

Highly automated / autonomous vehicles in Russia



World experience in testing driverless vehicles

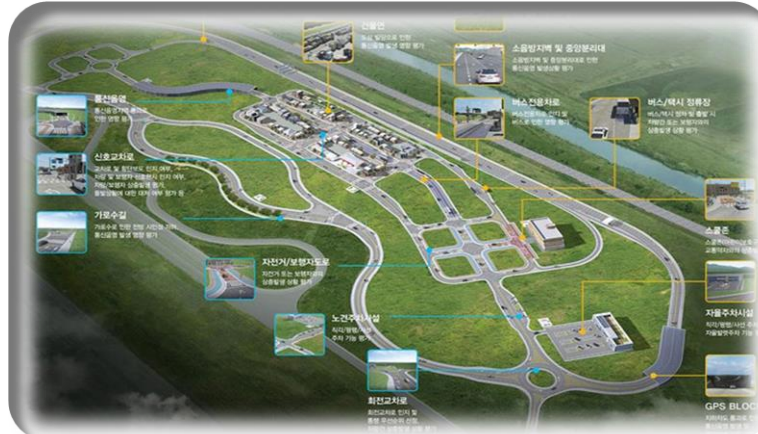
Small test sites



Example: “NAMI” Testing Centre’s test site for driverless vehicles.

Implementation of a **limited number** of driving scenarios.

Big proving grounds



Example: K-City.

The ability to safely implement **most** of the driving scenarios.

Public roads



The ability to test an **unlimited** number of scenarios.

Big risks for other road users!

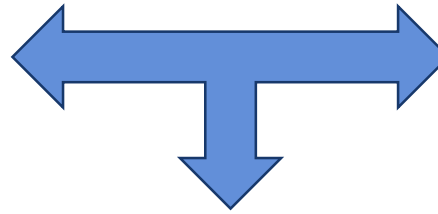
Testing the driverless vehicles on public roads. Possible ways of development

“USA way”

Reduction of administrative barriers by eliminating preliminary tests at the proving grounds and mandatory certification of the HAV. **All responsibility** for the technical condition of the vehicle **lies with the applicant.**

“European way”

Separation of areas of responsibility between the applicant of the HAV and the supervisory authority appointed by the regulator, which allows monitoring and assessment of the vehicle before releasing it to public roads. These actions are carried out on the basis of local government acts, implying verification of the HAV and control over its driving.



“Russian way”



3-component approach to assessing the safety of HAV

Road tests

- General impressions of vehicle behavior on the road
- Assessment of the capabilities of the automated control system to manage real traffic situations - verification according to a standard checklist
- Assessment of execution of typical maneuvers (analogue of a practical exam for obtaining a driver's license)

Track tests

- Validation of audit simulation results
- Confirmation of individual audit results
- Assessment of the behavior of the automated control system in difficult situations that are hard or impossible to verify on public roads
- Use of standardized test methods (allows for reproducible results)

Audit

- Project audit (methods, standards used in the design)
- Assessment of the safety concept (functional and operational safety) and measures for its implementation
- Checking as to what extent the established safety requirements and the implementation of traffic rules are taken into account
- Modeling the vehicle's behavior in various situations
- Assessment of the results of the manufacturer's own research
- Vehicle safety declaration

Regulatory documents regarding the development of HAV technologies in the Russian Federation

- Order of the Government of 11.26.2018 No. 1415 “On carrying out the experiment on trial field testing of highly-automated vehicles on public roads”.
- Draft concept of ensuring the road safety with the participation of HAVs on public roads.
- Draft Federal law “On Innovative Vehicles”. Prepared on February 12, 2020.



On carrying out the experiment on trial field testing of highly-automated vehicles on public roads

From December 1st 2018 to March 1st 2022 the highly-automated vehicles are legally able to drive on public roads



ORDER OF THE GOVERNMENT OF THE RUSSIAN FEDERATION

of November 26, 2018 No. 1415

On carrying out the experiment on trial field testing of highly-automated vehicles on public roads

The government of the Russian Federation decides:

1. Conduct in the territories of Moscow and the Republic of Tatarstan experiment on trial field testing on highways public of the high-automated vehicles from December 1, 2018 to March 1, 2022.

2. Approve the enclosed Regulations on carrying out experiment on trial field testing on highways public of the high-automated vehicles.

