

MANTRA

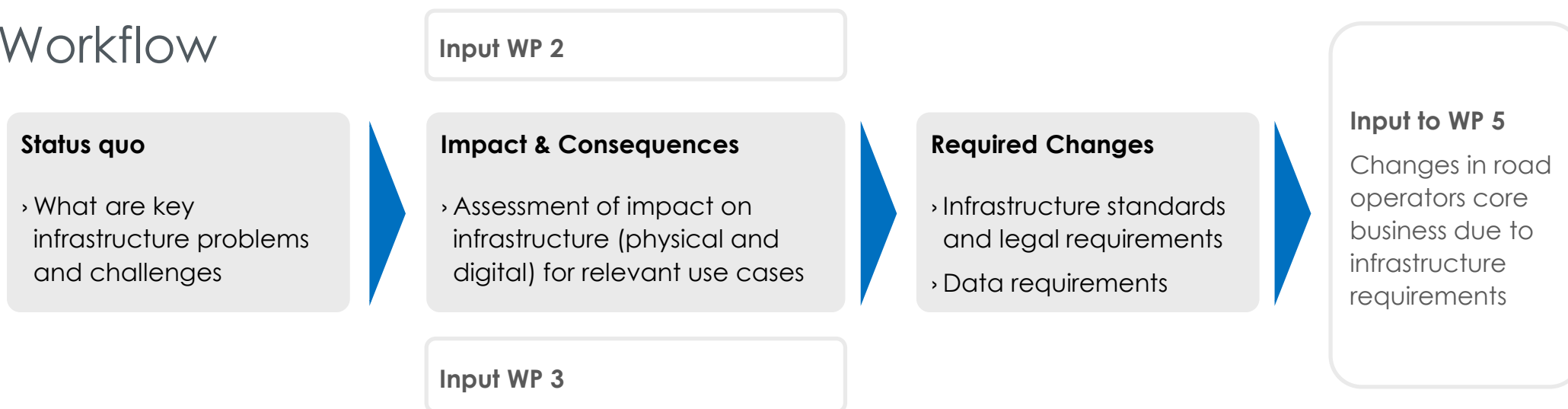
Making full use of Automation for National Transport and Road Authorities

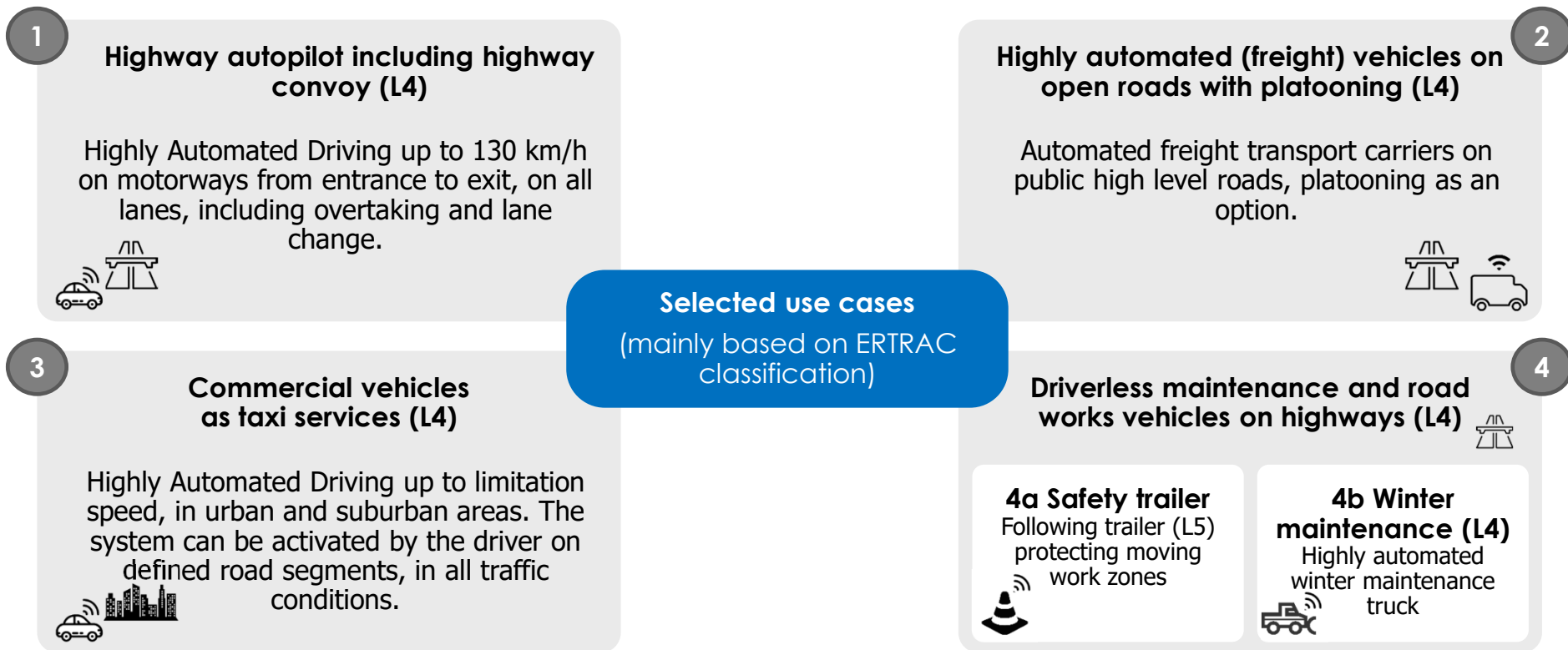
Workshop Vienna 13 March 2020, Sandra Ulrich

