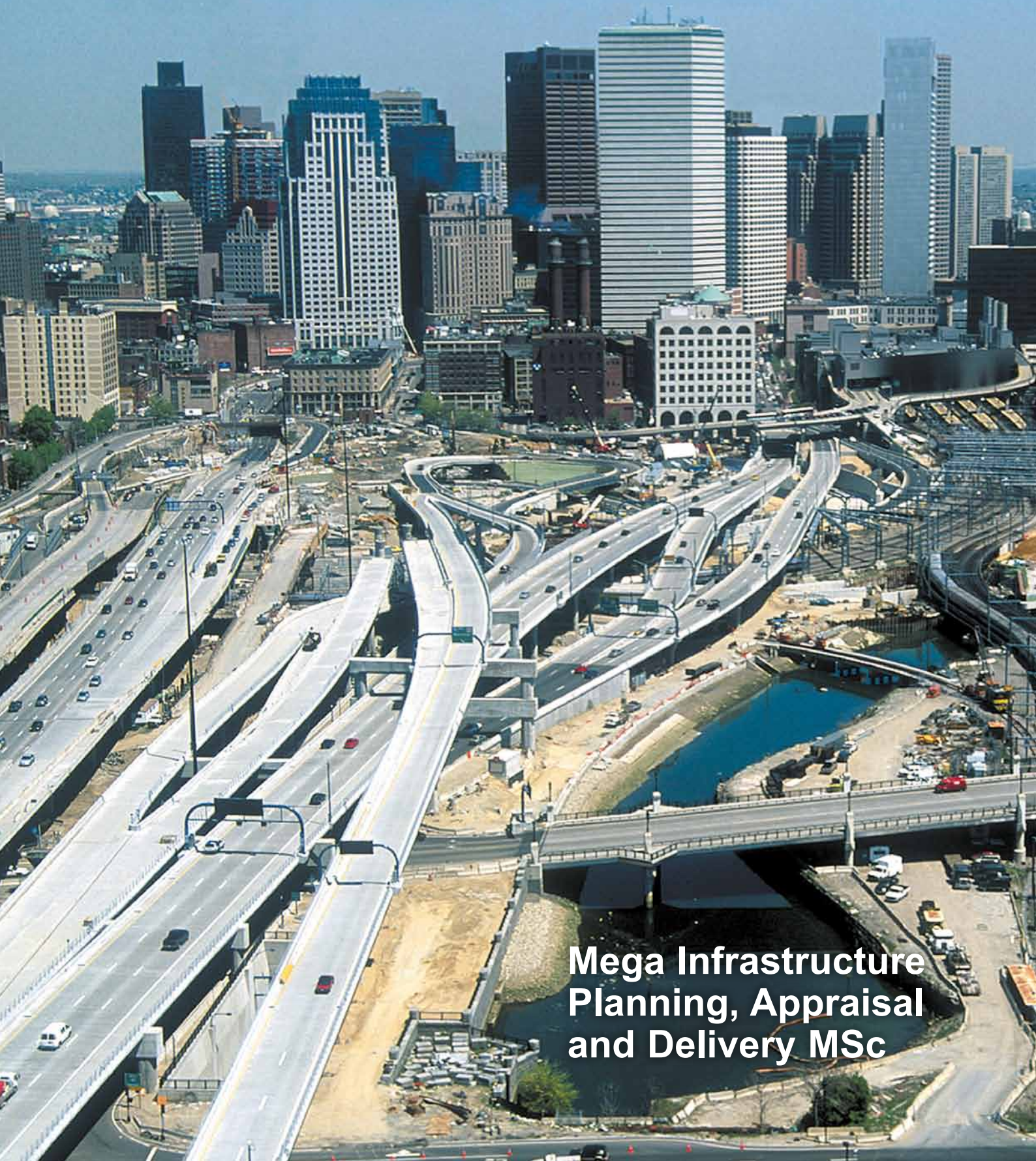




UCL



**Mega Infrastructure
Planning, Appraisal
and Delivery MSc**



National Stadium, Beijing, China

Mega Infrastructure Planning, Appraisal and Delivery MSc

Mega infrastructure is a particular class of infrastructure asset which typically costs in excess of US\$1Bn and attracts high levels of public attention and political interest. This is not solely due to the high cost of such investments, but principally as they impact directly on the quality of life and prosperity of the societies, economies, cities and regions they connect and traverse. Major infrastructure links, terminals, intersections and interchanges furthermore often provide focal points for urban agglomeration and industrial and commercial development.