3. To the Ministry of Industry and Trade of the Russian Federation with participation of the Ministry of Internal Affairs of the Russian Federation, the working group on development and implementation of the road map of Avtonet of the National technological initiative, Association of developers, producers and consumers of the equipment and appendices on the basis of the global navigation satellite systems "GLONASS / GNSS-Forum", "Assistance to Development and Use of Navigation Technologies" non-profit partnership, the federal state unitary enterprise "The central research automobile and automotor institute "NAMI" and owners of the high-automated vehicles of award of the Labour Red Banner to carry out assessment of results of experiment on trial field testing and to provide till March 1, 2020 and on March 1, 2022 the corresponding reports to the Government of the Russian Federation.

4. To enable the realization of this resolution within the established extreme number of employees of central office and territorial authorities of the federal executive bodies and budgetary appropriations provided in the federal budget to the corresponding federal executive bodies on management and management in the field of the established functions.

Russian Prime Minister
D. Medvedev

ПРАВИТЕЛЬСТВО РОССИЙСКОЙ ФЕДЕРАЦИИ

ПОСТАНОВЛЕНИЕ

от 26 ноября 2018 г. № 1415

МОСКВА

О проведении эксперимента по опытной эксплуатации на автомобильных дорогах общего пользования высокоавтоматизированных транспортных средств

Правительство Российской Федерации **п о с т а н о в л я е т :**

1. Провести на территориях г. Москвы и Республики Татарстан эксперимент по опытной эксплуатации на автомобильных дорогах общего пользования высокоавтоматизированных транспортных средств с 1 декабря 2018 г. по 1 марта 2022 г.

2. Утвердить прилагаемое Положение о проведении эксперимента по опытной эксплуатации на автомобильных дорогах общего пользования высокоавтоматизированных транспортных средств.

3. Министерству промышленности и торговли Российской Федерации с участием Министерства внутренних дел Российской Федерации, рабочей группы по разработке и реализации дорожной карты "Автонет" Национальной технологической инициативы, Ассоциации разработчиков, производителей и потребителей оборудования и приложений на основе глобальных навигационных спутниковых систем "ГЛОНАСС/ГНСС-Форум", некоммерческого партнерства "Содействие развитию и использованию навигационных технологий", федерального государственного унитарного предприятия "Центральный ордена Трудового Красного Знамени научно-исследовательский автомобильный и автомоторный институт "НАМИ" и собственников высокоавтоматизированных транспортных средств провести оценку результатов эксперимента по опытной эксплуатации и представить до 1 марта 2020 г. и 1 марта 2022 г. соответствующие доклады в Правительство Российской Федерации.

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4. Реализацию настоящего постановления осуществить в пределах установленной предельной численности работников центрального аппарата и территориальных органов федеральных органов исполнительной власти и бюджетных ассигнований, предусмотренных в федеральном бюджете соответствующим федеральным органам исполнительной власти на руководство и управление в сфере установленных функций.

Председатель Правительства
Российской Федерации

Д.Медведев

Participants of the experiment



Ministry of Industry and
Trade of the Russian
Federation



Ministry of Internal Affairs
of the Russian Federation



LABORATORY - The central
research automobile and
automotor institute
"NAMI"

THE OWNER

The legal person who
owns the highly-
automated vehicle and
who participates in
carrying out experiment
on voluntary basis

ORDER OF THE GOVERNMENT OF THE RUSSIAN FEDERATION Of November 26, 2018 № 1415

Paragraph 10 (b)

The testing laboratory conducts an assessment in the form of testing highly automated vehicles **for compliance with the mandatory requirements established by the Technical Regulation of the Customs Union "On the safety of wheeled vehicles" (TR CU 018/2011)** and the United Nations Regulations, which are applied by the Russian Federation by virtue of its participation in the Agreement concerning the Adoption of Harmonized Technical United Nations Regulations for Wheeled Vehicles, Equipment and Parts which can be Fitted and/or be Used on Wheeled Vehicles and the Conditions for Reciprocal Recognition of Approvals Granted on the Basis of these United Nations Regulations, concluded in Geneva on March 20, 1958, which are affected by changes made to the design of the vehicle.

