Australia-Indonesia

Environmental Science Workshop

17-19 April 2011
Shine Dome, Canberra

Australian Academy of Science

Australian Government
Department of Innovation
Industry, Science and Research

RISTEK

Australia-Indonesia

Environmental Science Workshop

17-19 April 2011

Australian Academy of Science
Shine Dome, Canberra

Australian Academy of Science

Australian Government
Department of Innovation
Industry, Science and Research

RISTEK

Welcome message

Dear Colleagues

On behalf of the Australian Academy of Science I would like to welcome the Australian and Indonesian participants in the *Australia-Indonesia Environmental Science Workshop*. This workshop follows on from the success of the *Agriculture and Food Security Workshop* held in Australia in 2010. We are delighted that the Indonesian delegation is being led by Professor Dr Syamsa Ardisasmita, Deputy Minister for S&T Networks, The Ministry of Research and Technology (RISTEK).

Environmental Science has become increasingly more topical in the last few decades, particularly in terms of identifying new and renewable energy sources and defining the effects of global climate change. Most recently, our world (and specifically the Asia-Pacific region) has been affected once more by devastating natural disasters such as earthquakes and tsunamis. This workshop will provide a forum to share ideas and information between Indonesian and Australian scientists on geothermal science, earthquakes and tsunamis, and marine science and oceanography, and will explore the potential for research collaborations between the two countries.

I would like to express my gratitude to Professor Jim Fox and Professor Dr Syamsa Ardisasmita for agreeing to be the Australian and Indonesian Convenors of this workshop. I thank participants from both countries for generously giving their time to ensure the success of this meeting.

I look forward to meeting you during the visit to Melbourne.

The Academy would like to acknowledge the support of the Australian Government Department of Innovation, Industry, Science and Research for this event.

Professor Andrew Holmes AM FAA FRS FTSE
Foreign Secretary
Australian Academy of Science

Contents

Program

Sunday, 17 April 2011

1830 – 2030	Welcome Reception in the **Drawing Room at University House** (Corner of Balmain Crescent and Liversidge St, ACTON) **www.anu.edu.au/unihouse**

Workshop Day 1 (18 April 2011)

0700 – 0800	**Breakfast available at University House**
0830 – 0900	**Arrival of participants and registration at the Shine Dome, Canberra**
0900 – 0905	**Welcome Address by:** **Professor Graham Farquhar FAA,** Vice President, Australian Academy of Science
0905 – 0920	**Welcome Address by:** **Professor Dr Syamsa Ardisasmita**, Deputy Minister for S&T Networks, The Ministry of Research and Technology (RISTEK)
0920 – 0935	**Welcome and Overview:** **Professor James Fox,** Resource Management in Asia-Pacific Program (RMAP), Australian National University
0935 – 1005	**Speaker 1: Professor Phil Cummins** *Lessons from recent tsunamigenic earthquakes worldwide*
1005-1035	**Speaker 2: Dr Pariatmono** *From the knowledge of earthquakes and tsunamis to community preparedness:* *The Indonesian effort*
1035 – 1105	**Morning tea**
1105 – 1135	**Speaker 3: Dr Mike Gagan** *Earthquake supercycle terminations in Sumatra over the last 5,500 years*
1135 – 1205	**Speaker 4: Dr Suhardjono** *The joint cooperation between Australia and Indonesia in seismological engineering*
1205 – 1235	**Speaker 5: Professor James Goff** *Indonesia: Completing the tsunami picture*
1235 – 1335	**Lunch**
1335 – 1405	**Speaker 6: Dr Ian Poiner** *TBA*

Program

1405 – 1435	Speaker 7: Dr Ekowati Chasanah *Marine Biotechnology research activity*
1435 – 1505	Speaker 8: Professor Terry Hughes *Research and training in support of the Coral Triangle Initiative on Coral Reefs, Fisheries and Food Security*
1505 – 1535	Afternoon tea
1535 – 1605	Speaker 9: Professor Dr Suharsono Soemorumekso *Biodiversity, socio-cultural adaptation and response of coral reefs to climate change*
1605 – 1635	Speaker 10: Dr David McKinnon *AIMS research in Indonesia*
1635 – 1700	Summary of Day 1
1700	End of Day 1
1900 – 2130	Official Dinner at Saffron Restaurant Franklin Street, Manuka www.saffronrestaurant.com.au

Workshop Day 2 (19 April 2011)

0800 – 0900	Breakfast available at University House
0930	Commencement of Day 2
0930 – 1000	Plenary presentation: Rod Brazier, Assistant Director General Indonesia and East Timor Branch AusAID
1000 – 1030	Speaker 11: Dr Taufan Surana *Development of geothermal energy in Indonesia*
1030 – 1100	Speaker 12: Professor Mike Sandiford *Geodynamic setting of earthquakes in the Banda Sea region, Eastern Indonesia*
1100 – 1130	Morning tea
1130 – 1230	Discussion on future bilateral collaborations
1230	End of Day 2
1230 – 1330	Lunch
1400 – 1700	Indonesian participants: site visit at the Research School of Earth Sciences, Australian National University Australian participants: return to their cities of origin

