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Department	School of Engineering and the Built Environment
Supervisors	Prof Pat Langdon, Richard Llewellyn, Achille Fonzzone
Funding Status	Funded PhD Project (European/UK students only)
Application Deadline	Click here to enter a date.
Project Title	Planning and operation of long distance e-bike routes

PROJECT DESCRIPTION

Cycling routes have been identified as an area for development to significantly reduce carbon emission and support health and wellbeing by encouraging active travel. This is particularly timely given recent development of battery and charging technologies of e-bikes, that have the added potential to extend the scope of cycling to older age groups and disabled populations.

However, the development of new routes that connect existing cycling infrastructure to national rural cycleways to create lengthy linear or circular routes is a new area of multidisciplinary research presenting significant challenges in terms of policy, technology, engineering, human factors, mapping and economics for these longer and non-urban routes.

A number of different challenges can be addressed within the Research area, some together:

- 1) The optimal modelling of the provision of effective e-bike infrastructure on long routes, including incorporation of existing charging infrastructure as well as an analysis of development of new charging and mobile charging facilities ;
- 2) A design analysis of bike and e-bike engineering features, including user interfaces and safety design considerations, as well as inclusive design (for a wider disability user base with an inclusive range of functional capabilities);
- 3) Engineering (Electrical, Design) analysis of the optimal or resilient provision of charging for e-bikes, including battery-swap, overnight charging, mobile charging and provision of over-night or fixed period charging facilities.
- 4) A transport economics analysis of the factors affecting the use of such routes by different demographics and usage groups, including qualitative approaches such as surveys and focus groups;
- 5) An operational analysis of the management and operation of such non-urban routes, including the roles of local businesses, communities and populations. This would include tourism, public health, seasonality, security, franchising and rental schemes;
- 6) Connected and communication strategies (apps, maps, booking systems, travel mode interfacing) to support such routes, in conjunction with 2,3,4, above. This could include information security and hacking, as well as asset tracking systems;
- 7) A business case analysis of operator fitness, and an example concept of operations tied to existing exemplars in Scotland and based on data and experiences collected in real-world practice.

Methodology could include elements that range from, surveys, field work, engineering design, power electronics, modelling of operations and designs; economic modelling and analysis, and public acceptance.

Academic qualifications

A first degree (at least a 2.1) ideally in an Engineering or Human Factors discipline with a good fundamental knowledge of Transport and Civil construction operations, economics and management; or

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battery and charging systems, sustainable design, public health, engineering design; or Human centred design, ergonomics, and design for inclusion.

English language requirement

IELTS score must be at least 6.5 (with not less than 6.0 in each of the four components). Other, equivalent qualifications will be accepted. [Full details of the University's policy](#) are available online.

Essential attributes:

- Experience of fundamental Engineering or Human Factors discipline
- Competent in Modelling, Engineering analysis, Engineering design OR Transport engineering
- Knowledge of Electrical and mechanical engineering, Human centred design, Public Health
- Good written and oral communication skills
- Strong motivation, with evidence of independent research skills relevant to the project
- Good time management

Desirable attributes:

Familiarity or experience with: cycling societal issues; Transport planning, e-bikes

Indicative Bibliography

Constantinos N. Genikomsakis, Nikolaos-Fivos Galatoulas, Christos S. Ioakimidis, Towards the development of a hotel-based e-bike rental service: Results from a stated preference survey and techno-economic analysis, *Energy*, Volume 215, Part A, 2021, 119052, ISSN 0360-5442,

Fishman, E. and Cherry, C., 2016. E-bikes in the Mainstream: Reviewing a Decade of Research. *Transport reviews*, 36(1), pp.72-91.

Kazemzadeh, K. and Bansal, P., 2021. Electric bike level of service: A review and research agenda. *Sustainable Cities and Society*, 75, p.103413.

Philips, I., Anable, J. and Chatterton, T., 2022. E-bikes and their capability to reduce car CO2 emissions. *Transport Policy*, 116, pp.11-23.

Reck, D.J., Martin, H. and Axhausen, K.W., 2022. Mode choice, substitution patterns and environmental impacts of shared and personal micro-mobility. *Transportation Research Part D: Transport and Environment*, 102, p.103134.

Shui, C.S. and Szeto, W.Y., 2020. A review of bicycle-sharing service planning problems. *Transportation Research Part C: Emerging Technologies*, 117, p.102648.

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Funding notes	May be funding available
Enquiries	For informal enquiries about this PhD project, please contact p.Langdon@napier.ac.uk or a.fonzone@napier.ac.uk
Web page	https://www.napier.ac.uk/research-and-innovation/research-degrees/application-process

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