On carrying out the experiment on trial field testing of highly-automated vehicles on public roads

97 Approvals on the vehicle compliance with the requirements of Government Order No. 1415 were issued

Participants of the experiment:

Yandex

MADI

In the near future may become participants of the experiment:

KAMAZ

“NAMI”

STAR LINE

NSTU

BASE TRACK

and other companies



Federal Law “On Innovative Vehicles”

Draft Federal law “**On Innovative Vehicles**”. Prepared on February 12, 2020.

The law draft on driverless vehicles and the licenses for test drivers of the HAVs will be submitted to the State Duma on February 20, 2020.

It is aimed at creating a regulatory system in order to ensure the safe operation of innovative vehicles.

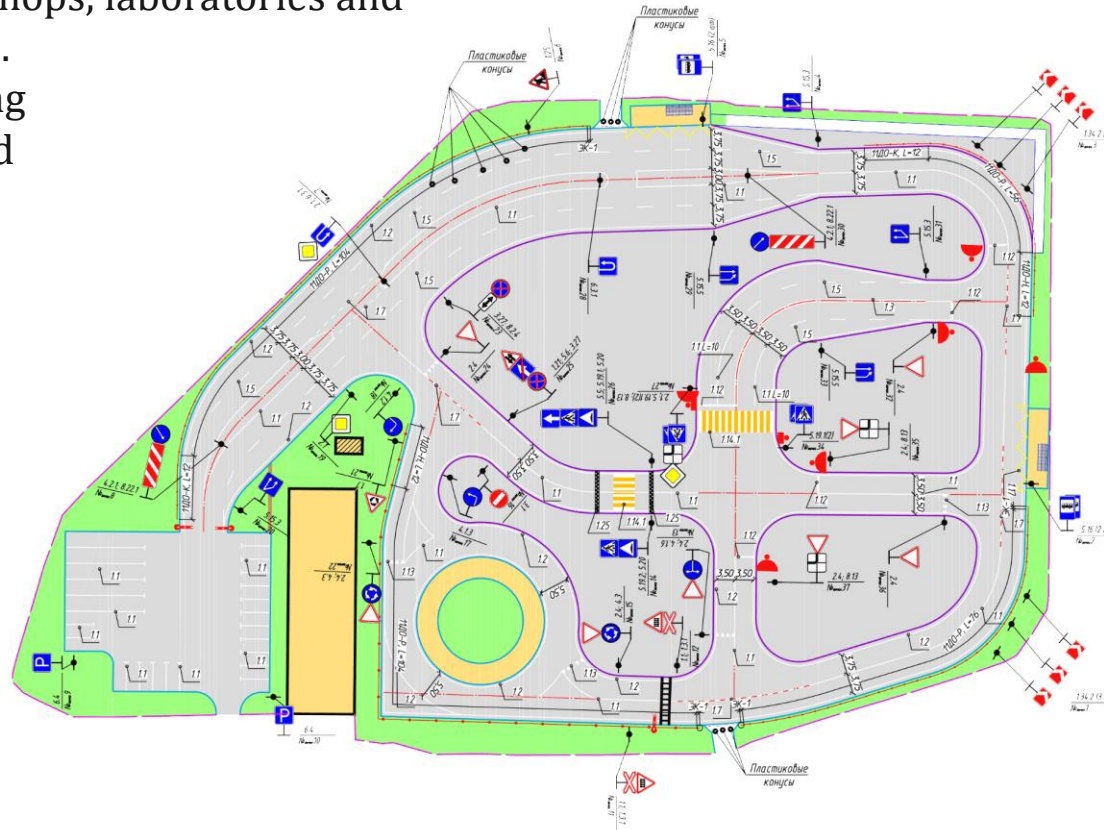
The law shall include:

- Requirements for test drivers on the mandatory obtaining of special driver's licenses
- Rules for mandatory driverless vehicle insurance
- Safety rules, namely the protection of the driverless vehicles from hacker attacks and security breaches.

