SECURE

Statistics of Environmental Change, Resources and Ecosystems

Annual Report

June, 2016

EPSRC
Pioneering research and skills

Contents

SECURE: Statistics of Environmental Change, Resources and Ecosystems

1. Vision

To bring together data providers and researchers from the environmental sciences with the statistical community to provide fresh intelligence and new insights into environmental change and society's management of that change.

2. Background

The EPSRC identified that the role of engineering and the physical sciences is particularly important in enabling progress in areas such as resilient national infrastructure, water security and protection against high impact extreme events, including flooding**.** They also recognised that there was currently little activity in the mathematical sciences space in these areas and that there was a need to explore new tools and techniques. This led to the April 2014 Forecasting Environmental Change Call for Networks "Plus" in the following topic areas:

- New Tools for Modelling of Environmental change,
- Forecasting of Impacts: Adaptation and Mitigation choices,
- Decision Support Tools for Environmental Change Forecasts.

Four networks were funded of which SECURE is one, the other three networks being: Recover, Past Earth, and Maths Foresees. SECURE is funded under grant number EP/M008347/1 and runs from February 2015 until February 2018.
This report summarises the first year of the network and looks ahead to future plans and developments.

Highlights of year 1

- In April 2015 SECURE launched its new website
- On the 11th September 2015 SECURE held its Launch Event which was attended by agencies and universities, providing an ideal setting for developing existing partnerships and forging new ones.
- The first project Feasibility call resulted in five projects being funded up to the value of £121,365.
- SECURE launched its new logo in September 2015, followed by its card in December 2015.
- An open funding call to support conference attendance was opened in December 2015.
- SECURE supported the PURE network in a joint event held on the 10th February, 2016 at the Isaac Newton Institute, Cambridge: on Computational and Data Challenges in Environmental Modelling.
- A separate call for workshops saw three workshops on different SECURE themes receiving funding. The "Environmental, Health and Wellbeing" workshop was held on the 12th February, 2016 and the "Use of 'low-cost' sensor technology to monitor air quality and engage citizens" workshop was held on the 30th March, 2016. The third workshop: "Modelling uncertainty from multi-scale data streams in environmental sciences" will be held at the University of Bristol on the 7th September, 2016.
- Four quarterly newsletters have been published.
- Thirteen new individual members have joined the network since the introduction of individual membership in December 2015. Three new universities are represented and one new institution.
- SECURE will be sponsoring a session at the TIES conference in 2016.

3. Structure

3.1 Operational Team

The Operational Team, based at the University of Glasgow is responsible for the day to day running of the network. Professor Marian Scott (OBE) from the school of Mathematics and Statistics of the University of Glasgow (UoG) is the Principal Investigator of the Network. She holds a personal chair in Environmental Statistics. Professor Susan Waldron from the School of Geography and Earth Sciences of the University of Glasgow is the Co-I. Susan holds a Chair in Biogeochemistry at the University of Glasgow and leads the Carbon Landscape Research Group within the School of Geographical and Earth Sciences. Dr Gillian Brown is the Project Co-ordinator. Together they form the day to day Operational Team for the Network.

The network appointed three boards each with a specific remit within the network.

3.2 Management Board

The role of the Management Board, which meets quarterly, is to oversee all aspects of the network. The Management Board has a general oversight of the budget, feasibility projects, activities, events and outreach. It receives reports from the project administrator, the Project Feasibility Review Board and liaises with the Scientific Advisory Board. The composition of the Management Board is the PI and Co-I, network administrator and three others from the membership.

Name	Institution	Expertise
Marian Scott (PI, Chair)	University of Glasgow	Time series modelling and functional data analysis for water and air quality modelling
Susan Waldron (Co-I)	University of Glasgow	Biogeochemical cycling, carbon modelling in aquatic systems
Jonathan Tawn	University of Lancaster	Extremes and spatio-temporal models
Mark Hallard	SEPA	Policy, environmental assessment
Christophe Sarran	Met. Office	Health statistics, computational fluid dynamics, health services consultancy
Gillian Brown (Administrator)	University of Glasgow	Network Administrator

Table 3.2: Members of the SECURE Management Board

3.3 Project Feasibility Review Board (PFRB)

The role of the PFRB, which meets annually, is to review and recommend feasibility projects to receive funding. The PFRB report their recommendations to the Management Board. The composition of the PFRB is the Co-I of SECURE (chair), the network administrator and three others from the membership.

