

# MANTRA

Making full use of Automation for National Transport and Road Authorities  
1 Sep 2018 – 31 August 2020

## Adaptations to NRA core business - recommendations

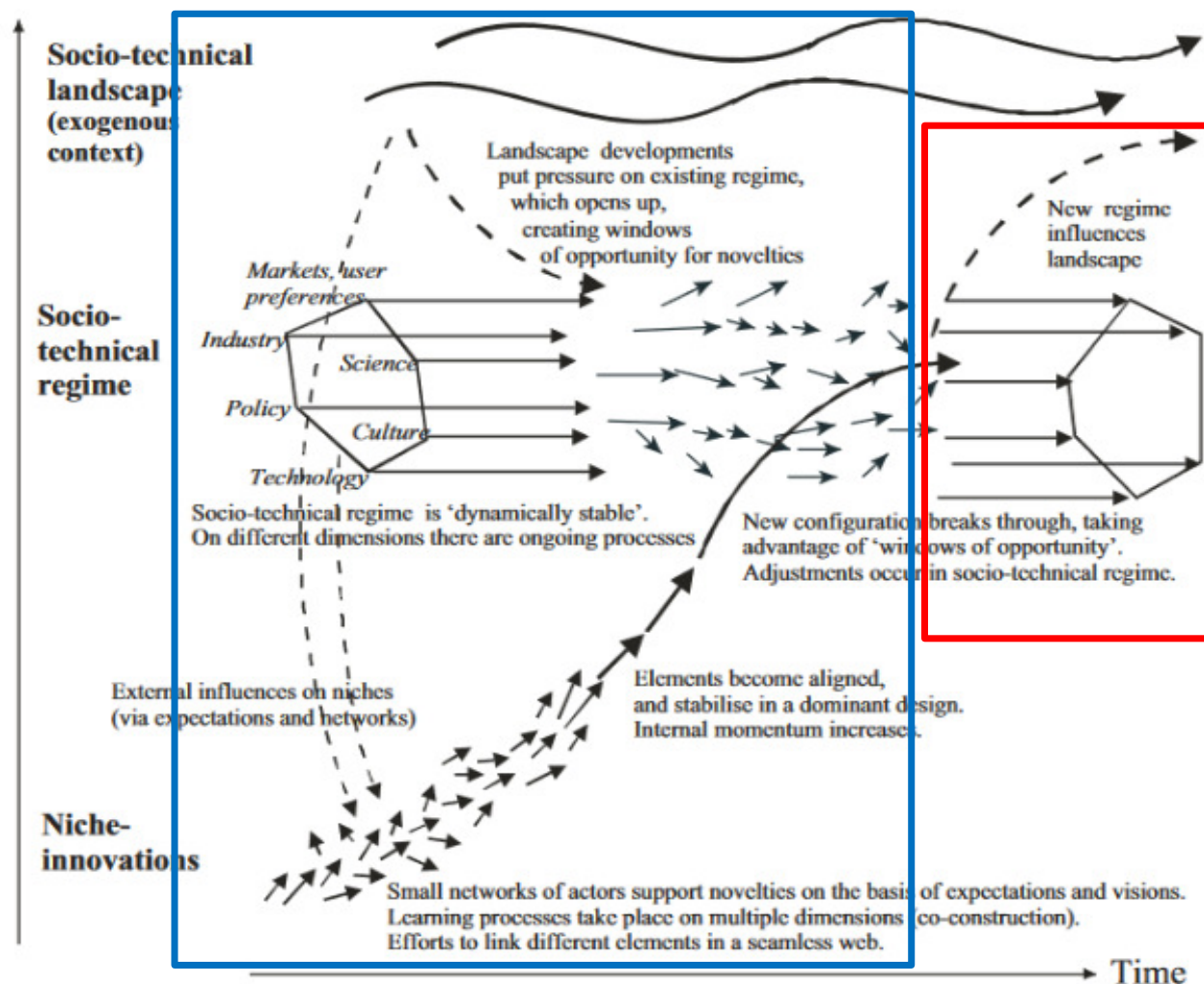
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## Process used in D5.1

- The Multi-Level Perspective (MLP) theory by Geels
- State of the art
  - » Current situation
  - » Socio-technical drivers
  - » Challenges due to HAVs
- Impacts on core business
  - » Mission and objectives
  - » Operations and use of technology
  - » Role
  - » Legal framework
- Adaptations to be made
  - » Recommended actions

