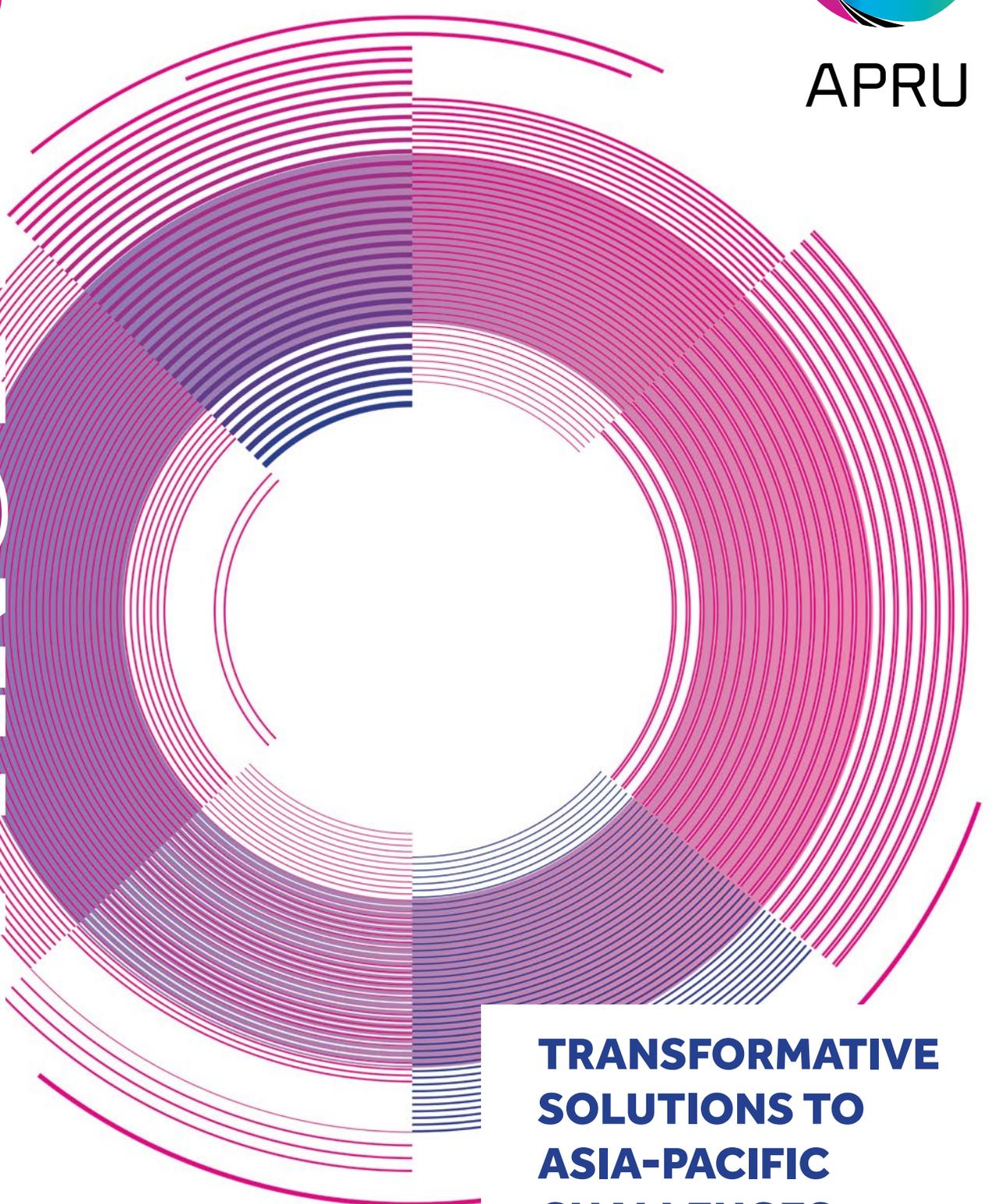


AMPLIFYING IMPACT



APRU



**TRANSFORMATIVE
SOLUTIONS TO
ASIA-PACIFIC
CHALLENGES**

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 Glyn DAVIS AC, Vice-Chancellor, The **University of Melbourne**
 Michael SPENCE AC, Vice-Chancellor and Principal, The **University of Sydney**
 Ian JACOBS, President and Vice-Chancellor, **UNSW Sydney**

CANADA

Santa J. ONO, President and Vice-Chancellor, The **University of British Columbia**

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CHINA AND HONG KONG SAR

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The Association of Pacific Rim Universities (APRU), established in 1997, is a network of leading universities for the Asia-Pacific region. As the voice of knowledge and innovation, APRU brings together thought leaders, researchers, and policy-makers to exchange ideas and collaborate on effective solutions to the challenges of the 21st century.



**AMPLIFYING
IMPACT**

***TRANSFORMATIVE SOLUTIONS
TO ASIA-PACIFIC CHALLENGES***

APRU IMPACT REPORT

2018

FOREWORD

This report reflects the positive impact of bringing together the social sciences and humanities with science and technology disciplines to address global challenges. Furthermore, it demonstrates the necessity of doing so if real solutions are to be found that are tailored to a wide diversity of contexts.

Underlying the critical issues of the Asia-Pacific region is the relationship of research and technological discovery to inequality in all of its many forms: economic, race, gender, social class, differential vulnerability to climate change, and health threats. Research universities are uniquely placed to respond, owing to their comprehensive range of capabilities and their deep links to their own societies. Many of the case studies in this report exemplify this role of social responsibility.

This second impact report naturally builds upon the first report, which mapped the research expertise of APRU member universities in order to provide an evidence base of their capabilities with respect to specific regional issues. It demonstrates the various models of cooperation that actively inform policy and practice through a neutral, international platform that encourages partnership and innovation.

The report also highlights the amplifying effects of an international network of leading universities that builds cooperation across the region and across borders of nations, discipline, language and culture – even in spite of tensions between countries and the competitive pressures of commercial interests.

The intersection of all these factors in an evolving context where actions are both local and global has given new salience to the APRU network. Collaboration with international organizations, governments, and business increases the impact of all we do and is building a new dimension to the international architecture of the Asia-Pacific region.

This report samples only a few of the many initiatives undertaken by our members and the network. It is intended as a basis for discussion and debate, as well as the development of new ideas, and lays the foundation for the creation of additional partnerships for research and policy impact.



Gene D. Block
Chancellor, UCLA
Chair, APRU

PREFACE

A trend of profound significance is shaping global science, running counter to heightened nationalism and the shift away from multilateral cooperation. A massive expansion in international scientific collaboration over the last 30 years has produced a system of open networks that, unexpectedly, does not mirror global geopolitical power and is not directly subject to national governance or evaluation regimes, yet enhances the quality of national science.¹

More study is needed to better understand this new global system and its influence on national science policy. However, it appears that the complexity of the global challenges facing humanity is partly responsible for this phenomenon. Most nations now participate in international research networks, rather than just a core of advanced economies. These networks focus around topics, geographical regions, or international relations contexts, and are affected by factors such as equipment location (telescopes, particle accelerators), access to specific physical zones and resources, dispersal of talent, and the financial opportunities of cooperation.²

This research suggests that the increased usefulness of APRU as an international network across the vast, diverse Pacific Rim derives from the many complex, cross-border challenges and the international research collaborations of its member universities intersecting with this new global system. Leveraging or even creating the underlying networks focused on specific questions, APRU acts more and more as a super-connector for solutions to global issues at both the policy and research levels.

This trend in global science provides the framework for this Impact Report, which examines a range of models for international collaborations on key challenges for the Asia-Pacific region: climate change, artificial intelligence (AI) and its implications, disaster risk and recovery, sustainable cities and landscapes, global health, women in leadership, and aging populations.

Over 20 years, APRU has developed into a resilient network of collaboration and trust, producing significant outcomes in education, research, innovation, and policy impact. This report focuses on APRU's achievements in interdisciplinary projects. The case studies and metrics aim to provide an evidence base for debating how to create even greater impact. We know we are just at the beginning of the journey.

A major theme is the necessity for collaboration between the social sciences and humanities (SSH) disciplines and the science, technology, engineering, and mathematics (STEM) disciplines. To this end, this report looks at capabilities in the SSH disciplines and ways in which they work with STEM disciplines.

The social sciences and humanities are essential for comprehending social, political, economic, and environmental contexts; as well as understanding different perspectives, languages and cultures; for critiquing society and its conventions; and contesting historical assumptions. These two fields are vital resources at a time of rapid change, technological innovation, heightening tensions and conflicts, and political or commercial interests influencing notions of the common good, public ethics, and social values.

The need for the SSH disciplines is especially attested to by the ubiquity of digital media, developments in AI and the use of big data. The social implications are unknown and likely to be pervasive. Core issues include framing the right questions, and interpreting and validating results. These tasks require knowledge, skills, and insights applied across disciplinary boundaries of both the SSH and STEM disciplines.

The impact of today's technology so deeply touches upon the very existence of humanity that, at a minimum, the inclusion of the SSH disciplines lessens the chances of unintended consequences. More optimistically, such collaborative models will provide timely solutions to key questions about the health of the planet and the survival of the human species.



Christopher Tremewan
Secretary General

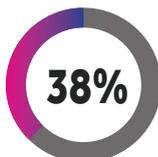
¹ Caroline S. Wagner, Han Woo Park, Loet Leydesdorff, (2015) 'The Continuing Growth of Global Cooperation Networks in Research: A Conundrum for National Governments', *PLoS ONE* (10)7:e0131816.

² *Ibid.*, pp.1-2

KEY FINDINGS



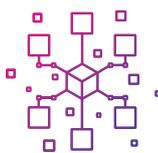
The effective application of new technologies to Asia-Pacific challenges requires increasing capabilities in interdisciplinary and international collaboration



Over 38% of research output by APRU members is collaborative internationally, a rate far in excess of Asia-Pacific and global averages, which demonstrates high connectivity within the global system of research networks



Focus on interdisciplinary research is rising globally, with recognition of the need to draw on both STEM and Social Sciences and Humanities expertise to address society's challenges. Over the past decade there has been an 85% increase in publications that mention interdisciplinarity, compared to a 31% rise in publications overall ⁽¹⁾



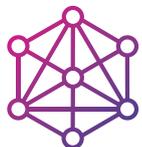
Emerging interdisciplinary models of cooperation between STEM and Social Sciences and Humanities disciplines draw on the APRU network to amplify their effect



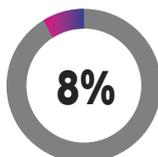
In economies where capacity is most limited, the need for Social Sciences and Humanities expertise - which takes into account unique cultural, linguistic and historical contexts - is often greatest



The share of funding for Social Sciences and Humanities disciplines has declined in most economies across the Asia Pacific, even though there is wide acknowledgement of their relevance to solving critical issues



APRU is bridging gaps in regional Social Sciences and Humanities capacity, supporting and connecting emerging researchers around the Pacific Rim to shape a more sustainable future



Cross sector collaborations have increased amongst APRU members by around 8% based on publications, demonstrating the network's growing amplification potential



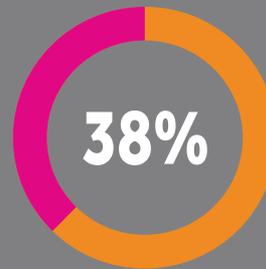
Citations are significantly above the global average, demonstrating APRU members' strength of academic performance across all disciplines including Social Sciences and Humanities and Science, Technology, Engineering, and Mathematics

⁽¹⁾ in the Scopus database

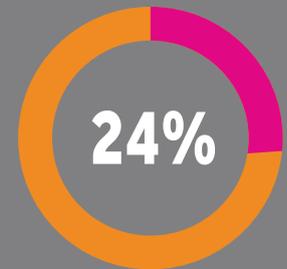
EXECUTIVE SUMMARY

Today's challenges, from climate change to migration, from health and population aging to the impact of AI, transcend borders and cannot be solved by one country alone. Yet multilateral cooperation is under threat.

For more than 20 years, the Association of Pacific Rim Universities (APRU) has brought together experts and leaders from across 17 societies. The geographical reach of APRU's network is unique as the only university alliance spanning the Americas, Asia and Australasia.



APRU member research output involves international collaboration.



The Asia-Pacific regional average comparison.

LEVERAGING NETWORK EFFECTS

This network of 50 leading research institutions provides a platform for partnerships with international organizations, governments, business, and local communities on global issues impacting the Asia-Pacific region; a region that is home to almost half the world's population and the most dynamic economies.

APRU has an extensive and diverse research capacity with over 150,000 researchers across the region, and in some disciplines, such as psychology, a surprisingly high percentage of the total Pacific Rim research capacity. Networks associated with some of the programs shown in Figure 1 provide a strong foundation of connections between these researchers and other regional stakeholders. The APRU Global Health Network, for example, now brings together over 1,000 stakeholders from over 25 economies to consider challenges such as the rise of non-communicable diseases in the region.

Through relationships of trust established over two decades, APRU is able to harness creativity and source solutions from across its membership to contribute towards solutions to existing and new challenges. A recent example in this report describes work to raise awareness of The United Nations' 2030 goals for a sustainable ocean. APRU is also able to raise the visibility of such issues, both amongst student bodies and more widely through partnerships, for example, with the media (e.g. The New York Times).

INTERDISCIPLINARY SOLUTIONS AND CAPACITY-BUILDING

The case studies in this report demonstrate how APRU research universities are responding to the complexity of global challenges by engendering new models of collaboration across the disciplines of social sciences and humanities (SSH) and science, technology, engineering, and mathematics (STEM). APRU also brings

an understanding of a wide diversity of socio-economic contexts and cultural perspectives to its interdisciplinary platforms and initiatives.

