



Forum and Workshop Report May 2011

Convened by SCCG and SSSI as part of the



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SYDNEY COASTAL COUNCILS GROUP INC. & SSSI (NSW)

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The Sydney Coastal Councils Group (SCCG) was established in 1989 to promote co-ordination between Member Councils on environmental issues relating to the sustainable management of the urban coastal environment.

The Group consists of 15 Councils adjacent to Sydney marine and estuarine environments and associated waterways. Member Councils include: Botany Bay, Hornsby, Leichhardt, Manly, Mosman, North Sydney, Pittwater, Randwick, Rockdale, Sutherland, Sydney, Warringah, Waverley, Willoughby and Woollahra. The Group represents over 1.3 million Sydneysiders. The SCCG covers 1346 Km² and encompasses the waterways of: the Hawkesbury River, Broken Bay; Pittwater; Port Jackson; Middle and North Harbours; the lower Lane Cove River, Botany Bay and the lower Georges and Cooks Rivers; and Port Hacking.

www.sydneycoastalcouncils.com.au



Surveying and Spatial Sciences Institute (SSSI) is the peak professional body in Australia and New Zealand representing professionals from the surveying and spatial industry. It gives a voice to the members of the spatial science community in both the state, national and international arena.

SSSI was formed in July 2009, merging the organisations, the Institution of Surveyors Australia (ISA) and the Spatial Sciences Institute (SSI) to create a not-for-profit, unified national authority in Australia.

Members of both ISA and SSI voted in early 2009 to dissolve their existing organisations, forming the new organisation, the Surveying and Spatial Sciences Institute, representing the interests of all professionals working in the surveying and spatial sciences professions.

The best components of both ISA and SSI have been adopted into the fabric of SSSI, to creating a strong, unified voice for the surveying and spatial science profession with an ability to better serve its members.

www.sssi.org.au

CONTENTS

INTRODUCTION.....	1
PROGRAM.....	2
PRESENTER BIOGRAPHIES & SYNOPSIS OF PRESENTATIONS	
Professor Colin Woodroffe, University of Wollongong Geospatial approaches to Mapping the Susceptibility of Coasts and the impacts of..... Climate Change	3
Mr James Carley, University of NSW Components for Coastal Setbacks and Inundation Levels.....	3
Mr Richard Lemon, SKM Data for Mapping, Analysing & Modelling Coastal Issues and Processes.....	4
Mr Alex Cowdery, AAM Key to Virtual Insight.....	4
Mr Phil Tickle, Geoscience Australia UDEM Project, National LiDAR Standards, NEDF-Portal (discovery and access).....	4
Mr Glenn Jones, Land and Property Management Authority The Mystery of LiDAR Best Practice.....	5
Mr Tim MacDonald, Gosford City Council Sea Level Rise Planning and Communication in Gosford.....	5
Dr Emma McIntyre, Eco Logical GIS as a Communication Tool.....	6
Mr Doug White, Australian Hydrographic Service A National Collaborative Framework for Hydrographic Data Management and Access.....	6
Mr Ben Crockett, Lagen Spatial Applying Technology in the Coastal Environment.....	7
Mr Arvind Varshney, Hassell Designing the Built Environment with Spatial Technologies: the HASSELL Experience.....	7
For the PowerPoint presentation slides please follow the links provided underneath the synopses. The full report and all presentation slides can be found at www.sydneycostalouncils.com.au/GIS Coastal Environment Forum	
FORUM SUMMARY.....	8
CONCLUSION.....	10

INTRODUCTION

The GIS in the Coastal Environment Forum and Workshop was delivered through collaboration between the Sydney Coastal Councils Group (SCCG) and the Surveying and Spatial Sciences Institute (SSSI). The aim of the day was to share information on the application of GIS to various coastal zone management issues. Demonstrations were provided of best practice and innovation regarding GIS and providing learning and networking opportunities on solving coastal and environmental issues. The core topics of this Forum were:

1. Coastal Processes
2. Application of LiDAR to Coastal Processes
3. GIS to help communicate Social Issues
4. Carrying Capacity

This Forum was the second in a series the two organisations intend on delivering to increase understanding of the use of GIS in coastal management. Outcomes from the initial forum 'Sydney's Integrated Spatial Future' held in 2009 provided the content for this event along with participant feedback, the following themes were identified:

1. Communication
2. Case Studies
3. Climate Change
4. Technology

The GIS in the Coastal Environment Forum and Workshop expanded these themes to the larger coastal science discipline through association with the '2010 NSW Coastal Conference', providing information on the various GIS tools and their application, in the areas of LiDAR, Metadata and the integration of GIS with asset management systems.