Typical examples of such mega infrastructure include: the Channel Tunnel – a 50km undersea rail tunnel linking the UK and France; the 4150km Trans-Siberian pipeline; the US\$40 Billion Songdo International Business District in South Korea; the US\$22 billion Boston Big Dig, the most expensive highway project in the USA; the US\$16 billion Belo Monte hydroelectric dam complex currently under construction in Brazil, the US\$1 Billion King Shaka International Airport airport serving Durban (South Africa) and the 7.6 US\$Billion Dubai Metro, the world's longest (75 km) fully automated metro network.

Such developments can offer attractive opportunities for enterprise and investment, making them sources of wealth production and distribution, as well as agents of social, community and territorial change. Incompetently planned, appraised or delivered, however, such investments can become a major drain on resources, as well as being disruptive in terms of their social, community and physical impacts, and are often environmentally unsustainable.

The growing demand for mega infrastructure projects on account of rising forces of globalisation and the increasingly interdependent nature of the global economy, spawn many risks and uncertainties, as well as opportunities. These in particular arise from the multiple challenges involved in seeking to simultaneously meet aims of sustainable development, making this MSc programme extremely timely in its aim to produce a new breed of mega infrastructure professionals able to better understand and deliver the key ingredients for mega infrastructure project success.

Background

Our growing understanding of the natural environment and the concept of sustainable development, together with our rising appreciation of the increasing risks and opportunities associated with greater global interdependence, provide us with a fresh perspective on past mega infrastructure development practices.

This new outlook suggests that previous practices have often been too restrictive, too narrowly focused on economic growth outcomes and too insensitive to externality costs and contextual influences. This has presented infrastructure specialists and policy makers with major challenges concerning how we should plan, appraise and deliver mega infrastructure investments more sustainably across all sectors, and how existing investments might be retrofitted to better service goals of sustainability. This new perspective is increasingly leading many in the international infrastructure development community to reflect on the scope and priorities of the planning, appraisal and delivery of mega infrastructure projects, programmes and plans and provides the focus of this MSc programme.

UCL's Mega Infrastructure Planning, Appraisal and Delivery MSc is unique in preparing students for the major challenges ahead globally in the infrastructure field. By highlighting new frameworks and methodologies that bring risk and uncertainty into the milieu of decision-making for mega infrastructure development, extending into the critical areas of governance, politics, finance and strategic infrastructure policy, and how sustainable development goals can and should be incorporated in future investment decisions – the programme offers a holistic approach to decision making and problem solving that lead to more robust investment outcomes.

Programme Objectives

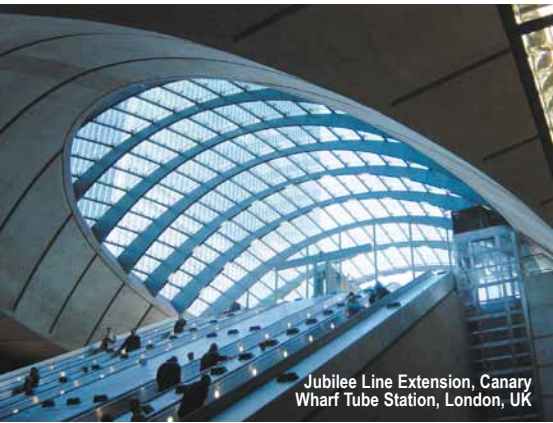
The MSc programme has been designed to equip students with the multidisciplinary competences required to plan, appraise and deliver large-scale and complex infrastructure projects fit for the multiple challenges facing the discipline in the 21st Century. It in particular seeks to advance the capabilities of its graduates to better communicate with key stakeholders in such projects.