Program

Wednesday, 20 April 2011 (Indonesian delegation only)

0930 – 1130	Site visit at the **Bureau of Meteorology - Melbourne**
1200 – 1330	Site visit at the **Melbourne Energy Institute, University of Melbourne**
1330 – 1430	**Lunch at the University of Melbourne**
1500 – 1700	Visit to the **Melbourne Aquarium including guided tour**
1400 – 1700	Dinner in the **Karagheusian Room University House** Professors Road The University of Melbourne **www.unihouse.org.au**

Workshop Convenors

Professor James Fox

Resource Management in Asia-Pacific Program (RMAP)
Australian National University

Email: james.fox@anu.edu.au

Environmental history and anthropology of Indonesia; resource management with a focus on developments in agriculture, forestry and fisheries in Indonesia; comparative Austronesian ethnology.

Professor Dr Syamsa Ardisasmita

Deputy Minister for S&T Networks
The Ministry of Research and Technology (RISTEK)

Email: syamsa@ristek.go.id

Dr Syamsa Ardisasmita is Deputy Minister for Science and Technology Networks of the Indonesian Ministry for Research and Technology. He obtained his Bachelor Degree in Physics from the University of Indonesia, Masters Degree in Signal Processing and Communication, Department of Electronics, University of Montpellier II, France, and PhD in Imaging Processing and Computer Vision from the same university in 1991. Dr Ardisasmita has been a Research Professor at the National Nuclear Energy Agency (BATAN) since 2006. Internationally, he is the national focal point of the ASEAN Committee on Science and Technology (ASEAN COST), national focal point of the Non Alignment Movement on Science and Technology, national focal point of the Islamic Organization Countries Committee on Science and Technology (IOC-COMSTECH) and has attended various international training and conferences in France, Austria, Japan, Germany, Korea, India and the USA, mainly in nuclear power issues.

Speakers

Dr Ekowati Chasanah

Research Centre for Marine and Fisheries Product Processing and Biotechnology
The Ministry of Marine Affairs and Fisheries (KKP)

Email: ekowati_ch@yahoo.com

Dr Ekowati Chasanah is a Biotechnology scientist with the Marine and Fisheries Product Processing and Biotechnology, Research Agency for Marine and Fisheries, based in Jakarta, Indonesia. Her background was in Enzyme Technology and microbiology, enriched with marine biodiscovery when she joined with the Australian Institute of Marine Science (AIMS) during the at 2006- 2007 research period. She applies her background to do research in marine biodiscovery especially from microbes. Since 2006, she coordinated the biotechnology research which covers several topics such as 1) assessment of anthropogenic stressor on the quality of the waters (physical, chemical, biology) and its relation to the bioactive produced by marine biota (sponges and soft coral) at CTI area; 2) exploration of marine bioactive produced by microbes especially fungi associated with marine biota; 3) isolation, production and application of biocatalyst isolated from unique marine environment and fisheries.

Marine Biotechnology Research Activity

The Marine Biotechnology research groups under the Research Center for Marine and Fisheries Product Processing is dedicated to exploring Indonesian marine and fisheries resources used to fulfill industrial and human needs for food and pharmaceutical based products. The objectives are to explore and use while maintaining marine resource sustainably. Related to the workshop topics, we will present 3 topics, 1) assessment of anthropogenic stressor on the quality of the waters and marine biota especially on the the spatial patterns of bioactive compounds produced by marine invertebrates (sponges and soft coral) at CTI reefs ; 2) exploration of marine bioactive produced by microbes especially fungi associated with marine biota; 3) isolation, production and application of biocatalyst isolated from unique marine environment and fisheries.

Research activity 1 is intended to give a baseline data on new MPA such as Sawu sea area, as well as to reassess the present zonation system based on the bioeconomy of marine biota under the MPA. The first year (fiscal year 2010) output of the activity was to present the status of physical and chemical data on waters surrounding Rote island (inorganic nitrogen, active phosphorous, pH, their effect to bioactive substances produced by sponge (Aaptos and Xestospongia) and soft corals (Nepthea sp), toxins algae, and microbial diversity of sponges related to the water and sediment. This study demonstrated that the quantity of bioactive metabolites from Aaptos sp. negatively correlates to the quality of its surrounding. Our current research on the relationship of pollutants and the diversity of associated microbes also showed similar results. Based on these findings, in the following year (2011), we will analyse metabolic fingerprinting of Aaptos sp. by means of NMR pattern recognition (PR) to build a comparative mapping of metabolic profiling in response to environmental conditions. This technique is constructed by loading spectral data of sponges' extracts and analyse them by using multivariate statistical analysis and principal component analysis in order to classify samples. based on the pollution level in their habitat. Applications of this technique can be used to identify and to detect environmental perturbations due to anthropogenic stressors that threat the sustainability of coral reefs' ecosystem. We suggest that this technique is easy to use and reproducible, and may be used to monitor coral reefs' quality in CTI waters in long term view.

