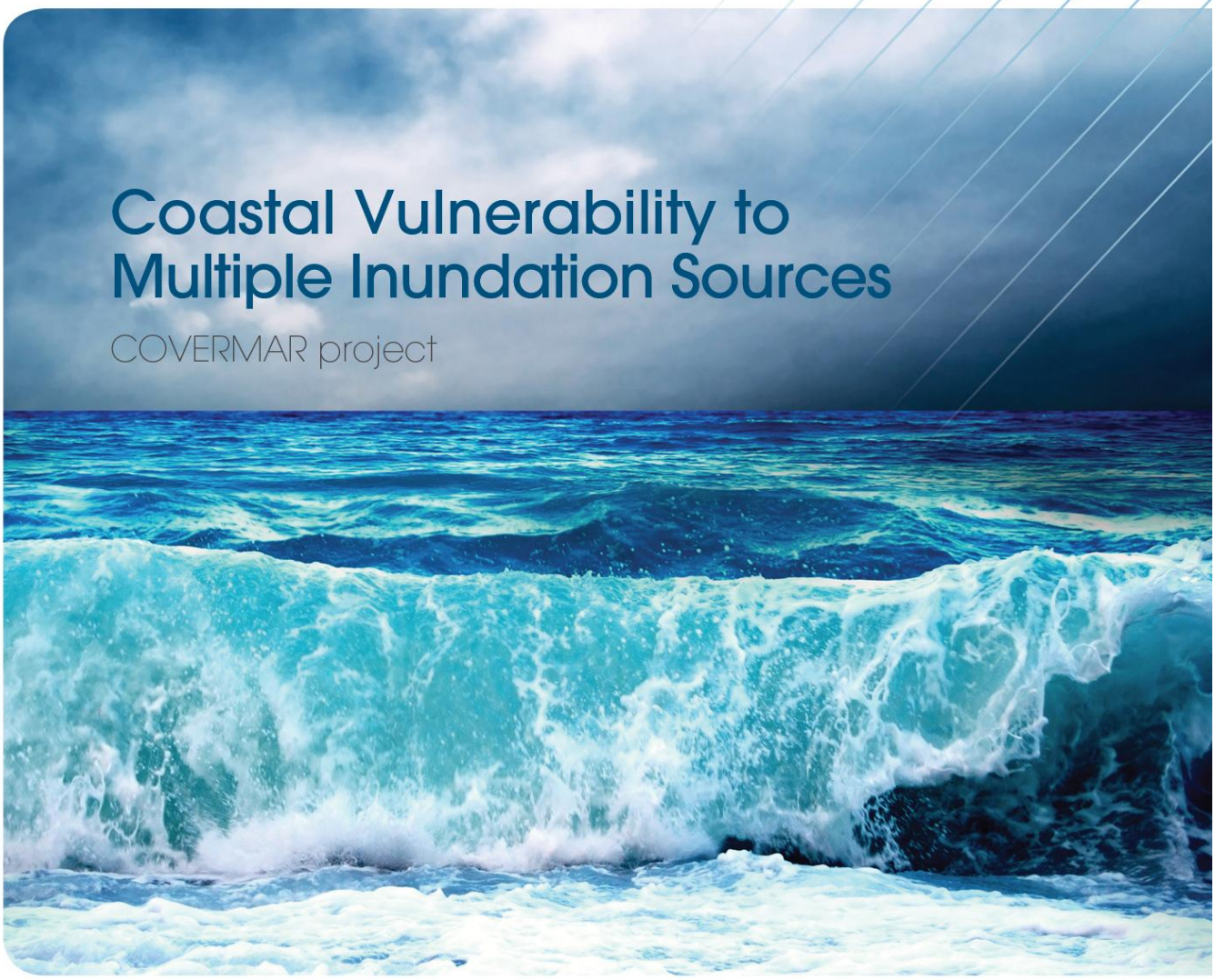
Coastal Vulnerability to Multiple Inundation Sources

COVERMAR project



Project Launch Outcomes Report

Launch date: 27 February 2014

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COUNCILS GROUP

Coastal Inundation.
COVERMAR Project.

Summary

On 17 February 2014, at Customs House, Sydney, the Sydney Coastal Councils Group (SCCG) launched the three key project deliverables of the ***Coastal Vulnerability to Multiple Inundation Sources Tool (COVERMAR)*** project. The project, conducted over approximately three years with a combined cash and in-kind value of more than $500,000.00, was Sydney's first probabilistic assessment of the vulnerability of critical infrastructure and different building types to multiple inundation, namely storm surges and tsunamis.

