NIS national navigation services provider GLONASS

Experience of GLONASS Technologies Utilization in Various Fields of Russia's Economy

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JSC "Navigation-information systems"

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GLONASS is a Russian Space System with unique features and global coverage

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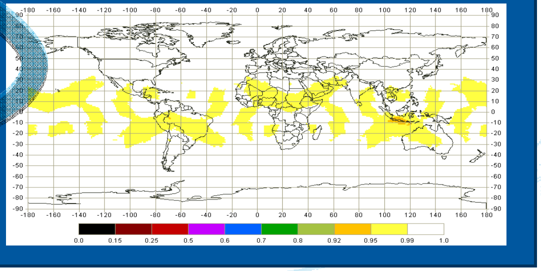
Key GLONASS segments:

- space complex together with orbital constellation
- Ground control complex
- special end-user complexes

GLONASS development:

- 1982– launch of the first GLONASS spacecraft
- 1996 – start of GLONASS civil use
- **8 December 2011** – full GLONASS orbital constellation
- 15 March 2012 – Federal Government Program for GLONASS Sustainment, Development and Use for 2012-2020 approved

GLONASS today:
28 satellites,
100% Russian territory,
100% global coverage.



Multi-constellation is a new global standard, is a benefit for users: better product for the same price – higher reliability, higher accuracy.

GLONASS
NAVSTAR GPS
GALILEO

Since 2011 GLONASS is on a par with GPS the Global Navigation Satellite System with 100% global coverage.

Satellite navigation:
new solutions, new safety, new services

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Transport monitoring and control systems: passenger, commercial, special transport

Government projects:
ERA-GLONASS, ITS, road tolling systems, digital tachographs

Emergency response service:
EMERCOM, Ministry of Interior, Ministry of Health and Social Development

Systems based on satellite navigation

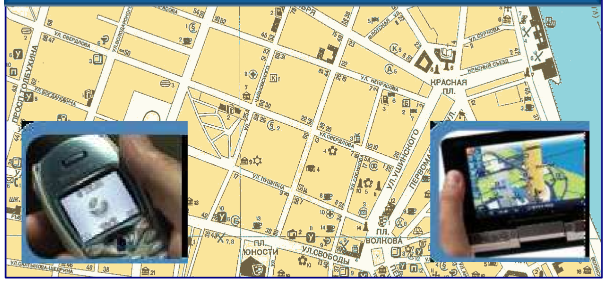
High-precision systems:
agriculture, aviation, engineering, geodesy, land survey, geological exploration

Navigation services
for car drivers

Navigation services
for passengers

Rathausmarkt

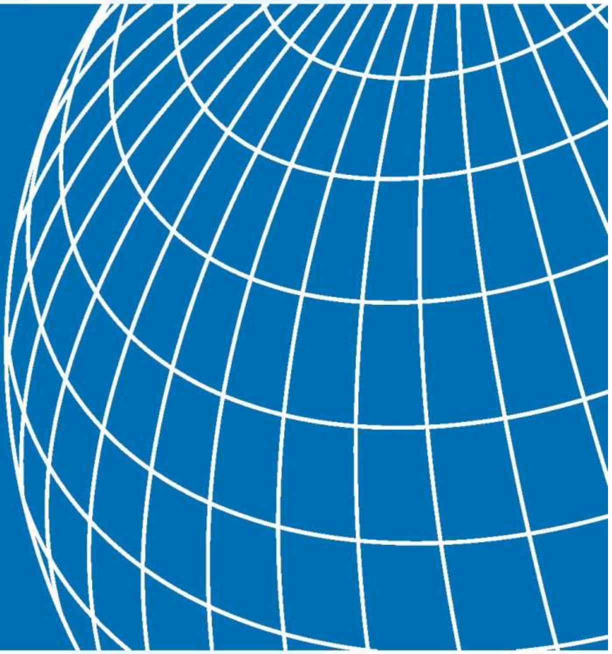
Navigation services
for pedestrians



Use of navigation technologies is a regular element of the modern way of life, a necessary condition for economic efficiency and competitiveness of companies and regions

1. Transport monitoring and control system

on the basis of GLONASS/GPS technologies



Transport monitoring and control system

Project

This system is an outstanding example of how GLONASS/GPS technologies can be applied to enhance fleet management and operation.