Increasing structuration  
of activities in local practices



## 1 Introduction

## 2 Core business of the road operators – state of art

## 3 Impacts of highly automated driving on core business

## 4 Road map for core business adaptation

4.1 Physical Road infrastructure

4.2 Digital road infrastructure and ITS systems

4.3 Operations and services

4.4 Planning, building, heavy maintenance

4.5 New business

Parts to be  
included in D5.1

## 5 Recommended action plan 2020-2024

5.1 Research and innovation

5.2 Regulation and standardisation

5.3 Deployment and operation

5.4 Stakeholder cooperation

Parts to be  
added in D5.2

## 6 Conclusions

## 1 Introduction

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**The workshop focus**

Parts to be included in D5.1

## 5 Recommended action plan 2020-2024

5.1 Research and innovation

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Parts to be added in D5.2

## 6 Conclusions

- Pavement design and maintenance standards review and adaptation
- Pavement enforcement on truck platooning routes
- Additional emergency bays, wide shoulders and safe harbours
- Safe minimum risk manoeuvre specification
- Safe passenger pick-up and drop-off points for automated shuttles and robot taxis
- General road design
- Ramps and junctions
- Road markings
- Road signs machine readability and digital twins
- Road equipment or furniture (gantries, gates, landmarks etc.)

- HD map processes
- Provision of data to HD maps
- Maintenance of HD maps
- RTK or corresponding land stations
- Trunk communications for short range and longer range V2I
- Roadside stations for short range V2I
- External indication of being driven by ADS, or being last in platoon to ensure safety and traffic management
- Road operator fleet supervision centres
- Remote operation centres including questions of "roaming" / cooperation between operation centres

- Use of digital twins for the (road) transport system
- Mandate to provide existing data to HD Maps
- Mandate for fleet managers and OEMs to provide feedback on HD maps
- Strengthen absorptive capacity towards Artificial intelligence, digitalisation and automated decision making (might involve a wide role for NRAs)
- Competitive awareness and potential selective cooperation with big tech companies who have already taken steps into the mobility domain and increase their roles in the digital mobility ecosystem,
- issues of human decision making at traffic management centres

- Harmonised marking of incident sites
- Harmonised management of incident sites
- Digitalisation of incident and traffic management plans
- Automation of incident warning and rerouting services
- Use of safety trailers at incident sites to safeguard incident clearance
- Use of safety trailers and similar vehicles in protection of moving events
- Provision incident and event management related data to traffic managers
- Legal adaptations to enable data sharing of safety critical data
- Leading or coordinating role of road authorities and operators in road incident management



- Cooperative traffic management concept
- Digitalisation of traffic management centres
- Digitalise traffic rules and regulations
- Deployment of geofencing for traffic management
- Provision of ODD management
- Conductor role of road authority/ operator in traffic management
- Removal of informative and route guidance road signs
- Flexible roadside stations

- Integration of operations management centre and traffic management centre
- Connected road maintenance zones
- Legal framework for specific use cases of driverless maintenance vehicles
- Procurement of automated winter maintenance vehicles

- Standardized communication protocols with TMC, fleet managers, service providers and automated vehicles
- Provision of hybrid C-ITS traffic information services
- Enhancing traffic information content
- Improving information quality
- Sharing of data
- Harmonisation of pictograms and messages

- New infrastructure and regulations for traffic law enforcement
- Enforcement through weigh-in-motion systems
- Environmental enforcement
- Wrong way driving detection and enforcement

- Implementing of physical measures possibly required by highly automated vehicles on toll plazas
- Marking of toll plazas for highly automated vehicles
- Definition of a pricing policy for highly automated vehicles
- Inclusion of road use charges into HD maps
- Update of concession agreements

- Road categorization ISAD levels also for digital and physical infrastructure
- Provision of digital twin and digital data of new road
- Use of digital twin and digital data of new road for heavy maintenance planning
- New approaches to road condition data collection for deterioration monitoring

- Standardized communication protocols with TMC, fleet managers, service providers and automated vehicles
- Provision of hybrid C-ITS road works warnings
- Harmonised marking of road works sites
- Harmonised management of road works sites
- Use of safety trailers at road works to ensure safety
- Use of automated vehicles to monitor the performance of road works management