KEY TARGET

“ To formulate concrete **consequences** of and **necessary changes** due to the selected automated functions to **infrastructure** and the **conservation*** of infrastructure ”

Workflow











* Together with PEB & CEDR CAD WG as part of the mini-workshop in Vienna (31.08.2018) and in more detail in Oslo (05.11.2018)

The impact and the resulting consequences and necessary changes to infrastructure will have various sources. In WP 4 at least the following will be analysed.

Impact, consequences and necessary changes to infrastructure due to...

	1	2	3
What?	<p>Automated function's operation itself </p> <p>With deployment of various automated function's impact on infrastructure will change in terms of road design, maintenance assumptions and required ITS</p>	<p>The necessity to provide required ODD </p> <p>Digital Infrastructure will need to be defined and amended based on ODD requirements in order to facilitate CAD</p> <p>Incl. ISAD levels</p>	<p>The possibility to improve O&M </p> <p>Operation and maintenance (O&M) of infrastructure could benefit by means of CAD in terms of automation of work procedures and new data sources</p>
Who?	<p>ARNDT IDC Infrastructure & Development Consultants</p> <p>Supported by </p>	<p></p> <p>Supported by </p>	<p>ARNDT IDC Infrastructure & Development Consultants</p> <p>Supported by </p>

Impact, consequences and necessary changes to infrastructure 



Of all use cases, automated freight vehicles are expected to have the biggest impact on infrastructure due to their operation. Following areas have been identified as most crucial

Pavement

- Faster deterioration due to higher loads and convoys
- Focus on complex areas of highways (junctions, merging lanes)
- Need for additional emergency bays and safe harbors
- Changing requirements/standardization for road marking

Tunnels

- Need for additional guiding functions (tunnel wall finishing)
- Lighting in exits/entries
- Total emergency systems: new requirements

Road Equipment

- Most effects on ITS and telematics – will be assessed in a specific task on ODDs.
- International standardization of road signs – machine & human readable
- Toll plazas need automated lanes

Road operator related ODD attributes

ODD attribute	Physical / Digital infrastructure	Static / Dynamic
Road	Physical	Static
Speed range	Physical	Static
Shoulder or kerb	Physical	Static
Road markings	Physical	Static
Traffic signs	Physical	Static
Road equipment	Physical	Static
Traffic	-	Dynamic
Time incl. light conditions	-	Dynamic
Weather conditions	-	Dynamic

ODD attribute	Physical / Digital infrastructure	Static / Dynamic
HD map	Digital	Static/Dynamic
Satellite positioning	Digital	Static
Communication	Digital	Static
Information system	Digital	Static
Traffic management	Digital	Dynamic
Infrastructure maintenance	Physical/Digital	Dynamic
Fleet supervision	Digital	Dynamic
Digital twin of road network	Digital	Dynamic

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* In order to deal with the dynamic non-infrastructure attributes of the ODD MANTRA has identified these three elements that should likely be added to the road operator relevant list of ODD attributes

ODD relevant collection of impacts for road operators

- ODD requirements for each of the attributes and each use case today
- ODD evolution for each attribute until 2020, 2030 and 2040
- ODD effects on different road types
- Responsibilities for establishing, operating and maintaining ODD
- Cost of establishing ODD