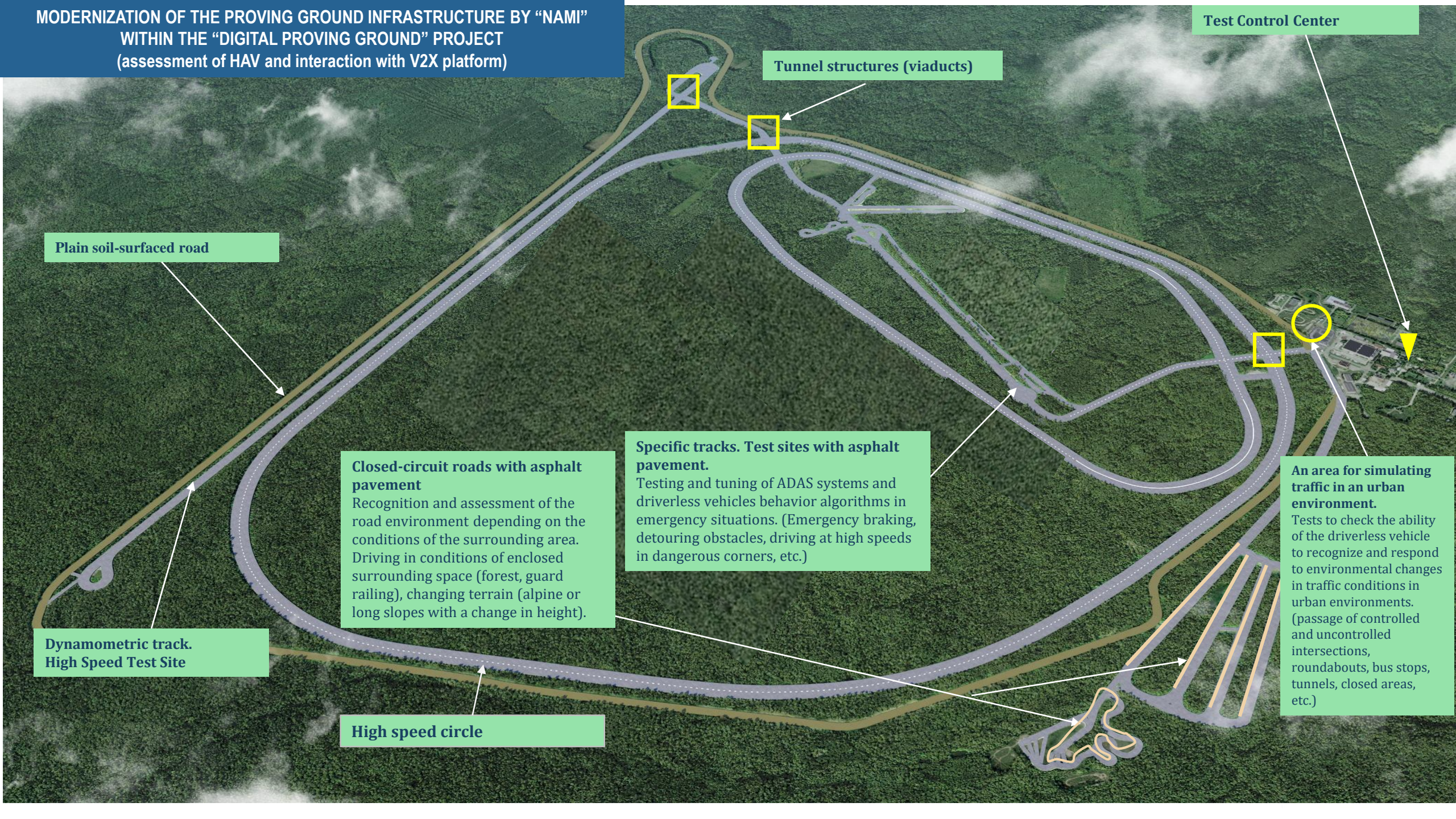
The adaptation of road infrastructure to the HAVs shall also be gradually introduced: adaptation of marking, road signs, etc.

“NAMI” Testing Centre. Highly-automated, connected, driverless vehicles testing zone “City”

- Area is 17,000 m² that simulates urban traffic conditions.
- The variety of units of the facility infrastructure allows simulating large number of scenarios.
- Street lighting provides round-the-clock testing.
- Video recording system is able to store the data.
- Accessibility of workshops, laboratories and presentation facilities.
- Accessibility of proving ground test tracks and constructions.
- Mobile units of infrastructure allow to change the facility configuration.



**MODERNIZATION OF THE PROVING GROUND INFRASTRUCTURE BY “NAMI”
WITHIN THE “DIGITAL PROVING GROUND” PROJECT
(assessment of HAV and interaction with V2X platform)**



Tunnel structures (viaducts)

Test Control Center

Plain soil-surfaced road

Closed-circuit roads with asphalt pavement
Recognition and assessment of the road environment depending on the conditions of the surrounding area. Driving in conditions of enclosed surrounding space (forest, guard railing), changing terrain (alpine or long slopes with a change in height).

