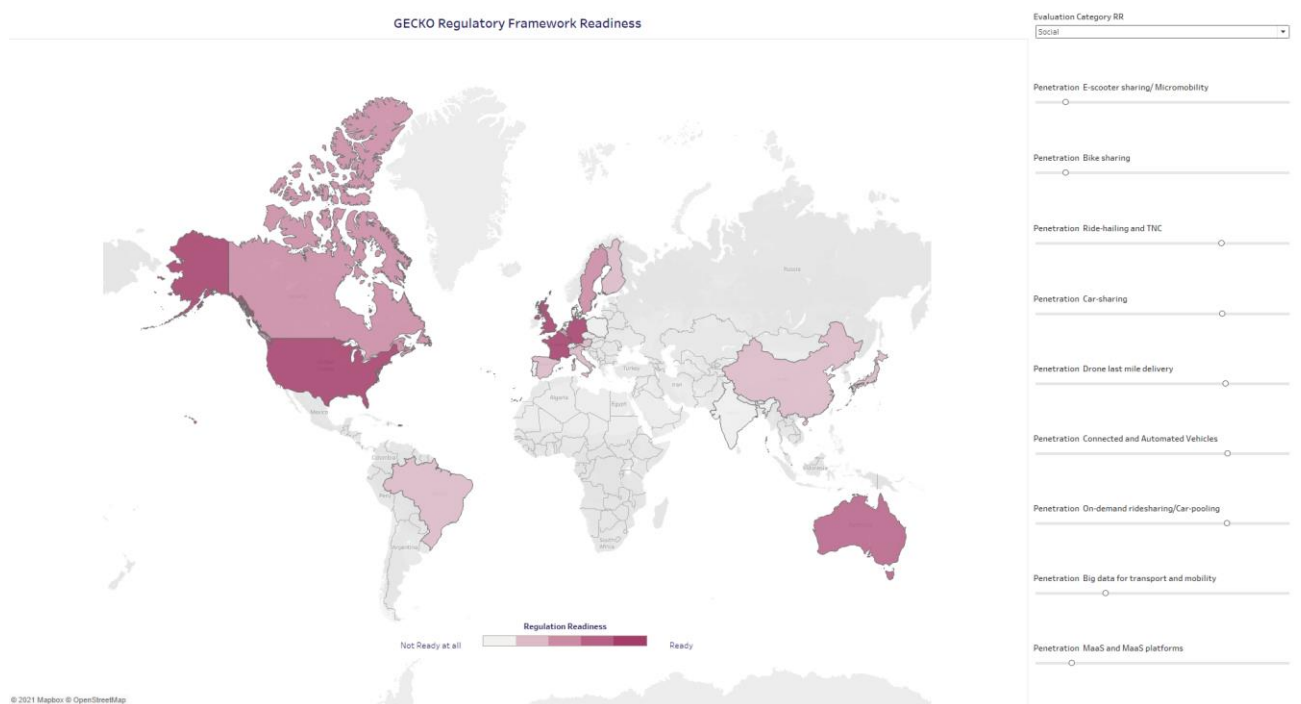


Figure 8 Configuration of levels of penetration in which car using (personal or in sharing) prevails

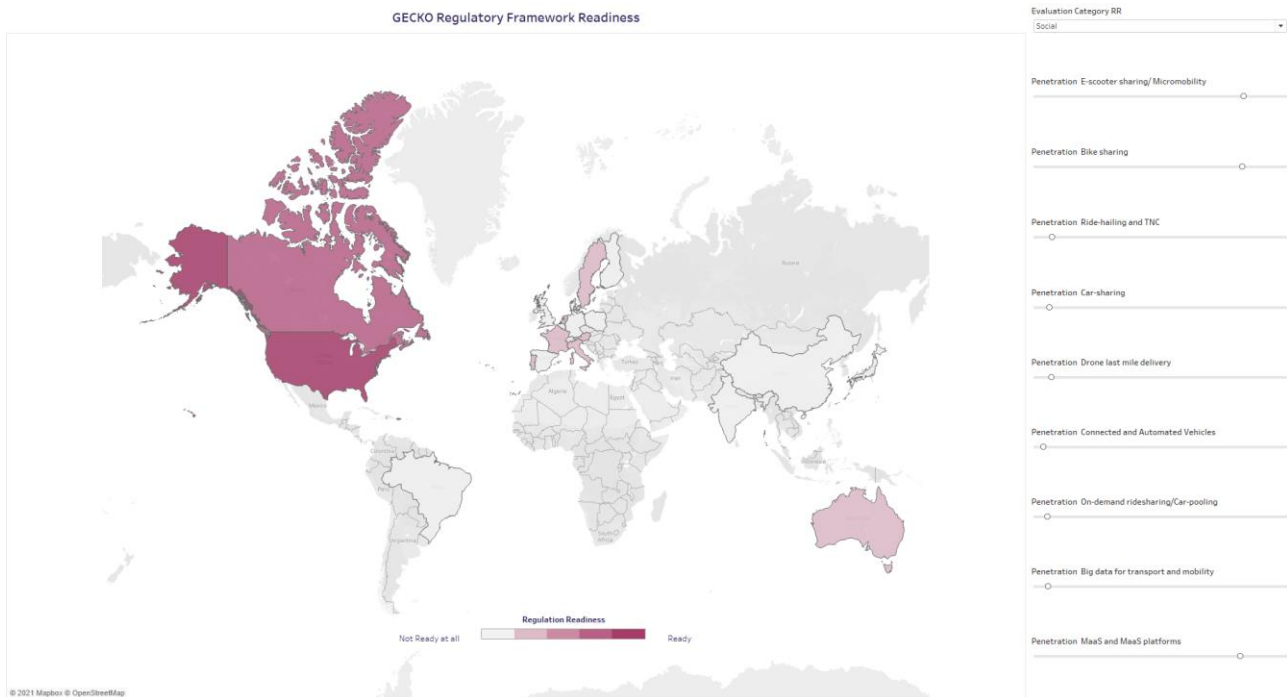


Figure 9 Configuration of levels of penetration in which soft mobility prevails

- Calculation: For each regulatory framework (applying in a specific jurisdiction level), the penetration share (in percentage) will be multiplied by the RC and each of its components obtained for each mobility solution. The values thus obtained are then added together to obtain an overall value of the entire regulatory framework in terms of RR and its components.
- Output: The user will see the overall assessment for each regulatory framework in terms of RR or one of its components. In this processing, therefore, the reference to the individual mobility solution is no longer present.

Since the RR is calculated as the average of the values obtained from the various regulations collected for each country, the reliability of the RR values also depends on whether regulations for each of the mobility solutions have been collected and analysed for each country. In the two figures shown above, for example, the RR value for the USA is always the highest. This is due to the fact that, in the current state of development of the database of regulations feeding the Compliance Map, regulations have been collected for almost all of the mobility solutions in the USA.

However, as mentioned at the beginning of this document and as will be further specified in the "Updating of the Regulatory Framework Dashboard and Compliance Map" chapter, the work of collecting and analysing regulations will continue until the end of the project, thus providing more reliable results.

2.1.3 Presentation of the barriers

The analysis of barriers was conducted by all GECKO partners tasked to identify and describe all impeding factors affecting the mobility solutions analysed. Furthermore, wherever possible, available solutions and best practices have been identified.

The end-user will be able to select one or more mobility solutions to visualize:

- Name of the case study
- Barrier name
- Description of the barrier.

Each description of the barrier presents a brief text coloured according to the barrier type (Political, Economic, Social, Technological, Legal, Environmental). Furthermore, by hovering the mouse over the description text, a pop-up window will be displayed, illustrating examples of solutions and best practices adopted to overcome that barrier.

The contents presented for this functionality rely on the knowledge gained by each partner through the project and on the various inputs collected from the GECKO stakeholders (workshops, questionnaires, interviews etc)

Following an example of the barriers for MaaS:

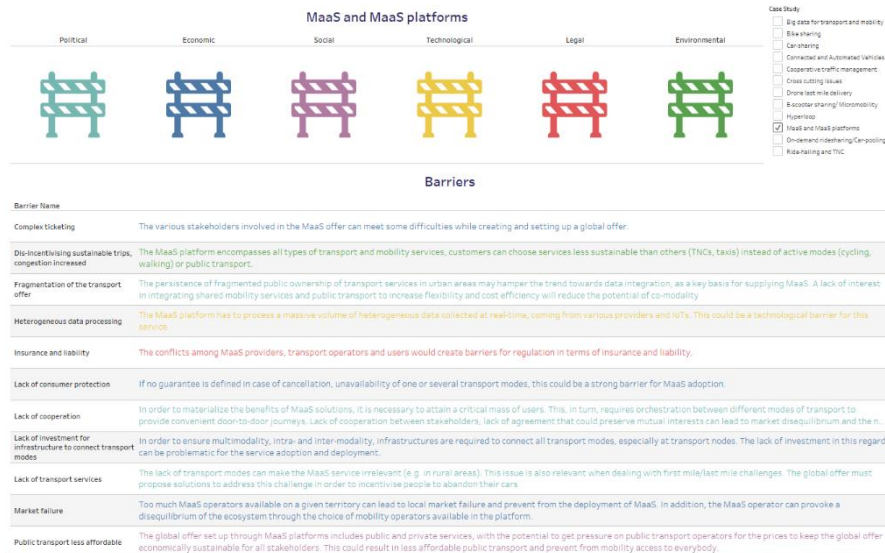


Figure 10 Example of Barriers presented in the Compliance Map for MaaS

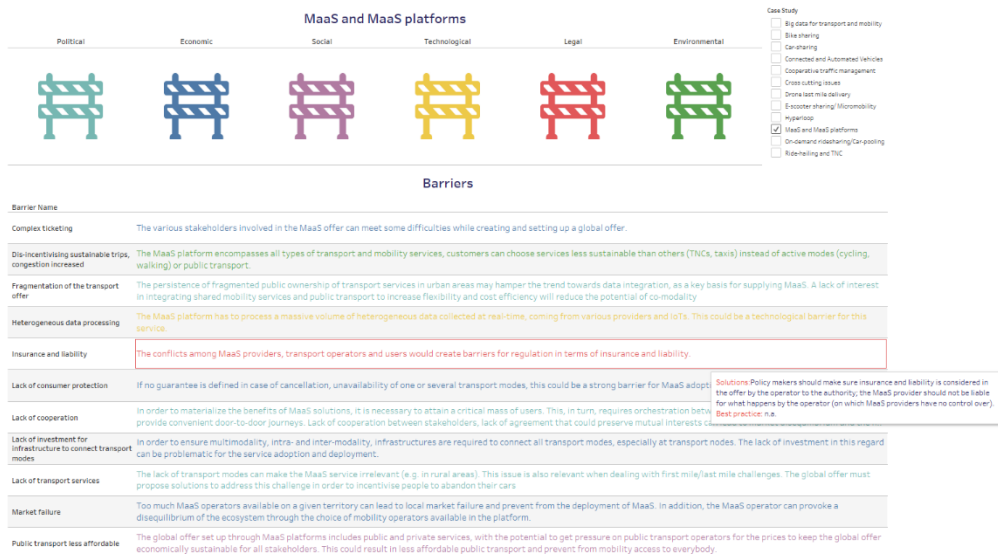


Figure 11 Example of contents presented to the end-user if he/she hovers the mouse over a barrier