Example: ODD effects on motorways

ODD attribute	2030	2040
roads covered	Selected core TEN-T roads without severe congestion to mitigate against possible capacity reduction	60% of motorway network covering core TEN-T network and other motorways with highest accident rates
shoulder or kerb	Safe refuges on some of the roads selected, half suitable for freight as well; digital information on all safe refuges, intact game fences on high risk sections	Safe refuges on some of the roads selected, half suitable for freight as well; digital information on all safe refuges, intact game fences on high risk sections
road markings	Harmonised machine readability of road markings. Enhanced maintenance on selected roads to ensure consistent and minimum quality of solid or dotted lines and symbols painted on the pavement	Harmonised machine readability of road markings. No enhanced maintenance due to automated vehicles

Operational tasks with identified biggest optimization potential

		Safety Hazard	Cost driver	Operational importance	Total Score
Winter maintenance	Preventive salting on highway main-carriageway	8	7	6	21
	Snow ploughing and salting on main-carriageway	5	5	5	15
Work zone protection	Unplanned incidents on first lane (accident, litter removal)	10	4	5	19
	Unplanned incidents on fast lane (accident, litter removal)	12	5	7	24
Operational highway works	Maintenance and repair of road assets and furniture	7	4	5	16
	Road marking	5	5	6	16

Traffic Management Improvements

Digital traffic management plans

- Classification of roads according to network flow hierarchy; “not always the shortest path will be fastest, nor the safest”
- Geo-fencing mechanism.
- Establishing a network performance Level of Service (LoS).
- Defining triggers to engage a cooperative traffic management.

Cooperative traffic management services

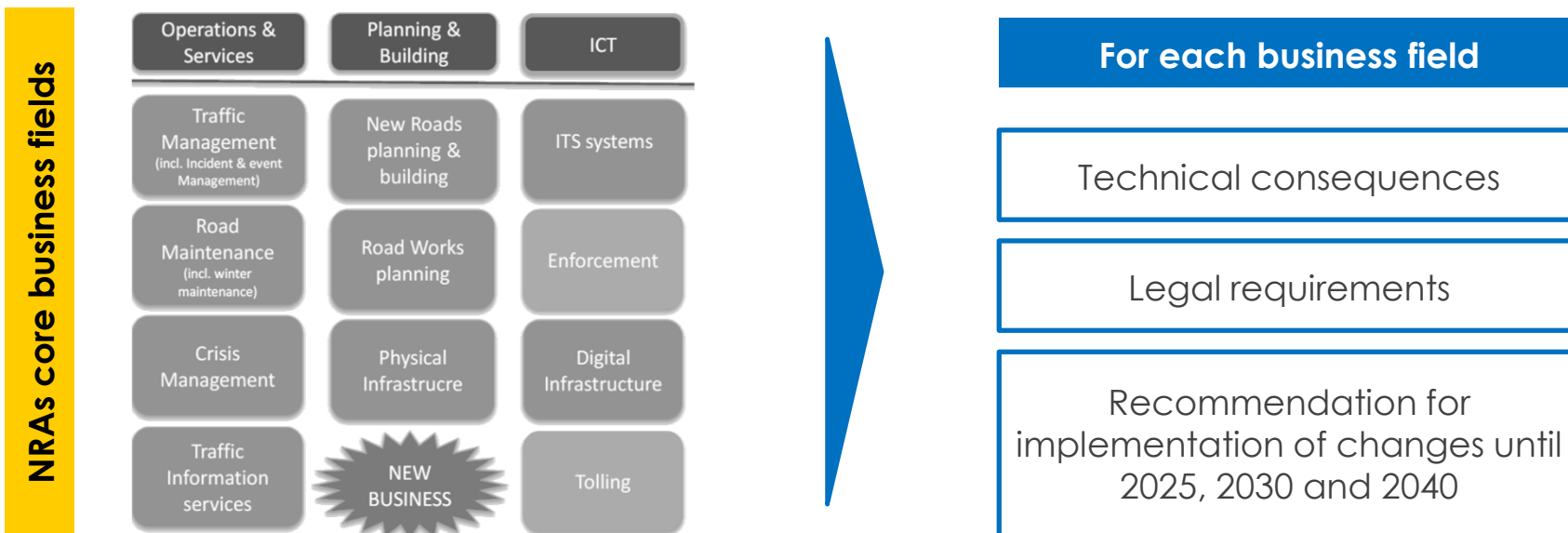


Common Operational Picture



ODD Aware Traffic Management

Impact on infrastructure in relation to NRAs core business fields



Common agreement of NRAs

“ main impact expected and planned for digital infrastructure

dependencies on physical infrastructure need to be limited
because of time and cost impact

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