The day finished with a workshop discussing the applications of GIS technologies for coastal processes. The forum was timely providing feedback and input into the NSW Location Intelligence Strategy being developed in 2011.

PROGRAM

Tuesday 9 November 2010	
9am	Registrations Open
10am	<p><i>Geospatial approaches to Mapping the Susceptibility of Coasts to the impacts of Climate Change</i></p> <p>Professor Colin Woodroffe, University of Wollongong</p>
10.30am	<p><i>Components for Coastal Setbacks and Inundation Levels</i></p> <p>James Carley, University of New South Wales</p>
10.50am	<p><i>Data for Mapping, Analysing & Modelling Coastal Issues and Processes</i></p> <p>Richard Lemon, SKM</p>
11.10am	Morning Tea
11.30am	<p><i>K2Vi (Key to Virtual Insight), a Visual approach to Sea Level Rise at Wellington, NZ.</i></p> <p>Alex Cowdery, AAM</p>
11.50am	<p><i>UDEM Project, National LiDAR Standards, NEDF-Portal (discovery and access)</i></p> <p>Phil Tickle, Geoscience Australia</p>
12.10pm	<p><i>The Mystery of LiDAR Best Practice</i></p> <p>Glenn Jones, Land and Property Management Authority</p>
12.30pm	Discussion Panel
12.40pm	Lunch
1.10pm	<p><i>Sea Level Rise Planning and Communication in Gosford</i></p> <p>Tim MacDonald, Gosford City Council</p>
1.30pm	
1.50pm	<p><i>GIS as a Communication Tool</i></p> <p>Dr Emma McIntyre, Eco Logical</p>
2.10pm	<p><i>A National Collaborative Framework for Hydrographic Data Management and Access.</i></p> <p>Doug White, Australian Hydrographic Service</p>
2.30pm	Discussion Panel
2.40pm	Afternoon Tea
3pm	<p><i>Applying Technology in the Coastal Environment</i></p> <p>Ben Crockett, Lagen Spatial</p>
3.20pm	<p><i>Designing the Built Environment with Spatial Technologies: the HASSELL Experience</i></p> <p>Arvind Varshney, Hassell</p>
3.40pm	<p><i>Application of GIS Technologies for Coastal Processes</i></p> <p>Convened by Geoff Withycombe Sydney Coastal Councils Group</p> <p>The forum will discuss and build upon the outcomes of last years Sydney Spatial Futures forum. Goals of the forum will be to discuss the capacity building required to better utilise GIS and spatial data in coastal issues and planning in NSW. The forum expected to discuss the technologies such as LiDAR, data requirements and sharing, plus future needs in an ever changing environment.</p>
4.30pm	Close

PRESENTER BIOGRAPHIES AND SYNOPSIS OF PRESENTATIONS

Professor Colin Woodroffe, University of Wollongong

[Professor Woodroffe](#) is a coastal geomorphologist and Professor in the School of Earth and Environmental Sciences at the University of Wollongong. He holds a PhD and ScD from the University of Cambridge, and was a lead author on the coastal chapter in the 2007 Intergovernmental Panel on Climate Change Fourth Assessment report. He has studied the stratigraphy and development of coasts in Australia and New Zealand, as well as on islands in the West Indies, and Indian and Pacific Oceans. He is the author of *Coasts, Form, Process and Evolution* (2003) and co-author (with A Short) of *The Coast of Australia* (2009).

Geospatial approaches to Mapping the Susceptibility of Coasts and the impacts of Climate Change

This presentation examines geospatial methodologies used to assess the vulnerability of the coast to various hazards and the impacts of climate change. Most adopt a linear shoreline that is segmented on the basis of physical attributes, and which is then used to derive a measure of the susceptibility of the shore to sea-level rise or erosion. At the global scale, the DINAS-coast database and the DIVA tool have been used to provide a comparative methodology. A coastal vulnerability index has been derived in the United States, and this has been modified for adoption at regional scale elsewhere. In Australia, a geomorphologically-focused segmentation methodology, developed in Tasmania, has been implemented at national level in order to assess the relative stability of coastal landforms. The effectiveness of each of these primarily descriptive approaches is assessed, and compared with other methods of assessing vulnerability. The spatial scale of representation and quality of data attributed to individual segments differentiate the methodologies, but significant challenges remain in terms of incorporating coastal behaviour, both in terms of physical parameters, but still more so in relation to socio-economic factors.

