**Life Cycle Assessment of Roads**

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**Background**

Road enables the movement of people, goods and services. Good design and maintenance of this vital infrastructure has a large part to play in meeting the sustainability targets of the Transport sector, such as carbon reduction. Road condition (skid resistance, roughness) has proven effects on safety and vehicle fuel efficiency. Conventional responsive mode (e.g. worst first) in road maintenance is unable to cope with the increasing demand, with too much reactive work in response to incidents and not enough focus on preventative work that is less expensive in the long-term. In the UK for instance, two minutes delay added to all vehicle trips would cost £12bn annually. Adding 1km to trip length (such as via diversion) to all vehicle trips at a speed of 40km/hour would cost £13.5bn per year. A holistic approach to study the many impacts of road is however, started only recently. There are methodological challenges in carrying out a life cycle assessment (LCA) of roads. This is further compounded by the emerging technologies in vehicles, roads and fuels which add uncertainty to LCA studies.

**Aim and Scope**

The project will build on the findings of road LCA. Researcher will identify the knowledge gap and the key questions to answer within the identified areas of study. It is expected that LCA modelling of road construction and its impact on the traffic will be carried out, followed by case studies to test and calibrate the model. Traffic management in road workzone can be investigated to advise the best practice in maintenance. Multi-objective optimisation approach can be incorporated with the LCA results. These will help road authorities to make informed decisions about what treatment should be carried out and when. Reference will be made to the current infrastructure asset management, with an aim to develop life cycle science for managing the road assets, and to improve key performance (e.g. cost, emissions).

The project could address (but not limited to) the following areas:

* Devise traffic management and develop transport modelling to assess and reduce the emissions from disrupted journeys;
* Fuel efficiency is a function of road condition, e.g. roughness. How remediation work can achieve a maximum saving (to road users) balanced by spending on the road work;
* Develop traffic based intervention schemes which take into account user fuel consumption as a result of change in road condition;
* Create an innovative design concept which involves environmental LCA, asset deterioration modelling, pavement research and user (i.e. travellers) satisfaction;

**Reference**

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