The programme is inter-disciplinary and international, drawing on numerous studies undertaken in this field by the OMEGA Centre and other leading research institutions with the aim to develop a critical understanding of mega infrastructure theory and practice. It investigates the fundamental question of *'what constitutes a successful mega infrastructure project, programme and/or plan'* in light of the many and fast-changing expectations that different stakeholders have of such investments, not least in seeking to contribute to sustainable development.

The MSc recognises that any judgements about 'success' need to be examined against different contexts. With this in mind, the programme therefore aims to arm students with the insights, knowledge and skills that will assist them to better plan, appraise and deliver future mega infrastructure developments in a manner that is especially sensitive to the risks, uncertainties and complexities of different contexts, whether temporal, cultural or physical.



Hoover Dam and Bridge, Ohio, USA



Jubilee Line Extension, Canary Wharf Tube Station, London, UK

The programme has also been conceived to provide enhanced capacity-building opportunities for those currently working in the field of mega infrastructure development. It also offers an invaluable grounded qualification for new entrants into the field.

Learning Outcomes

- Acquisition of understanding of the fundamental characteristics of mega projects, plans and programmes.
- Attainment of clear overview of past and contemporary challenges and trends in the theories and practice of mega infrastructure planning, appraisal and delivery.
- Understanding of the contribution that such initiatives make to environmental, social, economic and institutional objectives at local, national and global scales.
- Acquisition of basic knowledge of the international, national and regional policies and legislative frameworks, plus market contexts that surround mega infrastructure development.
- Appreciation of the diversity of stakeholders' agendas and of the interrelationships and tensions between local, national and global objectives.

- Enhanced understanding of the critical issues concerning sustainable infrastructure investment at all scales.
- Attainment of generic skills of strategic planning and risk management distilled from other professions and disciplines where risk, uncertainty and complexity are at the heart of their planning.
- Grounding in traditional and contemporary infrastructure planning and appraisal methods and techniques including: Financial, Economic and Social Cost Benefit Analysis (CBA), Cost Effectiveness Analysis (CEA), Environmental Impact Assessment (EIA), and Social Impact Assessment (SIA).
- Introduction to application of innovative methods and techniques to infrastructure planning, appraisal and monitoring, including: Multi Criteria Analysis (MCA), Stakeholder and Issue Analysis and policy-led MCA that facilitate the transparent trade-off between different project stakeholder priorities, aims and needs across the sectors and levels of development in a more holistic manner.

Programme Structure and Content

The MSc programme has a modular structure. A schematic representation of the structure of the programme and sequence of its modules is shown in the accompanying diagram. The MSc comprises nine mandatory modules, including one elective module, one group student project and a compulsory dissertation, totalling 180 credits.

Participation in the MSc programme may be on a full-time or a modular basis. The former is offered over 12 months, while the latter can be completed in a period from two to five years.

Core Modules

The core modules taken by all students cover and integrate the multiple and fundamental mega infrastructure project knowledge areas alluded to earlier, attempting to go well beyond the constraining 'disciplinary silos'.

■ Mega infrastructures as agents of change (15 credits)

This module defines the overarching characteristics of mega infrastructure projects, programmes and plans of various kinds and examines their roles as agents of change. It encompasses both the understanding of past perspectives of the roles of mega infrastructure and the investigation of 21st Century perspectives, where the global interdependency of economic growth and environmental impacts appears to be stronger than ever before, and where sustainability looms large as a key challenge for future generations. This module pays particular attention to the development context of such infrastructure investments and forms one of the foundation modules for the MSc.

■ Traditional infrastructure planning, appraisal and delivery toolbox (15 credits)

This module presents the traditional tools currently employed in the planning, appraisal and delivery of mega infrastructure projects, programmes and plans in the various key sectors of transport, energy, water and urban regeneration. It critically reviews the theory and practice used in these fields, drawing extensively from case studies in the UK and overseas in both the developed and developing world. The module draws extensively on the findings of the OMEGA Centre's international case study research and advisory practice, including its work for: the Volvo Research and Education Foundations (VREF), the RAMP Working Party of the Institution of Civil Engineers (ICE) and the Actuary Profession, HM Treasury and the European Investment Bank (EIB). Particular attention is given to project viability assessments and economic growth outcomes for different development contexts that are consistent with sustainable development aims.