The three key deliverables can now be downloaded from the project webpage:

Literature Review Report
Hazard Assessment Report
Project Outcomes Report

Presentations from the principle researcher and three other industry stakeholders (Geoscience Australia, NSW SES and the Hazards Research Group, University of Sydney) were delivered to 62 attendees representing 40 different organisations. Presentations provided an overview of storm surge and tsunami risk in Australia, reflected on the role of the NSW State Emergency Service and the contribution to research and information by Geoscience Australia. It also reviewed the development of the tool, project methodology, benefits afforded by the Advisory Committee, case study locations and the results thereof. An end-of-launch panel discussion provided an opportunity for participants to explore issues further.

Copies of the presentation slides for each presentation are also available from the project webpage:

Assoc. Prof. Dominey-Howes - **Australian tsunami – an overview**
Belinda Davies - **Emergency management of coastal hazards in NSW**
Mark Edwards - **Natural hazards impact assessment at Geosciences Australia**
Dr. Filippo Dall'Osso - **Coastal vulnerability to multiple inundation hazards**

Overall, 80% of respondents considered the event very good or excellent, and very or extremely unique. Ninety-two percent thought it was well structured and 50% said it exceeded expectations. Notably, 92% indicated that their skills and knowledge of coastal hazards such as storm surges and tsunamis improved by attending the event. Presenters were well prepared (100% agreement) and communicated well (90% agreement). It was also a good networking opportunity (87% agreement).

The subject matter, structure, duration, high calibre of presenters and the contribution of participants ensured that the event was a success. Lessons learned and evaluation results will be applied to future activities to ensure continuous improvement of SCCG events.

LAUNCH	
Project:	Coastal Vulnerability to Multiple Inundation Sources
Date:	17 February 2014
Venue:	Customs House, Circular Quay, Sydney
Time:	9:00 a.m. – 1.30 p.m.

Event objectives

		Achieved
1.	Engage a broad cross-section of stakeholders	✓
2.	Provide capacity (n relation to storm surge and tsunami hazard risk generally in NSW, including exposure, vulnerability and the economic cost	✓
3.	Review the SCCG's project Coastal Vulnerability to Multiple Inundation Sources Tool, in particular, its methodology, role of the project Advisory Committee and results	✓
4.	Provide a forum for networking and sharing of research, initiatives and ideas	✓
5.	Showcase the Sydney Coastal Councils Group achievements towards sustainable coastal management	✓
6.	Deliver presentations of related issues from key stakeholders	✓

Attendance

5	62	40	12	2
Speakers	Participants	Organisations	SCCG Member Councils	Other councils

SCCG Member Councils	Other Councils	Other organisations	
Botany Bay City Council	Shellharbour City Council	ACCARNSI UNSW	1
City of Botany Bay	Wyong Shire Council	AFAP Action on Poverty	2
Hornsby Council		Coastal Environment	3
Leichhardt Council		Cooks River Alliance	4
Manly Council		Department of Planning & Infrastructure	5
Mosman Council		NSW Trade & Investment	6
North Sydney Council		Freiburg Scientific Theatre e.V.	7
Pittwater Council		IPWEA	8
Rockdale City Council		Local Government NSW	9
Sutherland Shire Council		Macquarie University	10
Waverley Council		NSW Health	11
Willoughby City Council		NSW Public Works, Data & Natural Resources	12
		NSW SES	13
		NSW Treasury	14
		Office of Environment and Heritage	15
		Office of the NSW Chief Scientist & Engineer	16
		Private company	17
		Sydney Coastal Councils Group Inc	18
		Sydney Institute of Marine Science	19
		Sydney Opera House	20
		Sydney University	21
		The Climate Institute	22
		University of Sydney	23
		WCC	24
		Whitehead and Associates	25
		WorleyParsons	26

Background and context

Along the Sydney coastal fringe more than 7,000 properties are at risk from coastal inundation hazards. This has implications for councils, especially in relation to strategic planning and environmental and emergency management. In relation to two such hazards (storm surge and tsunami), the SCCG partnered with the University of New South Wales Pacific Tsunami Research Centre & Natural Hazards Research Laboratory to undertake Sydney's first probabilistic multi-hazard assessment of the vulnerability of critical infrastructure and different building types.