For soft corals, secondary metabolites of Nepthea sp, i.e 1,5 hydroxy cembranoid and 3,4 epoxy nepthenol acetate , could be used as chemical marker to evaluate the zonation system of the MPA such as at Seribu island. Based on the study, we proposed new zonation system of Seribu island MPA based on biopotential of marine biota at the reefs.

Research activity 2 is intended to obtain marine bioactive while minimizing marine biota as the sources. During the 3 years activity, we have isolated more than 100 isolates of fungi from marine biota especially sponges, and among them, 3 fungi were potential to produce anticancer and antioxidant substances. For research activity 3, we have isolated bacteria from unique marine environment, and explore for their potential enzymes. Hydrolytic enzymes such as proteolytic, celulolytic and chitinolytic groups are our target to fulfill the local industrial needs.

Professor Phil Cummins

The Centre for Natural Hazards
Australian National University

Email: phil.cummins@anu.edu.au or phil.cummins@ga.gov.au

Phil R. Cummins graduated from U.C. Berkeley in 1988 and worked as a postdoc and research fellow at RSES until 1997, when he took a position at the Japan Marine Science and Technology Center (JAMTEC). He led JAMSTEC's subduction zone earthquake modeling group until 2002, when he returned to Australia to work at Geoscience Australia on problems related to earthquake hazard. Since the beginning of 2010 he has taken up a 50% position at ANU's Research School of Earth Sciences as Prof. of Natural Hazards.

Lessons from Recent Tsunamigenic Earthquakes Worldwide

Despite the unprecedented attention focused on tsunamis worldwide following the 2004 Indian Ocean Tsunami, recent events show that the world is far from being safe from tsunami disasters. In this presentation I will focus on three types of earthquakes, and recent examples of them, that illustrate some of the major unsolved problems that continue to confound tsunami mitigation: (1) massive local tsunamis that far exceed historical experience (2004 Sumatra and 2011 Japan); (2) 'tsunami' earthquakes that generate tsunamis much larger than would be expected from earthquake shaking or conventional estimates of earthquake magnitude (2006 Java and 2010 Mentawai); (3) earthquakes with 'unusual' fault orientations, such as outer rise and complex faulting events (2009 Tonga Trench earthquake and Samoa tsunami). I will discuss the challenges such events present for tsunami warning and mitigation systems, and suggest possible remedies that might be developed through future research.

Dr Mike Gagan

Research School of Earth Sciences
Australian National University

Email: michael.gagan@anu.edu.au

Dr Mike Gagan leads the Earth Environment Stable Isotope Laboratory at ANU where his team aims to answer key questions about environmental change in the past and future. Since 1994, he has worked closely with colleagues at the Research Center for Geotechnology (Bandung) at the Indonesian Institute of Sciences to develop geochemical records from corals and speleothems to reconstruct the changing climate of tropical Australasia over the last ~200,000 years. The collaboration has grown to encompass themes in palaeoclimatology, climate modelling, volcanic impacts on the environment, sea level change, and early human dispersal in Australasia. Recently, the team has developed isotopic techniques for corals to reconstruct the recurrence intervals of great earthquakes in Sumatra. Mike was awarded his PhD in marine geology by James Cook University in 1990 and has co-authored more than 90 journal articles and book chapters, including 10 papers in Nature in Science.

Earthquake supercycle terminations in Sumatra over the last 5,500 years

The nature of catastrophic earthquakes, such as the 2004 and 2005 events in west Sumatra, is poorly understood largely because their recurrence intervals of great earthquakes remain unknown. Raised coral reefs preserved along the Sumatran subduction zone mark the times of vertical crustal deformation during great earthquakes back to at least 5,500 years ago. Our team has discovered that carbon-isotope ratios (13C/12C) in the skeletons of these corals record the sequence of crustal deformation during the decades leading-up to earthquake supercycle terminations. We now have continuous time-series of coral 13C/12C showing the pattern of crustal deformation before three great earthquakes around 1600 AD, ~2,000 years ago, and ~5,500 years ago. For all three cases, there is a distinct deformation "turning point" when crustal submergence switches to crustal emergence ~20-60 years before each earthquake. Our primary goal now is to examine crustal deformation leading to many great earthquakes in the past to see if the deformation turning point is a reliable precursor for earthquakes in Sumatra. If so, it would be useful to generate 13C/12C records for corals living along the Sumatran subduction zone to improve community awareness of where and when a great earthquake may strike next.