■ Risk, uncertainty and complexity in decision-making (15 credits)

This module introduces and critically reviews the treatment of Risk, Uncertainty and Complexity and their relationship with decision-making contexts in mega infrastructure planning, appraisal and delivery. The module draws on academic literature that presents the 21st Century as an era of greater risk, uncertainty and opportunity as global interdependencies increase. It calls on research findings derived by the OMEGA Centre from an extensive examination of megaproject decision making in professions and disciplines where

| Term 1 | Term 2 | Term 3 | Summer |
|---|--|-------------------------------------|--------|
| Mega infrastructures as agents of change 15 credits | Critical issues in sustainable mega infrastructure investment 15 credits | Student group project 15 credits | |
| Traditional infrastructure planning, appraisal and delivery toolbox 15 credits | Sustainable visions and challenges for mega infrastructure investments 15 credits | Research Methods Non-credit | |
| Risk, uncertainty and complexity in decision-making 15 credits | 21st Century infrastructure planning, appraisal and delivery toolbox 15 credits | E X A M S | |
| Elective Module 15 credits in either term | | | |



Tullamarine Freeway, Melbourne, Australia

risk, uncertainty and complexity are at the *milieu* of their planning and appraisal processes, as in the case of the military, medicine, insurance, banking and earthquake engineering and seeks to transfer lessons learned into the mega infrastructure field.

■ Critical issues in sustainable mega infrastructure investment

(15 credits) The principal aim of this module is to provide students with an international exposure to contemporary critical issues in mega infrastructure projects across a variety of important themes presented by highly experienced practitioners, including: transparency and corruption, role of public-private partnerships, impact of mega events on megaprojects, prospective role of pension funds in infrastructure development etc. The module offers an opportunity for in-depth reading, critical reflection and discussion around key issues and debates connected with the challenges of sustainable mega infrastructure investment. The aim is to enable students to develop a deeper knowledge of important challenges, practices and theories of mega infrastructure planning, appraisal and delivery, and to help form an integrated view of sustainable infrastructure investment in relation to key areas of knowledge.

■ 21st Century infrastructure planning, appraisal and delivery toolbox

(15 credits) This module follows on from the module on the *Traditional infrastructure planning, appraisal and delivery toolbox*. It has, as its starting premise, the belief that many contemporary conventional planning, appraisal and delivery approaches to mega infrastructure investment are not 'fit for purpose' for the 21st Century in light of the sustainability challenges they confront. The module substantiates this position by drawing from both theoretical and empirically based arguments and responds to the identified shortfalls and limitations of many traditional practices by proposing alternative approaches. These include the application of Multi Criteria Analysis informed by sustainable policy and planning frameworks and of Cost Benefit/Effectiveness Analysis designed to assist policy makers and politicians in making critical trade-offs, plus tools of

strategic environmental impact analysis, equity appraisal etc. Emphasis is placed here in all instances on the importance of transparency and accountability in the public decision-making process.

■ Sustainability visions and challenges for mega infrastructure investments

(15 credits) This module follows on from the modules on *Risk, uncertainty and complexity in decision-making* and the module on *Mega infrastructures as agents of change*. In the context of the premise that the 21st Century is destined to encounter increasing risks (and opportunities) and uncertainties as the forces of globalisation unfold, this module examines the evolution of the vision of sustainability as it applies to mega infrastructure development across all sectors. In addition to examining the economic, environmental and social dimensions of sustainability, this module also includes the concept of sustainable institutions as a fourth dimension.

■ Student group project

(15 credits) This module offers students an opportunity of role-playing client-professional practice decision-making in tackling a 'live case study.' This is undertaken in conjunction with parties from government and practice who act as proxy clients for the students during the preparation and presentation of their work/findings. It is here that the new knowledge acquired through the earlier core modules are synthesised, integrated and tested in the context of a live problem-solving situation. Students will be asked to undertake a client-based study notionally commissioned by a national or regional development agency from the perspective of a consulting firm. The project is intended to encourage students to translate the knowledge and skills learned from programme modules into mega infrastructure planning and appraisal practice, with a view to developing more effective and holistic mega infrastructure project, programme and plan delivery.