APRU members collectively have significant capacity in SSH disciplines, which increasingly intersect with STEM disciplines – not only in health policy, business, psychology and economics, but also in areas that have conventionally been thought of as the preserve of science and technology.

Members and APRU programs described here are therefore bringing together new combinations of expertise, for example: engaging the humanities to improve the sustainability of life in today's cities, or understanding how digital technology and AI will transform the future of labor. Collaborations with Google on AI provide one example of work in this area. APRU members are bridging gaps in regional capacity, and supporting and connecting emerging researchers to their peers around the Pacific Rim to shape a more sustainable and inclusive future.

OPPORTUNITIES AND IMPACT

The ability to relate research and education to international public policy means APRU has increasing relevance, reach and impact beyond academia. Holistic solutions to regional challenges require ongoing cross-sector and international dialogue. This requires structures and mechanisms to bring players together, and to build trust between those involved. Yet, in many areas, neutral international conveners are lacking. APRU maintains political neutrality without emphasis for one economy over another, and does not hold a stake in any particular solution. Through its closely-knit network, it also offers a level of dynamism and response not always possible in

larger intergovernmental organizations. The network focuses on key areas where other players are lacking, or where the group can realize the greatest impact.

With over 20 years of experience in leading interdisciplinary programs (Figure 1), APRU has long been bringing together academics, policymakers and practitioners from across the Pacific Rim. Such experience is described in detail in Chapters 2 and 4. This report provides an evidence-base of work to date, highlights the evolution of the organization, and showcases examples which may help further tap potential amongst members.

APRU PROGRAMS & INITIATIVES

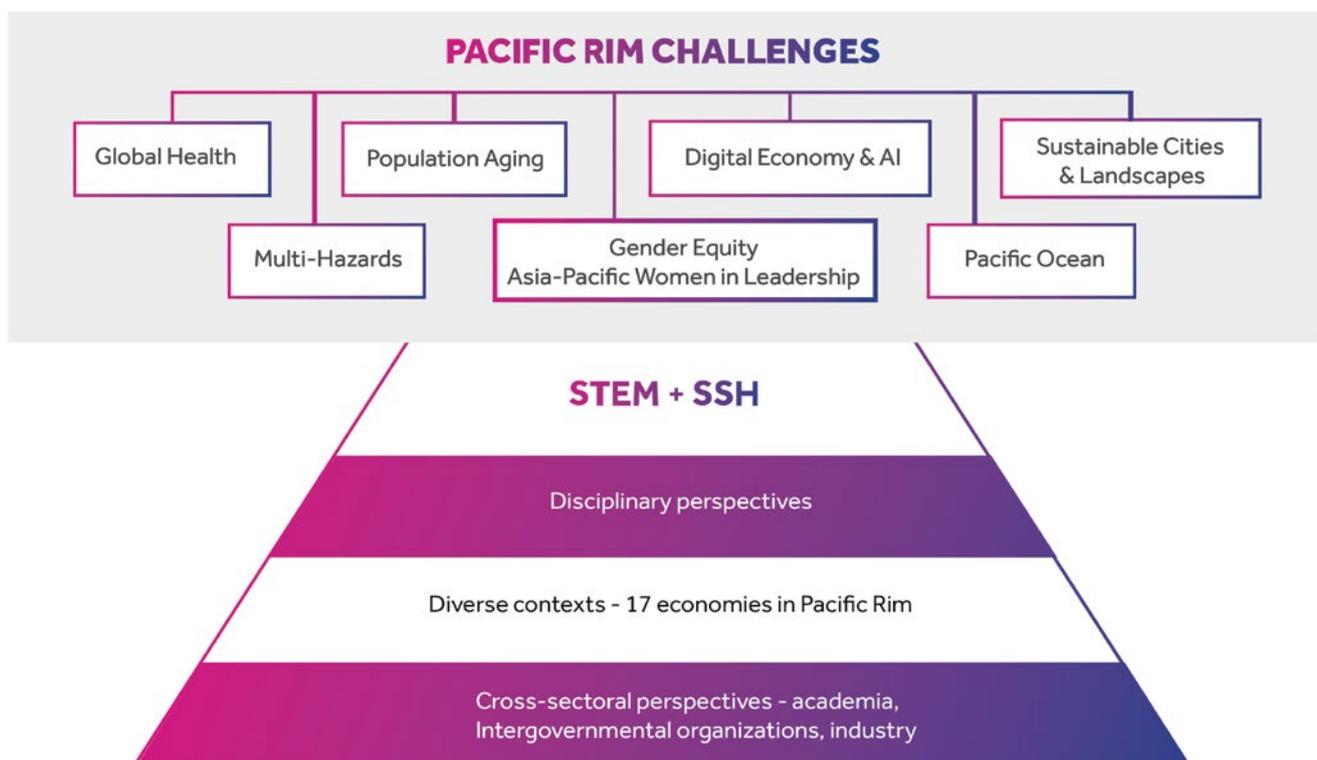


Figure 1: APRU Programs and initiatives address regional challenges by drawing on perspectives across disciplines, societies and sectors

Activities within APRU create opportunities for bright minds to come together from diverse backgrounds. Each program has its own focus, but all engage in complementary activities involving research, capacity-building, and informing policy and practice.

APRU's key advantage as a convener on regional challenges is the responsibility of its members for educating students across the region. The 2 million students currently enrolled in member institutions have a voice in society and also constitute the future leaders of government, business and industry. Through the network, institutional leaders are able to discuss the future of higher education and how to address future capacity needs, both with each other and with regional partner. Programs under APRU's umbrella work to address skills gaps and formulate

best practices for education and training (e.g. for healthcare professionals).

The network also acts as an agent of change, both through thought leadership and through example, across a range of issues. This is evidenced in APRU Presidents' commitments to gender equity developed through the Asia-Pacific Women in Leadership Program, and in statements on employee wellbeing and smoke-free campuses through the Global Health Program. One chapter focuses on the Global Health Program: an area of high importance across all economies with a strong history of interdisciplinary collaboration.

AMPLIFYING THE ASIA-PACIFIC VOICE OF KNOWLEDGE AND INNOVATION

APRU's contributions to society are amplified through external partnerships. Connections to policy, industry, and international dialogue are key points of value for the membership. At the same time, partners benefit from access to the resources of many universities through one point of contact. An essential strength of the network lies in its diversity and its ability to harness and synthesize these resources for external parties, which adds significant value.

Repeated and growing engagement with partners over time (as shown in Figure 2), highlights both the partnership value and maturing nature of APRU as an organization. It has also led to APRU members working towards building new models for collaboration to enable timely and responsive input. APRU strongly advocates for evidence-informed policy and, through such relationships, brings research to bear on policy formation.

This report offers case studies and metrics to resource the further development of effective responses to the key issues of our time by research universities, multilateral organizations, business, government, and communities acting in partnership.

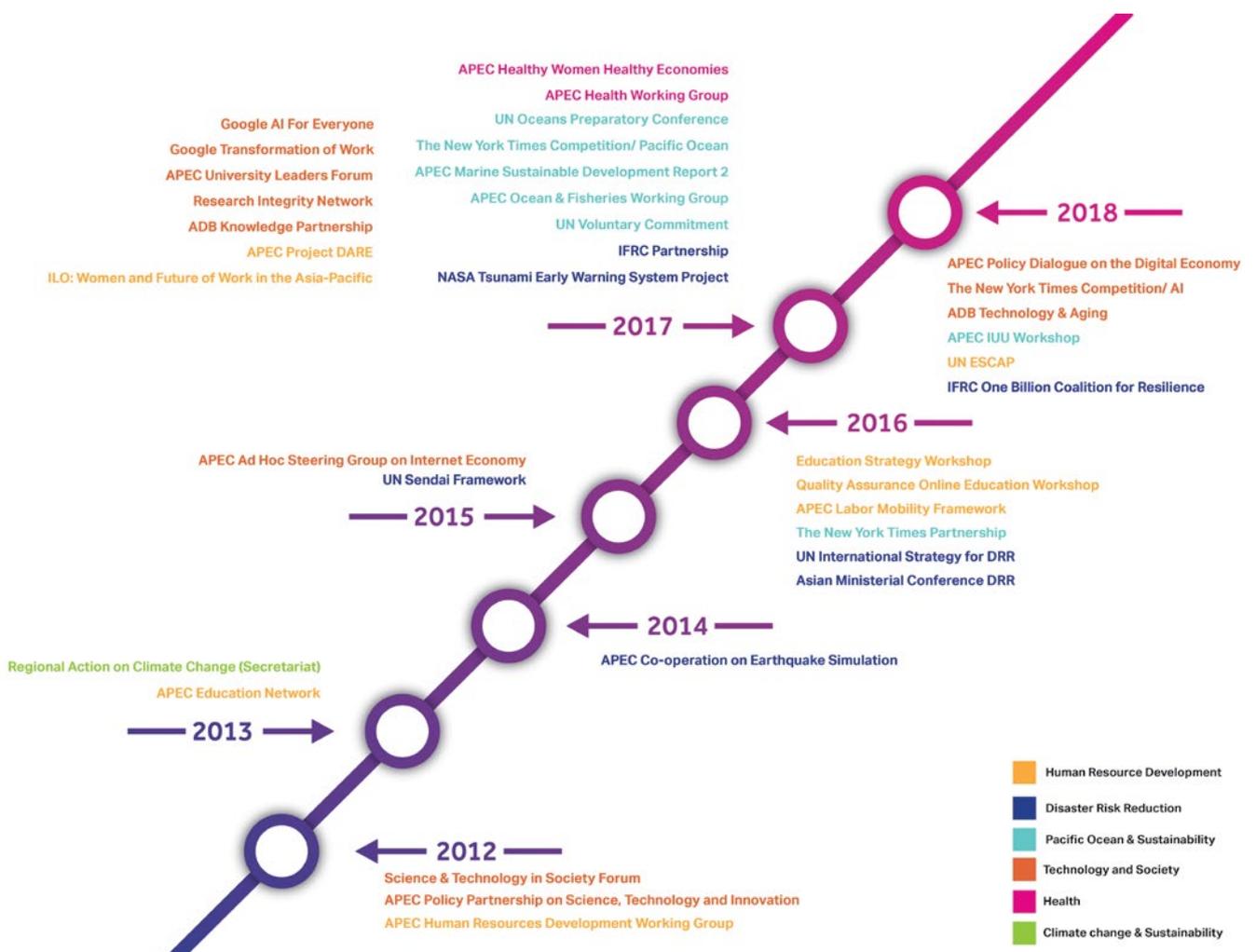


Figure 2: APRU partnerships since 2007. These have grown as the organization has matured. Colors of branches relate to each Pacific Rim Challenge (see key).



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1. INTRODUCTION: TOWARDS TRANSFORMATIVE SOLUTIONS

CHAPTER SUMMARY

This chapter provides introductory context for the focus areas in this report, **INTERDISCIPLINARY RESEARCH AND CAPACITY-BUILDING** (particularly in relation to major societal challenges for the Pacific Rim) **AND THE KEY ROLE OF THE SOCIAL SCIENCES AND HUMANITIES IN THIS CONTEXT**.

It touches on the following questions:

Why is interdisciplinary research and education important?

What are the challenges of delivery?

How can APRU help to bridge these challenges?

What challenges are the Social Sciences and Humanities facing globally and within the Pacific Rim?

This chapter also provides an overview of the Association of Pacific Rim Universities (APRU). The only network connecting leading universities in Asia, the Americas and Australasia acting as a "super-connector" for the Asia Pacific.

APRU:

HOLDS EXTENSIVE CAPACITY and expertise at its fingertips, with over 150,000 current faculty and 2 million students, and has a leadership role to play in development of future leaders and workforce for the region.

CATALYSES CONNECTIONS across economies and also across sectors, with networks of business, government, Inter-Governmental Organizations (IGO), Non-Governmental Organizations (NGO) and practitioner partners.

HARNESSES THE CREATIVITY AND DIVERSITY of its membership to move discussion into action and solutions on some of the greatest challenges facing the Pacific Rim today, such as driving progress towards the UN Sustainable Development Goals (SDGs).

1.1 Report Spotlights Interdisciplinary Impact

This is the second APRU Impact Report, which looks at the role and contributions of the Association of Pacific Rim Universities (APRU) and its members. This year APRU has focused on interdisciplinary work involving both social sciences and humanities (SSH) and science, technology, engineering, and mathematics (STEM). Within this context, we explore the important contribution of the SSH disciplines.

THE APRU IMPACT REPORT 2016, began by building an evidence base for the contribution of APRU universities, and recognizing the impact of such institutions in their societies and in the wider Asia-Pacific region. Understanding that there are many dimensions and areas of influence, the report considered the impact of APRU and APRU institutions across six main roles:

- Educators
- Societal Problem Solvers
- Knowledge Creators
- Agents of Change
- Connectors
- Innovators

The balance between these roles varies over time and depends on the cultural and socio-economic context of the institutions concerned.

The APRU Impact Report 2016 provided evidence to support statements of knowledge leadership by APRU through quantitative analysis and case studies, demonstrating the academic excellence of the network. Diversity of expertise was also evident within the group, with resulting potential for synergy and collaboration. In addition, the report took a deeper look at multi-hazards and contributions by APRU and its members in this space. Further work on this topic follows.

This second report explores in greater depth the value added by APRU as a network, and the range of activities led by the organization. This highlights the evolving role of APRU in the international policy arena as a natural convener and connector across the Pacific Rim, as a collective voice on issues of public importance, and as a synthesizer of knowledge and evidence to inform policy

and practice in the region. Chapter 2 reviews, at high level, APRU programs and activities related to a range of global issues.

The role and contribution of APRU with respect to the complex health challenges of today is also reviewed in this year's report (Chapter 4 In Focus: Global Health); specifically the need for interdisciplinary and cross-sector action.