Professor James Goff

School of Biological Earth and Environmental Sciences
University of New South Wales

Email: james.goff@unsw.edu.au

Professor James Goff is the Co-Director of the Australian Tsunami Research Centre and Natural Hazards Research Laboratory at the University of New South Wales. James is a geologist and geomorphologist by training. While his particular focus is on all aspects of tsunami research, he has studied natural hazards such as earthquakes, cyclones, volcanic eruptions, river floods, glacial outbursts, fires, and landslides in Australia, the Antarctic, New Zealand, Indonesia, Thailand, Sri Lanka, the Maldives, Papua New Guinea, Fiji, Tonga, Vanuatu, Hawaii, Pacific Northwest, Canada, UK, France, Greece, Belize, and Wallis and Futuna. He is an Adjunct Professor at the University of Hawaii, Honorary Research Associate at the University of Auckland, and "Scientist-in-Residence" at the Pacific Tsunami Museum, Hawaii.

Indonesia – Completing the tsunami picture

The 2004 Indian Ocean Tsunami needs to be placed in the longer term context of the magnitude and frequency of past events. To do this it is important to recognise that the Indonesian archipelago has both Indian and Pacific Ocean coasts and is also exposed to numerous local tsunami sources. Prior to 2004 over 50,000 people had been killed in Indonesia by tsunamis over the past 400 years – but that is merely a short historical record and does not include events from prehistory. This talk looks at why prehistoric tsunamis are an extremely important part of any tsunami hazard and risk assessment, and offers examples of how large some prehistoric events have been. Indonesia, like Australia, needs a comprehensive tsunami database including both historical and prehistoric events. In the absence of such a database we will always be preparing for the last big event that hit us and we will always be being caught out by the next, larger one.

Professor Terry Hughes

Centre Director
ARC Centre of Excellence for Coral Reef Studies

Email: terry.hughes@jcu.edu.au

Professor Terry Hughes is Director of the Australian Research Council (ARC) Centre of Excellence for Coral Reef Studies, which is headquartered at James Cook University, Australia. His research focuses on the linkages between the ecology of reefs and their importance for societies and economies. He has worked extensively in Australia, the Coral Triangle Region, and in the Caribbean. An important aspect of his research is understanding the dynamics and resilience of coral reefs, and translating this knowledge into innovative and practical solutions for improved reef management.

Professor Hughes is a Fellow of the Australian Academy of Science and the Beijer Institute for Ecological Economics, Stockholm. He is an ISI Highly Cited Researcher, and was recognized in 2008 by the International Coral Reef Society, with the award of the society's Darwin Medal. The ARC Centre of Excellence for Coral Reef Studies works in 38 countries to promote understanding and improved management of coral reefs. It is ranked #1 globally for outputs and citations in coral reef science, among >1500 institutions active in coral reef research. The Centre currently supports and mentors 190 research students from 34 countries.

Research and training in support of the Coral Triangle Initiative on Coral Reefs, Fisheries and Food Security

Professor Terry Hughes FAA, ARC Centre of Excellence for Coral Reef Science, James Cook University, Townsville QLD 4811, Australia.

In August 2007, President Susilo Bambang Yudhoyono of Indonesia proposed a new Coral Triangle Initiative on Coral Reefs, Fisheries and Food Security. The Coral Triangle region stretches across six countries: Indonesia, the Philippines, Malaysia, Papua New Guinea, the Solomon islands and Timor Leste, all of which have agreed to support the Initiative. The region has the highest levels of marine biodiversity in the world, which sustains the livelihoods of many millions of people. However, the marine-based natural resources of the Coral Triangle - and the economic and social benefits they generate - are increasingly threatened by overharvesting, pollution and climate change. Therefore, the Coral Triangle Initiative represents a transformational approach to marine management and governance, aimed at securing the future use and conservation of living resources. In collaboration with many partners throughout the region, Australian scientists undertake research throughout the Coral Triangle region, and are also major providers of graduate training for students from the region.

The Plan of Action for the Coral Triangle Initiative includes 4 objectives:

- Developing an ecosystem approach to fisheries management across the Coral Triangle
- Building a network of Marine Protected Areas across the region
- Developing measures to help adaptation to climate change
- Protecting threatened marine species.

This talk will present an overview of ongoing research and training programs the align with President Yudhoyono's vision for reconciling nation-building with conservation of coral reef ecosystems.

Dr David McKinnon

Research Scientist
Australian Institute of Marine Science

Email: d.mckinnon@aims.gov.au

Dr. David McKinnon has over 25 years experience as a biological oceanographer, and has research interests in zooplankton dynamics, planktonic food chains and the microbial loop. As part of the Australian Institute of Marine Science Water Quality and Ecosystem Health team he leads research into the environmental impacts of tropical aquaculture and on the biological oceanography of Australia's tropical seas.