The project, ***Coastal Vulnerability to Multiple Inundation Sources (COVERMAR)***, was coordinated by the SCCG and carried out by Dr. Filippo Dall'Osso under the supervision of Assoc. Prof. Dale Dominey-Howes. It builds upon the project *A Method for Assessment the Vulnerability of Buildings to Catastrophic (Tsunami) Marine Flooding*.

The COVERMAR project

1. Developed a multi-hazard tool to assess the vulnerability of buildings and critical infrastructure to extreme coastal inundation caused by storm surges and tsunamis, modelling 36 tsunami scenarios combining two sources, three annual tsunami probabilities, the current and two future sea levels and high tide and mean sea level.
2. Undertook a multicriteria analysis of the vulnerability of the SCCG's 15 Member Councils and identified Botany Bay and the adjoining Port Hacking and Bate Bay as appropriate case study locations.
3. Surveyed the physical and engineering attributes of all buildings in the study areas (~4000 buildings) and imported them into a GIS system.
4. Applied state of the art building fragility models to assess the level of damage of each individual building.
5. Calculated expected economic losses (Probable Maximum Loss) drawing upon current building construction, demolition and replacement costs. Results were displayed on a series of coded high-resolution colour coded maps.

Project deliverables inform coastal strategic planning, development assessment and emergency management. They expand awareness and understanding of the vulnerability of NSW coasts to inundation from storm surge and tsunami and its impact on infrastructure, canvassing recommendations in relation to planning and development, and coastal and emergency management.

Many elements of the project methodology can be applied to other hazards such as bushfire and catchment flooding.

Deliverables

The launch showcased the following publications:

1. **Literature Review and Report** - the scientific and legislative background.
2. **Hazard Assessment Report** - the numerical simulations of the selected tsunami and storm surge inundation scenarios and discussion of the methodology applied to determine flow velocity and water height for each scenario.
3. **Project Outcomes Report** - the methodology and results of the building and infrastructure vulnerability assessment at the Sydney case study locations.

Agenda

MC: Stephen Summerhayes, Manager Projects & Programs, SCCG

9.00 – 9.25	**Registration**
9:30 – 9.45 (15 mins)	**INTRODUCTION, WELCOME & ACKNOWLEDGEMENT OF COUNTRY** **Geoff Withycombe**, Executive Officer, SCCG
9:45 – 10.15 (30 mins)	**AUSTRALIAN TSUNAMI – AN OVERVIEW FROM HAZARD TO COMMUNITY RISK PERCEPTION** **Associate Professor Dale Dominey-Howes**, University of Sydney
10:20 – 10.50 (30 mins)	**EMERGENCY MANAGEMENT OF COASTAL HAZARDS IN NSW** **Belinda Davies**, Manager Emergency Risk Management, State Emergency Services
10.50 – 11.10	**Morning Tea**
11:15 – 11.45 (30 mins)	**NATURAL HAZARDS IMPACT ASSESSMENT AT GEOSCIENCE AUSTRALIA** **Mark Edwards**, Leader, Vulnerability Section, Earth Monitoring and Hazards Group, Minerals and Natural Hazards Division, Geoscience Australia
11.50 - 12.30 (40 mins)	**COASTAL VULNERABILITY TO MULTIPLE INUNDATION HAZARDS** **Dr. Filippo Dall'Osso**, Post-Doctoral Researcher, Hazards Research Group, University of Sydney
12:30 – 12.55 (25 mins)	**PANEL SESSION** A facilitated panel discussion to explore (a) questions from attendees which arise during the presentations, (b) issues for local government in relation to inundation management and strategic and land use planning, and (c) future priorities. **Panellists:** **Filippo Dall'Osso** **Belinda Davies** **Dale Dominey-Howes** **Mark Edwards** **Dave Hanslow**, Senior Team Leader, Coastal and Marine Unit, Science Division, OEH **Geoff Withycombe**
12.55 - 1.30	**Wrap up – summary of event, future activities and initiatives, close**

The event was conducted in accordance with the SCCG's sustainable event management policy.

Biographies* & Synopses

Dr. Filippo Dall'Osso, Post-Doctoral Researcher, Hazards Research Group, University of Sydney

Filippo is a environmental scientist with extensive experience in natural hazards, risk and vulnerability assessment, and coastal zone management. He holds a Ph.D. in Environmental Science specialising in inundation risk from Bologna University (Italy).