This year's report also focuses on the importance of the social sciences and humanities within APRU and in the context of global challenges. It recognizes that the tools, skills, and techniques developed by SSH researchers have much to bring to collaboration and leadership on these topics, and to areas of high relevance to APRU as an organization: from supporting work across languages and cultures, and enabling inter-country research and data collection, to engaging meaningfully with local communities. In summary, SSH expertise should be seen as an equal partner, and not as a "service provider" to STEM disciplines.

While much recent emphasis has been placed on STEM education globally, this report also recognizes work by APRU on SSH education and its importance in the present global environment. Learning to critically interpret information in the digital age, with its constant stream of information of mixed quality and levels of bias, is paramount. This is particularly important when presented with multi-faceted issues where there may not be one solution or right answer. Challenges faced by societies require cooperation and collaboration across borders, and the cultural understanding and appreciation of others' frames of reference.

This report spotlights interdisciplinary research, education, and the contribution of the social sciences and humanities. Disciplines provide the foundations for such work. The examination of interdisciplinary collaboration builds on the value of disciplinary research and the development of specialist expertise.

1.2 APRU: A Voice of Knowledge and Innovation for the Asia Pacific

APRU brings together the presidents of 50 leading research universities across the Asia-Pacific region. The universities span 17 economies, building international cooperation, fostering talent, contributing to social and economic advancement, and developing new knowledge on the major challenges facing the region. The organization was established in 1997 by the presidents of California Institute of Technology (Thomas Everhart); University of California, Berkeley (Chang-Lin Tien); University of California, Los Angeles (Charles Young); and University of Southern California (Steven B. Sample).

The founding presidents' vision was to establish a premier alliance of leading research universities from around the Asia-Pacific region. Seeing the rapid economic integration of the region and the formation of Asia-Pacific Economic Cooperation (APEC, www.apec.org), their aim was to act as an advisory body to international organizations, governments and business on the development of science and innovation, as well as on the broader development of higher education. This vision now includes focusing new knowledge on the global challenges affecting the region.

Located initially in Los Angeles and then in Singapore, the APRU International Secretariat is now based in Hong Kong, on the campus of The Hong Kong University of Science and Technology.

APRU is the only such network which spans Asia, the Americas, and Australasia. This unique geographical and institutional reach means APRU is a super-connector, bringing the strength of diversity to solving global challenges, and recognizing that the issues we face are too great for one organization or economy to solve alone.

As an organization, APRU has extensive resources at its fingertips. Each member brings its own experts and local knowledge, and information can be accessed through the network to identify cutting-edge issues, supporting research, and analysis on topics of regional importance. Through its Partnering on Solutions Programs, for example, APRU has established networks of thousands of academics and professionals with expertise on specific topics, ranging from global health to sustainable cities (see Chapter 2). Many of these challenges are multi-faceted and require an interdisciplinary, holistic approach, often with consideration of cross-border implications. APRU embraces opportunities for the membership to provide new thinking for the international-policy community on specific objectives, such as achieving UN Sustainable Development Goals (SDGs) in the region. APRU brings original research, critical thinking, and creativity to the conversation.

Universities are uniquely placed to take the long-term view needed for research into many social problems, and to curate and document the past. Over the past 20 years, APRU has developed experience in supporting multilateral dialogue to enhance collaboration, and offers a neutral platform for discussion and exchange between economies and stakeholders (be they governments, businesses, practitioners or academics). Each institution also brings its own network of connections and foundation of work.

Organizations such as APRU have a unique role to play in creating a neutral forum for dialogue and multilateral exchange, while improving intercultural understanding. The diplomatic role of networks such as APRU is worthy of recognition, bringing stakeholders together through common goals that transcend current and historical political interests. APRU has, therefore, developed multilateral and business partnerships with global entities such as APEC (Study 1) and The New York Times (Study 10).

As an organization, APRU also advocates for evidence-based solutions, supporting data gathering and providing a common voice to inform policy and practice across the Pacific Rim. Without such a voice, lessons learned from scientific reports and findings are often not fully assimilated in societal learning environments – and as a result, changes in practice, policy and regulation occur slowly. Through advocacy for evidence-informed policy and creating platforms for dialogue, APRU offers a conduit for knowledge throughout the region.

Two million students are currently enrolled in APRU institutions; APRU brings them together across the network to collaborate and is able to raise awareness and support development of capacity in areas of public importance. These students have a voice in society, and represent future leaders in government, business, and industry. Through engagement and interaction between the leadership of the network institutions and other international agencies such as APEC, APRU offers a forum for discussion on the future of higher education, and fills gaps in capacity in specific areas of current and future need.

Finally, APRU institutions are significant employers in the region, offering the opportunity to lead policy implementation by example. For instance, APRU pioneered action on gender equality through its Asia Pacific Women in Leadership (APWiL) network. Established in 2013, APWiL operates in a framework led by a core group from nine institutions across six economies. As another example, the APRU Global Health Program has garnered signatures and support for a joint statement on employee health and wellbeing.

STUDY 1: APRU & APEC – a growing partnership

In recent years, APRU has become more deeply engaged with APEC's work in science and technology policy, human resources development, education strategies, and labor mobility and employment. Further information on these activities is described in Chapter 3. The growing strength of this relationship is highlighted through the establishment of the University Leaders' Forum described here.

APEC UNIVERSITY LEADERS' FORUM, VIETNAM, NOVEMBER 2017

APEC's annual CEO Summit and Leaders' Meetings bring together high-level government officials and influential thought leaders from across the region. In 2017, a new event was added to these meetings: the inaugural APEC University Leaders' Forum, convened by APRU.

This new forum brings together leaders from academia, business, and public policy to understand how to effectively address the diverse needs of the region. The inaugural meeting focused on the implications of the "Fourth Industrial Revolution." How, for example, can the region deliver on the promise of

technological innovation and prepare the workforce with the necessary skills? Equally important, how do we meet the ethical challenges of ensuring that the benefits of innovation are shared with those who need them most, and not only those who can pay for them?

The future requires governance structures and policy mechanisms that ensure that governments and education have the ability to keep pace with the Fourth Industrial Revolution and harness innovations that promise the greatest social and environmental returns. Through their collaborative partnership, APRU and APEC have the opportunity to:

- Bring together thought leaders from across the region and economies, leveraging the networks of both organizations
- Build partnerships for policy development and capacity building in the Pacific Rim

The inaugural meeting launched a partnership between APEC's Project DARE and APRU on data analytics education (for further information, see Chapter 2.2), and the APEC Education Strategy Action Plan—two topics of great interest for APRU.

“

APRU's contribution to APEC Human Resources Development Working Group (HRDWG) is important as we share numerous cross-cutting issues in the digital age. Changes in social and economic status and rapid technological development affect education, human resources development and labor market in the Asia-Pacific region. To overcome the challenges of globalization and digitalization, we must invite public, private, academia and other multi-stakeholders to engage in interdisciplinary collaborations on the areas of Science, Technology, Engineering, and Mathematics (STEM), Social Sciences, and Humanities, which are fundamental driving force for socio-economic growth in the fourth industrial revolution.

PROFESSOR DONG SUN PARK, APEC HRDWG LEAD SHEPHERD

”

1.3 Interdisciplinary Research and Education

BOX 1 : What we mean by “Interdisciplinary”

This report highlights APRU network examples of research and education that bring expertise from the social sciences and humanities (SSH) together with the STEM (science, technology, engineering and mathematics) disciplines. We have chosen to focus on this pairing rather than collaboration between more closely-related disciplines or sub-disciplines, such as ecology and biology, where barriers are usually lower and the history of collaboration is often strong.

In academic literature, a distinction is often made between interdisciplinary and multidisciplinary research. In multidisciplinary projects, a variety of experts may be involved, working on the same data. These efforts are in unison, rather than indicative of ongoing mutual influence, engagement and exchange between disciplines.

The qualitative research case studies provided in this report show evidence of strong collaboration, whether this is in co-design of the project, mutual influence on research outcomes, or shared expertise in communication with stakeholders. In this way, these projects and programs can be described as truly interdisciplinary. These cases also illustrate the added value from such efforts. Through interviews, researchers noted the importance of the time needed to establish relationships and understand the incentives and challenges faced by researchers collaborating across disciplines or economies.

Ultimately, this investment has paid off in the quality and relevance of their work.

WHAT DO WE INCLUDE UNDER STEM, SSH, & RELATED DISCIPLINES?

The definition of STEM and of SSH vary between jurisdictions. For example, The National Science Foundation in the USA, currently includes social sciences among the STEM sciences. This, however, is not common in many other regions.

In this report, we include under STEM the life and physical sciences, technology, engineering and mathematics. Under social sciences, humanities and related disciplines, we include the arts, business, management studies, psychology, and economics. This is not to advocate for any particular definition but to aid in the interpretation of data and case studies in this document.

Disciplines are, in reality, dynamic and permeable. When collaboration between disciplines becomes routine and a new lexicon develops, barriers between previously separate and distinct fields may become imperceptible over time. New areas may emerge, as did bioengineering from the previously distinct fields of biology and engineering. In some cases, these new fields may even transcend the boundaries of STEM and SSH disciplines.

In today's complex, interconnected world, solutions to society's greatest challenges cannot be realized from the perspective of one discipline alone; expertise from STEM and SSH must be combined. Collaboration between traditional STEM and SSH disciplines is paramount if new solutions are to be developed and knowledge is to be appropriately applied. Social aspects are core to many global challenges - from climate change to terrorism, from urban sustainability to healthy aging. As discussed in Study 2, leadership from the social sciences brings added benefits, such as community-based participatory research. Work described here is collaborative both in design and in practice. Further examples of interdisciplinary research between APRU partners can be found in Chapter 2 and throughout this report.

Interdisciplinary research faces major challenges, notably:

- Language differences between STEM and SSH subjects
- Unequal budgets
- Responsibilities and different key performance indicators for promotion of faculty

- Unspoken perceived hierarchies between different research areas and methods
- Difficulties in obtaining funding for research that does not neatly fit within the usual definitions and funding programs

Despite these barriers to collaboration and additional time requirements for those involved, APRU members exemplify the value added from interdisciplinary research.

As a collective, APRU brings experience working across international boundaries—in heterogeneous cultural and historical contexts—and brings this experience to analogous challenges of collaboration between STEM and SSH researchers. APRU programs and initiatives are also typically mission-oriented and interdisciplinary in nature, focusing on the challenge at hand and partnering on solutions that work across both real and conceptual boundaries. Each program has its own strengths, mode of operation, and impacts as described in Chapter 2.1.

STUDY 2: Adapting to climate change: understanding community response and perception of risk

Researchers at APRU member institutions, The University of Auckland and The University of Sydney, are collaborating on a project exploring how rural communities living in disaster-prone river basins of Cambodia and Fiji respond to increasing climate-induced hazards. This work brings together quantitative, qualitative, and participatory research methods, bridging “academic” and “action-based” research. The importance of integrating the social and physical sciences is evident throughout this project, which was funded by the Asia-Pacific Network for Global Change Research. While researchers at The University of Sydney model the biophysical processes of hazard events, their colleagues from The University of Auckland examine local adaptation strategies.

Hazards can be quantified, observed, and mapped; but without an understanding of how communities perceive and respond to risk, appropriate lessons for adaptation cannot be drawn. In Fiji, for example, research has found that the loss of ancestral and cultural space through relocation is considered a greater risk than the occasional flood or cyclone. In Cambodia, seasonal events associated with risk, such as flooding, bring benefits to a community if well managed, such as killing rats and other pests while replenishing soil fertility.

The grounding from social science leadership from the outset has ensured recognition of the cultural, social, and political aspects of climate change adaptation, and has also facilitated the fieldwork and participatory research to engage communities and local stakeholders. The project approach is to recognize the expertise of local people in adapting and managing hazards. The researchers do not go into a community and tell that group how to adapt. This is particularly important as many communities are living in multi-hazard environments and solutions for one risk may exacerbate another; something that local solutions and values take into account when considering multiple risks. Building two-story homes, for example, temporarily addressed flood risk for some Fijian communities, but unlike local traditional structures, many of these collapsed in the face of Cyclone Winston in February 2016. Researchers are recognizing the value of local knowledge and taking lessons from local communities for strategies to manage disasters with solutions appropriate to the level of resources available.

The project involves time-intensive participatory research and community engagement. Through innovative approaches to human capital and resources, the team is also producing traditional academic outputs and policy-relevant materials. Dissertations have been translated into local languages and local expertise is used to develop reports useful for rural communities. Co-production of policy briefs with local counterparts and with input from the interdisciplinary team is just one example of how this group is working to inform policymaking in a local context.

APRU INSTITUTIONS: The University of Auckland; The University of Sydney

OTHER PARTICIPATING INSTITUTIONS: University of Western Australia; University of the South Pacific - Fiji; Royal University of Phnom Penh; Ministry of Rural Development - Cambodia



Participatory hazard mapping in a Fijian community (Photo: A. Neef)



Traditional bure in Fiji that withstood the force of Cyclone Winston in 2016 (Photo: A. Neef)

While there is increasing political focus on interdisciplinary research in connection with societal challenges, this is not the only motivation for collaboration between disciplines. New breakthroughs can arise by examining problems from new perspectives—from the application of existing methods to new areas, and from the pooling of expertise. Many strengths within APRU, highlighted in Chapter 3, are in disciplines which

bring together regional strengths in STEM (engineering, neuroscience) with the social sciences, such as history and philosophy of science, and psychology. Study 3 is an example of collaboration between APRU institutions across strengths in STEM and SSH, and of using technology to explore fundamental questions around the human condition.