3 LAYOUTS OF THE TOOL

In the development phase of the tool, two alternative layouts have been created:

- The first layout consists of two pages:
 - o The first page shows:
 - the Regulation Readiness (RR). The page reports:
 - A short description of the index in the box at the top right and indications on how to act on the filters to show the different results. From the filter in this box the end-user can decide whether to display the RR index or only one of its components. See how the results update in the other 3 boxes displayed.
 - 3 boxes showing 3 different views: by countries, by cities and future scenarios. In the countries and cities views the end user can select the mobility solution that is relevant for that view (so for example e-scooter is present at cities level and not at countries level).
 - In the future scenarios box, the end-user can click on the blue button at the bottom right-hand corner and change the penetration levels of each mobility solution; the results then automatically update, showing the countries whose regulatory frameworks are more ready to accommodate a higher market penetration of each of the mobility solutions.
 - Finally, by hovering the mouse over each country or city, the end user can read the name of the country or city, the related value of the RR or its individual component, a brief description of the regulatory approach adopted and, finally, the name and link to the main regulatory reference text.
 - o The second page shows the main barriers influencing the adoption/deployment of the mobility solutions studied in GECKO. The end-user can select one or more mobility innovations to be shown; on the right, the end user can read a short description of each barrier; if the end-user hovers the mouse over it he/she can also read solutions and best practices adopted to overcome this barriers, if available. The barriers description is coloured according to the type of barrier. For example, as shown in the legend, legal barriers are marked in red.

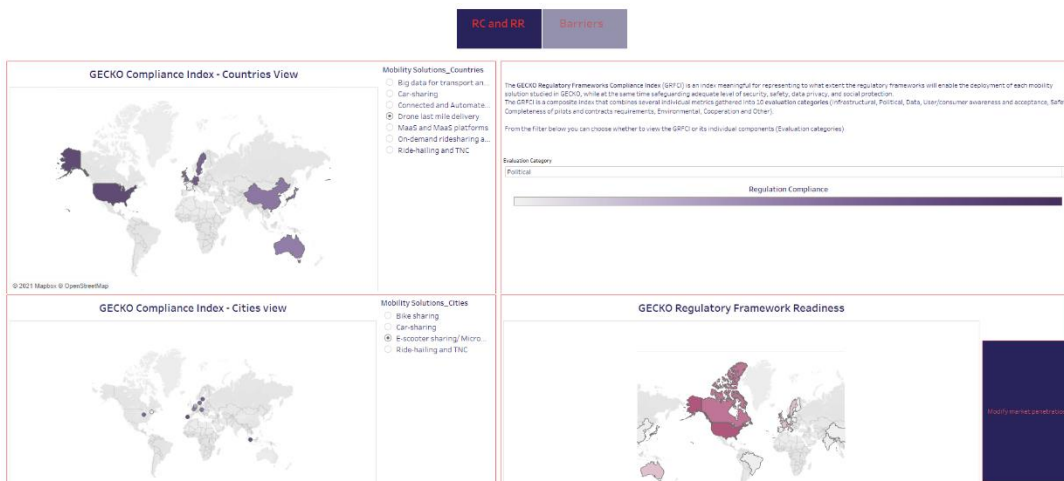


Figure 12 First layout – RC and RR page - overall view

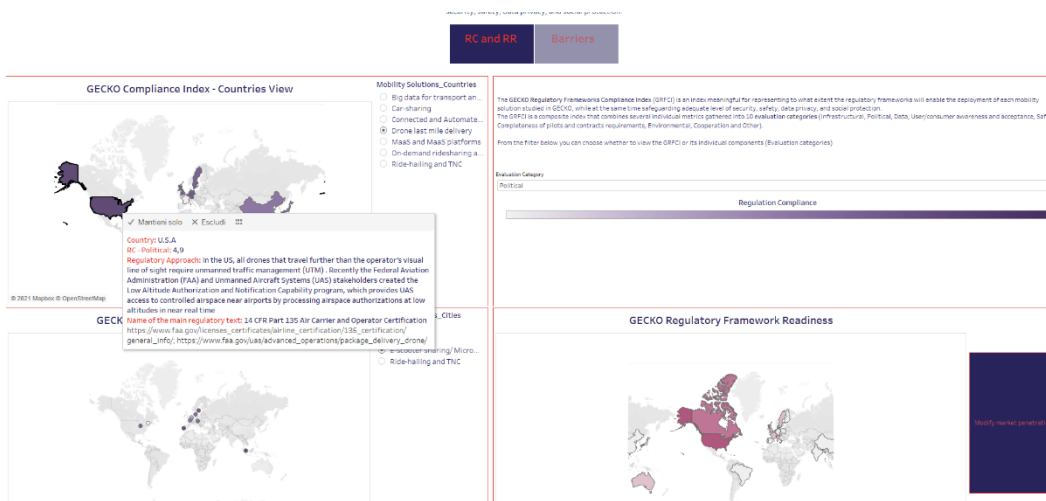


Figure 13 First layout – RC and RR page - Comments appearing by hovering the mouse over each country or city

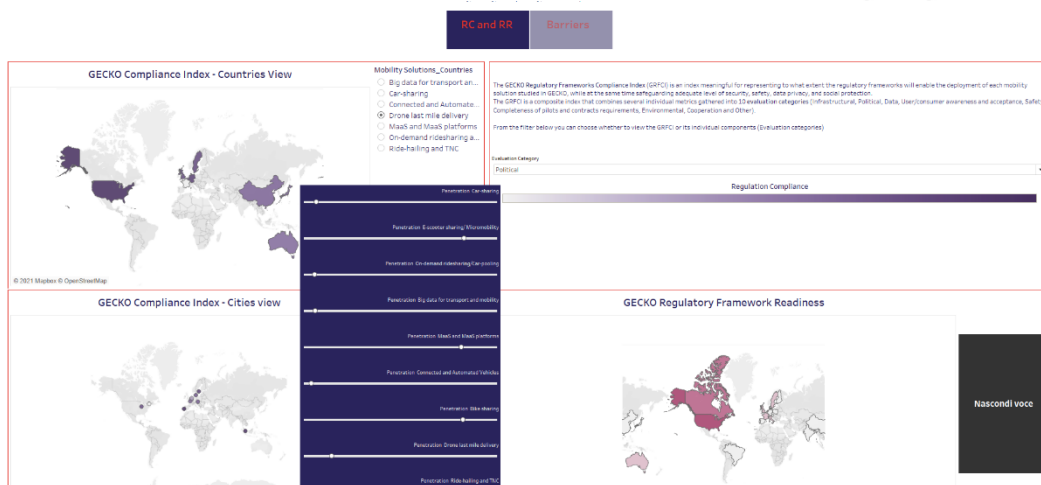


Figure 14 First layout –RC and RR page - Interactivity of the Future Scenario Map with different assets of mobility solutions' penetrations

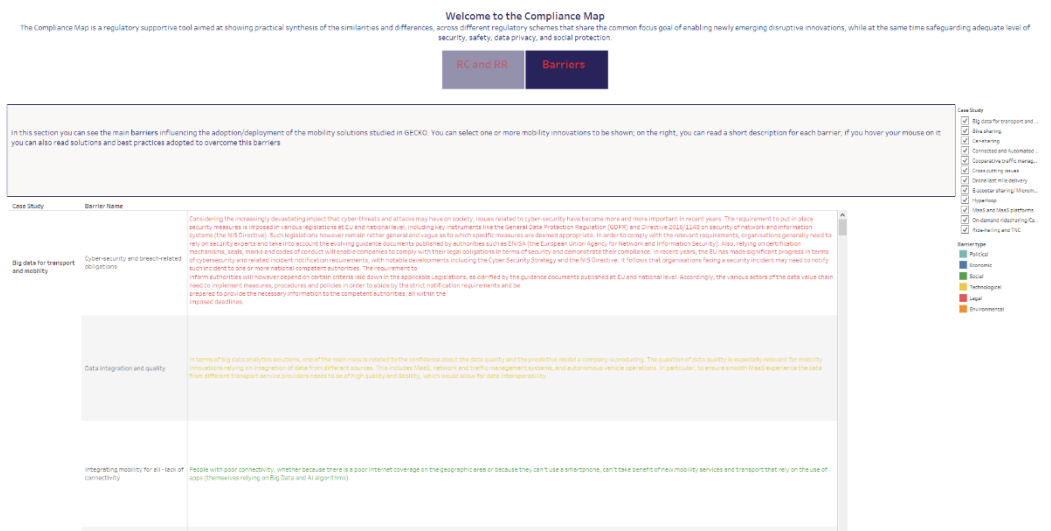


Figure 15 First layout - barriers page - overall view

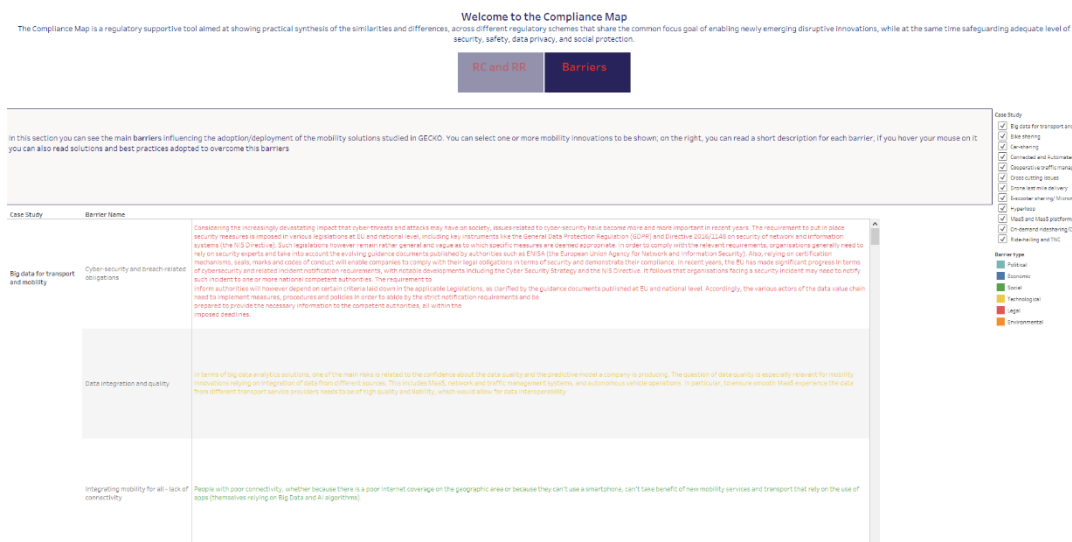


Figure 16 First layout - barriers page - Comments appearing by hovering the mouse on each barrier

The second layout shows the same contents using different views representing wider pages with RR.

