

Our Key Competence Areas are the fields in which KLU specializes. Find out about current discussions and research findings on Digital Transformation, Creating Value, and Sustainability for the benefit of transportation, global logistics, and supply chain management.



Dr. Asvin Goel is Full Professor of Supply Chain Management and Logistics at KLU. He has several years of working experience as an independent consultant and software developer for the logistics industry and served as Adjunct Professor of Supply Chain Management within the MIT Global SCALE Network and as visiting researcher at various renowned scientific institutions around the world. His current research interests focus on the optimization of difficult decision problems in transportation, logistics and supply chains.

THE ROUTE TO SUSTAINABILITY

EFFECTIVE PLANNING FOR REGENERABLE RESOURCES

EUROPE'S ROADS are busy and getting busier. That's the verdict of a European Commission study which estimates that by 2050 the volume of freight traffic on roads in the European Union will have risen by 50%. It is an increase that will have significant economic, ecological, and societal impact as more and more large vehicles jostle for space on already frequently congested city streets and highways.

A two-year research project led by Professor Asvin Goel and funded by the German Research Foundation (DFG) aims to develop models and methods to help transport service providers tackle these challenges.

A lot of work has been done on time-dependent vehicle routing (planning that factors in optimal times for routes to be driven to avoid periods of high traffic) in the past, explains Goel, who has worked in the field of vehicle routing for over 15 years. What sets his project, titled Time Dependent Routing of Renewable Resources, apart he says, "is that in this project, we are also considering regenerable resources."

"Take electric vehicles, which are increasingly used for freight transport. The vehicle's battery runs out and you have to recharge it before you can start again. It takes time to make the resource available again, so it's better to recharge during rush hour instead of further draining the battery while progressing slowly on congested roads. After recharging, the traffic may have cleared up and you can efficiently continue on your route with a fully loaded battery. This is one application where managing regenerable resources in the presence of time-dependent travel times is useful."

Another one is the compliance with hours of service regulations: Currently, truck drivers in Europe must take a minimum 45-minute break every 4.5 hours they drive and are only allowed to be on the road for nine hours in total before they are required to rest for the next eleven hours. This driving time includes periods stuck in traffic jams.

"Like a battery, drivers 'degrade' as well," says Goel. "They get tired and can't drive anymore. If you have

to take a break anyway, why not try to match up your break schedule with the traffic situation so one problem solves the other. It's good for drivers; it's good for society; it's good for everyone.

"That is essentially the new contribution of this project. We are developing algorithms that let you optimize vehicle routes, taking into account that traffic situations change and that your resources have to somehow be regenerated after a while, be it the hours of service regulations or the battery."

The project also has a number of logical possible extensions, including helping with planning so that drivers can book charging stations ahead of time. Another is the installation of electrified overhead lines so that trucks can charge their batteries while in operation. This technology is currently being tested by Siemens, and, like Goel's project, it is a positive step towards tackling the increased pressure being exerted on our roads and truck drivers.

By Jeff Kavanagh



LEARN MORE ABOUT THE TDR³ PROJECT

SUSTAINABILITY IN LOGISTICS TODAY

A BRIEF OVERVIEW BY ALAN MCKINNON, PROFESSOR OF LOGISTICS AT KLU

LOWERING COSTS by increasing energy efficiency, reducing waste and pollution, creating safe working environments – supply chain sustainability is high on the agenda of many businesses. In line with the United Nation's Sustainable Development Goals declared in 2015, sustainability is usually defined in economic, environmental and social terms.

Logistics negatively impacts the environment in many ways, mainly by releasing greenhouse gases (GHGs), impairing air quality and causing noise disturbance. Globally, the movement of freight is responsible for 7–8% of GHGs, a figure predicted to double by 2050 if companies do not achieve a deep decarbonisation of logistics operations. In much of the developing world a more pressing concern is the high level of air pollution, much of which originates from truck exhausts and represents a major health hazard.

The wider societal impacts of supply chains have come into focus as companies develop and expand their corporate social responsibility policies. These policies are often underpinned by ethical issues relating to sourcing, production, packaging and distribution decisions, and the working conditions of employees across the supply chain. Our research confirms that within the logistics sector, many environmental improvement measures also save money and yield a fairly rapid return on investment. Greening logistics is often just good business practice. The challenge lies in tailoring a package of measures that meets both economic and environmental goals.

SUSTAINABILITY – KEY COMPETENCE AREA OF KLU

KLU has established *Sustainability* for the benefit of transportation, global logistics and supply chain management as one of its Key Competence

Areas (KCA) to generate new insights into this important subject for researchers and practitioners. Our interest and expertise in sustainability lies in all three of its dimensions: environmental, social, and economic.

KLU professors conduct research in several fields related to sustainability in logistics. We keep abreast of technological, regulatory and managerial developments in this fast-moving field and so are well placed to provide regular updates on trends, initiatives and publications to students, managers and public policy-makers. KLU works closely with organizations and institutions in the field of sustainability, including the Global Logistics Emissions Council, Smart Freight Centre, Clean Cargo Working Group, the World Bank and the EU.

By Alan McKinnon



Alan McKinnon, PhD, is Professor of Logistics at KLU. He was previously a professor at Heriot-Watt University, Edinburgh. A graduate of the universities of Aberdeen, British Columbia and London, he has been researching and teaching in logistics for over 35 years, has published extensively in journals and books and been an adviser to several governments and international organisations, including the OECD, the World Bank, UN, World Economic Forum and European Commission.