Presentation available at www.sydneycoastalcouncils.com.au/sites/default/files/GIS_prof_colin_woodroffe.pdf

Mr James Carley, University of New South Wales

James is a senior coastal engineer at the Water Research Laboratory of the University of New South Wales at Manly Vale. James holds a Master of Engineering Science degree in coastal engineering and has over 18 years experience in coastal engineering. He specialises in coastal processes, coastal hazards, extreme events and climate change, and adaptation options such as coastal structures. He has been a member of Engineers Australia's Maritime Panel for over 10 years and was chair in 2007 and 2008. James has been a surfer, surf life saver and ocean swimmer for over 30 years.

Components for Coastal Setbacks and Inundation Levels

This presentation will present the various components for coastal setbacks and inundation. For erosion and recession of sandy shorelines, the setback components include:

- Storm erosion;
- Ongoing underlying recession;
- Recession due to future sea level rise;
- Reduced foundation capacity;
- Beach rotation.

For inundation, the components include:

- Predicted (astronomical) tides;
- Barometric setup;
- Wind setup;
- Other tidal anomalies;
- Wave setup;
- Wave runup;
- Sea level rise and climate change.

The presentation provides an explanation of each component, typical values on the open coast, and presents options for their depiction in GIS systems.

Presentation available at www.sydneycoastalcouncils.com.au/sites/default/files/GIS_james_carley.pdf

Mr Richard Lemon, SKM

Richard Lemon is a Registered Surveyor with over 20 years experience working for both the public and private sectors in surveying, GIS, aerial survey and mapping. Initially with the Commonwealth surveying and mapping agency (AUSLIG), he gained experience in the field surveying, remote sensing, GIS and project management. Thirteen years experience with Sinclair Knight Merz as the Manager of SKM's Spatial Division in Sydney and now Practice Leader for Aerial Survey and Senior Project Manager. Responsibilities include the project management of large multi-disciplinary survey, Imagery, LiDAR, GIS and data engineering/conversion projects, client management and management of SKM's digital ortho-rectified aerial photography product series, AUSIMAGE. Richard is also Project Director of SKM's DigitalGlobe satellite imagery business.

Data for Mapping, Analysing & Modelling Coastal Issues and Processes

Remote sensing is a valuable tool to map, analyse and model coast processes. Traditional photogrammetry, using both new and historical aerial photography, is still an ideal tool to monitor coastal changes over time. LiDAR technology is being used to capture increasingly large areas of terrain data. To improve modelling of coastal inundation from LiDAR derived DEMs it is necessary to use hydrologically enforced and conditioned DEMs. Richard will also look at some emerging remote sensing technologies that may have the potential to enhance the study of coastal processes.

Presentation available at www.sydneycoastalcouncils.com.au/sites/default/files/GIS_richard_lemon.pdf

Mr Alex Cowdery, AAM

Alex completed a BSc in coastal management and oceanography at Sydney University then completed a Diploma GIS at Sydney Institute of Technology. Alex works out of the AAM Sydney Office as a Spatial Solutions Consultant, which includes Business Development, Product Management and Project Delivery. AAM is a Geomatics solutions company that can assist with capturing, processing, storing, visualising and disseminating spatial data, information and knowledge.

Key to Virtual Insight

Alex will demonstrate K2Vi (Key to Virtual Insight), a visual approach to sea level rise at Wellington, NZ. Other topics discussed will include satellite imagery, LiDAR, aerial imagery and 3D building models.

Presentation available at www.sydneycoastalcouncils.com.au/sites/default/files/GIS_alex_cowdery.pdf

Mr Phil Tickle, Geoscience Australia

Philip Tickle is the Director of Natural Resource Information within Geoscience Australia's National Geographic Information Group. He has a Bachelor of Science Degree in Natural Resource Management and over 22 years professional experience in the application of Remote Sensing, GIS and Spatial Modelling to a range of issues in relation to natural resource management, forestry, agriculture, emergency management and topographic mapping. During this time Philip has worked in Government undertaking applied research, science-policy and program implementation, and also in the private remote sensing industry for several years.