Project objectives

- Permanent control of transport location and movement
- Control and automated mileage calculation, fuels and lubricants consumption
- Control of transport use efficiency (downtime, mileage)
- Improvement of personnel and fleet work planning
- Optimization of routes, traffic schedules
- Improvement of traffic safety, reduction of cargo and vehicles thefts
- Efficient management and dispatching of transportation

Result

- Permanent control of transport location, movement and condition
- Optimization of transport operation and capacity, cargo delivery planning
- Decrease of mileage, route downtime, vehicle misusing
- Motor transport operational period prolongation, reduction of fleet expansion necessity
- Reduction of cargo delivery times, improving trip turnover
- Fuel and oil consumption saving
- Enhancement of transportation safety, cargo consumption control

Effectiveness of using transport monitoring and control systems (Russian experience)

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RESULTS

1. **50%** decrease of theft losses, inappropriate expenditures
2. **10%** reduction of costs on fleet maintenance
3. Improvement of personnel discipline and responsibility
4. Prompt response to accidents and emergency situations
5. Permanent control of transport location, movement and condition
6. **20%** decrease of mileage
7. **10-15%** optimization of transport operation and capacity
8. **10-50%** fuel and oil consumption saving
9. Saving lives

Payback period of transport monitoring and control systems from 4 to 12 months

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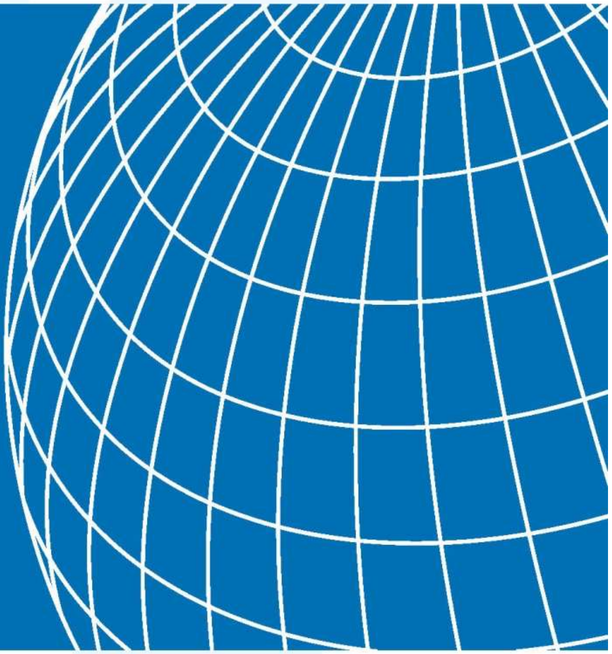
ERA emergency response system
GLONASS

2. Road Accident Emergency Response System

on the basis of GLONASS/GPS technologies

evidence from the Russian project



Road Accident Emergency Response System

Project

This system is an outstanding example of how GLONASS/GPS technologies can be applied to enhance public safety.

Project objectives

- Reduce fatality rates and aftereffects of injuries on roads
- Enhance the safety of freight and passenger transportation
- Build up domestic manufacturing to substitute for navigation technologies and products

Result

- Utilization of Road Accident Emergency Response System is expected to reduce ambulance and rescue personal arrival time by 30% on average;
- By preliminary estimates, fully deployed Road Accident Emergency Response System will save thousands additional lives annually, while substantially reducing the cost of emergency response and rescue services;
- The system will become a platform for providing a range of mainstream GLONASS/GPS -based services;
- Create mass demand for domestically-produced navigation devices.

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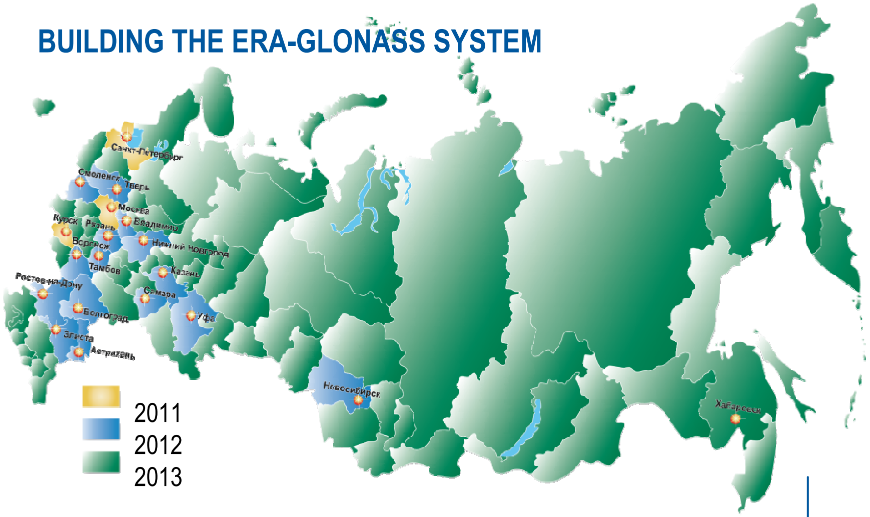
ERA-GLONASS ACCIDENT EMERGENCY RESPONSE SYSTEM

BUILDING THE ERA-GLONASS SYSTEM


Санкт-Петербург
Смоленск
Тверь
Москва
Курск
Рязань
Владимир
Воронеж
Нижний Новгород
Тамбов
Казань
Ростов-на-Дону
Самара
Волгоград
Уфа
Элиста
Астрахань
Новосибирск
Хабаровск
2011
2012
2013

ERA-GLONASS WILL SAVE FOUR THOUSAND LIVES EVERY YEAR

- Road safety
- Universal infrastructure
- Development of GLONASS technologies
- New navigation information services for motorists
- Throughout the entire territory of Russia
- All vehicles are included