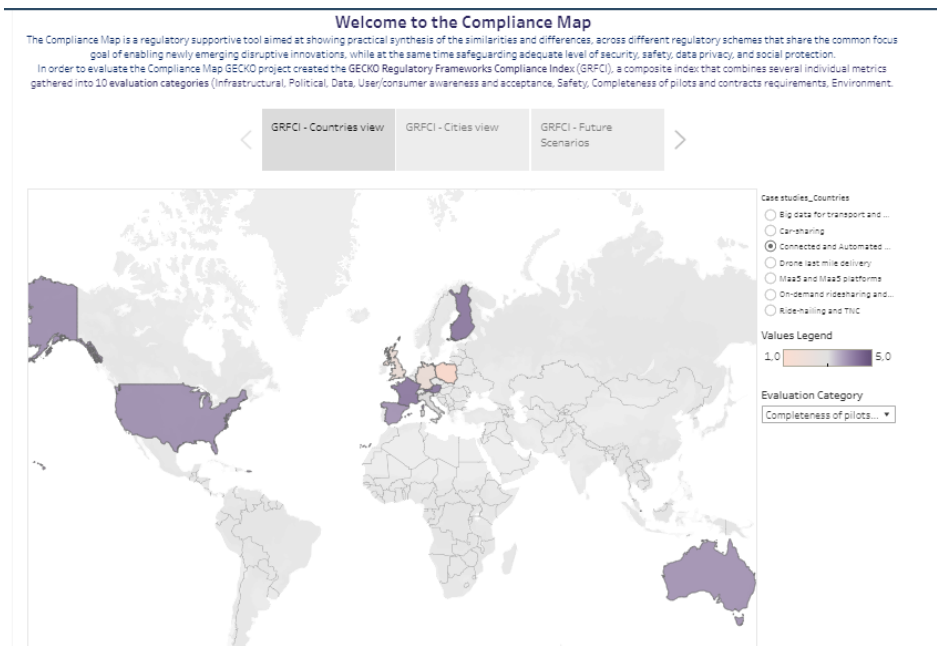


Figure 17 Second layout RR webpage - Overall view

- o Barriers shown as separate content, so it would be shown in the GECKO website through a dedicated link.

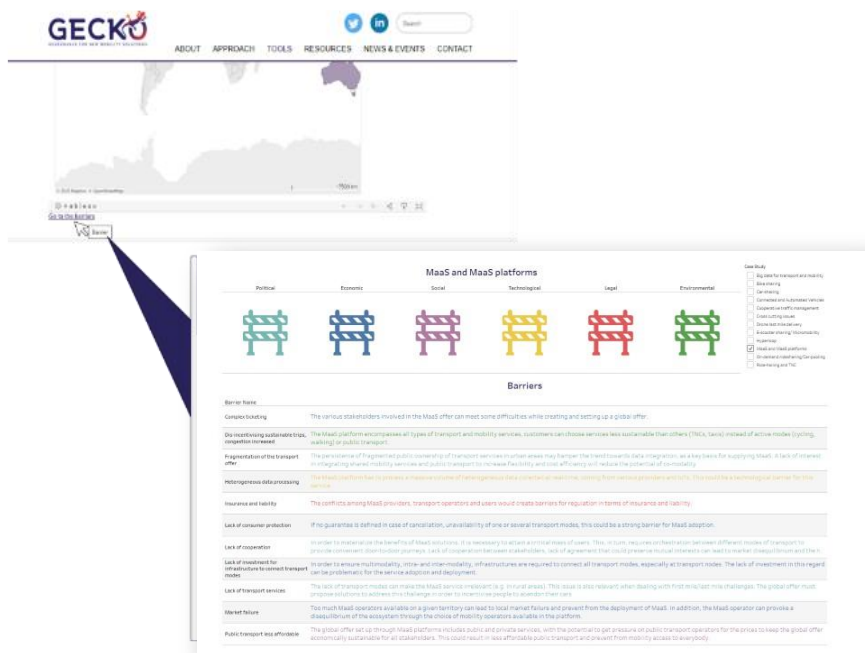


Figure 18 Second Layout - Directing the user towards the Barriers webpage

The two alternative layouts were presented to the GECKO partners. The second layout was chosen as the final one.

4 PROMOTION AND MAINTANENCE OF THE TOOL

4.1 Promotion of the tool

In collaboration with WP5 and WP6, the Compliance Map has been and will be further promoted among GECKO stakeholders and other possible external users (in particular policy makers).

More specifically, in collaboration with WP6, the promotion has been launched through an article included in the GECKO newsletter released on 12 November 2020.

Furthermore, in cooperation with WP5, the Compliance Map will be presented to the participants of the third (online) workshop to be held in April 2021.

The work to promote the Compliance Map will then continue further, mainly in cooperation with WP6, through:

- the newsletter announcing the final version of the tool which will be embedded in the GECKO website;
- national, European and international events;
- the final conference of the project.

4.2 Updating of the Regulatory Framework Dashboard and Compliance Map

In order to provide the end users with the most comprehensive holistic view of the regulatory frameworks related to the mobility categories studied by GECKO, the work of updating the Regulatory Framework Dashboard and the Compliance Map will continue until the end of the project lifetime, integrating new directives, policies and regulations.

At the time of writing the present deliverable this task is in progress: starting from the most relevant and up-to-date documents, papers and articles of international scope² related to each mobility solution studied by GECKO, partners involved in WP3 have been asked to continue the work of searching for regulations in order to achieve, for the Compliance Map, a greater geographical, thematic and temporal coverage.

Furthermore, the possible adoption of the tool by one of the Consortium partners will allow a continuous update beyond the project lifetime.

²See Annex II

5 CONCLUSIONS

For each mobility solution, this chapter provides a description of the similarities and differences found between regulatory schemes to generate a holistic view of the Compliance Map.

As the reader was reminded in the previous chapters, the results presented in this document must be considered as provisional, since the work of enriching the database feeding the compliance map and analysing the regulations will continue until the end of the project.

Connected and Automated Vehicles

Regulations governing testing and adoption of CAVs are mainly issued at national level. In terms of RC, the highest values are obtained by Singapore and Australia. Looking at the individual components in particular, Singapore scores highest in the following components: Infrastructure, Cooperation, Completeness of pilots and contracts requirements, thus laying a solid political and technical foundation for a wide deployment of autonomous mobility. Indeed, in Singapore the government is deeply committed in making the city-state a pioneer for AV. It opened the Centre of Excellence for Testing and Research of Autonomous Vehicles at Nanyang Technological University (CETAN) in November 2017; currently Singapore is exploring the application of self-driving technology to public transport to bring in new forms of shared mobility, but also to address the constraints the city faces from land and manpower perspectives. Moreover, while in other states testing is limited to small areas, since October 2019 autonomous vehicles have been tested on all public roads in western Singapore.³ On the other hand, Australia scores highest values in components such as Environment, Social, Safety but also Data, defining the conditions for a sustainable uptake and deployment of autonomous mobility. For example, in order to ensure safety of on-road testing, NTC (National Transport Commission) recommends “*Pre-trial testing of the vehicle at a test facility such as a closed track. This could provide additional assurance that the automated vehicle technology can be safely deployed on public road*”. For on-road testing, it recommends a human safety driver in the test vehicle unless a specific exemption of permit is granted for the test. In addition, it recommends that the trialling organization “*must develop a safety management plan outlining all key relevant safety risks for the trial and how they will be mitigated or eliminated*”. Trialling organizations are asked to follow existing crash reporting requirements and to report any serious incidents to the relevant road transport agency. In this framework “vulnerable road users” should “be considered carefully as part of the safety management of all trials taking place on public roads”. It is also stated that “*Trialling organizations will need to consider how their trial may impact existing infrastructure and how they plan to address this*”.

In the next developments of the database feeding the Compliance Map, regulatory frameworks from Israel, United Arab Emirates, Japan, The Netherlands and Sweden (indicative list) will be

³ <https://www.channelnewsasia.com/news/singapore/autonomous-vehicles-western-singapore-testbed-12029878>

added and analysed. In this way, GECKO project aims at achieving a greater geographical coverage and include countries having a relevant state of art of CAV testing.

Drone last mile delivery

Regulations ruling trials and adoption of drones for last mile delivery are mainly issued at national level. In terms of RC, the highest values are obtained by Australia, where drones can now be used to deliver 'just-in-time' supplies to customers who live within a 10 km radius from a base station. Items available for delivery could include food and drinks, medications or even small items of hardware or recreational supplies⁴. Looking at the individual components in particular, Australia scores the highest in almost all of them. The Civil Aviation Safety Authority (CASA) has given approval to Wing Aviation Pty Ltd (Wing) to operate delivery drone operations in Gungahlin, Australian Capital Territory (ACT) and Logan, Queensland. Wing was required to submit a safety case which included information about the reliability of their drones. Following assessment of the safety case, CASA permitted Wing to operate in closer proximity to a person than regulations normally permit. Wing's delivery system is automated – however a licensed drone pilot is always at the helm. CASA also defined time windows in which drones can provide the service; in any case additional operational restrictions may be imposed by the Department of Infrastructure, Transport, Cities and Regional Development.