After his studies, Filippo worked for 4 years as environmental consultant for a global environmental engineering company, Med Ingegneria, from their offices in Italy. At Med Ingegneria he was head of the Risk Assessment Division and managed a team comprised of spatial scientists, geologists and engineers. He moved to the University of New South Wales, Sydney in 2011, where he has worked as chief researcher of the COVERMAR project.

Filippo has published seven scientific papers (six as primary author) in international high-impact journals and he was invited to be a co-author of two UNESCO/IOC Manuals for Inundation Risk in the Mediterranean Sea and in the Indian Ocean, and the 2013 UN Global Assessment Report on Disaster Risk Reduction.

Filippo presented the methodology and the main results of the COVERMAR project. He provided an introduction about tsunamis and storm surges and how these events are considered within the NSW legislative framework addressing coastal risk. He then reviewed the numerical models used to simulate the selected storm surge and tsunami scenarios, under current and future sea level conditions. Filippo discussed the building vulnerability models developed in the project to assess the damage and the economic loss that buildings would sustain. The presentation ended with an overview of key results and a list of recommendations for stakeholders and risk managers for improved risk reduction strategies.

Click here to link to a pdf copy of the presentation slides.

Belinda Davies, Manager, Emergency Risk Management, State Emergency Services

Belinda Davies has worked in emergency management for more than 10 years. She is currently the Manager of Emergency Risk Management for the NSW State Emergency Service and manages the SES's planning function to develop plans, intelligence, and warning systems for floods, storms and tsunami. The role also coordinates the Service's input on floodplain and coastal risk management matters.

Belinda holds an Environmental Science (Honours) degree and a Masters Degree in GIS.

Belinda's presentation provided an overview of the emergency management of coastal hazards (flood, storm and tsunami) in NSW.

Click here to link to a pdf copy of the presentation slides.

* in alphabetical order.

Associate Professor Dale Dominey-Howes, University of Sydney

Dale completed a BSc (Hons) in Geography and Archaeology at London University and PhD in Geohazards at Coventry University, UK. His PhD was funded by a European Union Fellowship and he worked at the National Observatory of Athens, Greece.

Dale's interests and expertise are in natural hazards, hazard, risk and vulnerability assessment, disaster and emergency management. He is particularly interested in the interconnections between the natural world and the socio-economic contexts in which disasters unfold and considers 'natural hazards' in terms of coupled human-environment systems and policy.

Dale has worked on natural hazards such as earthquakes, river floods, tropical cyclones, tsunami, volcanic eruptions and bushfires in places as diverse as Australia, New Zealand, Bangladesh, India, Greece, Turkey, Ireland, Papua New Guinea, Fiji, Thailand, Iceland and the Maldives. He is presently involved in a variety of research projects focusing on hazards and risk in Australasia, the Indo-Pacific region, Europe and the United States.

Dale has completed research projects and consultancies for organisations as diverse as the United Nations, The World Bank, major insurance and reinsurance companies, State and Federal government departments and risk/disaster management agencies. He is Chairman of the United Nations UNESCO-IOC Post-disaster Policy and Protocols Working Group (2010 – present).

Dale provided a big picture overview of current understanding about the nature, frequency, magnitude and record of past tsunamis that have affected Australia. It outlined the latest efforts at tsunami risk management including the operation of the Australian Tsunami Warning System. Dale's talk concluded by exploring current community understanding of tsunami risk and considered the challenges that low risk awareness present for authorities and agencies tasked with the responsibility of tsunami risk management.

Click here to link to a pdf copy of the presentation slides.

Mark Edwards, Leader, Vulnerability Section, Earth Monitoring and Hazards Group, Minerals and Natural Hazards Division, Geoscience Australia

Mark Edwards leads a multi-disciplinary team developing engineering, economic and social vulnerability models at Geoscience Australia. His team undertakes modelling and post-disaster surveys in the development of vulnerability models for natural hazard assessments. He is an engineer with 14 years of industry experience followed by 15 years of risk research.

Mark outlined the important role played by Geoscience Australia (GA) in developing models, methods, information and tools to analyse hazard risk and impacts as well as building scientific capacity within government. For example, during the last 10 years, the Vulnerability, Resilience and Mitigations Section (VRMS) at GA has conducted extensive research to develop vulnerability models for typical Australian buildings for a range of hazards (earthquake, cyclone, flood, storm surge, tsunami, etc.). Furthermore, the section has conducted a number of field surveys in Australia and

overseas to record extent of damage, failure mechanisms and factors contributing to damage. These surveys not only helped to develop structural vulnerability models but also provide validation points for earlier developed models.