ЭРА система спасения
ГЛОНАСС

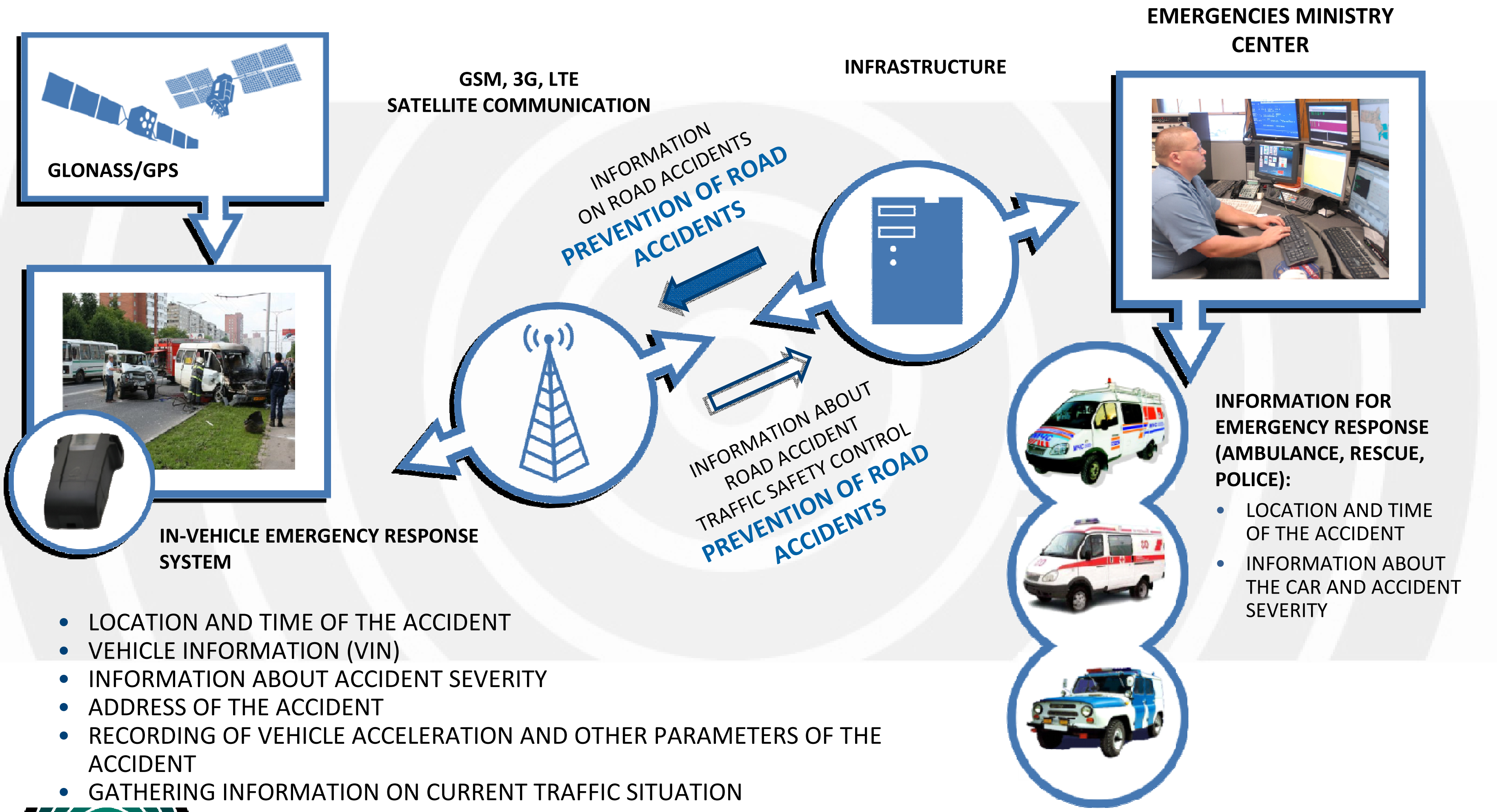
ERA-GLONASS INFRASTRUCTURE (FROM 2014):

- Basis for integrating navigation information networks
- in transport
- Common MVNO communications provider – the
- most extensive mobile communications coverage
- Common cartography
- Common protocols
- Interoperability with the «1-1-2» System

For the general public	For the government
Safety Better quality of life Access to additional services	Redaction in traffic accident causalities and fatalities Commercialization of GLONASS technology Contribution to social and economic development in Russia