In the next developments of the database feeding the Compliance Map, regulatory frameworks from Tanzania, Rwanda, Iceland, Canada, Dubai, Finland (indicative list) will be added and analysed. In this way, GECKO project aims at achieving a greater geographical coverage (particularly in Africa, where drones are used extensively to deliver medical supplies) and including countries having a relevant state of art of drones for last mile delivery testing.

Big data for transport and mobility

The general approach of sharing, standardisation and protection of data is mainly issued at national (or higher) level, while cities define specific requirements through contract requirements. Indeed, over the past few years, recent regulations regarding Big Data have been adopted to get the regulatory framework required for the deployment of new disruptive mobility services at the national or supranational level, mostly in terms of: personal data protection (GDPR), data-sharing for public services, and standards for data. There are currently few regulatory frameworks analysed for this use case, so the conclusions reported here may be subject to significant change. In terms of RC, the highest values are obtained by Singapore and the United Kingdom. Looking at the individual components, Singapore scores the highest in Infrastructure, Cooperation and Political. Indeed, the Land Transport Authority (LTA) has published a wide variety of land transport-related datasets (static and dynamic / real-time) on DataMall⁵ for enterprises, third-party developers, researchers, and other members of the public to promote collaboration and co-creation of innovative and inclusive transport solutions. Furthermore, the government is strongly committed in becoming a highly developed country

⁴ <https://www.casa.gov.au/drones/industry-initiatives/drone-delivery-systems>

⁵ <https://datamall.lta.gov.sg/content/datamall/en.html>

through its Smart Nation initiative, leveraging on several national projects, like National Digital Identity, E-Payments, Smart Nation Sensor Platform, Smart Urban Mobility and Moments Of Life⁶. On the other hand, the United Kingdom scores the highest in Environment, User/consumer awareness and acceptance and Safety. In September 2017, the Government published a study entitled “Scoping study into deriving transport benefits from big data and the internet of things in smart cities”⁷ which identified 6 key areas to be addressed: 1. Raising awareness, buy-in and coordination, 2. Standards, 3. Connecting datasets, 4. Closing data gaps, 5. Privacy, security and commercial sensitivities, 6. Skills and capability. In early 2020 then, the Government has launched an open big data project, particularly focused on public transport and called “Bus Open Data Service” aimed at providing passengers with real-time bus location and fares data (by 2021). In this regard, the Department for Transport published the “Bus open data implementation guide” to help operators meet the statutory requirements through the provision of the Bus Open Data Service (BODS). It’s a new digital service which provides access to third-party data consumers to a distributed model of bus open data, where the data are, largely, held by the operators who run the services.⁸

In the next developments of the database feeding the Compliance Map, regulatory frameworks from Finland, The Netherlands, Belgium, Estonia, China and USA (indicative list) will be added and analysed. In this way, GECKO project aims at achieving a greater geographical coverage and include countries having a relevant state of art of use of Big Data for Transport.

MaaS and MaaS platforms

Regulations aimed at adopting and deploying MaaS and MaaS platforms are mainly issued at national and regional level. This mobility solution does not have one particularly most effective regulatory framework compared to others analysed, with the United Kingdom, Sweden and Finland achieving very similar scores. Cross-government and private sector collaboration is one of the strengths of the UK regulatory framework: MaaS Global began piloting Whim in the West Midlands in August 2017. The provision of a MaaS solution was a key part of the West Midlands Combined Authority transport strategy and delivery plan for 2026. West Midlands Combined Authority and MaaS Global agreed commercial contracts with several transport operators. These include National Express West Midlands (bus and tram services); Enterprise (car hire); and Gett (taxi service); the Swedish regulatory framework better addresses social policy aspects: tests have been made with the travel service UbiGo in order to facilitate sustainable travel in larger cities and manage everyday life in a simple way without private cars. The test period in Gothenburg showed good results and now Ubigo is being tested in Stockholm. The Swedish Government has initiated the project KOMPIS, which aims to promote the emergence of MaaS in Sweden. Finally, Finland clearly regulates the data aspect and the evident identification of the

⁶ [20180710_D1.2_Big+Data+Policies_LeMO.pdf \(squarespace.com\)](#)

⁷ <https://www.gov.uk/government/publications/transport-benefits-from-big-data-and-the-internet-of-things-in-smart-cities>

⁸ [https://www.gov.uk/government/publications/bus-open-data-implementation-guide/bus-open-data-implementation-guide#:~:text=The%20Bus%20Open%20Data%20Service%20\(%20BODS%20\)%20regulations%20will%20require%20the,wass%20launched%20in%20November%202020](https://www.gov.uk/government/publications/bus-open-data-implementation-guide/bus-open-data-implementation-guide#:~:text=The%20Bus%20Open%20Data%20Service%20(%20BODS%20)%20regulations%20will%20require%20the,wass%20launched%20in%20November%202020)

role that Public Transport has to play within the MaaS environment; indeed in 2018, The Act on Transport Services in Finland brought together legislation on transport markets. The aim of the legislative reform was to provide the users with better transport services and to increase freedom of choice in the transport market. Part of this act ensures that regardless of the mode of transport, a provider of passenger mobility services shall ensure that essential, up-to-date data on its services is freely available from an information system (open interface). The data should be provided in a standard, easy to edit, and computer readable format. At minimum, this essential data shall include information on routes, stops, timetables, prices, availability, accessibility as well as access to the sales interface of their ticket and payment systems - at least for single tickets. In the next developments of the database feeding the Compliance Map, regulatory frameworks from Spain, Belgium, Canada, USA, Japan (indicative list) will be added and analysed. In this way, GECKO project aims at achieving a greater geographical coverage and include countries having a relevant state of art of MaaS adoption.

Car-sharing

Regulations aimed at maximising benefits from car-sharing are presented at both national and local level. As regards the national level, in terms of RC, the highest values are obtained by Germany, which scores the highest in almost all of the components and obtained very high scores for Infrastructure and Environment compared to other countries. In April 2017, Germany adopted a 'Car-Sharing Law' regulating allocation of parking spaces specifically for car sharing nationwide. Public parking spaces are allocated to fixed location-based services individually, whereas parking is shared for free-floating services. Additionally, the region of Lower Saxony in Germany introduced a law that regulates the special use of public roads within the road construction load of the communities for the purpose of car sharing with the aim of reducing the need for parking space and reduce environmentally harmful effects of motorised private transport. Competent authorities are thus allowed to determine suitable areas for station-based car sharing vehicles based on e.g. the need for integration with public transport. Car sharing providers are selected for station-based operations and must meet certain criteria including environmental and accessibility criteria.

As regards the local level, in terms of RC, the highest values are obtained by Sydney, which scores the highest in almost all of the components, distinguishing from other countries in particular in Environment, Data, Cooperation and Social. Sydney defined the Car Sharing Policy with the main objective to increase use of car sharing, and to ensure that the City's car sharing program is well-governed and transparent. Specific objectives include: using on-street parking spaces more efficiently: by replacing the parking demand created by underused private vehicles, reducing vehicle traffic and greenhouse emissions: by reducing vehicle kilometres travelled, and shifting travel to more fuel efficient vehicles; supporting the local economy: by decreasing the need of businesses and individuals to own a private vehicle and car space; increasing social inclusion: by enabling access to a variety of vehicles to households who could not otherwise afford them; and improving health: as people walk and cycle more.

In the next developments of the database feeding the Compliance Map, regulatory frameworks from Italy, Canada, and others (indicative list) will be added and analysed. In this way, GECKO project aims at achieving a greater geographical coverage and include countries having a relevant state of art of Car-sharing adoption.

Bike sharing

Regulations aimed at maximising benefits from bike-sharing are presented at local level. In terms of RC, the highest values are obtained by Chicago and Toronto. Looking at the individual components, Toronto scores highest in the components Data, Cooperation, Social and Safety. In Toronto the Toronto Parking Authority (“TPA”) is the owner of a self-serve bicycle rental system, managed by Shift Transit Inc. In June 2020 Bike Share Toronto and Canadian Automobile Association South Central Ontario (CAA SCO) have signed a multi-year partnership agreement that will make CAA SCO an Official Partner of Bike Share Toronto. The agreement includes CAA SCO’s commitment to continue its official sponsorship of Free Ride Wednesdays and provides CAA members and CAA On the Move members with special offers on bike share membership and rides through its CAA Rewards Program. On the other hand, Chicago scores highest in Environment, User/consumer awareness and acceptance and Completeness of pilots and contracts requirements; Chicago City has identified requirements for the operators in order to participate to the 6-months pilot programme (2018). The pilot is designed to explore the operational impacts of dockless bikes and gauge demand for the service in areas not served by the City’s popular Divvy bikeshare program.

E-scooter sharing/ Micromobility

Regulations aimed at maximising benefits from E-scooter sharing are presented at local level. In terms of RC, the highest values are obtained by Chicago and Lisbon. Looking at the individual components, as for bike sharing, the capital of Illinois obtained among the highest scores in Infrastructure, Data, Safety and Completeness of contract requirements; indeed the city has launched a multi-year programme of pilots to evaluate how and under which conditions and requirements e-scooter companies can contribute to the pursuit of the objectives of accessibility, safety, sustainability etc. The City will use the 2020 pilot to better understand how shared e-scooter operations function in Chicago, to have conversations with and receive feedback from residents, and to help determine if the service should be permitted to operate in Chicago in the future. The City of Chicago granted permission to three shared e-scooter companies to operate in the 2020 e-scooter pilot: Bird, Lime and Spin. The 2020 pilot ran four months from mid-August to mid-December. Each company was allowed to deploy up to 3,333 scooters throughout the City of Chicago for a total of 10,000 scooters citywide. For the 2020 pilot, the City drafted updated rules and minimum requirements based on the results of last year’s pilot and feedback from residents and community organizations. In order to select participating e-scooter companies, the City developed questions and objective criteria designed to help determine which companies are most able to meet the City’s goals and which companies are qualified for running a service that goes above and beyond minimum requirements. As regards Lisbon, the capital of Portugal scores the highest in Environment, Cooperation, Social, User/consumer awareness and acceptance, Political; following negotiations, the first eScooter operation was launched by LIME in October 2018, followed by further eight in the following 6 months. During negotiations, the city made clear to the operators that, for equity reasons, the service should cover the whole of the city, which in theory means that those areas less served by public transport should have more mobility options available. The long-term goal of the city is to provide a complete set of mobility services, with public transport as the backbone and NMS complementing it, to encourage people to give up

their private car. Political support from the City of Lisbon to enable these types of services to take off has been instrumental, with the direct involvement of the Mayor and Deputy Mayor in charge of transport. The city has adopted a management style, a tolerant approach to innovation and a proactive line in terms of finding solutions to boost the operations and tackle the adverse effects of these services.