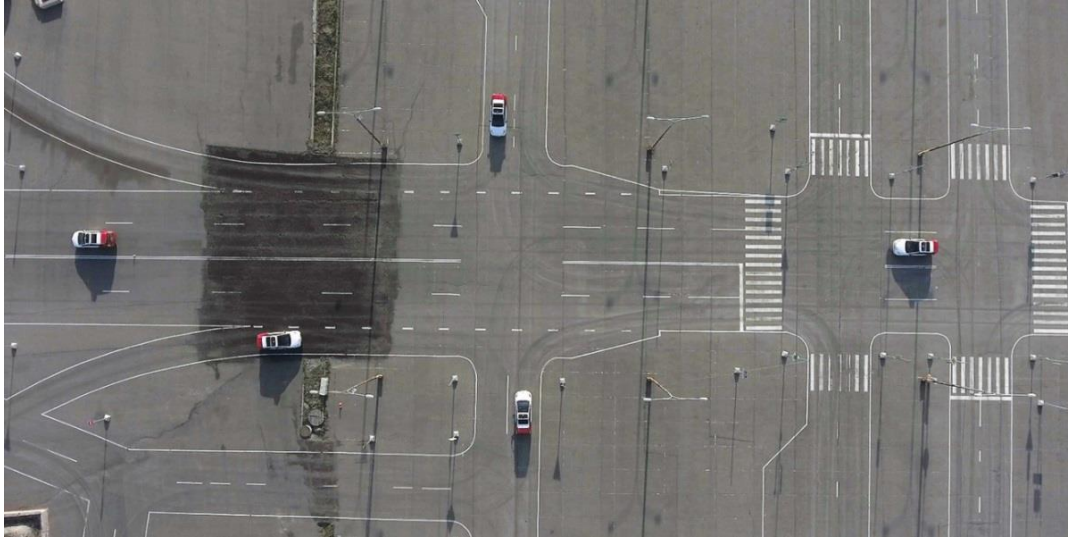
Specific tracks. Test sites with asphalt pavement.
Testing and tuning of ADAS systems and driverless vehicles behavior algorithms in emergency situations. (Emergency braking, detouring obstacles, driving at high speeds in dangerous corners, etc.)

An area for simulating traffic in an urban environment.
Tests to check the ability of the driverless vehicle to recognize and respond to environmental changes in traffic conditions in urban environments. (passage of controlled and uncontrolled intersections, roundabouts, bus stops, tunnels, closed areas, etc.)

Dynamometric track. High Speed Test Site

High speed circle

YANDEX proving ground



- Purpose: Proving ground for HAV testing when simulating traffic in urban environments and suburban traffic
- Objectives:
 - working out the basic scenarios describing most standard traffic situations using virtual modeling;
 - working out non-standard scenarios using virtual modeling;
 - testing new versions of vehicle control automation algorithms;
 - training of the test drivers.
- Total area: 180,000 sq.m.
- Number of tested HAVs: more than 100
- Infrastructure: road marking, road signs, guard rails, traffic lights, tunnel simulation, organizational and technical control center.

Specific aspects of the climatic conditions in the Russian Federation

- The length of public roads in Russia is 1 million 529.4 thousand km.
- The main part of Russia lies within the temperate climate zone.
- Large temperature differences, ranging from -55C to + 35C.
- Humidity range 30 - 100%.
- Precipitation (rain, snowfall, snowy roads, icy roads, fog).
- Climatic conditions affect road infrastructure.



Low sun, rain, snow, ice, night-time, or all these conditions at the same time – are HAVs ready for this?

Driverless vehicles competition at “NAMI” Testing Center facilities.

“The Winter City” Contest

Date of the contest (Final): December 10, 2019

Goal: Development of the technologies of safe automated driving of driverless vehicles under climatic and road conditions of Russia.

Competition task:

Cover a distance of 50 km in 3 hours

TECHNOLOGICAL BARRIER:

Driving of an driverless vehicles in an autonomous driveless mode and at different times of the day, in compliance with the traffic regulations under winter conditions of urban infrastructure, possibly with no road markings, under low visibility of the roadway, in the presence of traffic and hindrance to traffic, at an average driver's speed and safety level.



Thank you for your attention
Your questions are welcomed