AIMS Research in Indonesia

The Australian Institute of Marine Science has a long history of research in waters in or adjacent to Indonesian seas. Between 2005 and 2008 an ACIAR project in collaboration with the Department of Marine Affairs and Fisheries investigated the environmental impact of sea-cage aquaculture at sites in South Sulawesi and Lampung, as well as an Australian site in the Northern Territory. This project, in conjunction with a parallel land-based project, provided planning tools for the expansion of aquaculture in the coastal zone of Indonesia. In 2010 an ATSEA collaboration with LIPI saw AIMS scientists participate in a cruise to the Arafura sea on board the Baruna Jaya XIII, and a reciprocal cruise to the Timor Sea is planned for AIMS' RV Solander in July 2011. These projects demonstrate shared scientific interests between Australia and Indonesia, and the capacity to work together to provide the science necessary for resource management. AIMS is currently engaged in a broad portfolio of research in Australia's Northern and North Western Seas, with a particular focus on the banks and shoals of the Timor Sea. These areas are of shared interest for Australia and Indonesia and should be the focus for potential future collaboration.

Dr Pariatmono

Director of Government S&T
The Ministry of Research and Technology (RISTEK)

Email: pariatmono@yahoo.com

Dr. Pariatmono is Assistant to Deputy Minister for Empowering Science and Technology for Government Institution of the Ministry of Research and Technology (Ristek). Scope of work: science and technology for government procurement, science and technology for disaster mitigation (early warning, in particular), technology transfer policy for climate change, technology need assessment, green technology, water resources engineering, clean energy, innovation in emergency equipment

From the knowledge of earthquakes and tsunamis to community preparedness: The Indonesian effort

Indonesia is very prone to disasters, as it lies on the junction of the most active tectonic plates in the world. Moreover, with its tropical climate and frequent heavy rains, Indonesia also often experiences floods and landslides. These are the types of natural disasters which repeatedly dominate the occurrence of calamity in Indonesia. Therefore disaster mitigation should be taken into full consideration in the spatial development of Indonesia before taking any steps for increasing community preparedness. The knowledge of disasters which comes from both local wisdom and science and technology should be incorporated in the disaster reduction action plan of the country. The national law on disaster mitigation established after the tsunami in Aceh in 2004, also underlined the importance of having science and technology as a basic principle in disaster risk reduction.

From an earthquake and tsunami point of view, almost half of the 94 autonomous cities in Indonesia sit in the active faults, and almost half of the 80,000km of Indonesian coastline are susceptible to tsunami disaster. In terms of population, not less than 20 million people in Indonesia are threatened by tsunami. Meanwhile the number of people threatened by earthquakes is increasing due to sharp increases of the population in the cities. In 2008, for the first time, the number of Indonesian people living in the cities out numbered those in rural areas.

Even though for scientists, the technical knowledge of earthquakes and tsunamis has increased, the common scientific understanding on the natural disasters is very difficult to disseminate to the community under threat. The main obstacle comes from the level of poverty which disables the capability for protection. Therefore, several different schemes to increase efforts in awareness should be prepared. This presentation will discuss the Indonesian attempts to bind the knowledge of earthquakes and tsunamis, convey the scientific message to the community and finally promote the participation of the people in disaster exercises.

To begin my presentation, I will focus on the Indonesian Tsunami Early Warning Systems (Ina-TEWS). The system consists of structural and cultural components, but I will focus on the latter. Both parts of the system need to be tested regularly to ensure its effectiveness, and to encourage "people" participation in increasing independent preparedness. Since conducting a tsunami drill in Bali and Banten, a stakeholder's to-do-list has been developed, specifically for local government and other types of organisations. Last but not least, disaster scenarios based on the knowledge and judgements of experts are necessary to be developed in order to conduct tsunami exercises which can involve the whole community.

To conclude, some positives as well as hindrances in involving stakeholders during the implementation of a full scale exercise are presented. Capacity building activities including promoting PPP (Public-Private-Partnerships) scheme are also identified to maintain the sustainability of the overall Ina-TEWS.

Dr Ian Poiner

CEO
Australian Institute of Marine Science

Email: i.poiner@aims.gov.au

Dr Ian Poiner is the Chief Executive Officer of AIMS. Dr Poiner has significant experience in strategic development and planning of science, both as a practising scientist and at the organisational level. This is reflected in his successful large-scale, multi-disciplinary research projects and his establishment of national and international research programmes to support the sustainable use, conservation and management of marine ecosystems. Dr Poiner's scientific background is research into tropical fisheries and ecological systems, including in Australia's northern Great Barrier Reef, Torres Strait and the Gulf of Carpentaria. He has also worked in Jamaica, Papua New Guinea and Southeast Asia. Dr Poiner serves on a number of national and international committees. He is a member of the International Scientific Steering Committee of the Census of Marine Life, a 10-year international research programme to assess and explain the diversity, distribution and abundance of marine organisms throughout the world's oceans.