Ride-hailing and TNC

Regulations aimed at maximising benefits from ride-hailing are presented at both national and local level. As regards the national level, in terms of RC, the highest values are obtained by the United Kingdom, which scores the highest in almost all of the components and obtaining very high score for Environment compared to other countries; in UK ride-hailing companies must meet national regulation on Private-Hire Vehicles but cities have the discretion to define licensing standards. Transport for London conducts continuous checks on criminal background and driving history on ride-hailing drivers. Additionally, every three years drivers have to submit medical clearances; while other conditions for issuing licences include the need to pass vehicle inspections and commercial insurance coverage. Furthermore, in April 2019 London expanded application of the daily charge to include ride-hailing vehicles which are also subject of payment of an additional £12.50 charge per day to enter into the Ultra Low Emission Zone if they don't meet the required engines standards. This is not required for traditional taxi services and for this reason ride-hailing drivers are challenging this distinction in litigation. In this framework, it resulted that the social component, which includes the aspect of competition with existing services, has been better addressed by the Canadian regulatory framework; indeed, as regards the local level, in terms of RC the highest values are obtained by Toronto, which legalized ride hailing services since 2016; the legislation defines rules in terms of trip data requirement, minimum passenger fare, accessibility and consumer protective measures. The city imposed some price controls for ride-hailing services: in order to both protect the traditional taxi city services and to ensure adequate income for ride-hailing drivers, ride-hailing services cannot charge less than \$3.25 per trip (approximately the equivalent of the base taxi fare). In addition, the city allowed traditional taxis to use booking apps to charge below or above the metered rate, enabling them to compete with ride-hailing service providers on price flexibility⁹.

In the next developments of the database feeding the Compliance Map, regulatory frameworks from India, Australia, USA, Russia (indicative list) will be added and analysed. In this way, GECKO project aims at achieving a greater geographical coverage and include countries having a relevant state of art of Ride-hailing and TNC adoption.

On-demand ridesharing/Car-pooling

Regulations aimed at maximising benefits from on-demand ridesharing/Car-pooling are presented at local level. In terms of RC, the highest values are obtained by France and the United States. Looking at the individual components, France scores the highest in Environment, Data,

⁹ [E-Hail Regulation in Global Cities \(nyu.edu\)](https://www.nyu.edu/library/nyu/ehail/)

Social and User/consumer awareness and acceptance; the region Île-de-France Mobilités has decided to continue its policy in favour of carpooling by offering new benefits to drivers and travellers from May 2019. The aim is to encourage more and more Ile-de-France residents to take the step of shared mobility for their daily commute to work.

In the USA, the Sandbox Demonstration Program provides a venue through which integrated Mobility On Demand concepts and solutions – supported through local partnerships – are demonstrated in real-world settings.

In the next developments of the database feeding the Compliance Map, regulatory frameworks from Italy, Romania, Belgium, USA and Asia (indicative list) will be added and analysed. In this way, GECKO project aims at achieving a greater geographical coverage and include countries having a relevant state of art of On-demand ridesharing/Car-pooling adoption.



Reference Documents

- KPMG - Autonomous Vehicles Readiness Index (2019)- <https://home.kpmg/xx/en/home/insights/2019/02/2019-autonomous-vehicles-readiness-index.html#:~:text=The%20results%20of%20the%202019,of%20driverless%20cars%20and%20trucks.>
- “Unmanned Airspace” website - [Drone delivery operations underway in 27 countries - Unmanned airspace](#)
- D1.2 - Lemo project (2018) [20180710 D1.2 Big+Data+Policies LeMO.pdf \(squarespace.com\)](#)
- MaaS Alliance website - [MaaS in Action — MAAS-Alliance \(maas-alliance.eu\)](#)
- ACEA - Carsharing: Evolution, Challenges and Opportunities (2014) https://www.acea.be/uploads/publications/SAG_Report_-_Car_Sharing.pdf
- Deloitte - Car Sharing in Europe: Business Models, National Variations and upcoming disruptions (2017) - <https://www2.deloitte.com/content/dam/Deloitte/de/Documents/consumer-industrial-products/CIP-Automotive-Car-Sharing-in-Europe.pdf>
- ING - Car sharing unlocked (2018) https://think.ing.com/uploads/reports/ING_-_Car_sharing_unlocked.pdf
- Rudin Center Report - E-hail Regulation in Global Cities (2019) - <https://wagner.nyu.edu/impact/research/publications/e-hail-regulation-global-cities#:~:text=In%20recent%20years%E2%80%94and%20with,Ola%2C%20Lyft%2C%20and%20Didi.&text=Yet%20today%2C%20millions%20of%20e,and%20to%20improve%20working%20conditions.>
- CHUMS project - [FPR final.pdf \(chums-carpooling.eu\)](#)
- UC Berkeley - The Benefits of Carpooling (2018) - [The Benefits of Carpooling \(escholarship.org\)](#)

ANNEX I – Compliance Map: Guidelines for the user

This Annex is intended to provide a guideline to the Compliance Map user. This guideline will be available for downloading in the Compliance Map webpage itself.

The Compliance Map is a regulatory supportive tool aimed at showing practical synthesis of the similarities and differences, across different regulatory schemes that share the common focus goal of enabling newly emerging disruptive innovations.

The Compliance Map shows:

- **The Regulation Compliance (RC)** meaningful to represent how effectively each country or city regulate the different aspects necessary for the sustainable adoption of the new mobility solutions (namely Infrastructural, Political, Data, User/consumer awareness and acceptance, Safety, Completeness of pilots and contracts requirements, Environmental, Social, Cooperation, Others).
- **The Regulation Readiness (RR)** meaningful to represent a holistic assessment of the level of readiness of each country's regulatory framework to accommodate the introduction or diffusion of different mobility solutions according to their penetration levels.
- Entrance **Barriers** for different mobility services, business models and technologies.

Below is the screenshot of the web page where you can navigate through the contents of the GECKO Compliance Map.

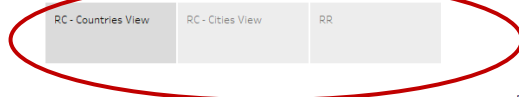
By selecting one of the three boxes at the top (circled in red in the picture below) you can switch between the different views available in the Compliance Map.



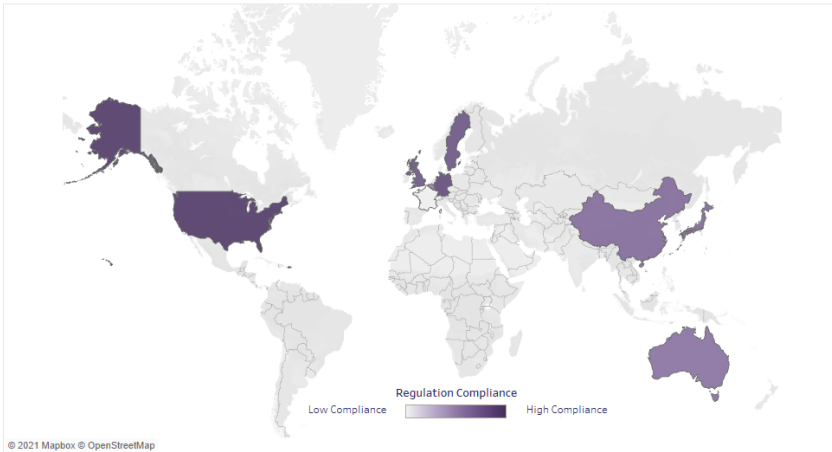
Welcome to the Compliance Map

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- * The Regulation Readiness (RR) meaningful to represent a holistic assessment of the level of readiness of each country's regulatory framework to accommodate the introduction or diffusion of different mobility solutions according to their penetration levels.



GECKO - Regulation Compliance - Countries View



- Evaluation Category: Political
- Mobility Solutions_Countries
- Big data for transport and mobility
 - Car-sharing
 - Connected and Automated Vehicles
 - Drone last mile delivery
 - MaaS and MaaS platforms
 - On-demand ridesharing and carpooling
 - Ride-hailing and TNC

The views are explained one by one below.



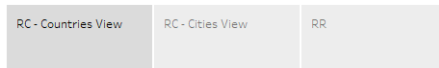
Regulation Compliance - Countries View and Cities view (first two boxes)

What you will find

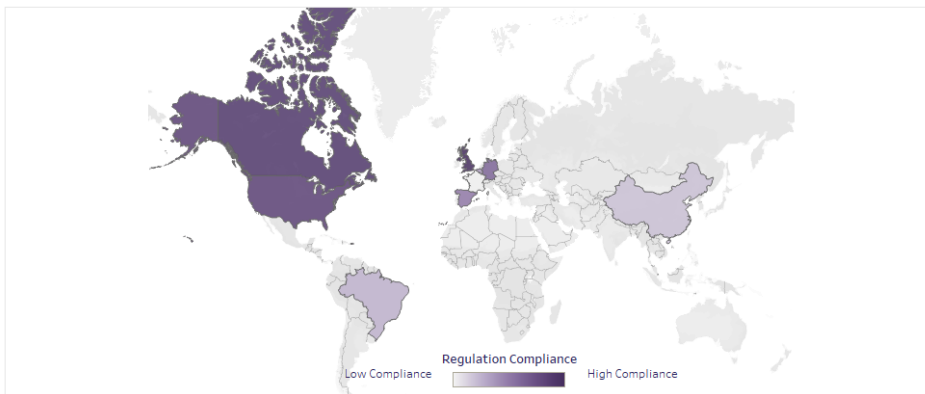
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- * The Regulation Readiness (RR) meaningful to represent a holistic assessment of the level of readiness of each country's regulatory framework to accommodate the introduction or diffusion of different mobility solutions according to their penetration levels.