Name	Institution	Expertise
Susan Waldron (Co-I, Chair)	University of Glasgow	Biogeochemical cycling, carbon modelling in aquatic systems
Ron Smith	CEH	Statistical modelling, air quality process models
Mark Cutler	University of Dundee	Earth observation, socio-economic impacts
Janine Illian	University of St Andrews	Spatial point processes
Gillian Brown (Administrator)	University of Glasgow	Network Administrator

Table 3.3: Members of the SECURE Project Feasibility Review Board

3.4 Science Advisory Board (SAB)

The role of the SAB is to guide network progress and receive the annual report for comments. The board advises the local management group on how to deliver objectives, and offer suggestions about scientific direction, and delivering impact and outreach. The composition of the SAB is five key national and international partners including the SECURE PI, one international member, one member from another LwEC network, and an EPSRC representative.

Name	Institution	Expertise
Marian Scott (PI, Chair)	University of Glasgow	Time series modelling and functional data analysis for water and air quality modelling
Montse Fuentes	STATMOS	Development of new statistical methods that can aid scientists working on atmospheric issues
Peter Ashwin	University of Exeter/ReCoVER PI	Dynamical systems theory and computational modelling
David Elston	BioSS	Ecological applications of random effect modelling, spatial and temporal modelling
Mark Haffey	Scottish Water	Water infrastructure and quality

Table 3.4: Members of the SECURE Project Feasibility Review Board

4. Growth and Development Objectives

The primary aim of the network is to grow communities, and develop collaborations and thus a shared and improved understanding of environmental change.

4.1 Membership

The network specifically sought members across a broad range of organisations, and recruited its initial membership in different disciplines. The founding membership of SECURE was nine universities and nine agencies. Together they bring a broad range of knowledge and experience. These have been directly mapped to the key statistical and environmental challenge areas that we have identified as the initial focus for the network. However, the network activities are open to all interested parties. Individuals interested in the SECURE network can apply to join in a simple and straightforward process. In this way we hope to encourage new members from either the existing institutions or from new institutions.

4.2 Engagement with Agencies and non-academic partners

Bringing both new agencies on board and creating partnerships with existing SECURE agencies is key to expanding the base of the network. The Launch event held on the 11th September provided an ideal opportunity for academics and agencies to strengthen existing partnerships and forge new ones. Around 60% of the delegates came from Universities and 40% from agencies.

5. Funding Streams

5.1 easibility Project Funding

The main funding stream of the SECURE network is the £300,000 Feasibility Project Funding Pot. The maximum funding available per project, which should be 3-6 months long, is £25,000. There have been two calls for feasibility projects. SECURE allocated £121,365 in its first year funding five Feasibility projects, and a similar number is anticipated from the second call. Details of the funded projects can be found in Table 1 on page 9.

5.2 Workshop Funding

Workshops on the following four themes were held at the Launch event in September, 2015:

Environment, health and wellbeing

New technology data streams

Shaping the data sets of the future

Linking process and statistical models

This was followed by a Workshop funding call on the same themes. The maximum available per workshop was £1250. Three workshops received funding with a total of £3,400 being allocated. Details of the funded workshops can be found in Table 2 on page 10.

5.3 Conference Funding

SECURE opened its open Conference funding call in December 2015. Funding is available for applicants who are presenting at either a UK based or international conference. A maximum of £400 is available for a UK based conference, and £1000 for an international conference. To date we have had three applications for international conferences and one application for a UK conference. All four have received funding. Details can be found in Table 3 on page 10.

5.4 Funding of joint events

In addition to having its own funding streams where it provides 100% of the funding SECURE is also committed to liaising with other networks and institutions to part fund or contribute to joint events.

SECURE co-sponsored a one day workshop in conjunction with the PURE network, Computational and data challenges in environmental modelling. This was organised by the Turning Gateway to Mathematics and held on the 10th February, 2016 at the Issac Newton Institute, Cambridge.

18th-22nd July: 26th Annual Conference of the International Environmetrics Society (TIES), Edinburgh Conference Centre, Heriot-Watt University, Edinburgh. SECURE is sponsoring a keynote session. Brian Reich from North Carolina University will deliver the keynote talk on behalf of Montse Fuentes who sits on the SECURE advisory Board.

6. Future strategy and plans for the future years

To help in the development of new collaborations, it is planned to announce a call for a small number of sandpits, and then provide follow-on funding from the sandpits to run feasibility projects. We will also be announcing a call for applications to organise training courses and workshops in the near future. The next annual event will be held in September, 2016.