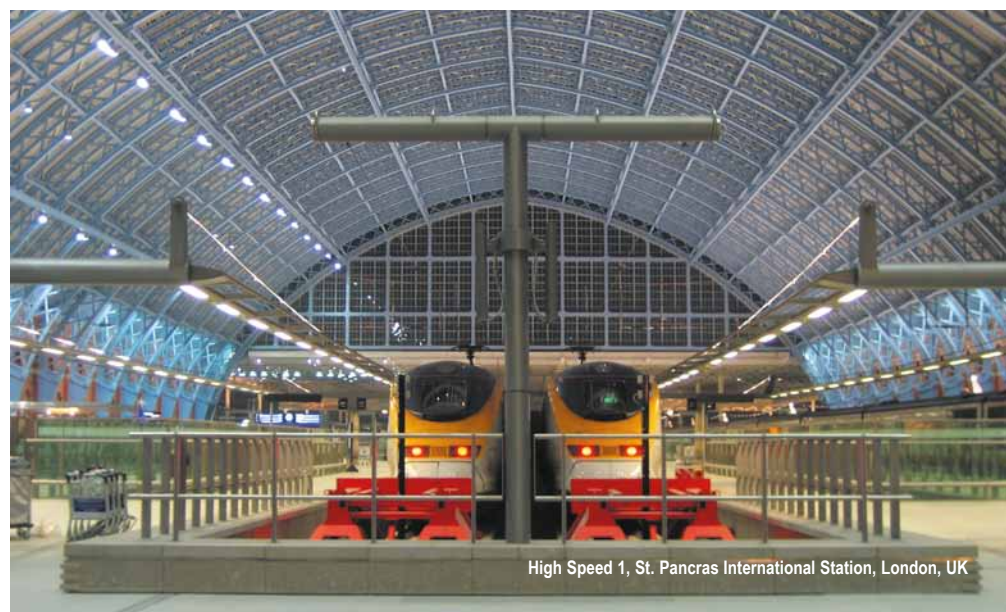
■ Elective Module (15 credits)

The elective module allows students to complement the programme's core modules with an individual specialisation based on his/her own interest, choice and career objectives. Subject to availability of places, students may take an elective chosen from a wide range of topics, including: public policy, spatial planning, sustainable urbanism, urban regeneration, urban design, transport planning and project management. These are offered to the MSc by a variety of UCL departments/Schools, including: the Bartlett School of Planning; the Development Planning Unit, the School of Public Policy, the School of Construction and Project Management, the Department of Geography, and the Department of Civil, Environmental and Geomatic Engineering. Selection of the module is undertaken following discussion with the Programme Director.

■ Dissertation (60 credits)

Following completion of all the taught modules, students have the opportunity to apply the knowledge acquired during the academic year in the writing of a final dissertation encompassing an intellectually challenging topic of their choice, subject to supervisor approval. The dissertation for which students are required to follow a preceding (non-credit earning) dissertation 'support module' on *Research methods* is complemented by the provision of one-to-one dissertation supervisor tutorials. Examples of recent dissertation topics include:

- *The Use of Multi-Criteria Analysis in Decision-Making on Mega Infrastructure Projects: The case of the Rotterdam Mainport development project*
- *The analysis of the Winners and Losers of the Hangzhou Bay Bridge Project in China: An examination of the role of PFI in mega infrastructure projects*
- *A Critique of Mega Infrastructure Project Appraisal Frameworks: Lessons for Abu Dhabi megaprojects*



High Speed 1, St. Pancras International Station, London, UK

The OMEGA Seminar Programme

The MSc is complemented by the OMEGA Seminar Programme, which runs throughout the academic year, involving a wide range of external speakers. Open to the public, this programme draws on experts in mega infrastructure development from many disciplines.