GECKO Compliance Index - Countries View



Evaluation Category

Cooperation

Mobility Solutions_Countries

- Big data for transport and mobility
- Car-sharing
- Connected and Automated Vehicles
- Drone last mile delivery
- MaaS and MaaS platforms
- On-demand ridesharing and carpooling
- Ride-hailing and TNC

Welcome to the Compliance Map

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- * The Regulation Readiness (RR) meaningful to represent a holistic assessment of the level of readiness of each country's regulatory framework to accommodate the introduction or diffusion of different mobility solutions according to their penetration levels.



GECKO Compliance Index - Cities view



Evaluation Category

Cooperation

Mobility Solutions_Cities

- Bike sharing
- Car-sharing
- E-scooter sharing/ Micromobility
- Ride-hailing and TNC

The RC is presented by making reference to two jurisdictional levels: Countries level and Cities level. For each of these views, mobility solutions relevant for that jurisdictional level are presented.

For countries:

- Big Data for transport and mobility
- Car-Sharing
- Connected and Automated Vehicles
- Drones for Last Mile Delivery
- MaaS and MaaS platforms
- On-demand ridesharing and carpooling
- Ride-hailing and TNC

For cities:

- Bike sharing
- Car-Sharing
- E-scooter sharing/Micromobility
- Ride-hailing and TNC

What you can do

From these views you can:

- Visualise the RC index for each highlighted country/city by selecting the overall RC or one of its evaluation category-component from the drop-down list.

Welcome to the Compliance Map

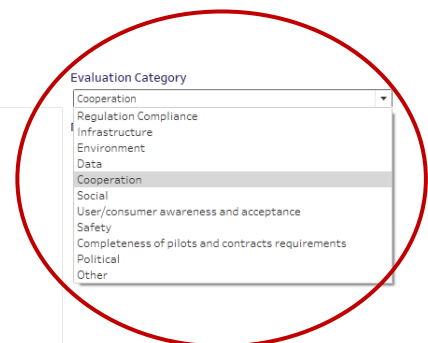
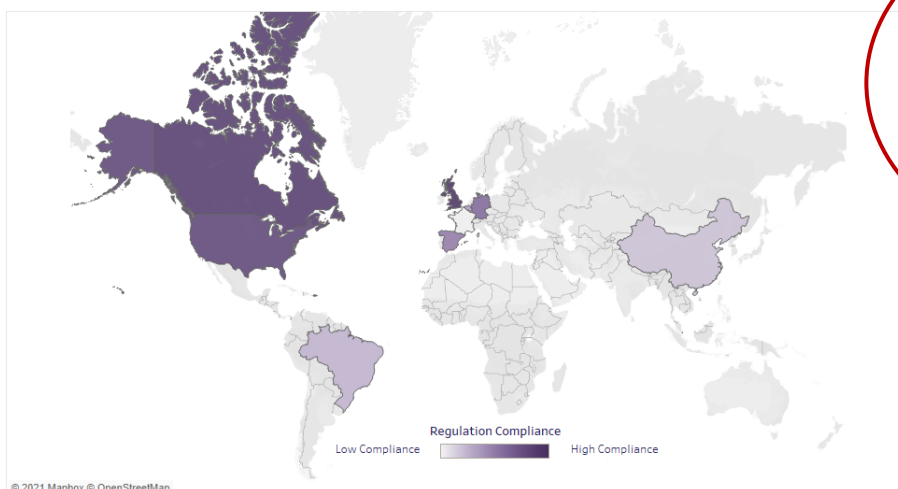
The Compliance Map is a regulatory supportive tool aimed at showing practical synthesis of the similarities and differences, across different regulatory schemes that share the common focus goal of enabling newly emerging disruptive innovations. The Compliance Map shows:

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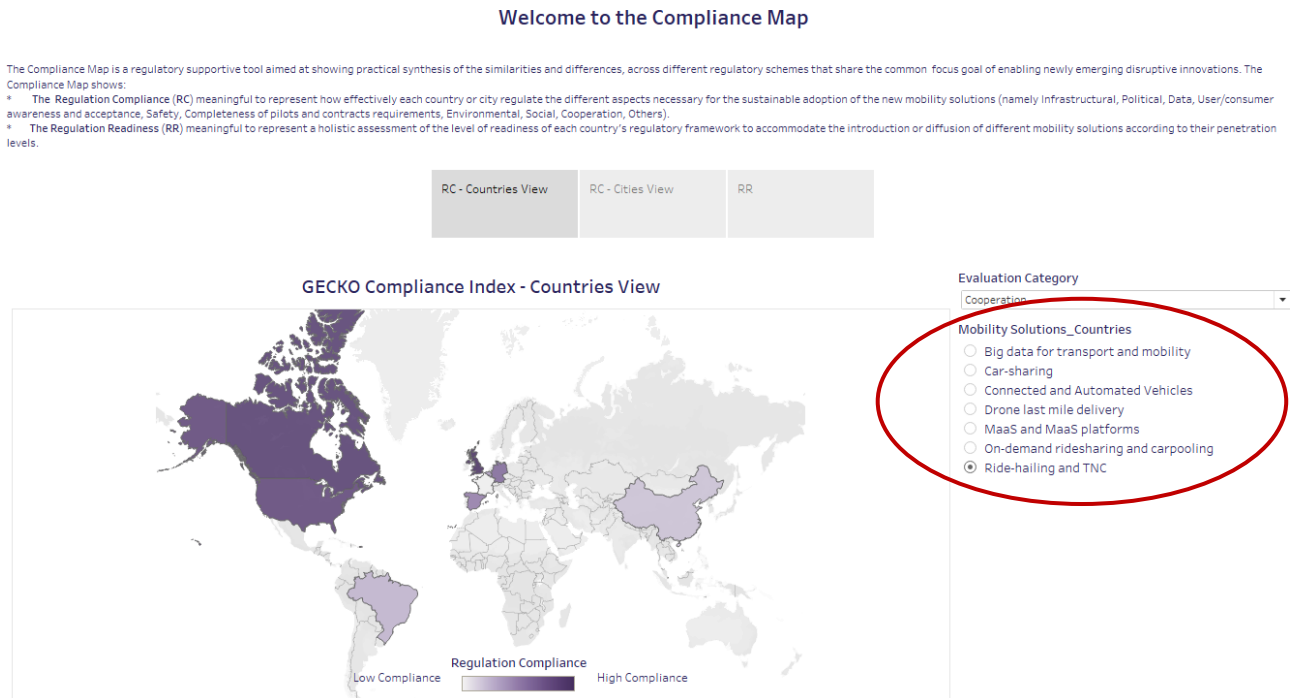
* The Regulation Readiness (RR) meaningful to represent a holistic assessment of the level of readiness of each country's regulatory framework to accommodate the introduction or diffusion of different mobility solutions according to their penetration levels.



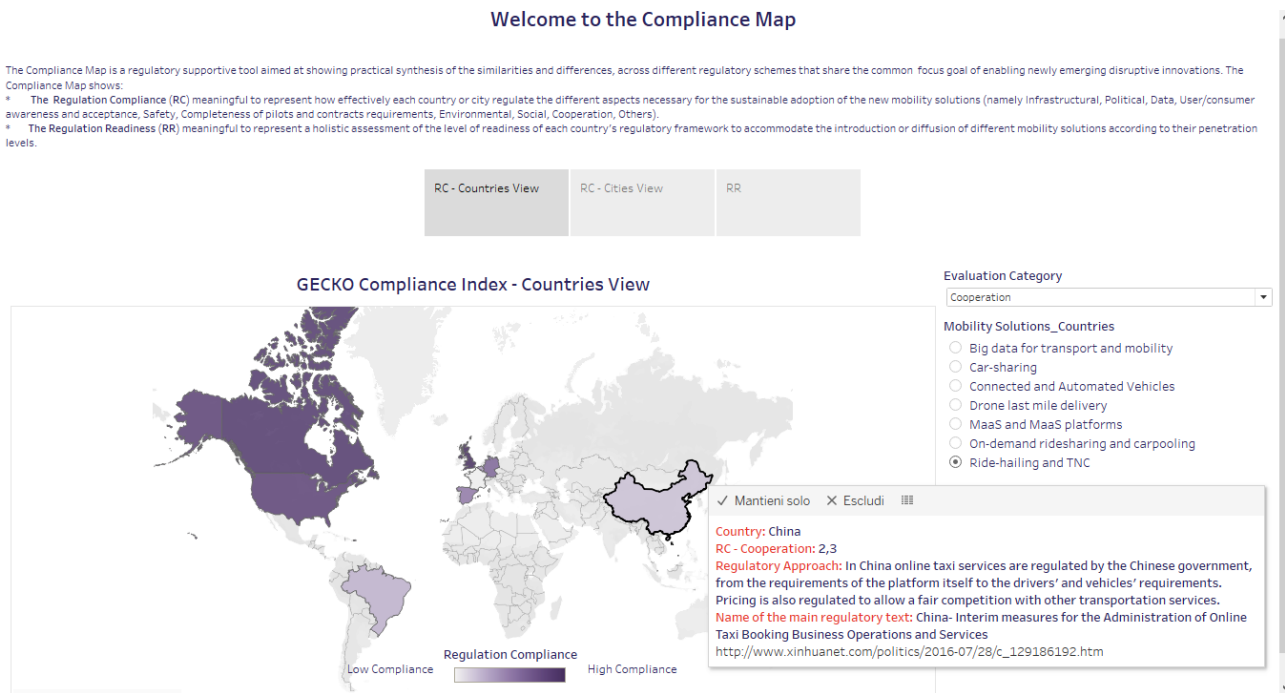
GECKO Compliance Index - Countries View



- Select the mobility solution to which RC (or its components selected in the previous point) relates



- Hover your mouse over each Country or City: a pop-up window will appear showing the following information:
 - o Country/City Name
 - o Value of the RC or the selected evaluation category-component
 - o Brief explanation of the regulatory approach
 - o Main Regulatory text
 - o URL to the main regulatory text
 - If you double click on the Country/City, you can fix the pop-up window and click on the URL to be redirected to the Regulatory text (or a relevant news on that, especially for non-originally English webpage).