ERA-GLONASS is the new level of safety on Russian roads

Emergency Response Functional Diagram



GLONASS/GPS

GSM, 3G, LTE
SATELLITE COMMUNICATION

INFRASTRUCTURE

EMERGENCIES MINISTRY CENTER

INFORMATION ON ROAD ACCIDENTS
PREVENTION OF ROAD ACCIDENTS

INFORMATION ABOUT ROAD ACCIDENT
TRAFFIC SAFETY CONTROL
PREVENTION OF ROAD ACCIDENTS

IN-VEHICLE EMERGENCY RESPONSE SYSTEM

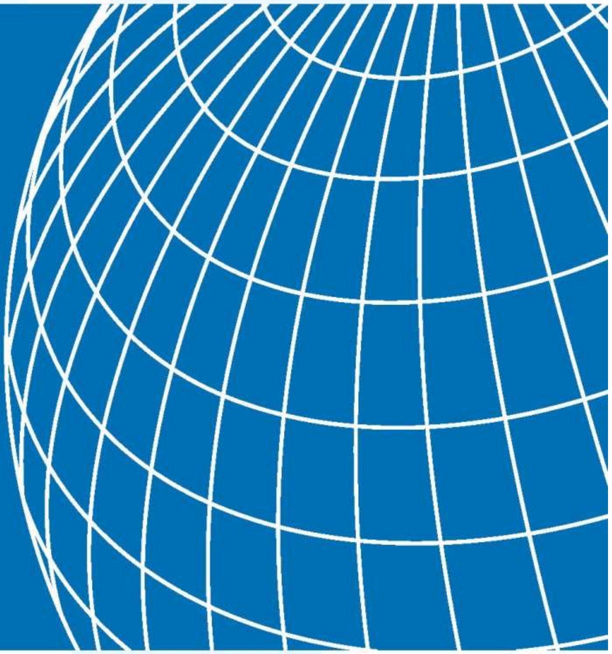
INFORMATION FOR EMERGENCY RESPONSE (AMBULANCE, RESCUE, POLICE):

- LOCATION AND TIME OF THE ACCIDENT
- INFORMATION ABOUT THE CAR AND ACCIDENT SEVERITY

- LOCATION AND TIME OF THE ACCIDENT
- VEHICLE INFORMATION (VIN)
- INFORMATION ABOUT ACCIDENT SEVERITY
- ADDRESS OF THE ACCIDENT
- RECORDING OF VEHICLE ACCELERATION AND OTHER PARAMETERS OF THE ACCIDENT
- GATHERING INFORMATION ON CURRENT TRAFFIC SITUATION

3. Road Tolling Solutions

on the basis of GLONASS/GPS technologies



Road Tolling Solutions

Project

Road Tolling Solutions enable the guidance of traffic to lower density routes and ensure mobility in chronically congested urban areas. These solutions provide as well value-added services to operators and transport companies.

Project objectives

- minimizing congestion
- minimizing total travel time
- maximizing total toll revenues
- maximizing accessibility
- maximizing social welfare

Result

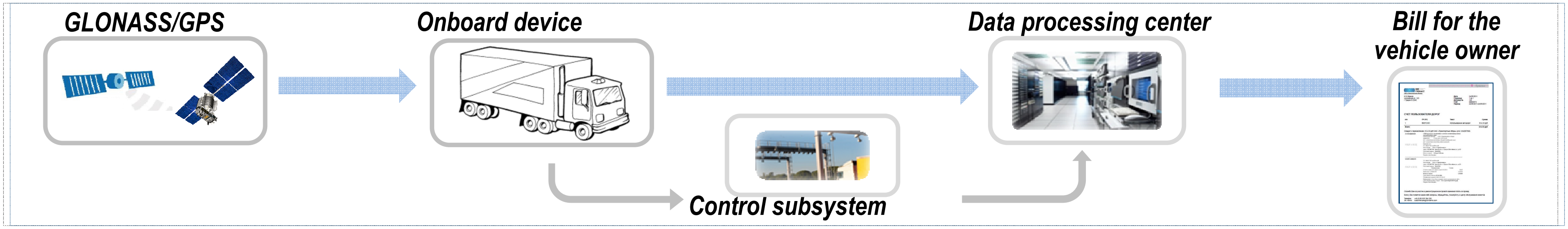
- Replenishment of the federal, regional, and municipal road construction funds
- Substantial reduction in expenditures for additional road-side infrastructure for any roadway network size or configuration
- Support for better informed and timely decision making on targeted financing and development of regional roadway network infrastructure
- Capabilities to quickly regulate and re-route traffic flows by leveraging motorists’ economic considerations

HEAVY FREIGHT VEHICLE TOLLING SYSTEM

For the first time in Russia, a system is being developed for recovering compensation for the wear, caused to the public roads by heavy freight vehicles – implementation of the user-pays principle.