The series aims to stimulate debate and discussion on crucial topics, such as: infrastructure investment, challenges of sustainability, and financing mechanisms within the global market. These seminars are held in order to bring to the public domain the work of practitioners and other researchers surrounding major projects. They foster ideas on tackling problems, threats and risks in contemporary and future environments. A selection of the most recent presentations include:

- Pierre Laconte, Past Secretary General of ISOCARP and IUPT on *The Louvain University campus development*
- Prof. Michael Hebert, Bartlett School of Planning, UCL on *Cross-Rail*
- Michael Schabas, First Class Partnership on *The Lagos Metro Blue Line*
- Jay Jayasundara, Past Infrastructure Advisor to UK Prime Minister on *Politics and Megaprojects*
- Robert Ravelli, Private Consultant on *US NE High Speed Corridor*
- John Steward, HACAN on *Heathrow's Third Runway*
- Christian Wolmar, Freelance journalist on *Megaprojects, Political Champions and the Media*
- Oliver Sparrow, The Challenge Network on *Regulatory Needs for Megaprojects*

Field Trip

Students will have the opportunity to visit a selection of some of the most important European mega-projects during a one-week trip. In this way students will be able to appreciate directly the way that different contexts, including cultural, political and institutional, frame mega infrastructure decision-making in the planning, appraisal and delivery. In the last years students have visited and received specially arranged presentations from a wide range of senior professionals, civil servants and academics regarding:

- France's High Speed TGV network
- The Paris Meteor



Visit to Örestad new town development in Sweden during MSc Field Trip

- The Port of Rotterdam
- The Rotterdam Central Station
- The Randstaad Rail and the Maeslant Barrier in the Netherlands
- The Brussels Station area development
- The Öresund Link in Sweden and Denmark

In addition to these presentations, students have benefited from presentations from the European Commission in Brussels on EU policies and plans on trans-national mega infrastructure developments and investments.

The OMEGA Centre and the MSc Programme Teaching Team

The MSc programme is directed by Professor Harry T. Dimitriou, who has taught, researched and practised internationally in the field of infrastructure development for over 30 years and held numerous advisory and consultancy positions, including for the World Bank, UNDP, UN-Habitat, Harvard Institute for International Development, Hong Kong Government, Government of Indonesia, and UK Regional Development Agencies

The MSc programme draws extensively from the recent international research findings of the OMEGA Centre which reports on decision-making in megaproject developments of 30 case studies in ten countries. Relying on evidence based lessons derived from the project experiences of more than 300 key stakeholders world-wide plus a comprehensive review of literature in the field. The MSc offers both exciting new insights into mega infrastructure development and a selection of innovative new approaches to megaproject planning and appraisal currently being developed as part of the OMEGA Centre portfolio of advisory services.

The MSc programme benefits from academic teaching contributions from the OMEGA Centre team, Dr. Robin Hickman, Prof. Mike Batty, and Prof. Sir Peter Hall from the Bartlett School of Planning, Prof. John Adams from UCL's Department of Geography, John Stone from Kings College London, Dr Ulf Dahlsten from London School of Economics, Prof Andrew Stirling from University of Sussex, and Prof. Willem Salet from University of Amsterdam.

Each module furthermore contains contributions from leading practitioners in fields related to mega infrastructure planning, appraisal and delivery who are invited to present their practical perspectives to the programme as a basis to enhance the theoretical and practice content of each module. Contributors to the programme to date have included:

- Dr. Roger Allport, *Imperial College London*
- Brian Field, *European Investment Bank*
- Detlef Golletz, *Thames Gateway Institute for Sustainability*
- Andrew Hayward, *Balfour Beatty Plc*
- Peter Head, *Ecoquest Trust, sometime of Ove Arup*
- Dr. Mayer Hillman, *Policy Studies Institute*
- Eleni Kyrou, *European Investment Bank*
- Chris Lewin, *Actuarial Profession*
- Joseph Low, *HM Treasury*
- Niall McNevin, *Mott MacDonalds*
- Dr. Molly Morgan-Jones, *RAND Corporation*
- Keith Perry, *EC Harris International*
- Stephen Potts, *Environment Agency*
- Peter Twelftree, *Steer Davies Gleave*
- Robert Upton, *Infrastructure Planning Unit, Planning Inspectorate*
- Jon Willis, *some time of London Underground*

Accreditation

The programme is accredited by the Royal Town Planning Institute (RTPI) as a 'specialist' fourth year for graduate students who have successfully completed an RTPI-accredited three-year undergraduate course.