STUDY 3: Cognitive developmental robotics – understanding the human mind

Some of our most fundamental questions as human beings are: Who are we as a species? What do we understand about being “human”? What distinguishes us from animals? How do we develop through childhood? And what does this teach us about the workings of the human mind? Psychological and behavioral experiments using robots and brain imaging are shedding new light on these questions. The work brings together APRU expertise in the fields of robotics engineering and computational modelling (from Osaka University) and studies in psychology (from University of Washington). Additional contributions from experts in neuroscience and brain imaging, pedagogy, cognitive science and philosophy formulate this interdisciplinary research team.

Researchers are investigating brain behavior in different social contexts. One study examines how we might interact in the future with robots designed to assist us in performing tasks. Some of the group’s experiments explore when a robot should take initiative during joint human-robot task execution, and to what extent people collaborate with robots with different attributes: is the robot proactive in assisting in tasks? Work considers the social aspect of this relationship.

A bigger challenge involves the development of human infant cognition. Due to ethical constraints on the participation of infants in studies and their inability to communicate verbally, research in this area is difficult. Nevertheless, research on the early stages of life has provided some insight into our development of self-awareness and the importance of this developmental influence on social behavior for the rest of one’s life. Recent research shows, for example, distinctive brain activities in autistic children when non-verbally

interacting with their mothers. New findings will provide important insights into the human condition.

The group explored the use of robots as a proxy by designing a robot to imitate a human infant. This robot has subsequently been used in experiments to understand interactions with caregivers.

Each discipline has its own approach to the questions, and all disciplines share the common goal of understanding the human cognitive process. The knowledge and findings in psychology and cognitive science are very useful in guiding the design of a robotic mind. Neuroscience is needed to build the neural architecture in the robot brain, and engineering and computer science are necessary to design and implement the models.

There are many ongoing lessons from such collaboration, and intensive discussion among the researchers from different disciplines is required. Differences in education and accepted terminology can lead to difficulties among experts—for example, the term “control” in engineering refers to physical control of the robots, while psychologists refer “control” as the base-line condition for comparison in an experiment.

In summary, technology, used wisely, has the potential to provide us with tools to further understand the human condition. Combining this power with expertise from the social sciences promises to open paradigm shifts in the future.

APRU INSTITUTIONS:

Osaka University; University of Washington

APRU members are also innovating with interdisciplinary education, exposing STEM students to the social sciences and humanities, and enhancing cultural understanding through international exchange. As an organization, APRU facilitates the exchange of innovative concepts in education through APRU’s Education and Research Technology (ERT) forum, and

also supports regional mobility, offering integrated access to information on opportunities in the network and region.

There is a balance between supporting breadth and developing sufficient depth of understanding. The latter requires some degree of specialization, while the balance varies depending on local challenges, opportunities for local employment and the

interests and strengths of each institution and student. Benefits for interdisciplinary education and associated opportunities include:

- Better understanding of the wider context surrounding challenges and their complexity in a real-world context. Often these issues require consideration from multiple perspectives, e.g. social, environmental, economic, ethical and technological.
- Improved understanding of the language of other disciplines, enabling future exchange and interpretation of evidence from other areas, which, in turn, improves adaptability and flexibility.
- Exposure to “different ways of knowing” new methodologies and approaches to problem-solving, enhancing critical thinking and understanding of bias or potential preconceptions.
- Increased recognition of and exposure to the value of interdisciplinary connections.

APRU institutions have been innovating their educational models. Some, for example, have introduced interdisciplinary studies programs, where students may enroll in courses regardless of traditional disciplinary boundaries. Others have sought to increase students' breadth of knowledge by facilitating enrollment in courses beyond their core disciplines or offering exposure to interdisciplinary research.

Study 4 examines the challenge of introducing changes and encouraging interdisciplinary education, focusing on one member's efforts to overcome these challenges within their own cultural context.

STUDY 4: Teaching beyond the test: encouraging interdisciplinary education

In Seoul, university entrance tests are considered so important that aircraft are rerouted and company employees are encouraged to go to work late on exam days to ease traffic in the streets of Seoul, reducing the chances of students being distracted or arriving late. Korean students apply to university through one department and, unlike counterparts in some other countries, changing disciplines is typically difficult. In this highly-competitive environment where education paths are selected early, how can students be encouraged to take courses beyond their comfort zone?

APRU member Korea University (KU) is implementing initiatives and policies to provide more interdisciplinary education for students. For STEM students, subjects such as social sciences and humanities, where there is typically not one “right” answer, can be daunting. By shifting the attitude of students, increasing exposure to other cultures and providing a more well-rounded education, KU hopes its students will become more entrepreneurial and better prepared with the foundational skills they will need in a new global work environment. These include:

- Abolishing straight-A scholarships while investing in needs-based and other scholarships, encouraging students to take risks by picking courses for more than just grades.
- Offering programs, such as China Global Studies, to expose students not majoring in Chinese or China Studies to aspects of other cultures during their semester breaks. Over their semester

breaks, students visit Chinese partner universities to study various topics including language, cultural studies, business, politics, media studies, economics and law.

- Establishing interdisciplinary programs and constructing new buildings and facilities for students and faculty to promote exchange and dialogue between disciplines at a social level, as well as at academic and professional levels.

In a country such as Korea, which takes great pride in and has great hope for its education programs, this can seem revolutionary. Korea is the world-leader in per-household spending on private tertiary education.

APRU INSTITUTION: Korea University



The shifting nature of higher education, with new opportunities for online and hybrid teaching, offers new ways to combine expertise from instructors across a range of disciplines. Chapter 3.2 describes activities by APRU and APRU members in this space. Study 5 describes how three APRU universities are working together to offer international education opportunities and enhance intellectual and intercultural breadth of education

for the potential leaders of tomorrow. Virtual activities and courses can potentially reach an even wider audience. Courses such as those created by APRU's Global Health Program (Chapter 4.2) are also relevant in this context. These courses bring together expertise from across disciplines, sectors and geographies to reflect on some of today's greatest and evolving challenges.

STUDY 5: Educating global citizens and leaders across three countries

Since 2008, three APRU universities (Yonsei University in Korea, Keio University in Japan and The University of Hong Kong) have collaborated to offer a unique study abroad program known as the 3 Campus East Asia program. Student participants experience, analyze and comprehend East Asia from a genuinely comparative perspective by living and studying as a multinational and multicultural community at all three campuses over one year.

The program is offered to students of all disciplines, and while the majority of those enrolled are oriented toward the social sciences and humanities, engineers and science majors have also participated. The core subjects are Japanese societal and historical background, Korean modernization and political-economy studies in Hong Kong. Multidisciplinary education is combined with elective subjects chosen by the students. The final summer internship in Hong Kong with local non-governmental organizations

(NGOs) or their equivalent, offers exposure beyond the classroom.

The success of the initial program led to its expansion to students from other institutions in 2013. Today, students from eight partners across the globe participate, including APRU member University of Southern California. Value extends beyond the curriculum for both the participants and the institutions themselves. Relationships forged through networking act as a valuable bridge between the three hosts, and between East Asia and the West. It is hoped that the program will equip alumni with the intellectual and intercultural breadth and depth needed to become future global leaders in the Asia-Pacific region, and citizens of our increasingly global community.

APRU INSTITUTIONS: Yonsei University; Keio University; The University of Hong Kong

1.4 Social Sciences and Humanities in Asia Pacific

The social sciences and humanities are essential for comprehending our social, political, economic and environmental context; understanding different perspectives, languages and cultures; critiquing society and its conventions; and contesting historical assumptions. At a time of rapid change, technological innovation, tensions and conflicts, and political or commercial attacks on academic values, the social sciences and humanities not only are a vital resource but they are also creatively crossing many traditional boundaries to work with science and technology disciplines on global issues, developing new strengths and insights in the process.

The need for the SSH disciplines is highlighted by the ubiquity of digital media, developments in artificial intelligence and the use of "big" data. Social implications from these issues are unknown and likely to be pervasive. Understanding them requires us to pose the right questions, then interpret and validate the results. This requires knowledge, skills, and insights

applied across disciplinary boundaries - from both the SSH and STEM perspectives.

This report highlights the role of SSH research in relation to diverse topics - from global health, climate change, food security, and response to disasters, to the digital economy, and questions of governance across borders. Case studies presented range from adaptation to climate change (Study 2) to artificial intelligence and the internet (Chapter 2.2).

Education in social sciences and humanities is critical as we seek to interpret and act upon our understanding of today's world, with its unprecedented volume of information from unreliable sources with varying quality. Today's students will address tomorrow's conflicts arising from the politicization of divergent religious and cultural views, and of migration and other global issues that transcend borders, such as climate change.

Challenges and Opportunities

The social sciences and humanities have lost funding at many universities in recent decades. Following the 2007–2008 Global Financial Crisis, many institutions faced increasing pressure from public funding authorities to deliver short-term results. The latter are often determined by measures that can be easily counted (such as publication outputs in high-impact journals) and, frequently, are inappropriate for the social sciences and humanities disciplines. Technological applications are often more easily recognized as impactful.

Yet, in most disciplines, new knowledge is often cumulative rather than a “breakthrough” discovery; patenting is not relevant in many cases, and bibliometric data out of context can be misleading. SSH and related disciplines generally require less technical, visible infrastructure. Low technology solutions may have similar, or in some cases, greater impact, (Studies 2 and 25 for examples). Nevertheless, such achievements are often less glamorous or politically visible. For other areas of research, the linear relationship between impact and social innovation can be particularly difficult to trace.

It is important to recognize that diversity within the social sciences and humanities means the issues mentioned above do not affect all subjects in the same ways. In addition, professional schools are often included within the social sciences and humanities, but are quite distinct from scholarship (including law, business, education, public administration, journalism), impacting metrics that disregard context.

Therefore, in this report, we recognize the limitations to quantitative data in SSH disciplines through contextualizing information and benchmarking within, rather than between, disciplines. Personal interviews and case studies are used to provide qualitative evidence of impact and success.

Some challenges held disproportionately by the social sciences and humanities have led to innovation and strength. These include, but are not limited to, requirements to work in local languages or multiple languages, increased interaction and engagement with local communities and stakeholders, and challenges of comparing data and results across cultural frames of reference.

Chapter 3.1 presents specific examples and associated case studies.

A new emphasis on liberal arts education in some countries emerges from concern that students focused on STEM subjects or business studies are more programmed, rather than broadly educated to have a deeper understanding of society and be creative in their chosen careers. It has yet to be seen whether these efforts are productive or align with other national objectives in societies where individual freedoms may be circumscribed by culture or politics. Nevertheless, the value placed on SSH by these policymakers can be viewed as recognition of their significant role in comparison to countries that have disinvested in these disciplines and implied their irrelevance.

This variation in approaches to SSH also indicates an inflection point for SSH disciplines, which now have the prospect of greater influence on the big questions facing society, provided they are open to new forms of interdisciplinary collaboration and are not diverted by policing disciplinary boundaries.

Social Sciences and Humanities Capacity in the Asia Pacific

Social sciences and humanities capacity is highly variable across the Asia-Pacific region, in part reflecting the disparate history of political support and funding for these disciplines. As noted above, some funding authorities have acknowledged the importance of these disciplines and recently increased funding in this space³, including some that have historically focused on STEM disciplines, such as China and Singapore. In many other jurisdictions, however, the share of funding for SSH disciplines has declined. Emphasis on STEM education is also having an unforeseen effect on SSH faculty, both in terms of research and teaching capacity.

Networking and collaborative projects are key to bridging the capacity divide in

the region, both today and in the future. This is essential if local viewpoints are to be reflected in international discourse. Many low- and middle-income countries, or small states where capacity is most limited, are particularly in need of SSH expertise that takes into account their unique cultural, linguistic and historical context. Global organizations such as UNESCO⁴ have highlighted this need and the importance of regional connectivity if the current status quo is to be shifted.

In many economies, APRU institutions provide key educational and research capacity, not only in their immediate surroundings, but also to other countries in the region. This includes, for example, training and support for local researchers (Studies 12, 24 and

27). Such researchers also benefit from connectivity within the region. APRU acts as a natural super-connector across the Pacific Rim, enhancing connections and enabling participation of researchers from APRU’s membership and beyond. APRU also connects the management and leadership of member institutions to reflect on curricula, capacity development, regional gaps and potential ways to address these.

Historically, the Pacific Rim, has been strong in STEM disciplines, and the higher volume of research typical from these disciplines is also true for APRU institutions. Equally SSH output from APRU is of high quality and, in a regional context, APRU expertise is significant. Bibliometric analysis also shows that

³ In November 2016, for example, Singapore announced a major rise in funding for SSH research worth S\$350 million (US\$252 million) over the next five years - an increase of 45 percent compared to the Ministry of Education spending on research in these areas over the previous five years. In

China, the budget for the social sciences and the humanities, including teaching and research, has been increasing.

⁴ 2010 World Social Science Report: Knowledge Divides. UNESCO Publishing.

the trend for APRU research in the social sciences is increasing in global publications over time (from, on average, 5.7 percent in the late 1990s⁵ to 7.1 percent today⁶).

From an educational perspective, Pacific Rim economies show some diversity in

graduate production by discipline (Figure 4). While APRU members are leaders in their local settings, they also benefit from the expertise and experience of others in the network. This is particularly evident in courses developed and offered across multiple institutions, such as the

Global Health Ethics course developed by APRU's Global Health Program (Chapter 4). APRU member institutions deliver training that draws on established skills and expertise from SSH disciplines, and are also innovating new applications, methods, and teaching approaches (Studies 17 and 18).