UDEM Project, National LiDAR Standards, NEDF-Portal (discovery and access)

Australia's coastal zone is highly vulnerable to the potential impacts of climate change due to the concentration of Australia's population, and the exposure of natural and built assets in coastal areas. Around 85 per cent of Australians live within 50 km of the coast, 25 percent lives within three km, and almost six million people live in coastal areas outside the capital cities.

Over the last 3-5 years all levels of government have dramatically increased co-investment in the acquisition of airborne LiDAR for the purpose of producing high resolution digital elevation models (DEM) capable of modelling coastal inundation. There is no doubt the investment in LiDAR is significantly improving the quality and accuracy of data available for use in coastal inundation modelling scenarios and risk assessment. However, issues are now being identified in relation to the quality and consistency of data post-processing and inundation modelling techniques at local levels which must be addressed to maximise the potential benefits of our collective investment.

The Commonwealth Department of Climate Change and Energy Efficiency, Geoscience Australia, and the CRCI for Spatial Information are working collaboratively with agencies in all States to address these issues. The presentation will provide an overview of a number integrated initiatives aimed at improving inundation modeling and decisions through: the development of national LiDAR specifications; inundation modeling; R&D; a national data portal, and web visualization tools to support communication of risk to the general public.

Presentation available at www.sydneycostalcouncils.com.au/sites/default/files/GIS_phil_tickle.pdf

Mr Glenn Jones, Land and Property Management Authority

Glenn is a Senior Surveyor at the NSW Land & Property Management Authority and has 35 years experience with the practical applications of geodesy and GNSS positioning. Glenn currently heads up the team responsible for elevation data management at LPMA, including the establishment of the Authority's own airborne LiDAR capability.

The Mystery of LiDAR Best Practice

Light Detection and Ranging (LiDAR) technology has matured to a level such that there is a variety of sophisticated "off the shelf" sensor and software packages now available. With the appropriate resources and training one can be operational in the capture and processing of data within a very short time-frame; however this is only the beginning of a complex, spatially enabled journey into calibration, flight planning, airborne kinematic GNSS, ground surveys, geoids, height datums, point classification and digital elevation products. This presentation provides an insight into this somewhat mysterious world where the ever increasing expectations of stakeholders can only be reliably satisfied by the application of best practice. Using the experience gained from establishing a LiDAR capability within the NSW Land and Property Management Authority (LPMA) and his quality assurance activities with external projects, the Author will highlight the key issues that must be addressed in order to meet the compelling need for high-accuracy elevation data and associated specifications.

Presentation available at www.sydneycostalcouncils.com.au/sites/default/files/GIS_glenn_jones.pdf

Mr Tim MacDonald, Gosford City Council

Tim has worked in a range of private and government based roles over the past fourteen years. With a focus on coastal and estuary management planning Tim has also gained expertise in catchment & stormwater management, habitat restoration, community capacity building and international development. Tim has spent the past 6 years in local government and currently works as the Senior Environment Planning Officer at Gosford City Council.

Sea Level Rise Planning and Communication in Gosford

The Commonwealth Governments Climate Change Risks to Australia's Coast – A First Pass National Assessment (2009) identified that the Gosford LGA has the third highest number of residential buildings in NSW at risk of inundation from a sea level rise of 1.1 metres and a 1-in-100 year storm tide. Gosford City Council is currently progressing with the development of its Brisbane Water Estuary Management Plan consecutively with the Brisbane Water Floodplain Risk Management Plan which includes incorporating the

State Governments Sea Level Rise Planning Benchmarks and elements of the NSW Coastal reform into strategic planning processes.

As communication of projected sea level rise impacts on coastal communities is a key element in supporting successful strategic planning processes, GCC have developed a series of indicative SLR maps as a means of highlighting the extent that sea level rise is expected to affect areas of existing development. Approximately 9000 properties identified as being potentially affected have had notifications placed on their Section 149 (5) Planning Certificates prior to the completion of stringent assessment processes. The presentation will outline the planning, mapping and communication process undertaken by GCC to date as well as preliminary assessment of the impacts of sea level rise on estuarine vegetation.

