GOODROUTE

Dangerous Goods Transportation Routing and Monitoring

Funding: European (6th RTD Framework Programme)
Duration: Jan 2006 - Dec 2008
Status: Complete with results
Total project cost: €4,888,402
EU contribution: €2,800,000

Background & policy context:

Although, according to statistics, the risk of accidents in critical infrastructures such as tunnels and long bridges is lower than on open roads and motorways, when accidents/incidents do happen, they may have multiple effects. Over 200 people have died in Europe as result of tunnel fires (successive effect of collisions) in the last decade (16 fire accidents occurred in road tunnels in Europe from 1986 until 2006), while 3% of the accidents on bridges are fatal (vs. 2% in total accidents). The Mont Blanc, the Tauern and the Gotthard tunnel catastrophes, among others, have demonstrated the urgent need for improving the prevention and mitigation of tunnel accidents, including adequate detection systems in combination with being prepared operation staff and emergency services.

Besides loss of human life and the tremendous economic cost (the Gotthard tunnel accident cost was estimated to be € 12 million, only in terms of repair and insured losses for vehicles), a single crash may close the infrastructure for many hours, creating long queues and delays, with vast financial cost induced for the whole business chain, let alone the environmental cost due to traffic pollution in queues, noise pollution and wasted energy (fuel) during queuing.

As a result of accidents, traffic jams but also road works and other unexpected events but also due to the different national regulations and individual infrastructure policies (i.e. Dangerous Goods vehicles are not allowed in Gotthard tunnel), truck drivers are often forced to follow secondary roads and alternative routes. But the actual accident risk and impact when using secondary roads or other alternative ways is not calculated. They have no particular guidance on the safest alternative when they need to re-route, whereas the consequences of road choice are not known to the business chain.

Objectives:

GOOD ROUTE attempted to address these problems by developing a cooperative system for Dangerous Goods Vehicles (DGV) routing, in order minimise the Societal Risks related to their movements, while still generating cost efficient solutions for all logistic chain actors involved. Besides routing, the developed system supports monitoring, re-routing (in case of need), enforcement and driver support, achieving its aims by utilising dynamic, real time as well as historical data.

The GOOD ROUTE Project objectives were aimed to:

- Analyse dangerous goods accidents and needs of the dangerous goods companies, transporters, drivers, recipient clients, transport infrastructure owners, authorities, etc., as well as the best practises followed so far, for the specification of an integrated, cost-efficient, fair and modular system.

- Develop an ontological framework, which will classify and correlate the dangerous cargo, vehicle types and road infrastructure elements, to automatically permit or re-route specific dangerous good vehicles through specific road infrastructures (i.e. tunnels, long bridges, etc.).

- Develop a collaborative platform, able to gather and process in real time vehicle, cargo and environmental data (road status, unexpected obstacles, weather conditions, population density) as input to an optimal routing and route guidance system.

- Develop a minimum risk guidance system, that is able to route and re-route dangerous goods
vehicles, taking into account individual and societal risk (based upon the collaborative platform based dynamic data), as well as conflict resolution and equity schemes.

- Develop Control Centre algorithms that will deal with movements of all participating dangerous goods vehicles within a certain geographical area, provide the necessary traffic and environmental data to them and inform in real time their logistic chain for any unscheduled re-routing required.

- Develop an on-board automatic data retrieval and storage system, to monitor key dangerous goods vehicle parameters (actual vs. planned route, speed, weight per axle, etc.), able to supply it to local nodes (i.e. police car at toll station or before tunnel/bridge, etc.), for enforcement purposes.

- Develop optimal user interfaces for both the drivers of the dangerous goods vehicle and the control centre operators, to provide them with appropriate information and/or warnings, without adversely affecting their workload or causing unnecessary behavioural adaptation.

Methodology:
The work under the project was structured in WPs as follows:

- WP1: Traffic safety vs. mobility needs
- WP2: Minimum Risk Route Guidance system
- WP3: On board Telematic System
- WP4: Infrastructure Telematic System
- WP5: Enforcement System
- WP6: Cooperative System Integration
- WP7: Pilot testing
- WP8: Guidelines, Training and standards
- WP9: Dissemination and exploitation
- WP10: Project management.

Parent Programmes:
FP6-IST - Information Society Technologies - Priority Thematic Area 2 (PTA2)

Institute type: Public institution
Institute name: European Commission
Funding type: Public (EU)

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**Key Results:**
GOOD ROUTE's answer to the needs of Dangerous Goods Transportation has been the development of a prototype cooperative system for dangerous goods vehicle routing, monitoring, re-routing (in case of need), enforcement and driver support, based upon dynamic, real time data, aiming to minimise the Societal Risks related to their movements, while still generating the most cost efficient solution for all actors involved.

It has been concluded that the combined route, which minimises cost and risk in the best possible way in each case and which is the one the developed system has been based upon, is the optimal one, when we take into account the overall risk as well as the business needs and that the use of the system cannot only reduce the overall risk, but the total economic cost as well, when sensitive parts of the infrastructure are concerned, which makes it also easier to be adopted by the stakeholders.

According to the socio-economic study performed, on one hand, the system itself takes a minimum investment of € 2.66 million for one year operation in one site and within a time horizon of five years, the system costs reach a total of more than € 27 million for one site. The main reason for this economic fact is the massive investment and operational cost related to the OBUs of the DG vehicle fleet, which can be hardly justified for a single infrastructure object (one site). Thus, although even one site can be theoretically operated with overall benefits under certain assumptions, nevertheless, it is recommended, for both economic and safety reasons, that the system is introduced for all/most critical infrastructures in a region (at least two sites).

Furthermore, the Route Guidance System and its embedded DSS is the first and only (so far) system that optimises routing by taking into account the risk associated with the road transport of dangerous goods in addition to the usual economic factors, such as time, distance and/or fuel consumed.

The DSS, on the other hand, is a system that combines methodologies from the area of Quantitative Risk Assessment and Vehicle Routing Optimization under real time conditions and local information.

The enforcement module developed within the project is connected to DTCO and anticipates the capability to transmit through wireless communication links driver and vehicle information to control centres and infrastructure nodes.

The success of the system penetration is dependent on two market factors, namely overall grow

**Technical Implications**

Overall, the context of use may be easily extended in many aspects. The decision making may anticipate more dimensions than the ones already considered (i.e. security, environmental safety), the telematic system could include more functionalities (like driver monitoring systems and other Advanced Driver Assistance Systems), more actors, if applicable, could be involved and access the Control Centre, whereas the context of use could be enlarged, including other transportation segments, besides the Dangerous Goods transportation, as well as other transportation modes, besides road transport. The cooperative principles embedded in the system architecture would allow more advanced communication potentials, which have not been demonstrated in the context of GOOD ROUTE, like communication with other vehicles or other infrastructure items (VMS, beacons, V2V, etc.).

Documents:
- [Final Publishable Report (Final report)]

**STRIA Roadmaps:** Infrastructure  
**Transport mode:** Road transport  
**Transport sectors:** Freight transport  
**Transport policies:** Safety/Security  
**Geo-spatial type:** Other