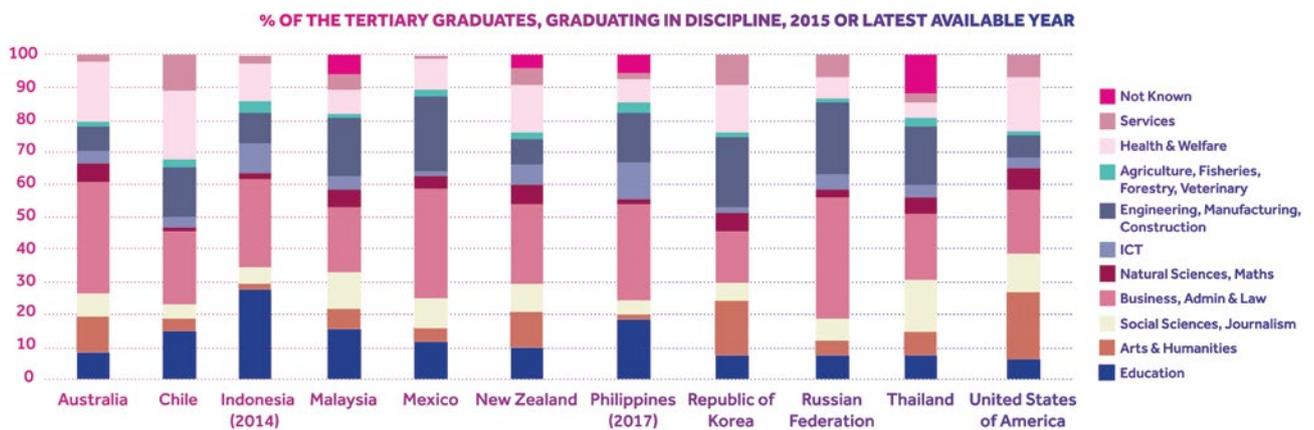


Figure 3: Production of students by discipline in the Pacific Rim. (Countries with available data, UIS Statistics)

⁵ Four year average 1997-1999 inclusive, based on Scopus data.

⁶ Four year average 2014-2017 inclusive, based on Scopus data.

2. INTERDISCIPLINARY COLLABORATION WITHIN APRU CHAPTER SUMMARY

Working between disciplines, sectors and cultures requires a strong foundation. APRU's leadership- and knowledge-base provides credibility, enabling the organization to catalyze dialogue and action on topics of regional importance. APRU has:

- Two decades of experience in bringing together interdisciplinary expertise to address regional challenges, and of building trust and relationships to define common goals between its members and networks. The organization's strength lies in bringing together diversity and harnessing creativity from different intellectual, cultural and sectoral perspectives.
- Immense potential to spread awareness on issues of public importance throughout the Pacific Rim.
- The ability to influence the direction of future education and training to enable the region to meet emerging challenges and raise capacity.
- Institutions with strong cross-sector connections, some with strong government relations, and others with rich links to business or medical institutions. Individually, these networks are valuable, and when leveraged further through the APRU network and activities, the opportunity for regional impact increases substantially.

This chapter describes APRU programs and initiatives, providing evidence to support these statements and demonstrate the evolution of the organization over time. Strategic partnerships have grown in number and their mutual value is highlighted not only by repeated engagement, but in the increase in commitment and depth of activity from both sides.

The chapter concludes with quantitative data on collaboration between APRU members (interdisciplinary and cross-sector).

2. Interdisciplinary Collaboration within APRU

Many challenges of international collaboration - for example, cultural and language barriers, different budgets and priorities, and issues with funding across borders - are also analogous to some of the challenges facing interdisciplinary research teams. APRU has 20 years of experience working to overcome these challenges to develop fruitful collaborations. The cultural diversity of the network offers opportunities for creative approaches to problem solving, as well as challenging preconceived ideas. APRU catalyzes exchange and synthesizes findings to facilitate further discussion and action. The organization acts as a collective voice of knowledge and innovation in the region and offers

a single point of contact, facilitating strategic partnerships with other key international organizations such as APEC and the United Nations.

This chapter looks at existing and recent APRU programs, and potential opportunities for future interdisciplinary collaboration and partnership within and beyond the network.

APRU's academic performance is very strong across all disciplines, for SSH as well as STEM subjects. All have citations significantly above the world average in their field, as shown in Figure 4. Psychology, a discipline often at the intersection between STEM and SSH, is

one area where APRU members produce both high volumes and highly cited research.

In terms of volume of output relative to the rest of the world, Figure 4 shows APRU reflecting the emphasis on STEM in the Pacific Rim. In areas such as Arts and Humanities and Social Sciences, APRU still contains a high share of the total capacity and publications in the Pacific Rim. The specialization is therefore reflective of the overall region and several SSH strengths observed within APRU are also in subjects which bridge STEM and SSH disciplines (Chapter 3.2 for further information).

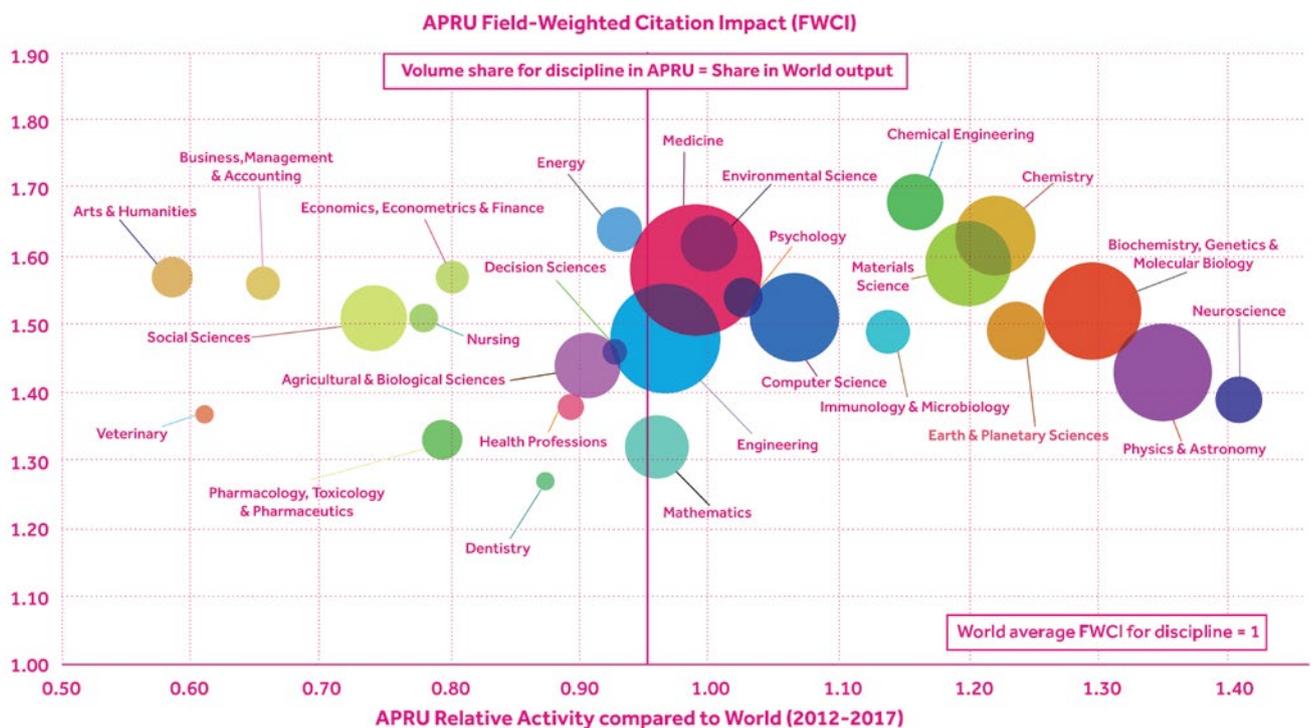


Figure 4: APRU research specialization by discipline (based on publication citations and volume). All disciplines are cited well above the global average. APRU produces a higher-than-expected volume of output in many STEM disciplines.

2.1 APRU Programs: Transformative Solutions to Asia-Pacific Challenges

Over the past decade, APRU Partnering on Solutions Programs have brought together regional expertise, taking an interdisciplinary approach to addressing regional challenges. All have slightly different modes of operation and ways of achieving impact. For example, each initiative has a different balance between research, capacity building and policy activities; although each program contains some activities in each of these three pillars.

Here we review some of the main programs within the APRU network. The following table highlights some key features of five current/recent programs. A further detailed consideration of the Global Health Program is also included in Chapter 4 of this report.

CHALLENGE	DIGITAL ECONOMY	GENDER EQUITY (APWIL)	GLOBAL HEALTH
STRENGTHS OF THE PROGRAM INCLUDE:	Industry engagement	Ability to realize change within network	Size and breadth of network (over 1,000 health experts), educational activities
RANGE OF INTERDISCIPLINARY EXPERTISE INVOLVED IN STRATEGIC DIRECTION OF PROGRAM INCLUDES:	Computer science, system engineering, artificial intelligence, innovation, business models, policy and regulation, international relations, politics journalism, international security, law, philosophy.	Leaders from across disciplines & from university management: chemistry, engineering, international business, law, medicine, executive management, international affairs	Medicine, public health, epidemiology, environmental health, anthropology, sociology, education, economics, international governance
LEAD INSTITUTION	Keio University (Since 2015)	The University of Auckland (Since 2013)	University of Southern California (Since 2013)
CORE MEMBERS/ PARTICIPANTS	Tsinghua University; Keio University; KAIST; Korea University; Yonsei University; Kyoto University; University of Indonesia; University of Malaya; University of California, San Diego; Stanford University; UNSW Sydney	Keio University; The University of Tokyo; National Taiwan University; Osaka University; The University of Auckland; University California, Los Angeles; University of Oregon; UNSW Sydney; Waseda University; University of California, Davis	University Southern California; The University of Auckland; UNSW Sydney; The University of Tokyo; The University of Tokyo; National Taiwan University; University of Indonesia; Seoul National University; University of the Philippines; Fudan University; The University of Hong Kong; University of Hawai'i at Mānoa; National University of Singapore
PROGRAM ESTABLISHED	2015	2013	2007
FURTHER INFO:	Chapter 2.1	Chapter 2.1	Chapter 4

Pacific Ocean is the latest program in development. For more information, see Chapter 2.2.

While each program or activity is described here individually, in reality there are intersections on many topics: between population aging and

Participants identify the need for such programs specifically due to:

- The lack of alternate connections between academia, policymakers, business and practitioners, enabling dialogue across borders.
- Limited or slow assimilation of research findings and lessons learned into change in policy and practice.
- Lack of holistic, interdisciplinary research into regional challenges and unequal input and/or gaps in data within the Pacific Rim.
- Future need or gaps in existing capacity to address emerging issues.

Overcoming these challenges requires a strong foundation of research to gather evidence to inform policy choices or develop new solutions. The issues transcend borders, and our understanding and response to them can also benefit from doing so. Many issues, however, such as data sharing or consideration of cross-border effects, are sensitive and require established trust between parties. The programs and their networks provide a foundation and connections for this work.

Each program brings together expertise from across the region geographically and from a diverse set of disciplines. In most programs, an advisory group of intellectuals from a range of backgrounds provides strategic oversight for the direction of activities.

MULTI-HAZARDS	POPULATION AGING	SUSTAINABLE CITIES & LANDSCAPES
<p>Policy & international knowledge exchange activities</p>	<p>Policy input</p>	<p>Collaborative research (interdisciplinary and cross-sector)</p>
<p>Climatology, earthquake engineering, hydrology, flood risk, earthquake physics, tsunami engineering, risk assessment, building safety, economics, education, monitoring, communication humanitarian disaster response</p>	<p>Social policy, demography, gerontology, cognition, health policy, sociology, social psychology, labor economics, migration, pension finance,</p>	<p>Landscape architecture, planning, architecture, human ecology, environment, sustainability, law, sociology, public policy, geography</p>
<p>Tohoku University (Since 2013)</p>	<p>UNSW Sydney, (2014- 2017) Keio University (Since 2018)</p>	<p>University of Oregon (since 2016)</p>
<p>Tohoku University; Chulalongkorn University; Tsinghua University; University of California, Davis; University of Chile; University of Hawai'i at Mānoa; The University of Tokyo; National Taiwan University; University of the Philippines</p>	<p>UNSW Sydney; The University of Tokyo; National University of Singapore; University of Southern California; The University of Sydney; The University of Melbourne; The Hong Kong University of Science and Technology; University of Indonesia; Keio University; Zhejiang University</p>	<p>Tsinghua University; National Taiwan University; The University of Hong Kong; UNSW Sydney; Australian National University; The University of Auckland; University of Chile; University of Hawai'i at Mānoa; University California Los Angeles; University of Oregon and University of Washington</p>
<p>2005</p>	<p>2009</p>	<p>2016</p>
<p>Chapter 2.1 & APRU Impact Report 2016</p>	<p>Chapter 2.1</p>	<p>Chapter 2.1</p>

Multi-Hazards Program

The Multi-Hazards Program responds to research gaps on causes, consequences and disaster risk reduction (DRR) from multi-hazards in the Pacific Rim. This program recognizes the need for further DRR capacity in the region. A particular strength of the program is its cross-sector partnerships. The program leadership has built strong connections from the outset and work by the group in promoting evidence-informed policymaking continues to this day.

The topic of multi-hazards and DRR was a focus of the APRU Impact Report 2016. That report contains information on the importance of this issue in the Pacific Rim, where 3.2 billion people were affected and 423,000 lives were lost due to natural disasters between 1990 and 2015. The 2016 report began to highlight APRU's academic strength in this area. Since then, APRU has collaborated with Elsevier on a global study on disaster research: *A GLOBAL OUTLOOK ON DISASTER SCIENCE, NOVEMBER 2017*, which further highlights APRU's scholarly output in this area.