- Coverage:
  - 1,700,000 freight vehicles with gross weight over 12 tons
  - 50,000 kilometers of federal highways
- Flexibility and scalability
- Integration with the ERA-GLONASS System
- Interoperability with foreign systems

FUNCTIONAL DIAGRAM



GLONASS/GPS

Onboard device

Data processing center

Bill for the vehicle owner

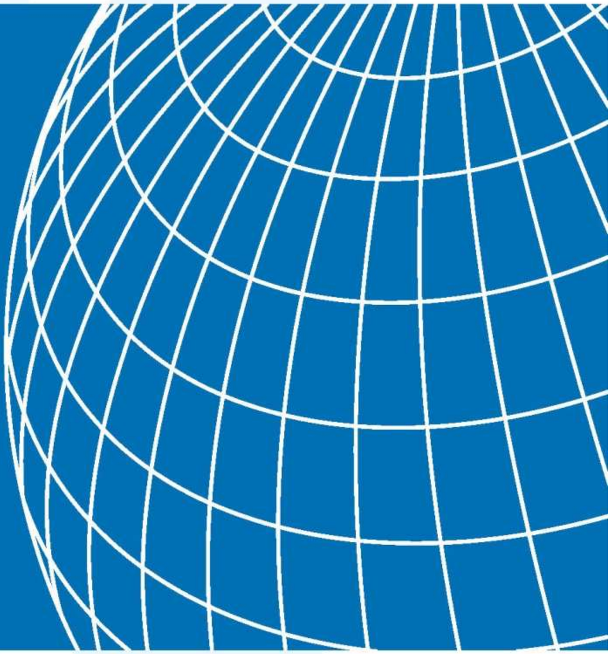
Control subsystem

For the general public

- Improvement in road quality
- Safety and convenience

For the government

- Transport infrastructure development
- Reduction on expenditures for developing the federal highway network
- Universal basis for building similar tolling systems



4. Intelligent Transportation System

based of GLONASS/GPS technologies

ITS projects

Project

Conversion of separate control of different urban traffic systems to a centralized multimodal traffic control system, including all the urban transport devices.

Project objectives

- Automated road traffic control
- Automated registry of road violations
- Optimization of traffic routes with allowance for the traffic management, traffic service, and traffic condition
- Informing citizens and organizations about the traffic situation in the city
- Informational support for state and municipal contracts involving traffic services
- Information support of special emergency response services

Result

- Considerable optimization of traffic flows will be the confirmation of the project’s success
- Integrated urban traffic management
- Integrated travel and traffic information services

Technological basis of the Intelligent Transport System

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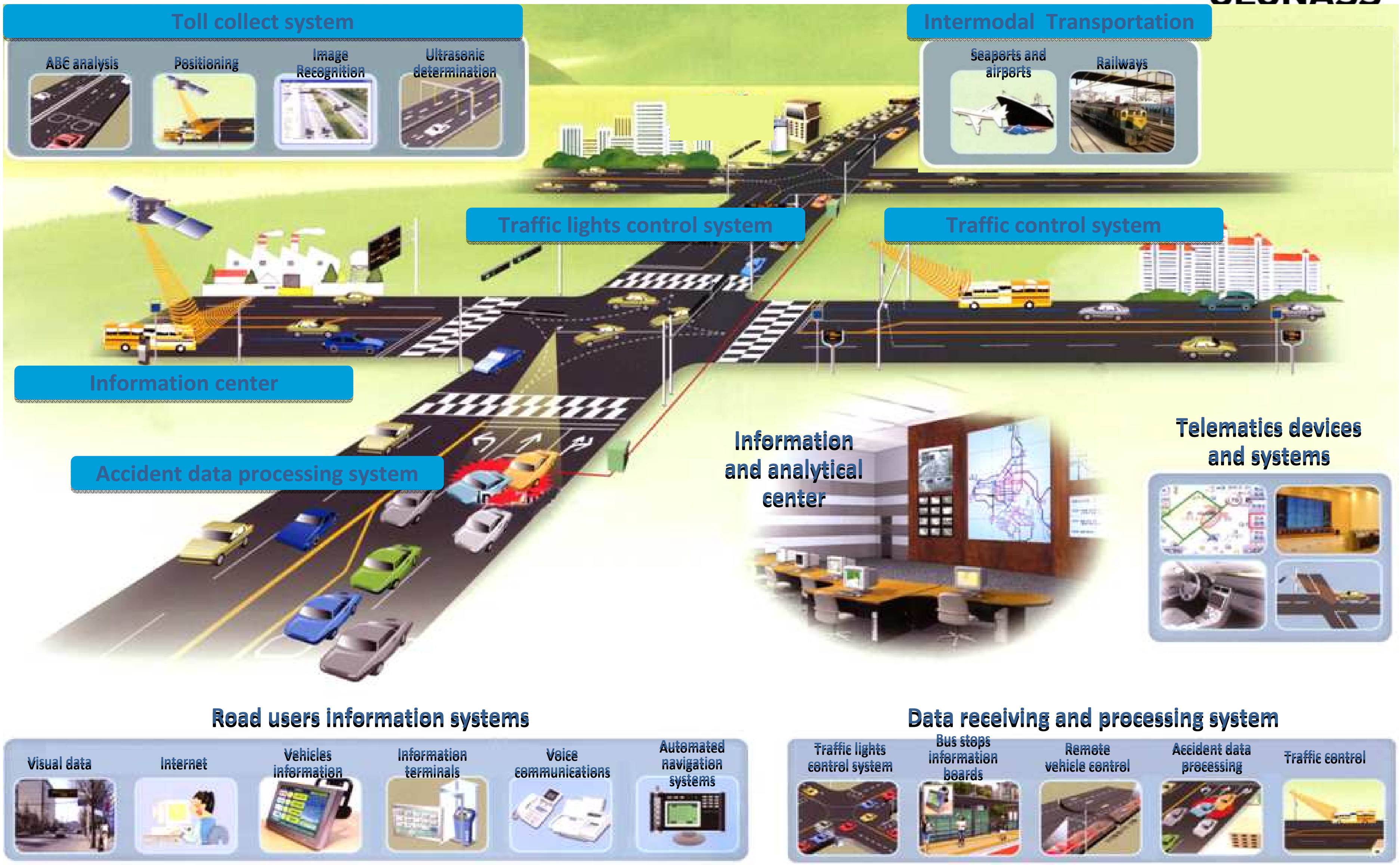