Professor Mike Sandiford

Director
Melbourne Energy Institute University of Melbourne

Email: mikes@unimelb.edu.au

Mike Sandiford is Professor of Geology and the Director of the Melbourne Energy Institute at the University of Melbourne. He was an ARC Professorial fellow at the University of Melbourne from 2000-2009 and before that a Reader in Geology at the University of Adelaide. His research interests include tectonics, earthquake geology, geomorphology and geothermics with a special focus on the young tectonic activity in the Indo-Australian tectonic plate. His work on the thermal structure of the Australian crust has lead to the current upsurge of interest in geothermal energy exploration in South Australia. He was recipient of the Mawson Medal by the Australian Academy of Sciences in 2004, and has been recipient of the Stillwell Medal by the Geological Society of Australia a total of three times. He was editor-in-chief of Tectonophysics from 2004-2009.

Geodynamic setting of earthquakes in the Banda Sea region, Eastern Indonesia

The seismic history of the Banda Sea in eastern Indonesia includes the ninth largest event of the 20th Century (the ~Mw8.5 great Banda Sea earthquake of 1938) and the largest intermediate depth (100-300 kms) earthquake ever recorded (the ~Mw8.3 1963 event). Despite experiencing six Mw > 7 intermediate depth events in the last 50 years, making it one of the most active intermediate depth earthquake zones on the planet, there has been relatively few damaging shallow earthquakes in recent times. This talk will briefly discuss the geodynamic setting of earthquakes in this region.

Mr Ruben Silitonga

Deputy Director for International S&T Network Development
The Ministry of Research and Technology (RISTEK)

Email: ruben@ristek.go.id

Mr Ruben Silitonga is Deputy Director for International Science and Technology Network of the Indonesian Ministry for Research and Technology. He obtained his Bachelor Degree in Public Administration from the University of Sumatera Utara, Medan, Indonesia and Masters Degree in Human Resource Management from Curtin Business School, Curtin University of Technology, Perth, Australia, in 1998. He has attended several international training sessions on management issues in Australia, Japan, Philippines and China. Before he joined the Ministry in 2009, Mr. Silitonga worked for the Indonesian Institute of Sciences (LIPI).

Professor Dr Suharsono Soemorumekso

Director
Research Centre for Oceanography, Indonesian Institute of Sciences (LIPI)

Email: director-rco@indo.net.id

Dr Suharsono is a Research Professor and the Director of the Research Centre for Oceanography, Indonesian Institute of Sciences (LIPI). He obtained a Bachelor Degree in biology from the University of Gadjah Mada, Indonesia, in 1979 and PhD in ecology and coral reef at the University of Newcastle upon Tyne, UK.

His main research focus is in coral reef and coastal management. He was involved in the Indonesian Coral Reef Rehabilitation and Management Program (COREMAP) for 7 years and from 1999 – 2004 was appointed a deputy chairman of the COREMAP. Internationally, he is a member of several international scientific organizations, such as; Indonesian Scientific Authority for Marine Biota, Animal Committe-CITES, member of ISRS (International Society for Reef Study), Indonesian Focal point on Coral Working Group –CITES, Indonesian Focal point on International Coral Reef Initiative, Focal point on ASEAN Sub –Committee on Marine Science (SCMSAT) for ASEAN COST (Committee on Science & Technology.) Vice Chair for Integrated Coastal Area Management (ICAM) of Indonesian National Scientific Board on IOC/UNESCO,

Biodiversity, socio-cultural adaptation and response of coral reefs to climate change.