As highlighted in the 2016 report, the program began engaging with UN policymaking processes from the outset. This included involvement in the UN World Conference on DRR (Sendai, March 2015)⁷ to improve DRR in Pacific Rim societies. More recently, APRU was intimately involved with the inaugural World Bosai Forum in November 2017, part of Japan's commitment to implementing the Sendai Framework and bridging the gap between DRR research and ground-level implementation. APRU showcased examples of how research networks are reaching out to corporate and government actors to further DRR. The network also signed a memorandum of understanding with the International Federation of Red Cross and Red Crescent Societies (IFRC) at the event, signaling the beginning of collaborative efforts. The IFRC and APRU agreed to support cross-sector research, aiming to implement disaster science and to work together beyond research to pursue DRR advocacy in forums such as the Asian Ministerial Conference on DRR.

Since 2016, the APRU Multi-Hazards Program has also organized technical, thematic and side events at various other events in partnership with the United Nations International Strategy for Disaster Reduction (UNISDR). The APRU Multi-Hazards program director played a key role in the preparation of UNISDR's first Asia Science and Technology Conference on Disaster Risk Reduction - from input on the initial design, and speakers to summarizing outcomes. The conference brought together key policymakers and representatives of scientific organizations, strengthening the interface between science and policy.

APRU also collaborates with other relevant groups throughout the region, including work with the Asian Disaster Reduction and Response Network, and holding a Regional Innovation Forum for disaster risk reduction (Bangkok, December 2016).

Complex issues like DRR often require input from actors across multiple levels and sectors to identify appropriate, practical solutions. These examples highlight the role of networks such as APRU in convening and supporting multi-stakeholder collaboration on societal challenges, acting as a super-connector to bring together regional interdisciplinary initiatives on DRR. It also highlights APRU's willingness and ability to partner with other key players. The value of these strategic partnerships is echoed by their growing strength and number.

One recent example of collaboration is in the area of hazard early warning systems. Issues such as these require data sharing and trust between centers and jurisdictions as such events have no concern for national boundaries. The organization's strength as a connector is highlighted in the 2016 report through three examples involving APRU members: Tohoku University; University of California, Davis; University of California, Irvine; University of California, Berkeley; California Institute of Technology; University of Oregon; University of Washington; University of Hawai'i at Mānoa, and National Taiwan University.

⁷ See APRU Impact Report 2016, page 30 for further information on APRU's work on the Sendai Framework for DRR.

Previous cases moving forward: early warning systems

NEW PARTNERSHIPS & IMPACT

In the APRU Impact Report 2016, Study 19 highlighted work by University of California, Davis (UC Davis) and APRU collaborators on tsunami early warning systems. UC Davis, as a key member of the Multi-Hazards program, has helped develop new partnerships on this topic, including establishing links with NASA. Such relationships are essential if research is to support action in the region.

In July 2017, the Multi-Hazards Program collaborated with NASA, the Global Geodetic Observing System and APEC on a workshop to discuss the potential for tsunami early warning systems using the latest global navigation satellite system data and associated new experimental techniques. Researchers from APRU helped provide important clarity on the usefulness of the technology, and as a takeaway action will provide analysis to understand the minimum and optimum number of sites for implementation. Successful application also requires capable analysis centers, product assimilation into existing infrastructure, reliable communications and data sharing. Here, the APRU community has agreed to partner with different groups to promote data sharing (APEC), develop plans for data streaming (GNSS community), and identify further partnerships.

Regional sharing of lessons learned following disasters has also been a core part of the program since its inception. Study 6 presents an example of such a collaboration between members of the APRU Multi-Hazards Program, University of Hawai'i at

Mānoa and the International Research Institute of Disaster Science (IRIDeS) at Tohoku University in Japan, which lead the program. A further example of interdisciplinary research by program leader IRIDeS can also be found in Study 15.

STUDY 6: Communicating disaster science

Regionally, it is important to exchange knowledge and learn from rare, unexpected, high-impact events such as the 2011 Great East Japan earthquake and tsunami. These "black swan" events offer lessons for improving our understanding of how our physical world operates and the human response to such disasters.

University of Hawai'i at Mānoa started working with colleagues at IRIDeS, Tohoku University in the immediate aftermath of the Great East Japan earthquake in 2011. Strong academic, policy and community links have been built over the last six years between Hawai'i and Japan.

The Communicating Disaster Science 2016 conference, held in Hawai'i, covered topics including:

- How tsunamis are formed, modelled and tracked.
- The impact of tsunamis on the design of buildings and communities, including changes in Hawai'iian inundation zones and seawalls in Japan.
- How to increase community awareness of both preparedness and disaster response, including challenges to news and social media.
- Disaster storytelling and preservation of memories - an important communication tool

to highlight appropriate response in the event of crisis and to maintain awareness.

Enabling community resilience and designing appropriate response strategies require a synthesis of scientific evidence, policymaking and engagement of the local community. The conference connected a variety of stakeholders from across two nations.

COMMUNITY ENGAGEMENT is vital on this topic and was evident throughout the event. Japanese high school students who had been visiting Hawai'i during the disaster in 2011 returned for this event and brought with them an outpouring of community support. Key local organizations volunteered and a documentary film was shown on the Japanese experience, exploring the tsunami and its aftermath through personal stories. An educational fair enabled researchers from the College of Social Sciences and the School of Ocean and Earth Science and Technology to exchange information with the community on how to prepare and gather feedback.

A round table of **COMMUNICATION PROFESSIONALS** brought knowledge from Japanese experience in managing coverage with limited

infrastructure and advised on how best to inform communities in real time. Their Hawai'iian counterparts shared their experience of informing multiple island communities, a subject that posed a challenge in the aftermath of the 2011 earthquake.

Representing **POLICYMAKERS AND THE POLITICAL COMMUNITY**, members of the Japanese Diet were in attendance, along with the Consul General of Japan, the President of the Hawai'i State Senate and the Mayor's Office.

Ongoing engagement between the two countries continues with follow-up trips planned by members of the Diet.

Bridging STEM and SSH, policies regarding disaster preparedness and response require the best available evidence of hazards, as well as cultural understanding of what responses are acceptable to the local community. The preferred responses to tsunami hazards, for example, differ between nations: seawalls used in Japan are not considered a viable option in a Hawai'iian context. As demonstrated in this case study, universities also act as facilitators for dialogue on how to prepare for and respond to disasters - bringing together stakeholders including local policymakers, communications professionals, academics and the communities concerned.

APRU INSTITUTIONS: University of Hawai'i at Mānoa; Tohoku University

The Digital Economy and Beyond

New technology has immense potential to impact society. The explosion of the internet has changed how we communicate and conduct business, and is part of major socio-cultural changes occurring today. While the technology was first created and utilized in labs, its widespread adoption and constant evolution continues to have profound effects on society and social relationships. In the online community, for instance, borders no longer reflect national boundaries and are constantly evolving. The resulting tension between government and business has not gone unnoticed by APRU. It raises questions across the region as to how to balance issues of sovereignty, security, freedom and privacy.

Through APRU's Digital Economy Program, led by Keio University, stakeholders have been brought together⁸ to engage in and maintain a multilateral conversation on this topic of growing and critical significance. Dialogue has contributed to the formation of interoperable views on how to work together across cultures on this global topic.

The social sciences are essential to understanding these impacts and addressing core issues of dignity of the human race in the internet space. What rules and regulations should govern businesses and online activities? How do we maintain and balance core values such as freedom and privacy? How can we best enable opportunities for positive impact; for example, improving economic prosperity and reducing disparities in health services, while also reducing potential harms such as threats to security and individual freedom, privacy, and liberty?

Recognizing it is not sufficient to consider these challenges from the point of view of one discipline or one stakeholder, be it business, government or the wider society, efforts of the Digital Economy Program have brought different

expertise and groups together to co-develop solutions. From an academic perspective this requires bringing together STEM researchers (computer scientists and engineers) with researchers in law, economics, sociology, anthropology and business, and bringing this expertise together with business and government for regular dialogue. Convening appropriate experts and stakeholders from across the Pacific Rim is no small task, and benefits enormously from the connections and personal relations of APRU members and the APRU Secretariat.

In the APRU Impact Report 2016, we highlighted two such meetings run by the Digital Economy group in 2015: the APRU Internet Business Offsite between business and academia, and the Internet Economy Summer Seminar - which brought together government regulators from eight Asia-Pacific economies with APRU faculty and industry. The Business Offsite has since been repeated on an annual basis, forming the backbone of this program.

In 2017, members from the Digital Economy program joined the meeting of APEC's Ad Hoc Steering Group on the Internet Economy to bring perspectives gathered from this experience, one of many connections between APRU and APEC. Further discussion on related collaborations can be found in Chapter 2.2.

The preliminary gatherings first highlighted the issue of fragmentation across the region, and while the technology has changed over the years, many of the underlying issues remain the same. Over the past three years, conversations have evolved in step with the technology, business, and political environment. Today, questions of artificial intelligence (Chapter 2.2) are increasingly pressing, with implications for the future direction of the APRU digital economy group and its members.

⁸ Work began from a research group at Keio University, that has now formed a new think tank: the Asia Pacific Institute for the Digital Economy (APIDE)

Population Aging

Since 2008, APRU member universities have hosted annual research symposiums in the Asia-Pacific to discuss the impact of aging and to share solutions arising in the Pacific Rim.

Demographic change is nowhere more diverse than among the Pacific Rim economies. The region includes economies such as Japan, with the highest proportion of existing elderly citizens in the world; as well as rapidly aging populations such as China, Singapore, and Korea; and younger populations such as the Philippines, where over 50 percent of the current population is under the age of 25. Overall, the region faces a challenge of population aging. In 1990, about seven percent of the region's population was aged 65+; that proportion is now 10 percent, and by 2050, about one-quarter of Pacific-Rim residents will be 65 or over.

Recognizing the importance of this issue in the Pacific Rim and the opportunities arising from demographic diversity, in 2014 a new APRU research program on Population Aging was established. Led and managed from 2013 until 2017 by the ARC Center of Excellence in Population Aging Research (CEPAR) based at UNSW Sydney⁹ and from 2018 by Keio University, the program seeks to improve data capture on

aging, enhance research collaboration and support policy discussion throughout the region. The program's steering group members and their networks are a key component of this program, facilitating dialogue with policymakers through their recognized expertise and extensive connections. Multiple workshop events throughout the year encourage action; covering topics including Population Aging and the Chinese Economy and Aging Innovation and Sustainable Development.

The steering group's expertise and the program's activities range from topics such as financial considerations and economic policy in connection to aging (including pensions, savings and financial resources) to sociological considerations surrounding an aging society. Members of the steering group come from seven economies and span the demographic range described earlier. This diversity, combined with their interdisciplinary expertise, allows a holistic regional consideration of population aging issues. APRU Member experts have been working closely with APEC to support the development of an APEC Labor Mobility Framework (Study 7). Other contributions to APEC include input on financial resources for social protection systems in aging societies.¹⁰



Figure 5: Interdisciplinary and international expertise of Population Aging Steering Group (colored by expertise).

⁹ CEPAR also has research sites at other APRU member facilities: Australian National University, The University of Melbourne and The University of Sydney, and at University of Western Australia.

¹⁰ APRU representative Professor Barbara McPake (The University of Melbourne) presented on this topic at the workshop APEC International Workshop on Adaption to Population Aging Issues, July 2017. The outcome of the International Workshop was submitted to the Health Working Group to provide input to the Health Policy Dialogue on Promoting Healthy Aging & Non-Communicable Diseases (NCD) Control and other related meetings.

STUDY 7: Enhancing regional labor mobility to combat challenges of population aging

PROVIDING APEC WITH EVIDENCE TO INFORM REGIONAL POLICY

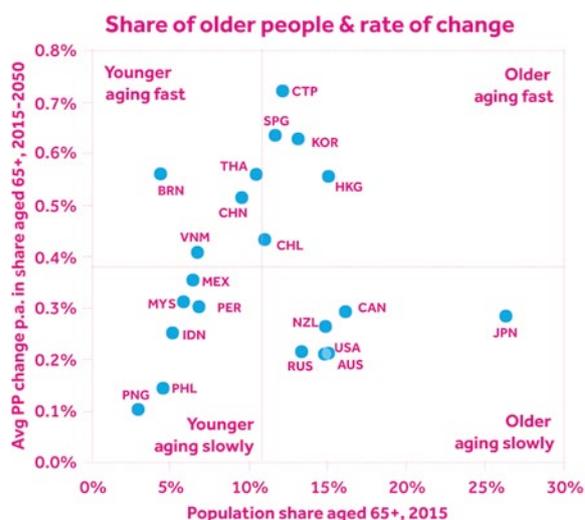
Population aging is taking place APEC-wide. In 1990, about seven percent of the region's population was aged 65+. The proportion is now 10 percent, and by 2050, about one-quarter of APEC's residents will be 65 or over. Work by APRU experts suggests that cooperation in migration policy, education, and technology transfer would allow emerging economies within APEC to increase rates of growth, countering the "headwinds" of population aging. This analysis was discussed in a workshop on the Development of an APEC Labor Mobility Framework (February 2017). The workshop was held alongside the 1st APEC Senior Official Meeting hosted by Vietnam.

EVIDENCE: The team analyzed the role of demographic change on the labor force and economic growth through a supply-side Gross Domestic Product (GDP) accounting framework capturing the contribution of population, participation, and productivity to GDP. While productivity is a major factor, changes in the size and age structure of the population have also played an important role over the last 25 years. Over this period, population changes were estimated to be responsible for about one-quarter of GDP growth in Korea and Hong Kong, one-third in Vietnam and Thailand, and one-half in Malaysia, with most of the growth in Mexico and Brunei.