AT VRMS, Mark explained, that engineers develop vulnerability models for buildings for various natural hazards by using three major approaches:

- Engineering approach: this is based on the knowledge of the structure and its components and how they behave when exposed to hazards.
- Empirical approach: this is based on the observations recorded during the post-event damage surveys.
- Expert opinion: this is based on the judgment of an expert panel which is in turn based on their vast experience and field observations.

To assess impacts from natural hazards, the vulnerability information is combined with exposure, i.e., elements at risk, and hazard intensity, i.e. severity and likelihood of hazard. The results from the impact assessment study provide evidence base for decision making and helps to formulate and plan appropriate mitigation measures to reduce the impacts from future events.

Click here to link to a pdf copy of the presentation slides.

Dave Hanslow, Senior Team Leader, Coastal and Marine Unit, Science Division, OEH

Dave is the Senior Team Leader, Coast and Marine Unit, Science Division, NSW Office of Environment and Heritage. He is a Coastal Geomorpholigist and has worked on a variety of coastal management problems including shoreface processes, wave setup and runup on beaches and in river entrances, as well as emergency management of coastal erosion, coastal monitoring and shoreline change detection. Dave's recent work has mainly been on focussed on coastal risk management with recent projects examining risk to communities in NSW associated with tsunamis and sea level rise. Between 2008 and 2010 Dave spent 2 years living in the Torres Strait, working on climate change, coastal erosion and inundation issues impacting island communities for the Torres Strait Regional Authority.

David was a panellist in the end of launch panel discussion.

Stephen Summerhayes, Manager Projects & Programs, SCCG

Stephen is a solicitor of 19 years' standing, admitted to practise in both England and Australia. In 2003 he established his own legal firm to fund undergraduate studies in Environmental Science and International studies and, thereafter, a postgraduate Master of Environmental Science by research.

Before starting work with the SCCG in 2011 he spent two years in Latin America studying and working for not-for-profit organisations in Ecuador and Guatemala.

To enhance his service delivery at the SCCG he has undertaken a Diploma of Project Management, Diploma of Management and a Cert IV in Training and Assessment. Stephen tutors adult literacy (volunteer) as part of the TAFE NSW adult literacy program.

Stephen was the event Master of Ceremonies. He welcomed participants, reviewed the day's agenda, explained logistics, ran an engaging 'ice-breaker' to foster engagement and facilitated the event generally.

Geoff Withycombe, Executive Officer, SCCG

Geoff Withycombe has an Applied Science degree in coastal management and has been the Executive Officer of the Sydney Coastal Councils Group Inc. since 1998. In his role as Executive Officer, Geoff has responsibility to implement the Group's Strategic Plan and provides advice, policy development and decision making support for the 15 member councils. Geoff also holds other Director positions.

Geoff welcomed participants and thanked presenters, panellists and the host Council, City of Sydney. He gave an Acknowledgement of Country and set the context of the event, drawing upon other SCCG projects that compliment the COVERMAR project. He also reviewed the role the SCCG plays in sustainable coastal management, reviewing its Aim, Mission and Strategic Plan Outcome Statements.

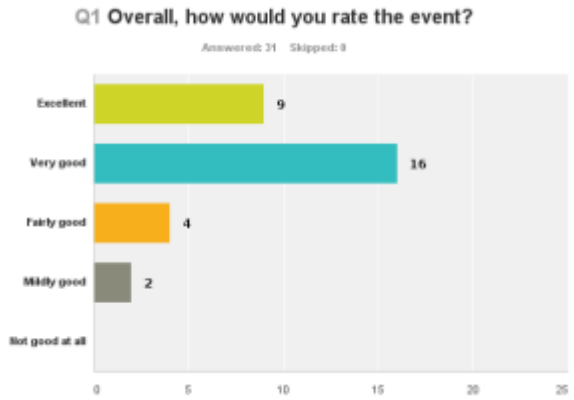
At the conclusion of the event, Geoff summarised key elements of each presentation, the result of the panel discussion and reiterated his thanks to all for participating.