Toll collect system
ABC analysis
Positioning
Image Recognition
Ultrasonic determination
Intermodal Transportation
Seaports and airports
Railways
Traffic lights control system
Traffic control system
Information center
Accident data processing system
Information and analytical center
Telematics devices and systems
Road users information systems
Visual data
Internet
Vehicles information
Information terminals
Voice communications
Automated navigation systems
Data receiving and processing system
Traffic lights control system
Bus stops information boards
Remote vehicle control
Accident data processing
Traffic control

ITS implementation examples (1/2)

ALTAY REGION

Results:

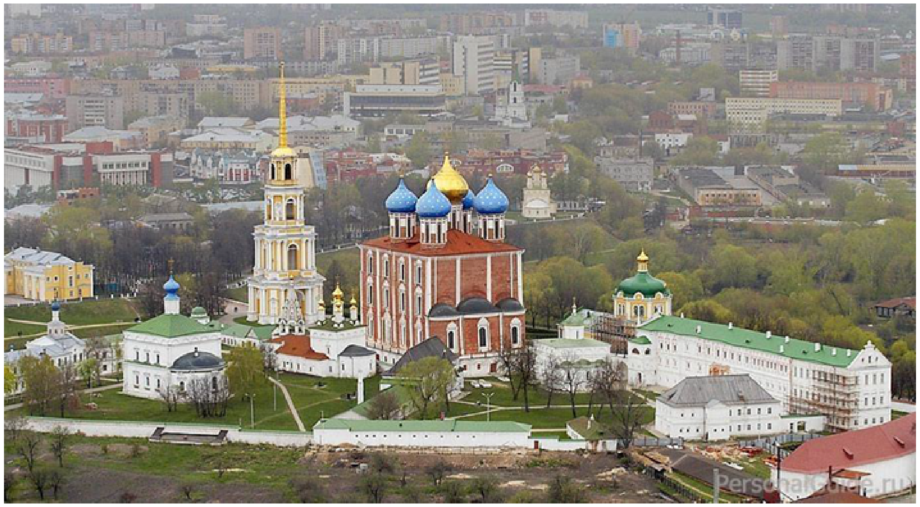
- **The efficiency of spending fuels and lubricants increased by 20%**
- **Number of successful patient reanimation increased by 20%**
- **Speed of response to the accidents increased in 2 times**
- **As a result of ITS implementation in Altai region the expenditure of fuel fell by 20% (up to $160 000 per year)**

ITS implementation examples (2/2)

RYAZAN CITY

Results:

- ❖• Raising labor discipline of the drivers: drivers strictly carry out professional tasks
- ❖• Enhancing of public transport indices due to integrated traffic control
- ❖• Significant reduction in the fuel cost: fuel savings up to 25%
- ❖• Optimization of vehicles on the route: alignment movement schedules, shorter intervals
- ❖• According to the results of implementation of ITS elements, the regularity of passenger transport in Ryazan reaches 99.9%, speed of response of emergency teams increased up to 10 %.



5. Logistics & Transportation Center in preparation for the Olympic Games in Sochi 2014

based of GLONASS/GPS technologies

LOGISTICS & TRANSPORTATION CENTER FOR THE 2014 WINTER OLYMPICS IN SOCHI

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- Use of GLONASS/GPS satellite navigation technologies
- Managing freight transportation by all modes of transport (rail, air, road, sea)
- Managing passenger transportation by all modes of transport (rail, air, sea, road, aerial lift)
- Common information system for transportation companies and their customer base
- Situation management, rapid response to contingency and emergency situations

Benefits from building the L&TC in Sochi:

- Increase by 20% in Sochi transport hub capacity from transportation volumes forecast for the period of Olympic facilities construction
- Reduction by 50% in the number of vehicles needed for the Olympic construction

NEW, UNPARALLELED APPROACH:

- The first implementation in Russia of an end-to-end technology for managing multiple modes of transport (rail, road, and sea) with utilization of GLONASS
- The first time that a common integrated information system for transportation companies and their customers has been developed in Russia

PROJECT SCALE:

- Seven million passengers and 65.5 tons of cargo
- 4,000 passenger and 5,000 freight vehicles
- Integration with Olympics security system

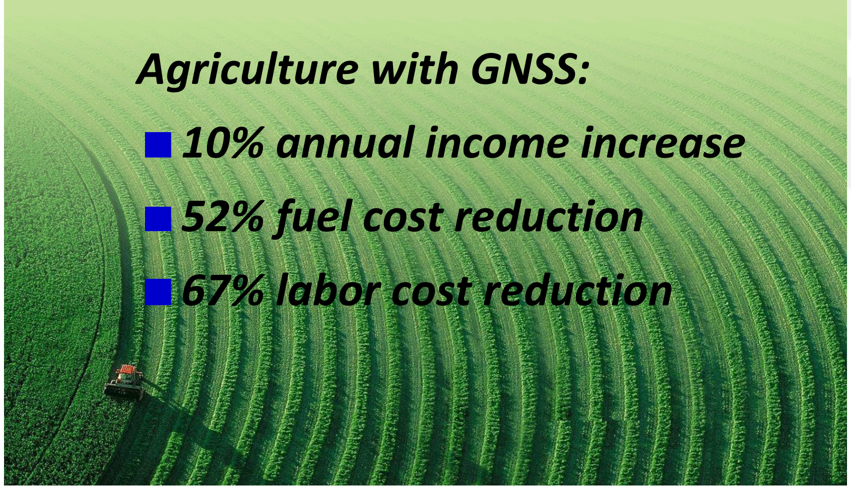
5. High-precision systems

based of GLONASS/GPS technologies

High-precision systems

Agriculture

- Navigation technologies in agriculture solve complex tasks faster, better and at lower cost.
- Use of navigation equipment, combined with hydraulic systems of agricultural machinery, gridding of field parts, work in real time provide:
  - High accuracy of area measurement;
  - Tracing machinery trajectory;
  - Work in any conditions, even at night;
  - Differential application of fertilizers and means of protection to cultivated fields.



Agriculture with GNSS:

- ***10% annual income increase***
- ***52% fuel cost reduction***
- ***67% labor cost reduction***

Land survey and utilization

Service: precise definition of object coordinates and geodesic support

High-precision positioning gives a possibility to:

- Increase measurement accuracy;
- Optimize boundaries ordering;
- increase labor productivity in 3-4 times;
- increase speed of kinematic shooting in 2-3 times;
- improve the collection of land payments in 1,5 times.

Engineering

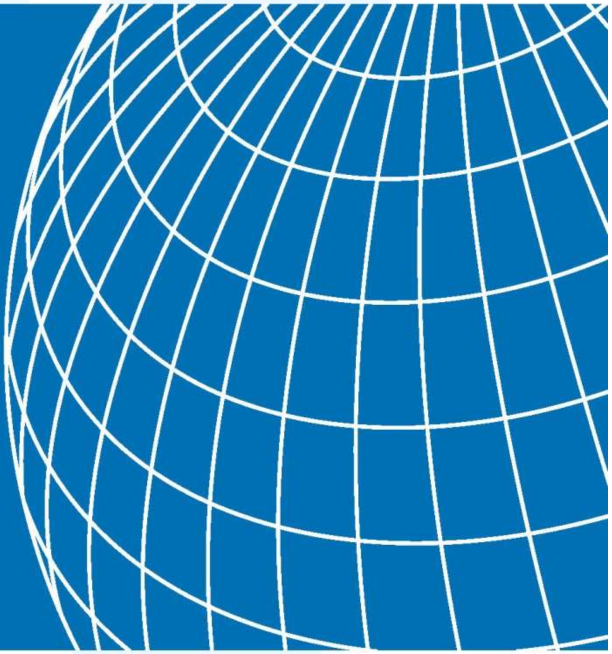
Service: geodetic support, technically complex constructions monitoring, construction and road machinery control systems.

High-precision positioning gives a possibility to:

- Save machine-hours and fuel;
- reduce consumption of materials, mismanagement of resources;
- Increase efficiency of machine run;
- Optimize work of surveyors;
- reduce the human factor.

6. Pipeline monitoring

based of GLONASS/GPS technologies



Pipeline monitoring system

State-of-the-art
leak detection system for pipelines.