POPULATION: In the future, "demographic dividends" are expected to reverse to become "demographic deficits." It means that the working-age populations will grow more slowly or decline, while the number of "dependants" increases. This relates not only to the total size of the potential workforce, but also to its composition: greater proportions of older people, who are less likely to work. Indeed, by 2050, declines in the total labor force are expected in China, Hong Kong, Japan, Korea, Russia, Thailand and Chinese Taipei. For others, demography is expected to contribute less in the future than it has in the past.

Demographic differences can offer synergies within the bloc: youthful populations in places with few jobs and low productivity can move to places with high labor demand and productivity, as is the case with internal migration to cities. Inward migration has been particularly important for Singapore, Australia, Hong Kong and Canada. To what extent can permanent and temporary migrants offset demographic headwinds? The modelling gives a sense of the labor force and economic impacts of several migration scenarios. Those jurisdictions that find inward migration

acceptable and where institutions are in place to attract and take full advantage of both temporary and permanent migrants may be able to offset some of the effects of population aging.



PARTICIPATION IN THE LABOR FORCE: Modelling and analysis are considered policy levers and barriers to participation, particularly for women and mature-age workers.

PRODUCTIVITY: The team considered the role of education in overcoming challenges of a smaller workforce and also in enabling structural change in the economy (e.g. retraining older workers). Migration also has a potential role to play here, matching skills to jobs in the short term, as well as improving the exchange of knowledge and technology, and ultimately productivity, in the medium term. Productivity is also impacted by health status and provision.

Various complementary policy levers can therefore drive future welfare. As highlighted, cooperation will be critical to create synergies between economies that are aging and developing at different rates, allowing APEC to meet the challenges of an aging century. Experts from APRU will continue to be actively involved in the next phase of the development of the APEC labor mobility framework, providing a foundation for policy making in APEC economies.

APRU INSTITUTIONS: UNSW Sydney; The University of Melbourne; The Hong Kong University of Science and Technology; Australian National University via APRU Population Aging Research Program, led by CEPAR (UNSW Sydney)

Sustainable Cities and Landscapes

The Sustainable Cities and Landscape (SCL) initiative, established in 2016, responds to regional concern around sustainability and cities in response to increasing urbanization and growing populations. Some of the world's most densely populated cities, including Hong Kong, Singapore, Shanghai, Beijing, Taipei, and Manila, are located in the Asia-Pacific where demand for basic infrastructure, such as water supply, human waste management, and transportation is high.

The Pacific Rim region encompasses much of the social and environmental variability seen globally: from differing landscapes and ecologies to varying governance structures, demography, and economic systems. The geographic scope of APRU enables a compelling set of case studies to analyze the various challenges involved in sustainable urban development.

Cities draw from, contribute to, and impact their surrounding landscapes; understanding the interdependencies and context between cities and their surroundings is therefore essential. Food, water, and energy exemplify the cross-scalar and interconnected social, ecological, and economic dimensions of sustainability. These dimensions are interdependent, and therefore interdisciplinary research efforts are key if policy and practice is intended to improve sustainability across all areas. Numerous "sustainable" solutions in the past have failed due to lack of understanding of the city-landscape system as a whole.

The program aims to act as a thought leader in formulating solutions through the intellectual assets, innovative capacity, and cultural diversity of APRU's members. The emphasis is on collaborative research, pulling together expertise from across APRU and throughout the Pacific Rim. The program works across sectors, bringing in partners from academia, local stakeholders, urban policy makers, and major developers. The inaugural conference, held in Portland, Oregon in 2017, brought together 120 experts from 14 economies. Applied, thematic working groups are a distinctive strength of the program, helping to strike a balance between high-level systems thinking and technical specificity, and collaborating towards action. Topics covered by active working groups include urban agriculture, urban biodiversity, sustainable urban design, the future of urban water and sanitation, "green"¹¹ conflicts, sustainable transportation, and urban expansion.

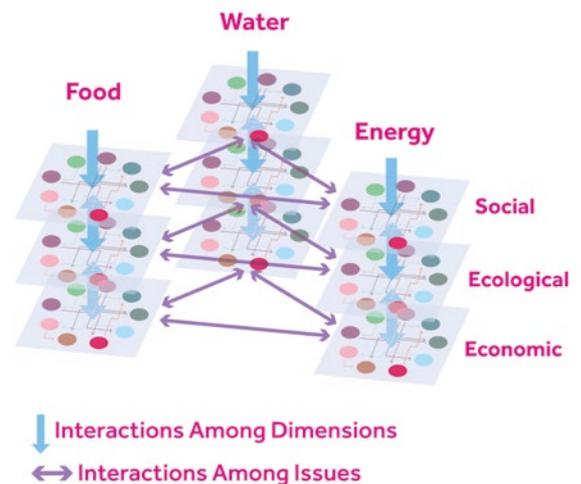


Figure 6: Sustainability is a multi-dimensional challenge

“ The SCL Program has created an excellent platform for us to engage with academics, professionals, and decision makers across the rapidly urbanizing Asia-Pacific region, bringing together multiple disciplines and perspectives to broaden our understanding and to allow us to discover new approaches to achieving a more sustainable future.

There is no comparable forum for engaging with these issues in this half of the world.

MATTHEW PRYOR, HEAD OF LANDSCAPE ARCHITECTURE, THE UNIVERSITY OF HONG KONG ”

“ APRU has a wide field of vision and can bring together the brightest minds to resolve conflicts between cities and landscapes, human and environmental health. We believe that SCL Program has unique potential for addressing challenges of our living environment. We face challenges and issues in China, however, resolving environmental issues is a global topic which crosses borders and societies. The SCL Program can unite people from different regions and ethnicities to devote resources to this global issue.

JIE HU, DIRECTOR OF THE URBAN PLANNING & DESIGN INSTITUTE, TSINGHUA UNIVERSITY ”

Academics and practitioners alike recognize the importance of this program and the lack of other international exchange on this topic.

¹¹ Conflicts between renewable energy and landscape conservation

An early output of the program looks into the potential need to rethink streets in an era of autonomous vehicles.¹² It provides ideas about how city planners, policymakers and communities can consider choices to be made over the coming years. This work recognizes the need to proactively consider disruptive technologies, such as driverless vehicles, that have the potential to influence our cities in both positive and negative ways.

The initiative also recognizes the power of history: the past still has much to teach us, for example, about ecological management. One of the working groups has been analyzing the Chengdu Plain. One of the most densely-populated agricultural landscapes in China, the Chengdu Plain has sustained over 2,000 years of flourishing urban culture, as well as probably the highest per-hectare regional production of grain. This represents an example of a sustainable human-natural coupled system, dependent on a clearly-defined historical act of design: the Dujiangyan irrigation system. Changes are being considered in landscape morphology, metropolitan, local governance and finance, regional watershed management, and national policies

of urban development and food security. The group hopes to inform both multilevel governmental policy and grassroots action by considering different aspects of the system, and the changes that have enhanced or reduced its resilience.

One strength to the approach taken is in the outreach to practitioners, with urban planners and municipal partners present from the outset. The involvement, for example, of city planners in relevant working groups assists in:

- Ensuring the research understands real-world constraints faced by practitioners
- Framing questions in a way that is relatable and relevant to practitioners and policymakers
- Assisting in translation of findings

As leaders of the initiative, University of Oregon is an innovator in this space (Study 8), bringing new models of cross-sector collaboration that are being shared across the region. Training for practitioners is also part of the program, with initial sessions starting in China.

STUDY 8: Harnessing the creativity of universities to improve community sustainability and quality of life

The EPIC Network began with a concept trialed in Oregon in 2009, known as the Sustainable City Year Program (SCYP). This study involved a year-long partnership between a selected city and a university in which existing courses and projects were directed towards a city's self-identified, real-world challenges. It followed a vision to harness the creative problem-solving potential within universities, where risks and innovative thinking can be encouraged in an open environment and faculty have access to, or in some cases are the creators of the latest research thinking in their field of expertise. Seven city partnerships with University of Oregon have followed in the footsteps of the original SCYP.

The scale of engagement (typically 400+ students across 10+ disciplines and 20+ courses, giving 50,000+ hours of effort to 15 to 25 city-identified vexing issues) is beyond the resources typically available to a city. The multi-disciplinary approach and "out-of-the-box" ideas resulting from these partnerships aim to expedite the introduction and adoption of innovative ideas in local government. Connecting university classrooms and faculty to real-world challenges is not new; many existing collaborations have been focused on one-off projects or individual personal relations. It is the scale of this work which amplifies and shifts its potential impact. The model has been recognized for its success by diverse sources, from the New York Times to the Chronicle of Higher

Education (one of higher education's most successful and comprehensive service-learning programs). It has received an award for social entrepreneurship and innovation from Ashoka, an international organization supporting social entrepreneurship and change.

The program also acts as a bridge between disciplines, enabling discussions between students and faculty within a real-world framework. It emphasizes the role of universities within the community as potential agents of change. Communities are full partners and are involved in a joint iterative process from the outset to agree the scope of work and remain involved throughout the year. Faculty opt in to the program and success is measured by the enthusiasm from those involved to continue engagement beyond the life of the formal partnership.

Examples of impact in these partnerships include financial savings (business students' saved Oregon's capital, Salem, a recurring \$800,000 per year), adoption of improved policies (15 of 17 student ideas to improve bicycle transportation were adopted and implemented within three months in SCYP's Redmond partnership) and improved engagement of marginalized communities (students worked with members of the marginalized Latino community, leading directly to increased participation in boards, commissions and other public roles).

¹² Download the report from: https://www.apru.org/images/TP3/SCL/Rethinking_Streets_SCL2017.pdf

Since 2009, the success of this model has been repeated across many other US cities. University of Oregon began training other universities and communities in 2011, and to date 25 US institutions have implemented the SCYP model, now collectively referred to as the EPIC Framework. This includes APRU U.S.A. partner institutions such as University of Washington, which has been running the “Liveable City Year” program for several years.

University of Oregon program leaders for the sustainable cities and landscapes initiative are now sharing this experience beyond the U.S.A. Within APRU, plans are underway to explore this model in the Pacific Rim.

APRU INSTITUTIONS: University of Oregon; University of Washington

Gender Equity – Asia Pacific Women in Leadership (APWiL)

Gender inequities in society limit access to the full range of talent and diversity present in the region. Issues such as lower participation of females in the workforce or the lack of women’s involvement in senior positions (the so called “glass ceiling”) have gained increasing attention in the Pacific Rim and internationally over recent years. The United Nations, for example, includes a Sustainable Development Goal (SDG) on gender equity as part of its 2030 goals.

While different societies have a variety of historical starting points in regards to gender equity, all APRU institutions see some shared issues including:

- Systemic barriers and unconscious bias in promotion and recruitment policy and practice
- Retention of women in the workforce
- Pay gaps between men and women

Gender inequality also typically varies between disciplines, with some seeing greater gaps than others.

The Asia Pacific Women in Leadership Program (APWiL) differs in format from the preceding programs, but also shares some common elements. From its formation in 2013, the initiative has recognized the importance of evidence, supporting the collation of empirical data from across the network. The 2013 Gender Gap Survey identified the baseline against which progress could be assessed. This included gathering data on representation of women at different levels across APRU

institutions, as well as detailed information on existing policies designed to address gender equity at each member institution. This survey is now being updated to understand progress and new policy developments over the past five years.

Annual APWiL workshops also facilitate comparative case studies and constructive evaluation of policies. By sharing experiences and innovative examples, both from within and outside higher education, the organizations can learn about best practices in changing organizational systems and culture across different settings. This peer-to-peer network also provides a forum to discuss challenges and generate new ideas, while improving understanding of reasons behind the successes and failures of others.

The program brings attention to the issue of gender equity in higher education, with strong spokespeople providing leadership on action among the membership and beyond. Over time, this work leads to policy action among members, serving as a driver for change.

As early as 2014, 14 Japanese institutions came together at an APWiL workshop and prepared a joint proposal to support the improvement of women’s status in higher education in Japan (the Shinagawa Proposal 2014), which was also supported by the relevant government Ministry.¹³ In 2016, APRU Presidents and Vice Presidents from across nine economies and 19 institutions came together for a statement on gender equity and diversity, jointly endorsing the following principles:

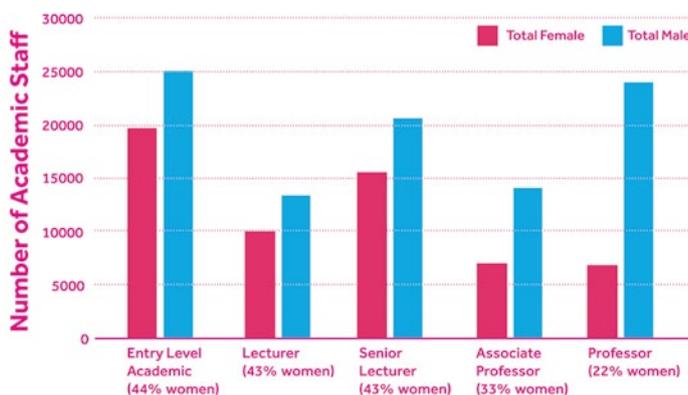


Figure 7: Academic staff by gender and career stage Gender inequality increases with seniority of position. Source: APRU Gender Equality Report, 2013.

- Diversity at all levels is a key factor in the success of universities.
- The achievement of diversity requires a commitment to promoting equity and bringing about the associated changes that result in positive and powerful outcomes.
- APRU universities will work towards making gender equity an integral part of their diversity strategy, organizational structure and culture including their strategic objectives and senior accountabilities.
- APRU universities will develop a clear, consistent, and sustainable policy framework appropriate to their diverse contexts that guides, promotes and reinforces their commitment to gender equity and diversity.
- APRU universities will commit to collecting and using data to measure progress and inform future strategy and policy.