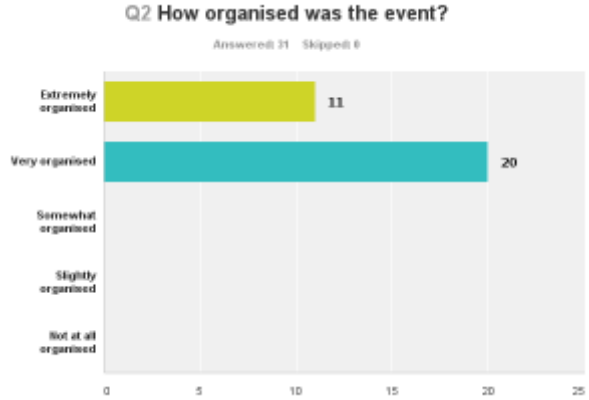
Evaluation

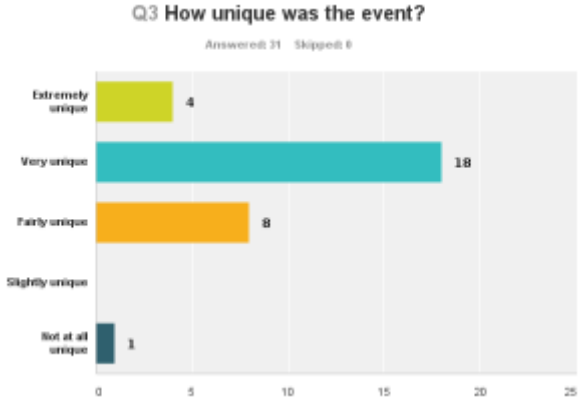
To assess the success of the launch against the Objectives and to enable the SCCG to deliver informative, relevant and engaging events, a post event online survey was conducted. The SCCG is keen to keep doing the things it does well and to work on those things that can be improved. The survey was specifically designed to obtain information and insight into participants' views of the event, including suggestions for enhancing future events. It utilised Likert-style rating questions and comment fields.

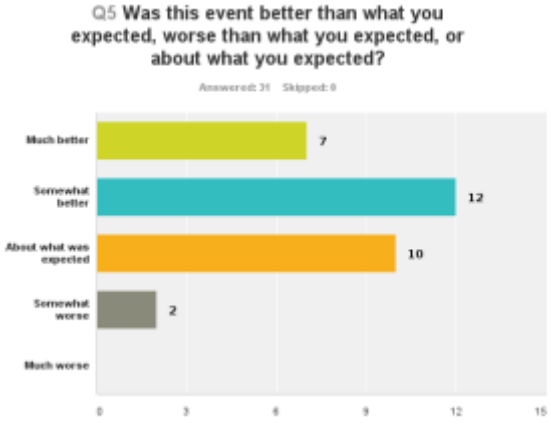
Fifty percent of participants completed the online evaluation. Results were overwhelmingly positive and are presented in the series of graphs below.

Event overall



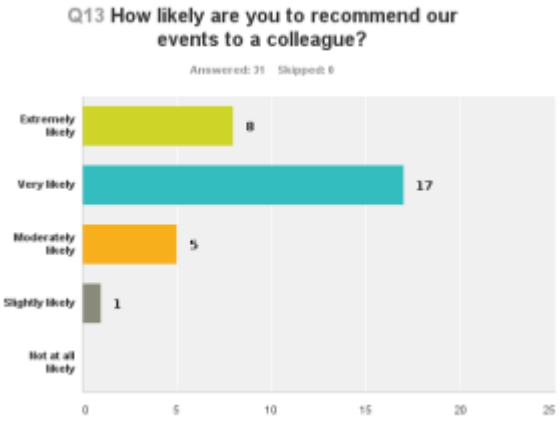






Comments:

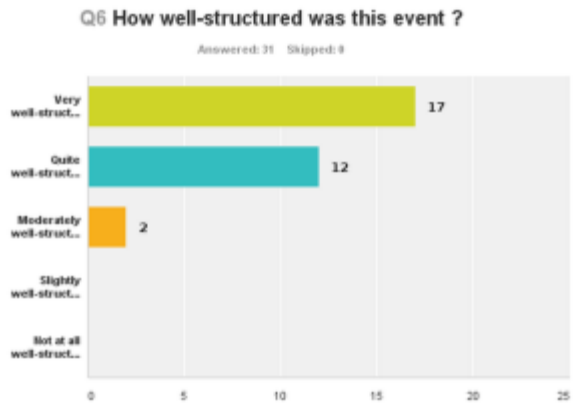
- Well done to the team at SCCG - congratulations on yet another outstanding project
- The panel session was well organised and I liked the idea of submitted questions being selected and addressed to panel members
- First presentation was interesting and informative.
- There could be more discussion on policy implications