In general, scientists agree that the centre of maximum marine biodiversity is situated in the Indo-west Pacific region. It occupies an area about the size of Europe. Indonesia is situated in this area and has two shallow waters: the Sunda shelf in the west and the Sahul shelf in the east. In between there are many large and small islands surrounded by deep clear water. Indonesian shore lines are fringed by mangrove forests, sea grasses and coral reefs. Its so exceptionally diverse in wildlife that there is no comparable region in the sea due to a concentration of biodiversity. Although there are clear indications that Indo West Pacific is the centre of maximum marine benthic biodiversity; the exact boundaries have not yet been determined. This is due to variation in species diversity within this centre that have not yet been studied well enough. Several biota have restricted distributional ranges, whereas others have widespread. Although populations species are genetically connected within their ranges, the range boundaries are not always known. Study on phylogeny using the molecular methods, information becomes available about how populations are related to each other, providing fine scale resolution of genetic pattern over broad temporal and spatial scales. Inventory of biodiversity in several locations has been done and the results indicate that central and eastern Indonesia are situated within the center of maximum diversity. More westward, the coral species richness seem to be less high. We will systematically continue our inventory in the western part of Indonesia in order to find the exact westernmost boundaries of the center of marine diversity. Although several hypotheses have been proposed to explain the centre of marine biodiversity, little agreement exists among scientists. Three major theories have been proposed to explain the epicentre of biodiversity: First theory suggests that high diversity is a result of a mixture of Pacific and Indian ocean fauna. Second theory is the centre of accumulation which allopatric speciation occurs in peripheral population with subsequent dispersal to the centre. Third is the theory of the centre of origin which allopatric divergence within the center dispersal to the periphery. Integrated study from different disciplines of knowledge is needed to understand the processes generating high biodiversity in the epicenter of biodiversity. Multifarious study such us geological setting, ocean processes, current pattern, lava dispersal, gen flow and genetic pattern over broad temporal and spatial scale can help to explain this concentration of species in this region. Hopefully we can help to ensure the preservation of this remarkable ecosystem. We will also develop a data base on coral reef biodiversity in order to determine the regions that may be the absolute richest on earth or have exceeding high concentrations of unique species. Working together with experts from different countries on coral taxonomy fosters the data base, improving capacity building and producing scientifically credible data on diversity, distribution and environment that will be important for local and national government. The data will contribute to sustainable management of living marine resources in globally important areas of the world in general and especially for Coral Triangle area.

Indonesian coral reefs are not only central in the globally important Coral Triangle biodiversity hotspots but also very significant for the livelihoods and cultural systems where great numbers of Indonesian people depend on the sustainable use of coral reef resources. It is very important to study the ecosystem health in order to guarantee the sustainability of marine resources. Coral reefs and other ecosystems in Indonesia have been experienced widespread changes in communities structure due to a combination of pressures, including destructive fishing activities, pollution from land based activities, coral bleaching due to increasing water temperature and other outbreaks of other biota such as HAB and crown of thorns. Almost all ecosystem functioning and services derived from coral reefs depend on healthy living corals. The destruction and reduction of live corals will be a real threat to the people whose depend on coastal resources for food and incomes. The effectiveness of sustainable coral reefs resources requires an integration of socio-cultural and economic systems including the behavior of ecosystem users into policy making. For the effectiveness of coastal management it is vital to study socio-cultural interactions related to reefs resources, user patterns combining the representation of reefs exploitation, impact on species diversity and reef structure and its feedback on resource use.

Climate change can be detected with the help of paleo-proxies in long life biota that deposit thin layers of hard skeleton. Skeleton in corals have long been considered a valuable tool for reconstructing past environmental and climate variability. Skeleton records also reflect growth response to sea surface temperature variability and change in concentration of the carbonate ion or pH. The other activities will study the response of coral to climate over ecological and evolutionary time scale. The collection of sample sites will be conducted across the Indo-West Pacific through the Indian Ocean. Samples will be taken in Biak, Maumere, Wakatobi, Makassar and Natuna for 2011. For 2012 samples will taken in the Java sea and West Sumatera. The broad scale of study sites will help distinguish between source of variation such us Indonesian through flow currents in the east, low salinities in the west and water temperatures caused by local climate fluctuation, from those related to global climate changes. Massive corals will be drill and cut into slices for analysis of banding patterns in order to reconstruct climate variability in the last decade. Small samples of CaCO3 will be taken from the bands with the help of a micro-drill. Stable oxygen isotopes and Sr/Ca analyses on the samples will provide time series on the temperatures and precipitation changes, sea water acidification change (Using boron isotope) and can also be used as a reference for changes in biota composition and richness. Changes in coral growth over time will also be analysed from these samples.

Dr Suhardjono

Centre for Technical Geo-potential Seismology and Time Mark
The Agency for Meteorology, Climatology and Geophysics (BMKG)

Email: suhard@bmg.go.id

Dr Suhardjono is currently the Director of the Centre for Earthquakes and Tsunamis at the Agency for Meteorological, Climatological and Geophysical (BMKG). Before he took this position, he was the Director of the Centre for Technical Geo-potential Seismology and Time Mark at the Agency. He obtained a Bachelor Degree in Physics from the University of Indonesia and Post Graduate on Seismology from IISEE Tsukuba, Japan.

Geodynamic setting of earthquakes in the Banda Sea region, Eastern Indonesia

The unique geography and tectonic condition with a huge population and also rapid increase in urbanization have made Indonesia a disaster-prone area, especially suffering from geological disaster. Many major cities in Indonesia had been set up in coastal and mountain areas since many people rely on sea cultivation and plantation for their living. Unfortunately, these areas inevitably suffer from earthquakes and this may lead to fatalities and economic loss.

