The SafetyCube Decision Support System (DSS) addresses the common challenge of road safety decision makers to implement the most appropriate measures to reduce casualties. While many countries use road accident data to identify priorities and to measure trends there are frequent uncertainties in the nature and impact of the risk factors and of the effectiveness of the range of measures that exist. Risks and measures can be described by vehicle, infrastructure and road user characteristics but often the most effective measure to mitigate a specific risk may be of a different type. For example, infrastructure and vehicle-based measures may be the most effective for behaviour-related risks so a systems-based approach is essential.

Safety CaUsation, Benefits and Efficiency (SafetyCube) is a European Commission supported Horizon 2020 project running from May 2015 to April 2018. Its main objective has been to develop an innovative road safety Decision Support System (DSS) that enables policy-makers and stakeholders to select and implement the most appropriate strategies, measures and cost-effective approaches to reduce casualties of all road user types and all severities. The core of the project was a comprehensive analysis of road safety risks (problems) and measures (solutions), including cost-benefit of measures. The
method focused on road users, infrastructure, vehicles and injuries framed within a systems approach. Involvement of road safety stakeholders at the national level, EU level and beyond has be sought at all stages.

The SafetyCube DSS aims to be a reference system for road safety in Europe that is improved and enhanced over time. Its objective is to provide the European and Global road safety community a user friendly, web-based, interactive Decision Support Tool to support evidence-based policies and to identify the most effective measures.

The development of the DSS has been based on the integration of the best scientific knowledge about road safety risks and measures into an intuitive but comprehensive tool that is freely accessible over the web.

**Work performed from the beginning of the project to the end of the period covered by the report and main results achieved so far**

Based on a series of stakeholder consultation events the main content, outputs and functionality were developed and used as the basis of the DSS development. This enabled a coding protocol to be developed that would be used to record data from many studies of infrastructure, vehicles, road user behaviour or post-crash care. Studies were selected for the DSS prioritised according to criteria based on specific search terms, peer reviewed sources, recency and EU validity. In some cases, meta-analyses of specific risks or measures were available, where possible these were updated with the results taking preference over individual studies.

A total of 1301 individual studies of crash risk factors or the effectiveness of road safety interventions were selected and together these enabled over 7,500 estimates of risks or measures. These estimates were extracted from the studies and entered onto a back-office database together with a large amount of supporting data to enable future interpretation and comparisons.

To enable users of the DSS to identify suitable measures for the risk factors of concern a new taxonomy of risks and measures was developed. This was used as the primary link between risks and measures and provided the core of the functionality of the DSS and it ensured that all relevant measures, whether infrastructure, road user, vehicle or post-crash care based, would be identified.

A new web interface to the DSS was developed to provide access to the studies with a set of training videos and reference information to enable intuitive use. Stakeholder consultations were used to identify the preferred set of entry points that most users would use.

A standard set of results are generated by the DSS to ensure the appropriate level of detail was available for all users. Summary information provides a short overview of the nature and magnitude of the risk or the effectiveness of a measure, indicated through colour coding. A list of relevant studies is generated with links to the original information. The results page also gives access to a longer document that gives a complete description of the underpinning evidence and an interpretation of the research for policy-
makers. Full information about the relevant studies is made available and the search terms and engines are listed so the results are repeatable or can be updated. There is a total of 211 available synopses on the DSS.

Policymakers normally pay attention to the costs and benefits of implementing a road safety measure and the DSS has made a major advance by developing the E3 calculator (Economic Efficiency evaluation). New standardised estimates of the costs of crashes and casualties have been developed working with EU member states and these have been incorporated into a flexible calculator accessed on the DSS. This enables users to estimate the economic efficiency of a measure by entering the programme costs and expected casualties avoided. Either specific or standardised costs and injury valuations can be entered. Further, 31 baseline estimates of economic efficiency have been generated and can be adapted by users.

Finally, the DSS also addresses the important area of serious injuries and the related societal costs. A definition of Abbreviated Injury Scale level 3+ has been adopted as a standard definition of serious injury however the comparability of various enumeration methods has been questioned. The DSS incorporates a comparison of the Methodologies with guidance for future convergence. Furthermore, a detailed analysis of the societal costs of serious injuries has been prepared using the standardised values for EU 28. Finally, in-depth crash injury databases have been examined to identify the most important risk factors associated with serious injury.

Progress beyond the state of the art and expected potential impact (including the socio-economic impact and the wider societal implications of the project so far)

The SafetyCube Road Safety DSS (www.roadsafety-dss.eu) is the first integrated road safety support system developed in Europe. The DSS goes above and beyond existing decision support systems by:

• Providing scientific evidence for both road safety risks and measures
• Taking a holistic approach considering road users, infrastructure, vehicles, and post impact care.
• Presenting over 7,500 estimates for risk and measure effects, 1250 coded studies, 211 synopses of risks and measures and 31 cost effectiveness analyses.
• Demonstrating the links between risk factors and respective measures.
• Applying a common ranking system; colour codes are applied to all risks and measures, so it is possible to compare the relative risk and effectiveness of risks and measures.
• Providing guidelines for the enumeration of MAIS3+ injuries to obtain more comparable estimates between countries together with measures of societal impact and key risk factors.
• Providing cost benefit analysis examples for selected measures.

The DSS is directed towards all road safety policy makers and their scientific support teams but is freely accessible over the web. It will directly contribute to the EC target of a reduction of traffic fatalities of 50% by 2020 and the further reduction of killed and seriously injured casualties. Traffic casualties
account for a total cost to the EU of over 100 billion and the implementation of the most effective measures revealed by the DSS has the potential to result in strong in-roads to the very high levels of societal costs of crashes.