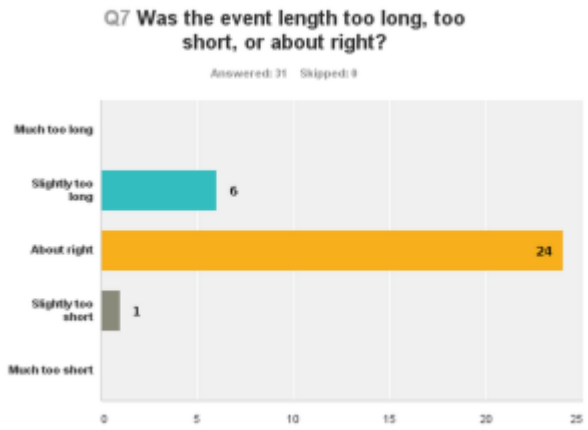


What was the most valuable part / highlight of this event?

- Filippo's explanation of the Tsunami model Closely followed by Dale's tsunami overview
- Presentation of COVERMAR project
- Networking
- The presentations were great. It was also good to have good quality sound and visual
- Australian Tsunami - AP Dominey-Howes Natural Hazards Impact Assessment - Mark Edwards - Geoscience
- Findings summarised in presentations
- Meeting contacts in the local government sector
- The participation of Geoscience Australia, SES and the presentation of the COVERMAR project
- Opportunity to communicate directly to council staff who do planning
- The MC
- Understanding the relative levels of risk from tsunamis v storm surge
- I found all sessions of equal value
- The very brief information which described the results of the study
- Presentation from Prof Dale Dominey-Howes
- Questions were separate from presentation
- Tsunami presentation and the talk by Geoscience Australia
- Hearing the insights from the presenters as they focused on issues raised by the audience during the planned question time at the conclusion of the event
- Details of the project which is of direct relevance. Panel session at end of day particularly good way to finish
- Seeing the connections between the different work that is being done
- Risk of local offshore landslide being most likely cause of tsunami. Comparison of tsunami risk against storm surge risk - whilst intuitively the results are expected, it is good to highlight the risks from storm surge which probably aren't understood by the layperson or across Council
- Presentation on Australian Tsunami- an overview from hazard to community risk perception
- Learning technical aspects of the work
- Diversity of speakers and thoroughness of content

Structure and length



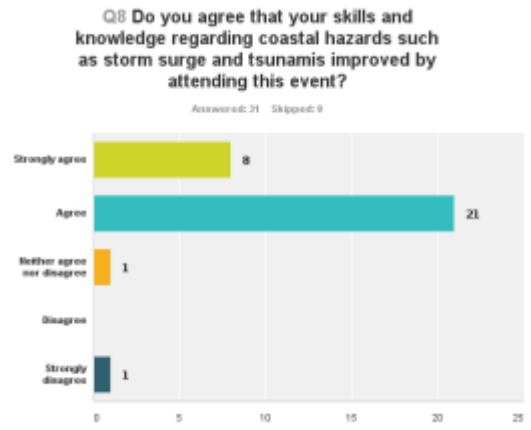


Comments:

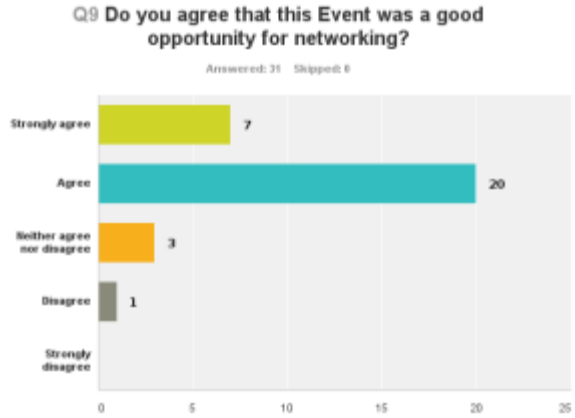
- Very well structured with great additional guest speakers (SES and GA) providing the right balance of background, context and new science. The end of session panel session was also very useful

- A little too much emphasis on the Government perspectives which I feel didn't add too much to the information presented
- I thought the series of presentations followed by a panel and the question box worked really well. However, there probably could have been more time given to get through all the questions