Presentation available at www.sydneycoastalcouncils.com.au/sites/default/files/GIS_tim_macdonald.pdf

Dr Emma McIntyre, Eco Logical

Emma is an Environmental Scientist with a PhD in Public Participation GIS. She studies at University of Wollongong with Professor Woodroffe. As part of her PhD Emma was involved in 2 separate case studies of community use of GIS in the south coast of NSW. Since completing her PhD in 2007 Emma has been working as a consultant for Eco Logical Australia where she has been involved in a number of projects that use GIS as a communication tool. Today Emma will present some of her PhD work as well as some of Eco Logical's work in the area of using GIS to coastal environments and particularly as a tool for presenting information to a range of stakeholders.

GIS as a Communication Tool

GIS has long been used as a tool for viewing, compiling and analyzing information from any number of sources, in a wide range of formats and in diverse applications. Since the event of the internet, information with a spatial component is increasingly conveyed via a number of different methods via the web. There is also a trend for increasing community involvement in environmental decision-making processes and as such GIS, including webGIS, has become an increasingly common tool for facilitating community involvement in environmental decision-making processes. A number of case studies for presenting coastal GIS issues to communities is presented here. These include two case studies applied in Emma's PhD research in Public Participation GIS on the south coast of NSW, as well as a number of more recent projects. The results of each case study are presented and discussed, including feedback obtained from community participants as well as some of the technical and other changes faced. Recommendations for future applications will also be discussed.

Presentation available at www.sydneycoastalcouncils.com.au/sites/default/files/GIS_dr_emma_mcintyre.pdf

Mr Doug White, Australian Hydrographic Service

Doug is Deputy Director of Data Management at the Australian Hydrographic Service and leads the team responsible for the organisations data management framework, within which maritime geospatial data, nautical charts and publications are managed. Prior to this Doug was a geospatial consultant and worked on a diverse range of spatial information and technology projects throughout State and Local government in Australia and New Zealand. Doug holds a MAppSc in GIS and a BSc in Geography.

A National Collaborative Framework for Hydrographic Data Management and Access

A discussion on the challenges of managing Hydrographic data and recommendations for the creation of a national marine spatial data infrastructure that consolidates jurisdictional datasets and enables access to data for use in coastal GIS applications.

Presentation available at www.sydneycoastalcouncils.com.au/sites/default/files/GIS_doug_white.pdf

Mr Ben Crockett, Lagen Spatial

Ben is currently employed at Lagen for 4 years after a 7 year stint working in London. Experience in a diverse range of GIS and spatial tools, including FME, FME Server, E-Cognition and Eonfusion. Specialising recently in E-Cognition software. I personally have been involved in a number of projects utilising E-Cognition technology including; impervious / pervious surface cover classification, radio and communications, general land classification and classification of coastal environments. My passion is utilising new technology in a simple and effective way. Currently new technology is underutilised and more than likely too complex or technical for most potential users. Lagen Spatial aim to bridge this gap.

Applying Technology in the Coastal Environment

The focus of this presentation will be on utilising emerging technologies for practical purposes. As this is a Coastal focused meeting I will incorporate emerging technologies and workflows within a Flood inundation and Sea Level inundation framework. I will also briefly cover a project Lagen Spatial worked on in conjunction with Bega Shire Council. This project utilised E-Cognition technology.

Presentation available at www.sydneycoastalcouncils.com.au/sites/default/files/GIS_ben_crockett.pdf

Mr Arvind Varshney, Hassell

Designing the Built Environment with Spatial Technologies: the HASSELL Experience

Presentation available at www.sydneycoastalcouncils.com.au/sites/default/files/GIS_arvind_varshney.pdf

FORUM SUMMARY

The GIS in the Coastal Environment Forum & Workshop provided an opportunity to hear from academics, special professionals and managers to gather the collective concerns of participants in the use of GIS and spatial information for understanding coastal processes. The outcomes from this event will form the basis of future collaborative projects and capacity building events and forums facilitated by the SCCG and SSSI, to better utilise GIS and spatial data with coastal issues and planning in NSW.

Applications of GIS Technologies for Coastal Processes Workshop

The overall aim of the afternoon workshop was to identify issues, needs and actions in relation to:

- Issues for practitioners;
- Understanding coastal processes;
- Training;
- Data collection and storage, and the
- Use of GIS as a communication tool & integration into policy.

