Maths and Public Policy - Launch Event
Wednesday 10th December 2014, The Royal Society, London
Summary Note

The Turing Gateway to Mathematics (TGM) is delivering a programme of work and associated events on behalf of the Engineering and Physical Sciences Research Council (EPSRC), which are bringing together mathematical sciences researchers and policy makers to explore modelling and problem solving. The launch event on 10th December was held at the Royal Society in London and was attended by 85 delegates from across Government departments, academic institutions, learned societies and other public sector organisations.

John Toland, Director of the Isaac Newton Institute, welcomed delegates and provided an introduction to the afternoon's events. He thanked EPSRC and the TGM for the delivery of the event and introduced the speakers. The Turing Gateway to Mathematics (TGM) is an impact acceleration initiative of the Isaac Newton Institute (INI) based at the University of Cambridge. It acts as a vehicle for knowledge transfer between the mathematical sciences and potential users of mathematics, such as industry and other academic disciplines in the UK as well as internationally.

Presentations - copies of the slides used during the event can be seen at www.turing-gateway.cam.ac.uk

Philip Nelson, Chief Executive *(EPSRC)*

Philip gave an introduction to EPSRC, which has a role to help make the UK the best place in the world to research, discover and innovate. A key focus is on building leadership in research – both in academia and wider organisations – through support for the best researchers and doctoral students, with a focus on the private as well as public sector.

Philip provided 3 examples of their role in relation to the public sector - supporting an ageing population in their homes, predicting and preventing floods and Olympic gold-medal winning engineering. He illustrated investments in maths through research projects, such as support to the POEMS and CliMathNet networks, as well as the recently announced Alan Turing Institute (not to be confused with the TGM), which will be based at the British Library and have a focus on big data.

Muffy Calder, Chief Scientific Adviser for Scotland

Muffy spoke in her capacity as working for Scottish Government, but reflected on experience elsewhere in her career. She highlighted that mathematical modelling is truly part of science and that we need to explore the amount of details required in order to ask and answer the right questions. Scientists need to provide robust and reliable evidence and Muffy illustrated four examples across a wide range of mathematical domains - monitoring of animal movements for the purpose of protecting seabirds; engineering models that sit behind transport planning; an example related to bathymetry, which is the study of the underwater depth of lake or ocean floors; and a final example related to altruistic live kidney donations.

Roy Anderson, Director *(London Centre for Neglected Tropical Disease Research, Imperial College London)*

Roy spoke about applied mathematics and large scale computational analyses for the study of the spread and control of infectious diseases. He illustrated this by talking about various epidemics and pandemics including influenza A, SARS, HIV and Ebola, plus the control of some of the endemic Neglected Tropical Diseases (NTDs). One challenge for the control of NTDs relates to the efficient use of drugs that are donated by pharmaceutical companies for use in developing countries, and the need to develop optimum drug treatment schedules to control or eliminate these infections at minimum costs in terms of delivery to populations in poor regions of the world.

He argued that policy makers need to make an assessment at the end of an outbreak on how well mathematical models predicted the course of the epidemic and how well different control interventions worked. The foot and mouth epidemic is a good illustration - when the outcome was compared with the prediction, good agreement was achieved – giving policy makers confidence in the utility of mathematical and analytic tools.

Bernard Silverman, Chief Scientific Advisor *(Home Office)*
Bernard spoke about modern slavery – an issue that the Coalition Government takes seriously. Internationally, there are agreements for countries to have mechanisms to identify potential victims of modern slavery. In the UK, this is led by the National Crime Agency (NCA). Data is collected from various sources to provide a measure of the number of potential victims. This number only presents a partial picture of modern slavery, as many potential victims are not known to the agencies giving information to the NCA.

Multiple Systems Estimation (MSE) was used to identify the number of victims that are not reported or do not appear on any lists, this is known as the "dark figure". MSE is a more complex form of 'mark-recapture' methods, that were used in the 2011 census to estimate the undercount, the proportion of the population not "caught" by the initial census. Bernard showed how the "dark figure" had been calculated from multiple lists of potential victims and the interactions between the various data sets.

Richard Heaton, Permanent Secretary for the Cabinet Office and First Parliamentary Counsel
Richard provided an introduction to the Cabinet Office, which is responsible for coordinating policy decisions across Government, the Government Digital Service, and championing open policy making and open data. He highlighted that fiscal challenges and real world problems remain huge - for example, the ageing population, climate change, peoples' expectations of Government - all linked with calls for more than incremental efficiencies. This provides a real opportunity to do things differently and be liberated, not limited, by these challenges and constraints. As he described it "we are in the market for ideas and answers".
Advances in science and maths relate to horizon scanning - which in turn will influence planning. There needs to be solid planning related to resources, human sciences and information, which Richard illustrated with a number of examples.

Panel Discussion Session

The talks were followed by a facilitated panel discussion session, which raised a number of questions and points that are briefly outlined below. These will be further reflected on, as this programme of work continues.
One key theme related to the relationship between policy makers and those involved in academic research and mathematical modelling. A number of points were highlighted:

- communication - how to communicate uncertainty and bridge the gap between the policy makers and the scientists;
- use of appropriate language and its role in public perception of science;
- the role of mathematics and modelling and value of research inspired by real world needs;
- the value of sharing information and the peer review process;
- need for the development of the right skills to facilitate all of the above and the funding to support this.

The
Council for the
Mathematical
Sciences

Tweets were sent throughout the event **@TuringGateway @EPSRC** using
#MathsPolicy

Conclusion

Hetan Shah, Executive Director of The Royal Statistical Society and speaking on behalf of the Council for the Mathematical Sciences (CMS) brought the event to a close. He argued for a 10 year framework for investment in science, and for greater regard to the balance between capital and revenue spending. He expressed concern about funding leading to concentration of mathematical science departments - all universities would benefit from mathematicians and statisticians to support their scientific colleagues. Attention needs to be paid to the 'people pipeline' to ensure there are sufficient trained mathematical scientists to meet the needs of academia and industry. Education for the wider population was also important, whilst the Q-step programme and the new core maths qualifications are important in this regard, he stated that the mathematical sciences community needs to keep pushing this up the national agenda.

Hetan reiterated thanks for attending the event and concluded by outlining that following the launch event, two further workshops will be held in 2015 to take forward the issues raised and to explore specific themes in more details. These will be *Cities and Infrastructure* on 11th March and *Health and Society* workshop on 24th March.

Post Event

Verbal feedback on the day was positive and a number of emails and twitter messages from delegates were exchanged post-event which highlighted the value of attending. Analysis of the feedback forms demonstrated that the public policy case studies offered a good insight into how Government departments have implemented mathematical techniques to assist with policy decisions. It was also clear from the responses that the presentations were well received by academics and policy makers, with the majority of participants actively engaging with the discussion and networking sessions. The calibre of speakers was felt to be high, with attendees highlighting that the talks contained engaging, informative and interesting material. Post event material was sent to those who had been unable to attend and this was felt to be useful. Feedback will be used to inform the two further workshops that will take place in March 2015.