Capacity building



Networking



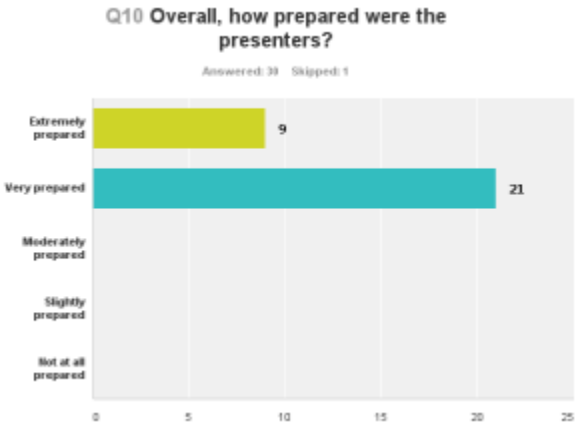
Comments:

- List of attending delegates would of been useful
- There was plenty of time before the start, at morning tea and post event to catch up with and make contacts in the storm surge and tsunami sector
- May have been an opportunity to get together for an informal lunch after the event
- Distribute attendee list with final Agenda (part of the gee-up to come along?). If the event is busy enough sometimes don't find out that someone of interest was even there
- Having the registration period and a break in the middle works well for networking
- Longer break times

Q. Do you have any ideas to enhance networking opportunities?

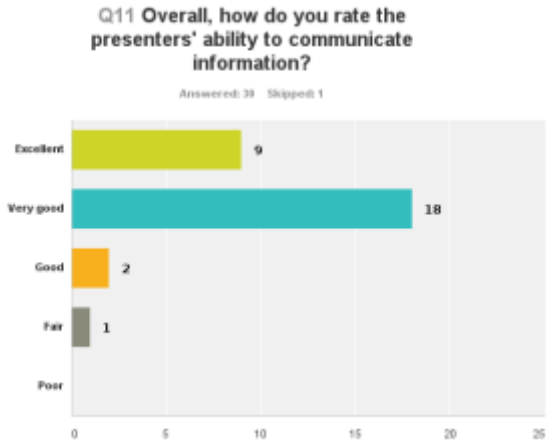
Allocated seating, based on work areas and/or areas of expertise. An exercise at the start of the event sharing name, business, and something else.

Presenters



Comments:

- Some good, some not so good. Although al



Comments:

- First presentation was great - the other needs to

speakers had put a lot of effort into their presentations • I feel the Govt presentations were "off the shelf" and could have been tailored better to the project and the audience • Nearly all presenters were very well prepared, • The SES presentation would be improved with a take home message	think about how to better tell the story of what they are presenting. We can look at technical reports later - need to keep the presentation interesting • Varied markedly from speaker to speaker • The structure of Dale's presentation was very good. He went straight to the point and kept the audience's attention
Specific Questions	
Do you have any suggestions on how we can enhance future events? • More time for the panel to answer questions • Keep up the good spectrum of invitees. • Think about the audience better and keep the presentations interesting and accessible • Panel session at the end was a little rushed. Questions written during the event were a good idea but perhaps needed to be sorted prior to the session starting to maximise the spread of questions. This panel session was a strong part of the workshop and provides an opportunity to for questions from the audience to be addressed. Might be worth a follow up response /answers to questions raised but not addressed on the web site? • Distribute notes and written material at the event • Keep doing what you're doing	Do you have any other comments, questions, or concerns? • Well done SCCG • Really liked the icebreaker exercise. • I would be interested in whether Dr Dall'Osso sees an expansion of the COVERMAR project to include critical infrastructure, as he said it was possible • Another highly relevant and well run opportunity to disseminate information. Congratulations and thanks • Thank you for an informative morning

The SCCG Secretariat will consider the evaluation results in detail, particularly the comments to tailor the delivery of future events. The resolution of results provided by the structure of the survey enables resources to be allocated to areas identified as priorities or which are evaluated less favourably. The results also contribute to the SCCG's baseline data against which future performance can be judged.

Acknowledgements

COVERMAR was funded by the Australian and NSW Governments and conducted under the Natural Disaster Resilience Program, as described in the National Partnership Agreement on Natural Disaster Resilience and the NSW Implementation Plan 010/11.

The COVERMAR Advisory Committee guided and informed the project and our thanks are extended to Committee members for their respective contribution.

The SCCG extends thanks to presenters and participants for their contribution and feedback. The contribution of the City of Sydney Council in providing the launch venue is also gratefully acknowledged.

SYDNEY COASTAL COUNCILS GROUP

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