Accreditation by the Joint Board of Moderators (JBM) has been confirmed as a result of the programme meeting the further learning requirements for students who have completed undergraduate studies in an approved engineering school. This will enable engineering graduates to satisfy the academic requirements for Chartered Engineer status and corporate membership of either the Institution of Civil Engineers, the Institution of Structural Engineers, the Chartered Institution of Highways and Transportation, and or the Institute of Highway Engineers.



Susquehanna Steam Electric Station, nuclear power station, Pennsylvania, USA



Accreditation of the programme by the Royal Institution of Chartered Surveyors (RICS) for students is also being progressed.

Career Opportunities

Graduate students from the Bartlett School of Planning at University College London have been very successful in gaining employment from a wide range of both public and private employers following their graduation from the School.

Because the Mega Infrastructure Planning, Appraisal and Delivery MSc is a relatively new programme, the employment placement statistics are rather limited. Nonetheless, with its strong links to industry, government and academia on a global scale, to date 85% of the 2012 MSc intake have gone on to find placements within the first year after graduation. They have taken up positions in government, investment banking, community

development, academia, consulting and the construction industry. Two graduates have been accepted to undertake PhD studies at the OMEGA Centre.

Entry Qualifications

Applicants must normally have obtained a first or second class honours degree (with a minimum of 2.2 or its equivalent) or other qualification of equivalent standard. Entrants from all disciplines will be considered, with preference given to those with work experience in some aspects of mega infrastructure planning, appraisal and delivery. A demonstrated high level of competence in both spoken and written English is also required.

Overseas students whose first language is not English will be asked to provide evidence of this. A minimum overall score of 6.5 with a minimum of 6.0 in each of the sub-tests for IELTS or 580 plus 4 for TWE in TOEFL is required.

Programme Fees

Programme Fees are fixed annually by University College London and are therefore subject to modification. Annual fees for the 2013-2014 session are:

| MSc | Full-time |
|-----------------|-----------|
| EU students | £10,750 |
| Non-EU students | £19,500 |

Modular (Flexible) students can spread their studies over a period of up to five years. This is different to Part-time which is fixed-term for 2 years. Modular students select their modules for the year. Once selected, a fee will be calculated for the academic year based on the number of credits assigned to the modules chosen – in any academic year applicants will only pay for the number of credits chosen in that year. Please note that all courses are subject to annual inflationary increases.

Application Procedures

Applications can be made online, or application forms downloaded, at www.ucl.ac.uk/prospective-students/graduate-study/application. Applicants are also encouraged to contact the programme Admissions Tutor.

There is no fixed deadline for applications but nominations for grants and sponsorship from various sources usually close in the spring and applicants are advised to apply as early as possible. Details of scholarships, including the BSP 'Centenary Scholarships', are available from the Bartlett School of Planning website: www.bartlett.ucl.ac.uk/planning/programmes/applying/funding-and-scholarships

Mega Infrastructure Planning, Appraisal and Delivery MSc
Director and Admissions Tutor
Professor Harry T. Dimitriou
DipTP MSc PhD MRTPI
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More detailed information can be found at: www.bartlett.ucl.ac.uk/planning

The OMEGA Centre website can be found at: www.omegacentre.bartlett.ucl.ac.uk

For general enquiries about UCL, applicants are advised to contact: Admissions and General Enquiries Office, UCL, Gower Street, London WC1E 6BT
E-mail: degree-info@ucl.ac.uk

Term dates

A thirty week academic year is followed. Although term dates vary from year to year, academic years commence towards the end of September with three terms of twelve, eleven and seven weeks respectively. Terms one and two each contain a reading week and term one an orientation week.

Disclaimer

This brochure is correct at the time of going to press but no guarantee can be given that it will not be amended before the commencement of, or during, the programme to which it refers. UCL and the BSP reserve the right to alter or suspend any of the courses and modules as necessary. It is not guaranteed that every workshop or seminar will be offered every year. Please check with the Programme Director on the latest position.

OMEGA CENTRE

Centre for Mega Projects in Transport and Development

A global Centre of Excellence in Future Urban Transport sponsored by Volvo Research and Educational Foundations (VREF)

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VREF

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