Understanding and interpreting results

In general, a high value of either the overall RC indicator (or a single evaluation category score composing it) means that the related regulatory framework is effective in enabling the mobility solution (the former from a general point of view, the latter from a specific perspective) and vice versa.

To give an example, if in the Compliance Map we select the evaluation category "Completeness of pilots and contract requirements" and the mobility solution " E-scooter sharing/ Micromobility", we see that Stockholm scores very low because the market is currently unregulated and no permit from the City is needed to put a fleet of shared e-scooters on the streets.

On the other hand, if we look at Chicago, we see that the capital of Illinois obtains among the highest scores compared to other cities because it has launched a multi-year programme of pilots to evaluate how and under what conditions and requirements e-scooter companies can contribute to the pursuit of the objectives of accessibility, safety, sustainability etc.

Regulation Readiness - Countries View and Cities view (first two boxes)

What you will find

The Regulation Readiness (RR) represents a holistic assessment of the level of readiness of each country's regulatory framework to accommodate the introduction or diffusion of different mobility solutions according to their penetration levels. The RR is referred to the country level. It combines all of the regulations (local, regional, national) and relative analysis pertaining to each country.

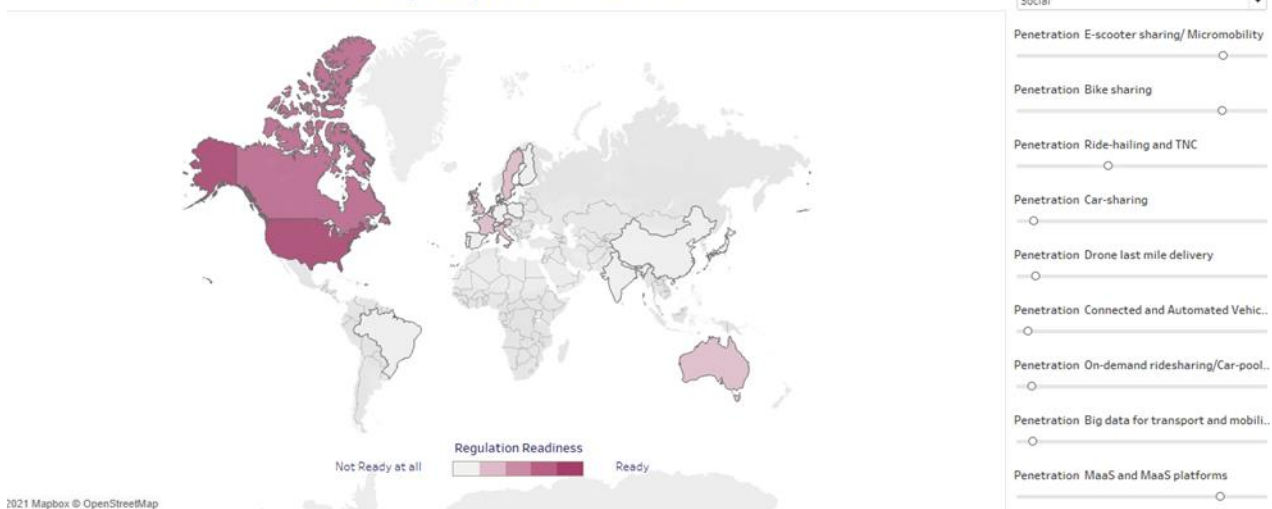
Welcome to the Compliance Map

The Compliance Map is a regulatory supportive tool aimed at showing practical synthesis of the similarities and differences, across different regulatory schemes that share the common focus goal of enabling newly emerging disruptive innovations. The Compliance Map shows:

- * The Regulation Compliance (RC) meaningful to represent how effectively each country or city regulate the different aspects necessary for the sustainable adoption of the new mobility solutions (namely Infrastructural, Political, Data, User/consumer awareness and acceptance, Safety, Completeness of pilots and contracts requirements, Environmental, Social, Cooperation, Others).
- * The Regulation Readiness (RR) meaningful to represent a holistic assessment of the level of readiness of each country's regulatory framework to accommodate the introduction or diffusion of different mobility solutions according to their penetration levels.



GECKO Regulatory Framework Readiness



What you can do

Similar to the RC, it is possible to visualise the RR index for each coloured country/city by selecting the overall RC or one of its evaluation category-component from the drop-down list.

Furthermore, through the use of different sliders (circled in red in the picture below), you will be able to select every possible combination of mobility solutions penetration. As a result, the Compliance Map will automatically update the values of RR obtained for that combination.

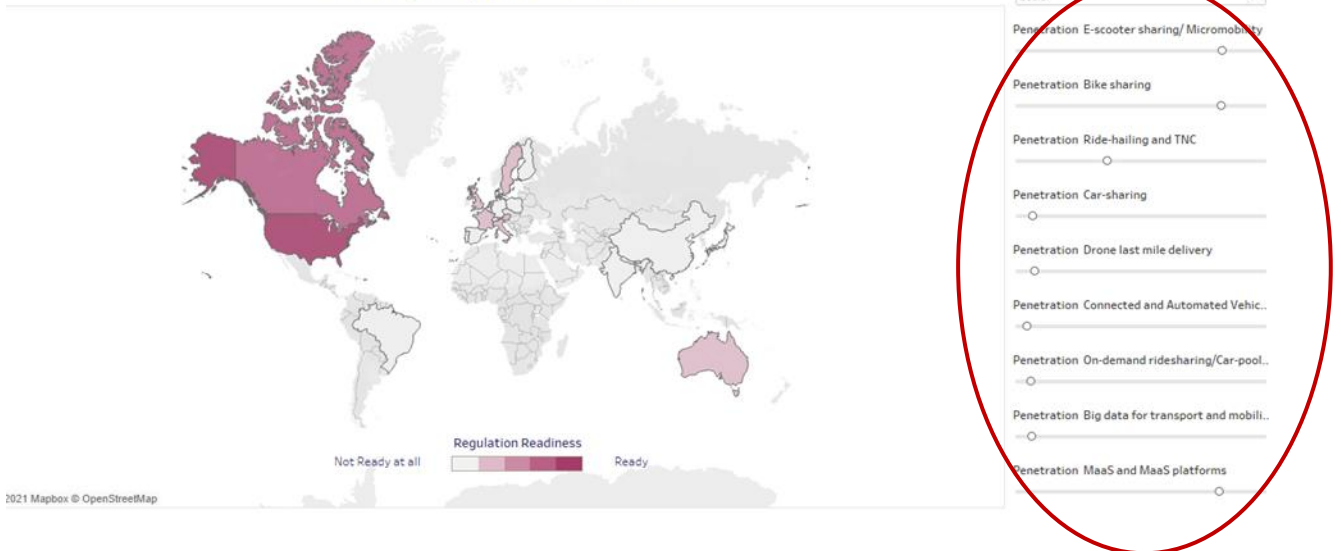
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GECKO Regulatory Framework Readiness



Understanding and interpreting results

In general, a higher value of the RR means that the related regulatory framework is more ready to accommodate the selected combination of mobility solutions penetration.

Note to the user:

Since the RR is calculated as the average of the values obtained from the different regulations collected for each country, the reliability of the RR values also depends on whether regulations for each of the mobility solutions have been collected and analysed for each country. In the two figures shown above, for example, the RR value for the USA is always the highest. This is due to the fact that, in the current state of development of the regulations database feeding the Compliance Map, regulations in the USA have been collected for almost all of the mobility solutions.

However, the work of collecting and analysing regulations will continue with the aim at providing the more reliable results possible.

Barriers

What you will find

The webpage dedicated to the barriers presents the entrance barriers that may occur in mobility services uptake providing a qualitative but structured methodology, representing aspects influencing the adoption/deployment of the mobility solutions studied in GECKO from diverse, mutually interdependent, viewpoints: Political, Economic, Societal, Technological, Legal and Environmental. This analysis is aimed at providing an overview of the main difficulties faced by these innovations, supporting decision on policies to be adopted to pave the way for a sustainable adoption of a particular innovation.

Barriers are shown as separate content, so it is shown in the GECKO website through a dedicated link:

The screenshot shows the GECKO website interface. At the top, there is a navigation menu with links for ABOUT, APPROACH, TOOLS, RESOURCES, NEWS & EVENTS, and CONTACT. Below the menu is a map of Europe with a search bar. A blue arrow points from the 'Barriers' link on the map to a detailed 'Barriers' section.

The 'Barriers' section is titled 'MaaS and MaaS platforms' and is organized into columns for Political, Economic, Social, Technological, Legal, and Environmental. Each column contains a colored icon representing a barrier. Below the icons is a table of barriers with their descriptions.

| Barrier | Description |
|---|---|
| Complex ticketing | The various stakeholders involved in the MaaS offer can meet some difficulties while creating and setting up a global offer. |
| Disincentivizing sustainable trips, competition increased | The MaaS platform encompasses all types of transport and mobility services, customers can choose services less sustainable than others (TNCs, taxis) instead of active modes (cycling, walking) or public transport. |
| Fragmentation of the transport offer | The persistence of fragmented public ownership of transport services in urban areas may hamper the trend towards data integration, as a key basis for supplying MaaS. A lack of interest in integrating shared mobility services and public transport to increase flexibility and cost efficiency will reduce the potential of co-modality. |
| Heterogeneous data processing | The MaaS platform has to process a massive volume of heterogeneous data collected in real time, coming from various providers and IoTs. This could be a technological barrier for the service. |
| Insurance and liability | The conflicts among MaaS providers, transport operators and users would create barriers for regulation in terms of insurance and liability. |
| Lack of consumer protection | If no guarantee is defined in case of cancellation, unavailability of one or several transport modes, this could be a strong barrier for MaaS adoption. |
| Lack of cooperation | In order to materialize the benefits of MaaS solutions, it is necessary to attract a critical mass of users. This, in turn, requires coordination between different modes of transport to provide convenient door-to-door journeys. Lack of cooperation between stakeholders, lack of agreement that could preserve mutual interests can lead to market disequilibrium and then to a lack of investment for infrastructure for mixed transport modes. |
| Lack of investment for infrastructure for mixed transport modes | In order to ensure multimodality, intra- and inter-modality, infrastructures are required to connect all transport modes, especially at transport nodes. The lack of investment in this regard can be problematic for the service adoption and deployment. |
| Lack of transport services | The lack of transport modes can make the MaaS service irrelevant (e.g. in rural areas). This issue is also relevant when dealing with first-mile/last-mile challenges. The global offer must propose solutions to address this challenge in order to maximize people to use their cars. |
| Market failure | Too much MaaS operators available on a given territory can lead to local market failure and prevent from the deployment of MaaS. In addition, the MaaS operator can provoke a disequilibrium of the ecosystem through the choice of mobility operators available in the platform. |
| Public transport less affordable | The global offer set up through MaaS platforms includes public and private services, with the potential to get pressure on public transport operators for the prices to keep the global offer economically sustainable for all stakeholders. This could result in less affordable public transport and prevent from mobility access to everybody. |

What you can do

You can select one or more mobility solutions to visualize:

- Name of the case study
- Barrier name
- Description of the barrier.