THE SYSTEM ANALYSES PRESSURE IN DIFFERENT PARTS OF THE PIPELINE AND DISPLAYS:

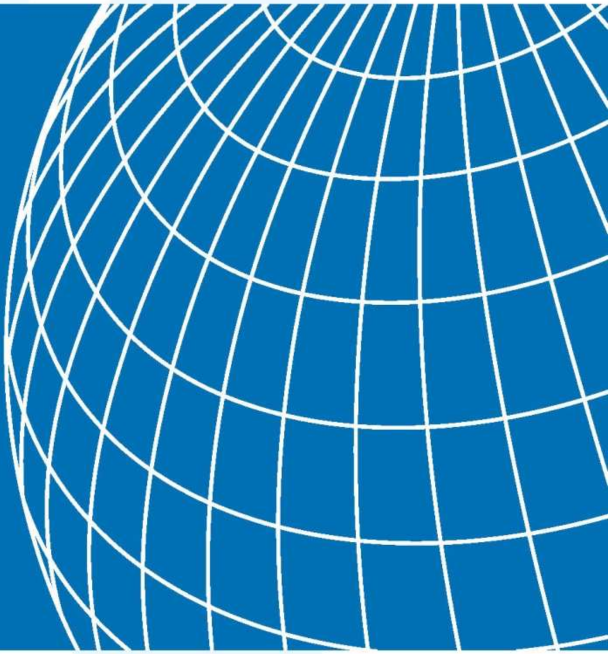
- Pipeline leaks
- Theft of pipeline contents
- Pressure reading deviations
- Connection to other management system applications
- Link with security systems
- Security/remote management of technological elements, valves

PRECISION AND FAST OPERATION:

- Detects defects from 3mm in diameter
- Pinpoints leak location with an accuracy of within ten meters (the system provides operators with a mean average probable point of the leak within a specific range)
- Rapid feedback (as a rule, alert signal is displayed after 90 seconds, delay ranges between 30 and 120 seconds, depending on the volume and viscosity of the pipeline contents, as well as the number and distribution of control points)

7. Economic effects

based of GLONASS/GPS technologies



Benefits from navigation technologies implementation in Russian regions

EFFECTS

Russian Region

Safety

Higher safety on the roads by:
- Automated central transport monitoring and control systems
- **20-62%** redaction in traffic accident causalities and fatalities
- Enhance responsiveness to accidents, abnormal or emergency situations
- Monitoring compliance with traffic rules and speed limit

Social

Better quality of life by:
- Better quality of transport services
- Increase of average vehicle speed on 12-40%
- Better awareness about road situations

Economic

Cost reduction in road-transport complex by :
- Reduction of operational and outside maintenance costs on transport by 12-30%
- Transparency of budget transport costs

Higher profitability of transport and logistics industries by:
- Route planning and operational management optimization
- Reduction of transport-operating costs (decrease of mileage and vehicle downtime)

Management

Establishment of integral control transport system of the Region by:
- Automatization of planning, monitoring and control processes Автоматизации процессов планирования, мониторинга и управления дорожным движением
- Transport fleet control optimization

Ecological

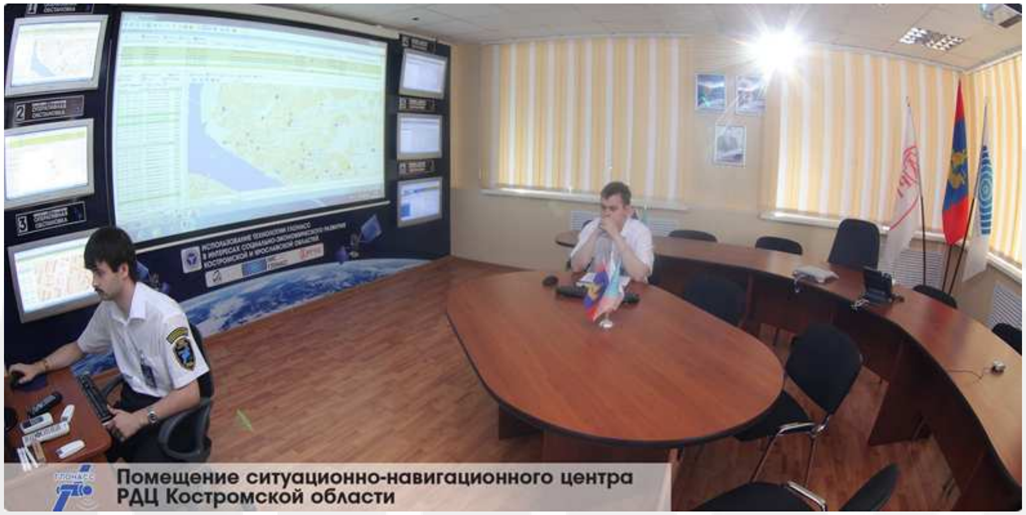
Better ecology by:
- **8-18%** reduction of ecological damage from road transport

Investors

Economic

- Return on investments
- Profitability and creating conditions for system development

Social-economic effects from using GLONASS technologies in Russia (using the example of Kostroma region)


Помещение ситуационно-навигационного центра
РДЦ Костромской области

Помещение ситуационно-навигационного центра
РДЦ Костромской области

Quantitative evaluation for 2012-2014*

	Factor	Evaluation
1	Average speed increase	↑ 12-40%
2	Redaction in traffic accident causalities and fatalities	↓ 20-62%
3	Decrease in industrial disasters	↓ 12-35%
4	Reduction of ecological damage from road transport	↓ 8-18%
5	Transport-operation cost saving	↑ 12-30%

** By JSC "NIS"*

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Thank you for your attention!

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