The workshop allowed participants to discuss the day's themes, technologies showcased, data requirements and sharing, which lead to recording their issues and future needs. Questions or issues participants were asked to think about were:

- Should LGA's be responsible for sea level rise studies?
- Discovery and access to data;
- Communication;
- Use of GIS;

The groups noted the issues, needs, and actions that could be taken and possible responsible parties for those actions. While a number of the groups may have deviated slightly from the topics the result was a comprehensive list of issues and needs that can be divided into the following categories:

- Governance (including standards)
- Education and Research
- Capacity Building (people, technology)
- Data and Access
- Communication

1. Governance

The question was raised by participants 'who should be responsible for the different undertakings needed to improve GIS in the coastal environment?' No conclusive outcome was agreed upon, however several areas were identified in relation to governance:

- A need to integrate spatial data and processes understanding into management and planning decisions. This is also a communication issue but a management framework must be in place to allow this to occur.
- A need for standards, data classification, data integrity and accuracy, with a means to manage and share data.
- Intellectual property rights need to be easily determined and allow improved access to and use of data. Options put forward included whole of government data licensing and creative commons licensing.
- Good governance should enable partners and funding through Memorandums of Understanding.
- Good governance would also enable access to data across all levels of government plus allow whole of government purchasing of data such as LiDAR.

2) Education and Research

There is a great deal of difficulty in sustaining knowledge in small organisations in specialised areas such as coastal processes and the more technical modelling skills for GIS use. A good mix of understanding and expertise in both is required to bring the two together to produce sound models for use in coastal management. It was noted that there is a need for more GIS training at a professional level such as specialised short courses. There also needs to be a better appreciation by GIS officers of the coastal processes. Several other knowledge areas were highlighted by participants:

- Bridging the gap between data and visualisation tools;
 - Inundation maps need depth data (risk is associated with depth not extent of inundation);
 - Public awareness of GIS visualisation limitations (i.e. input data quality);
 - More research and support by private industry and government in modelling the coastal processes. With this also comes an understanding of the key processes and data needed to allow good modelling to occur;
 - Representation and research into dynamic and morphological processes (e.g. sea level rise, estuarine processes); and
 - Training and awareness of State government funded data and availability.
-

3) Capacity Building

Participants of the workshop identified the need to develop staff skills and knowledge in the following areas:

- Use of GIS for various tasks.
- Details of various coastal processes by GIS operators.
- New technologies.

Staff require continuing education and training due to the speed of developing technology and improved techniques of modelling coastal processes.

4) Data and Access

The availability of good reliable data has always been a limiting factor in monitoring and reporting natural resource changes. The workshop participant's primary issue was the access to data / information. The need to be able to easily discover available data and its fit for purpose (enabled by good metadata) was a reoccurring theme in each workgroup. Solutions put forward to enable data discovery and use included:

- Development of a Government "cloud" for spatial data access; and
- Further development of discovery portals. These included population of NEDF and LPMA data portals.

It was proposed that the NSW Common Spatial Information Initiative (Cs2i), Geosciences Australia and NSW LPMA plus Local Government all have a role to play in making this happen.

It was noted that people should have access to government and private sector data, and know about its availability. Specific data sets participants would like access to are accurate LiDAR and shallow water bathymetry data, as well as knowing the actual accuracy of the data.

5) Communication

Several communication issues were identified by the working groups with discussions centred around knowing what data is available, its fit for use and how to get access to the data and information. The main issues highlighted were:

- A need for communication between disciplines and specialists (qualified GIS specialists and scientists with knowledge of coastal processes)
- Communication about technology and data changes.
- Communication about the reliability data and the uncertainties of the various modelled information produced, e.g. GIS and map products to visualise the results of modelling to the public. The public needs to be aware of the limitations of the published picture.

CONCLUSION

The day forum included many interesting and insightful presentations that lead to a very productive workshop in the afternoon. As summarised above there were five main categories where participants identified issues and needs to further enhance the use of GIS in coastal management. Clear actions were made in relation to improving data and access (category 4). The organisers will be meeting to further recommendations and scope the next event.

The organisers SCCG and SSSI would like to sincerely thank all the presenters who gave up their valuable time to share their knowledge and experience. Thanks also go to all those who attended the event and contributed to the workshop.



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