Over 17 years, more than 32 destructive earthquakes occurred in the Indonesian archipelago. These earthquakes caused many casualties and infrastructure damages. The devastating earthquake, such as the Magnitude 7.6 West Sumatra Earthquake on 30 September 2009 which occurred inland and killed thousands of people, had a devastating impact on inhabitants, buildings and infrastructure. The other earthquake with Magnitude 7.7, which also occurred on 25 October 2010 in Mentawai Islands, generated a local tsunami. This tsunami earthquake caused many fishing villages along coastal area to be swept away and killed hundreds of people. The number of deaths was not consistent if we compare with the size of earthquake. Moreover, if small earthquakes occur close to the high populated area, these can kill large numbers of people.

In late 2008, Indonesia and Australia governments launched a multi-year partnership program for regional disaster reduction throughout innovative scientific solution and problem solving analysis. This program aims to strengthen Indonesian capabilities on disaster mitigation, preparedness and awareness. Both countries also contributed in funding, specialist officers and supporting arrangements.

Furthermore, as a part of this program, a multi-disciplinary cooperative research project was established between Australia and Indonesia Institutions; Geosciences Australia (GA) and Australian National University (ANU) in Australia; Meteorological, Climatological, Geophysical Agency (BMKG), Geological Agency of Indonesia (Badan Geologi), Indonesian Institute of Sciences (LIPI), State Ministry of Research and Technology (RISTEK) and Institute of Technology Bandung (ITB) in Indonesia. The research activities are divided into two main projects, namely: Probability Seismic Hazard Analysis (PSHA) and Ground Motion Prediction Equations (GMPEs) for Indonesia. In addition, to enhance human resources capabilities for Indonesia research institutions, several trainings and workshops will be held in Indonesia and some governmental officers from Indonesia will have opportunities to study at the ANU through funding and facilities provided by Australian government.

The earthquake hazard assessment of Indonesia has changed rapidly over the past of decades. From 2002 until now, the entire hazard assessment was developed based on megathrust earthquakes. Since 2008, however, it has been realized that intraslab and crustal earthquakes which frequently happen onshore are also important to be assessed, for example; the earthquakes occur in Java Island. This is because the vast majority of inhabitants settle in this island.

Looking at this, it is urgent to investigate the hazard impact of these types of earthquake and also to find the effectiveness of countermeasures due to future larger earthquakes. The current technology that BMKG has to carry on hazard assessment is ShakeMap software which is developed by USGS. This software has been used since 2010 and became very important to alert local population to earthquake shaking. In addition, the new acquiring seismic data of seismic networks and strong ground motion networks in BMKG afford potential opportunities to study earth crustal structure of Indonesia region. The development of Interferometric Synthetic Aperture Radar (InSAR) analysis may provide better analysis for crustal deformation owing to active faults. Finally, all research will be an important step forward for the Government of Indonesia and for people who live in areas vulnerable to earthquake shaking.

Dr Taufan Surana

Centre of Energy Conservation and Conservation Technology
The Agency for the Assessment and Application of Technology (BPPT)

Email: taufansurana@gmail.com

Dr Taufan Surana is a senior researcher in Geothermal Energy Utilization, Centre for Energy Conversion and Conservation Technology, at the Agency for the Assessment and Application of Technology (BPPT). With a background in energy system engineering, he along with his team, develops small scale geothermal power generation as well as geothermal direct use application technologies by introducing maximum local contents. Taufan graduated from the Geothermal Institute at the University of Auckland (New Zealand), and obtained a PhD from the School of Science & Technology, Nagasaki University, Japan, in 2004.

Development of Geothermal Energy in Indonesia

There are 5 types of geothermal systems, that is, convective hydrothermal, geopressured, sedimentary, hot dry rock and radiogenic geothermal systems (John W. Lund, 2007). Most of the geothermal systems in Indonesia are convective hydrothermal types associated with vulcanic activities. Hydrothermal reservoir consists of heated water and/or steam stored in permeable rock at depths reachable by commercial drilling, typically less than 4 km (Subir K. Sanyal, 2005).
A hydrothermal type geothermal system is composed of 4 main component, that is, (a) heat sources; (b) recharge area; (c) permeable rocks; and (d) fluids. According to the Geothermal Law No.27/2003, development of geothermal energy in Indonesia is divided into 5 stages: preliminary survey, exploration, feasibility study, exploitation, and utilization.
At present, there are 276 locations which have been identified with the total potential capacity of more than 29,000 MW. Indonesia has been focusing on the development of high enthalpy geothermal resources for electricity generation with the total installed capacity of 1,196 MW (only 4.1% of the potential resources). In order to accelerate the development of geothermal energy, the Government of Indonesia launched the 2nd fast track program of the 10,000 MW electricity development, including about 4,000 MW of geothermal power generation by 2014.

Notes

Notes

Notes

Australian Academy of Science
GPO Box 783, Canberra ACT 2601
T (02) 6201 9460 **F** (02) 6201 9494
ie@science.org.au
www.science.org.au