In the first year of the network it has been important to set up systems for communication and to form the Boards to guide and facilitate the objectives of the network. The website was launched in April, followed by the SECURE logo and card. During the first year the first round of Feasibility funding and workshop funding was held. The Feasibility Project process has been amended and simplified for future calls, whilst still maintaining the stringent conditions of the first call. We are planning an alternative funding stream, where sandpits funding is linked to Feasibility Funding in for the third and final feasibility call. While the first year of the network has seen existing partnerships successful in feasibility applications a major aim going forward is to expand the base of the network by bringing new institutions on board. Allied to this aim it is important that the opportunity is given for the development of new partnerships. The plan is to facilitate this through devoting funding resources to sandpit type meetings. An encouraging start has been made in the introduction of individual membership. Our annual conference planned for late September will provide another opportunity for interested parties to meet and exchange ideas. Details of all the events, project reports etc are available at our website:

www.gla.ac.uk/research/az/SECURE

Feasibility Project Call May 2015: There were thirteen applications and five were funded. There was both topic and geographical spread.

Ref. No.	Lead Applicant	Other Applicants	Project Title	Start Date	End Date
FP2015001CM	**Claire Miller (Uni. Of Glasgow)**	Marian Scott (EMS), School of Mathematics and Statistics (M&S), UoG, John Douglass and Linda Pope, Environment Agency (EA), Mark Hallard and Graeme Cameron, Scottish Environment Protection Agency (SEPA), Robert Willows (RIW), Formerly of the EA, Honorary Senior Research Fellow, School of M&S, UoG. Kelly Gallacher (KG), School of M&S, UoG	Statistical software to identify spatiotemporal patterns and coherence over river networks	1st Nov.,2015	April, 2016
FP2015002SR	**Stefan Reis (CEH)**	Christine Braban, Massimo Vieno, Ron Smith (NERC Centre for Ecology & Hydrology, CEH); Mat Heal (The University of Edinburgh, School of Chemistry); DK Arvind (The University of Edinburgh, School of Informatics); Marian Scott, Duncan Lee (University of Glasgow); Miranda Loh, Susanne Steinle, Hilary Cowie (Institute of Occupational Medicine, IOM)	Feasibility testing of low-cost sensors to represent spatio-temporal variability of ambient ground-level NO2 and O3 concentrations	1st Dec.,2015	31st May,2016
FP2015006BM	**Ben Marchant (BGS)**	John Bloomfield, Hydrogeologist, BGS; Emma Eastoe, Statistics Lecturer, LU; Jennifer Wadsworth, Statistics Lecturer, LU	STAGE: STAtistical modelling of Groundwater Extremes	Jan, 2016	June 21st, 2016
FP2015009AC	**Alexis Comber (Uni of Leeds)**	CI Dr Jennifer Dickie, Lecturer in Environmental Geography, University of Stirling	Getting the right spatial & social mix: improved methods for planning community Renewable Energy facilities	Jan 2016	June, 2016
FP2015010CB	Claudie Beaulieu (Uni of Southampton	Rebecca Killick, Mathematics and Statistics, Lancaster University, Co-PI, .	Detection of abrupt changes in land and ocean ecosystems	Oct.,2015	March, 2016

Table 1: Awarded Feasibility Projects

Workshop Call October 2015: Three applications received funding.

Ref. No.	Lead Applicant	Speakers	Workshop Title	Date and Venue
WS2015001BS	Ben Swallow, Uni. Of Bristol	Jonathan Rougier (University of Bristol) Hartmut Boesch	Modelling uncertainty from multi-scale data streams in environmental sciences.	7th September,2016 University of Bristol
WS2015002SR	Stefan Reis, CEH	Tbc from CEH, IOM, Uni. Of Edinburgh, SEPA	Use of 'low-cost' sensor technology to monitor air quality and engage citizens	30th March 2016 COSLA conference centre, Edinburgh
WS2015003MS	Marian Scott, University of Glasgow	Karen Exley**,** Public Health England Richard Mitchell, Uni. of Glasgow.	Environmental quality, human exposures and deprivation-improving our understanding of the interactions.	12th Feb. 2016, Hilton Grosvenor, Glasgow

Table 2: Awarded SECURE workshops

Conference Funding: This was opened in December 2015 and to date there have been four applications, all of which have received funding.

Ref No.	Applicant	Conference	Title of presentation	Date
CF2015001SR	Stefan Reis	iEMSs 2016	Integrating low-cost sensor and model data to improve the assessment of personal exposure to air pollution in urban-rural nexus	10-14 July 2016
CF2016002EJ	Esther Jones	International Statistical Ecology Conference Seattle, USA	Novel application of a quantitative spatial comparison tool to species distribution data	28/06/16 - 01/07/16
CF2016003IP	Ilaria Prosdocimi	The 26th Annual Conference of the International Environmetrics Society	A depth-duration –frequency analysis for short-duration rainfall events in England and Wales	18-22 July 2016
CF206004IR	Indrani Roy	AOGS2016	The influence of Sunspot Activity and Geomagnetic Activity on Winter Surface Climate	31st July – 5th Aug. 2016

Table 3: Awarded SECURE conference funding