Each description of the barrier presents a brief text coloured according to the barrier type (Political, Economic, Social, Technological, Legal, Environmental).

Following an example of the barriers for MaaS:

MaaS and MaaS platforms

Political Economic Social Technological Legal Environmental

Case Study

- Big data for transport and mobility
- Bike sharing
- Car sharing
- Connected and Automated vehicles
- Cooperative traffic management
- Cross cutting issues
- Drone last-mile delivery
- E-scooter sharing / Micromobility
- Hyperloop
- MaaS and MaaS platforms
- On-demand roadsharing/Car-pooling
- Ridehailing and TIC

Barriers

| Barrier Name | |
|--|---|
| Complex ticketing | The various stakeholders involved in the MaaS offer can meet some difficulties while creating and setting up a global offer. |
| Dis-incentivizing sustainable trips, congestion increased | The MaaS platform encompasses all types of transport and mobility services, customers can choose services less sustainable than others (TNCs, taxis) instead of active modes (cycling, walking) or public transport. |
| Fragmentation of the transport offer | The persistence of fragmented public ownership of transport services in urban areas may hamper the trend towards data integration, as a key basis for supplying MaaS. A lack of interest in integrating shared mobility services and public transport to increase flexibility and cost efficiency will reduce the potential of co-modality. |
| Heterogeneous data processing | The MaaS platform has to process a massive volume of heterogeneous data collected at real-time, coming from various providers and IoTs. This could be a technological barrier for this service. |
| Insurance and liability | The conflicts among MaaS providers, transport operators and users would create barriers for regulation in terms of insurance and liability. |
| Lack of consumer protection | If no guarantee is defined in case of cancellation, unavailability of one or several transport modes, this could be a strong barrier for MaaS adoption. |
| Lack of cooperation | In order to materialize the benefits of MaaS solutions, it is necessary to attain a critical mass of users. This, in turn, requires orchestration between different modes of transport to provide convenient door-to-door journeys. Lack of cooperation between stakeholders, lack of agreement that could preserve mutual interests can lead to market disequilibrium and the n. |
| Lack of investment for infrastructure to connect transport modes | In order to ensure multimodality, intra- and inter-modality, infrastructures are required to connect all transport modes, especially at transport nodes. The lack of investment in this regard can be problematic for the service adoption and deployment. |
| Lack of transport services | The lack of transport modes can make the MaaS service irrelevant (e.g. in rural areas). This issue is also relevant when dealing with first mile/last mile challenges. The global offer must propose solutions to address this challenge in order to incentivise people to abandon their cars. |
| Market failure | Too much MaaS operators available on a given territory can lead to local market failure and prevent from the deployment of MaaS. In addition, the MaaS operator can provoke a disequilibrium of the ecosystem through the choice of mobility operators available in the platform. |
| Public transport less affordable | The global offer set up through MaaS platforms includes public and private services, with the potential to get pressure on public transport operators for the prices to keep the global offer economically sustainable for all stakeholders. This could result in less affordable public transport and prevent from mobility access to everybody. |

Furthermore, by hovering the mouse on the description text, a pop-up window will be displayed, illustrating example of solutions and best practices adopted to overcome that barrier.

MaaS and MaaS platforms

Political Economic Social Technological Legal Environmental

Case Study

- Big data for transport and mobility
- Bike sharing
- Car sharing
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| Insurance and liability | The conflicts among MaaS providers, transport operators and users would create barriers for regulation in terms of insurance and liability. |
| Lack of consumer protection | If no guarantee is defined in case of cancellation, unavailability of one or several transport modes, this could be a strong barrier for MaaS adoption. Solutions: Policy makers should make sure insurance and liability is considered in the offer by the operator to the authority; the MaaS provider should not be liable for what happens by the operator (on which MaaS providers have no control over). Best practice: n.a. |
| Lack of cooperation | In order to materialize the benefits of MaaS solutions, it is necessary to attain a critical mass of users. This, in turn, requires orchestration between different modes of transport to provide convenient door-to-door journeys. Lack of cooperation between stakeholders, lack of agreement that could preserve mutual interests can lead to market disequilibrium and the n. |
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ANNEX 2 – Indexes calculation

Regulation Compliance

The **RC** is an aggregate index, obtained as an average of 10 evaluation categories:

- Infrastructural
- Political
- Data
- User/consumer awareness and acceptance
- Safety
- Completeness of pilots and contracts requirements
- Environmental
- Social
- Cooperation
- Other (namely Liability for Connected and Automated Vehicles; Public Transport for MaaS)

In turn, the values of each evaluation category were obtained as a weighted average of the KPIs belonging to that category. The values of the KPIs and their weights within each category were defined in accordance with the results of the stakeholder consultation carried out in T3.2¹⁰. This procedure was carried out for each mobility solution.

For the sake of clarity, the Compliance Map shows only the RC and the value obtained for each evaluation category, while, for what concerns the individual KPIs values, the end-user will refer to the Regulatory Framework Dashboard (see Deliverable D3.1 and D3.2 for the methodology).

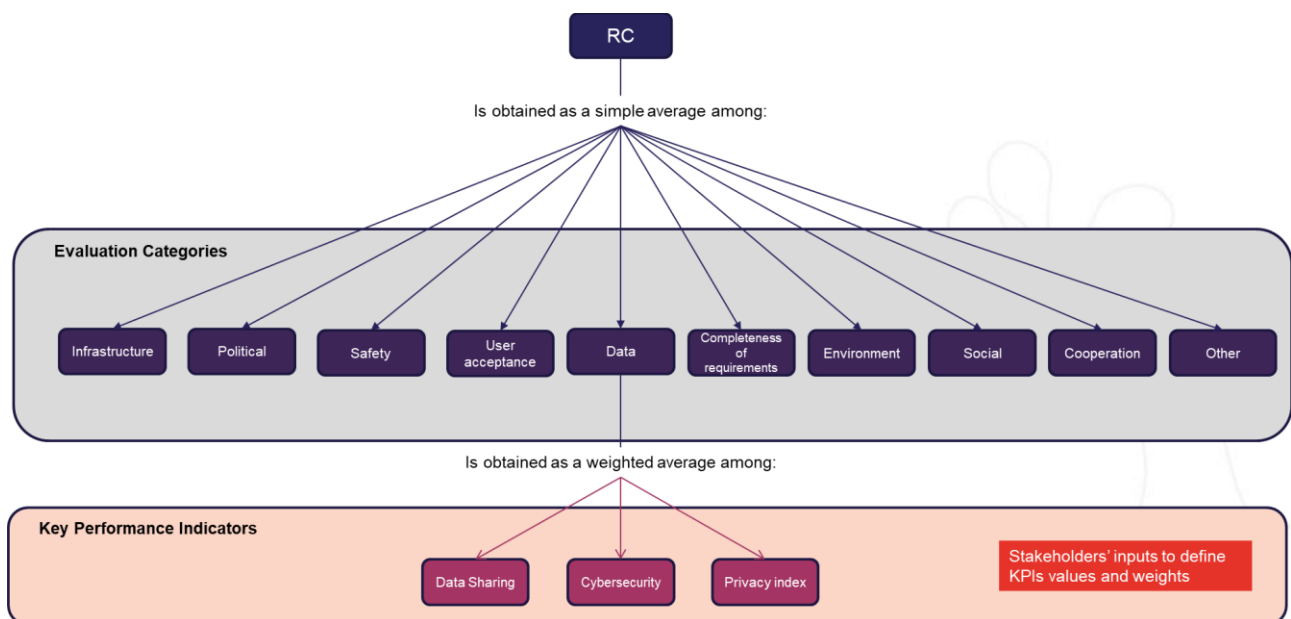


Figure 19 Conceptual scheme used for the definition of RC

¹⁰ For more details about the methodology, please refer to GECKO D3.2

$$RC_{j,ms} = \frac{\sum_i RC_{i,j,ms}}{10}$$

$$RC_{i,j,ms} = \frac{\sum_k x_k KPI_{k,j}}{\sum_k x_k}$$

Where:

$RC_{j,ms}$ = Regulation Compliance Value

$RC_{i,j,ms}$ = Regulation Compliance Value component

i = Evaluation Category

j = Jurisdiction level (city or country)

ms = Mobility Solution

k = number of KPIs belonging to each evaluation category

x_k = Weight of each KPI withing each evaluation category

$KPI_{i,j,k}$ = Value of each KPI

In the compliance map $RC_{j,ms}$ and $RC_{i,j,ms}$ are shown on the Compliance Map by a colour code that is darker the more effectively the regulatory framework complies with its objectives.

Regulation Readiness

The **RR** is a composite index obtained by multiplying the RC for the combination of mobility solutions penetrations selected by the end user.

$$RR_j = \frac{\sum_i RR_i}{10}$$

$$RR_{j,i} = \frac{\sum_J RC_{i,j,ms} \text{ } ms\%}{n_{ms,j}}$$

Where:

RR_j = Regulation Readiness Value

$RR_{j,i}$ = Regulation Readiness Value component

$ms\%$ = Combination of mobility solutions penetrations selected by the end user

J = Jurisdiction level (country clustering)

$n_{ms,j}$ = Number of mobility solutions analysed for each country

GECKO CONSORTIUM

The consortium of GECKO consists of 9 partners with multidisciplinary and complementary competencies. This includes leading universities, networks and industry sector specialists.



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