¹³ Ministry of Education, Culture, Sports, Science and Technology of Japan (MEXT).

Success in this area is enhanced by strengthening accountability. The APWiL program provides some mutual accountability between the members through shared commitments such as these, and peer pressure is also raised within the group as members share their own aspirational targets for gender equality. Workshops held at universities in Auckland, Hong Kong, Philippines, and Sydney have provided opportunities for participants, including university Presidents and Vice Presidents, to share institutional goals and successes.

Finally, the APWiL is led by a core group of women from senior leadership positions across the network, with personal experience of the systems concerned. These leaders offer women-in-leadership examples to others, and the program itself has a role to play in developing peer support, mentorship and networking for the next generation.

2.2 Looking to the Future: Interdisciplinary Programs in the Latest APRU Initiative

APRU programs form an important backbone for the network, and they continue to build and learn from each other. Focusing on major regional challenges, they facilitate work across a variety of sub-topics and enable capacity building in these areas. Beyond the programs, other APRU activities and initiatives have developed naturally as the organization and relationships mature.

This section looks further at examples falling under two different themes. These APRU collaborations include: specific interdisciplinary research projects, educational guidelines for future areas of demand, and policy briefs and technical papers built on the expertise across the APRU network on a particular topic. While the focus on research, capacity building and policy is similar in both initiatives, these activities demonstrate how APRU continues to innovate with new pathways and platforms.

Artificial Intelligence, Automation, and Employment in a Data-Driven Future

Building on relationships developed through the Digital Economy Program, APRU is coordinating projects on related topics of growing prominence in this area. This includes industry-funded research projects on (1) artificial intelligence in society and (2) the role of automation and transformation of work in the Asia-Pacific region (supported by Google).

The new research projects and the preceding work by the Digital Economy Program underline the importance of interaction between STEM and SSH disciplines. As new technologies are developed, the social sciences and humanities offer essential research and analysis as to the potential value, risks, and impact of such technology. This research is needed to inform policy regulating our international online community.

The first project focuses on questions of trust and social implications of AI and the governance surrounding technological development. Research also considers questions of equity of access, both for those seeking to innovate with AI (from startups to larger companies and research institutions) and for those seeking to access the resulting technology (whether by geography, age, or gender).

The second project considers how the digital age is transforming industry and society, and the potential social and cultural impacts of automation. How can the future workforce be prepared, and what transformations are required in the education system, and in re-skilling or redeploying the existing workforce? Project outputs will be disseminated to

policymakers, governments and institutions to broaden the discussion on automation and assist in developing evidence-informed solutions and policies. APRU's extensive network of connections and the relationship with funding partner, Google, will help spread the findings of this work.

APRU and APEC's Human Resources and Development Working Group is working to raise data science and analytics competencies in the regional workforce, providing input on skills needed to prepare APEC youth in a data-driven future. APRU acts as a natural conduit for information, and as a superconnector on this issue amongst the membership. Collective input with APRU, APEC centers, stakeholders from the private sector, government ministries, international organizations, and other experts has resulted in an endorsed checklist of skills. The checklist (including business, organizational, technical, and workplace competencies serves as a recommendation to educational institutions and governments on the skills employers will require in the data-driven future. More information on Project DARE (Data Analytics Raising Employment: An Employer Driven Approach to Prepare the Youth Workforce for a Data Driven Future) can be found on the APEC website.¹⁴

These latest activities also demonstrate how APRU programs and involvement in regional challenges can evolve over time as questions shift and new opportunities arise.

¹⁴ <https://aimp2.apec.org/sites/PDB/Lists/Proposals/DispForm.aspx?ID=1935>

The Future of the Pacific Ocean

APRU is connecting the latest research and science with policymakers and international partners, bringing together perspectives from across the region.

One of the latest APRU initiatives looks at different ways to establish a network of experts on a specific challenge, and new pathways to link this capacity to a higher-level global initiative, such as the 2030 UN Sustainable Development Goals (SDGs). While APRU's programs and members have long conducted work supporting high-level targets at both local and regional levels, this activity seeks to feed directly into the process with non-governmental organizations (NGOs) and other regional parties. APRU's strengthening support for the SDGs is evidenced by public commitments such as those for SDG14.¹⁵

SDG14 focuses on conserving and using the oceans, seas, and marine resources for sustainable development in the face of growing challenges such as climate change, marine pollution, and overfishing. This challenge is particularly salient to the Pacific Ocean, which is the current source of approximately 60 percent of the world's annual fish catch, and features extensive coral reefs and exceptional biodiversity. The Pacific Ocean plays an important role in the climate system, and climate change effects are predicted to be felt more strongly in the Pacific than elsewhere. As a network bringing together leading institutions across Asia, Oceania and the Americas, APRU acts as a natural connector to bring together expertise on this issue for the region. The organization has significant potential both to raise awareness and capacity on such topics and also to offer input into how such goals could be realized.

Work to integrate expert opinions from across the network is led by the Secretariat. Under the Pacific Ocean banner the first cluster project is led by marine science and policy experts from the University of British Columbia and University of Washington.

This taps into member expertise on this topic (Study 9). Active engagement with UN initiatives and APEC working groups is ongoing, with APRU committing resources and contributing research expertise to address the key challenges of the Pacific Ocean.

Through surveys and workshops, the project seeks to identify:

- Potential co-benefits and trade-offs between the wider SDG goals and SDG14
- Challenges that a changing climate, ocean, and earth present for achieving SDG14 targets in the Pacific
- The effect of potential solutions to respond to these global environmental changes
- Policy and institutional gaps to advance the SDG14 goals

This work recognizes the oceans as a complex, dynamic socio-ecological system linked to various aspects of human wellbeing, including important considerations of social equity in the region. As such, this study integrates interdisciplinary expertise relevant to marine policy and management to develop ideas and guidance on this challenge. It intentionally focuses at three different levels:

- A strategic scale considering systems level, long-term, international considerations
- A tactical scale examining national and institutional relationships and opportunities
- An operational scale reviewing concrete, action-based initiatives and their likely effectiveness

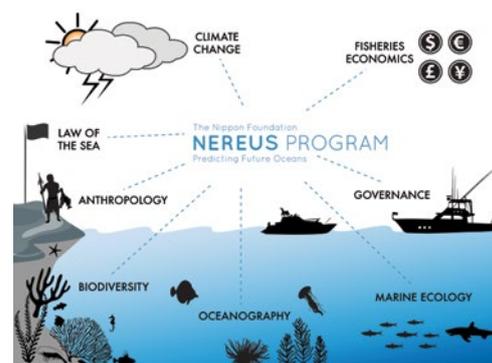
Policy briefs, technical papers and other material arising from this activity will be used to inform and influence policy and drive forward the implementation of SDG 14.

STUDY 9: How can we support a sustainable future for our oceans?

APRU initiatives and programs benefit from the foundation of strength established by APRU members. In the pursuit of sustainable ocean management, The University of British Columbia and University of Washington have been operating the Nippon Foundation Nereus Program since 2011. The Nereus Program currently brings together 17 institutions globally, and is co-led by the University of British Columbia and the University of Washington.

Social and environmental sustainability challenges are heavily interlinked, emphasizing the need for interdisciplinary work in this field. In order to monitor and understand the frequent and intertwined fluctuations in the environmental and socio-political

states of the ocean, Nereus pulls expertise from across the natural and social sciences.



¹⁵ See also Chapter 4 for information on activities relating to SDG3 on health and wellbeing

The Nereus leadership created an innovative, collaborative and secured work environment to empower our researchers to effectively work across disciplines and cultures, while maintaining rigorous research standards. Considering and communicating such a breadth of knowledge and perspectives presents both challenges and opportunities for advancing scholarship and academic contributions to governance strategies. The Nereus Program creates cross-disciplinary dialogue and catalyzes projects that foster professional relationships between researchers and practitioners. The program nurtures intellectual interests across sectoral boundaries, challenging researchers to go beyond data or resource sharing and move into a space where cultural and methodological exchanges between these two groups are the norm.

Research by Nereus participants have brought concerns to light regarding the Pacific Ocean and the risks to its coastal communities in the face of climate change. According to the projection, if climate change persists unchecked, many Pacific Island nations risk losing 50 to 80 percent of marine species in their waters by the end of the 21st century. Our researchers have also highlighted the challenges faced by indigenous communities, such as the coastal First Nations in British Columbia, to maintain their cultural heritage and food sovereignty. Other research interests include the pursuit of socially responsible seafood, which takes into consideration human rights issues and labor abuses in the seafood production chain, ocean governance for the high seas, socio-economic contribution of mangrove fisheries, and the contribution of small-scale fisheries to food security and economic development in developing countries. These examples also emphasize the challenge of social equity, whereby marginalized communities are often severely and disproportionately impacted by environmental and socioeconomic challenges. Considerations for heterogeneity in the values and worldviews of researchers from an SSH background are essential in understanding these dynamics.

The Nereus Program and its experts are often involved in ongoing policy discussions. They have also been called upon to lead activities such as The Special Report for the Ocean and Cryosphere in the Changing Climate by the Intergovernmental Panel on Climate Change (IPCC), and to engage, for example, in the Ocean Conference held at the headquarters of the United Nations to discuss the Sustainable Development Goals (SDGs) and the implementation of Food and Agriculture Organization of the United Nations volunteer guidelines for securing sustainable small-scale fisheries.

Similar to the APRU "Partnering on Solutions" Programs, the Nereus Program work extends beyond research to capacity building/education and outreach (both to the community and in policy forum). Capacity building is integral from the outset, supporting PhD and post-doctoral students, and building new research capacity to promote trans-boundary discussions, participating in interdisciplinary endeavors to develop comprehensive visions for solutions, and spreading knowledge across the region, between different sectors. The alumni network enables development of further collaboration.

APRU and the Nereus Program are now building upon this foundation and the extensive network and connections of APRU to further their collective impact on sustainable development, coastal communities and the management of the Pacific Ocean. This is in line with APRU's commitment to supporting Sustainable Development Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development.

FOR FURTHER INFORMATION:
www.nereusprogram.org

APRU INSTITUTIONS: The University of British Columbia; University of Washington

To increase awareness and encourage interest on this topic, APRU recently initiated a case competition on the sustainable use of aquatic resources in collaboration with the New York Times. Plans are underway for annual student-focused activities in collaboration with international partners.

STUDY 10: APRU and The New York Times collaboration

CASE COMPETITION ON THE FUTURE OF THE OCEAN, 2017

In 2017, APRU partnered with The New York Times to raise awareness on the impact of climate change on the Pacific Ocean through a case competition. Each team was asked to draft a policy response dealing with the complexities of climate change in

800 words. Applications were received from students of 31 universities from 12 countries in the Americas, Asia, and Australasia. The entries were judged by senior university leaders and staff from The New York Times' award-winning newsroom.

The 2017 winners from University of Washington were a truly interdisciplinary team featuring members

from the schools of fisheries and aquatic science, public policy and governance, and oceanography. Their submission focused on harmful algal blooms and protecting both public health and the fisheries and aquaculture industries by better forecasting, disseminating, and designing systems to mitigate effects of these increasingly prevalent events.

Collaborations such as this leverage the strengths and skills of all parties. APRU provides a communication

channel for over two million students around the Pacific Rim, from a range of cultural backgrounds and economies, as well as access to a network of academic experts. The New York Times, as a newspaper, has worldwide recognition and readership, and a reputation for award-winning journalism. Together, these partners deliver immense capacity to raise awareness and strengthen leadership in the region.

2.3 Sharing Lessons and Innovating with APRU Initiatives

Establishing a Strong Foundation

Much of the description in the previous sections has focused on recent APRU developments. It is important to recognize that such work is enabled through the history of the network and its early activities. The Global Health, Multi-Hazards and Population Aging Programs all had their origins in the mid 2000s. Program networks were initially established in their earliest years without the leadership of a host institution. From 2013, interested members were encouraged to take operational and strategic leadership of existing and emerging programs. This transition allowed the programs to grow beyond a traditional academic network and focus on APRU's aims to translate expert knowledge to support policy and advocacy and build capacity in the region.

As new programs emerged, they identified the need for different operational models, involving policymakers and industry from the inception of the program. In parallel, existing

programs are evolving to deliver greater impact. The expanding and deepening connections of the different programs can be seen in Figure 8.

Building credibility, creating relationships and demonstrating the potential value of a program takes time, and requires stability for such foundations to evolve. In this regard, the programs have established core networks with sufficient depth and breadth to be resilient to human resource changes that take place in any organization.

The importance of trust and credibility generated during early and ongoing work of APRU and its programs continues to be recognized as essential for the formation of relationships with external partners, such as intergovernmental organizations (IGOs), practitioners and non-governmental organizations (NGOs).

Rising to the Challenge of Translating Research into Policy Impact

The establishment of relationships, credibility, and trust has launched a second transition for the organization. Today, APRU has the freedom to begin exploring new pathways, platforms, and models as the organization seeks to better support the translation of research, build regional capacity, and realize policy impact. This applies both within and beyond the existing programs and initiatives.

For any new initiative, it is important to identify the right academic leaders from within the network. APRU identifies future leaders and enables their participation, either by facilitating funding or by ensuring that such leaders can publish openly in peer-reviewed journals - essential for individual career progression and for the academic institutions involved.

At the same time, well-designed initiatives can produce output with greater relevance to APRU's partners and today's society. Enhanced understanding of the challenges and questions from a policy perspective enables APRU programs and initiatives to better frame research questions for the needs of this community and communicate the results.

Increasingly APRU is engaging earlier with stakeholders, not only disseminating results once work is complete. In this way, additional perspectives are brought into the work, and pathways for findings are identified in advance, improving chances of global uptake acceptance. APRU's partnerships with Google (Chapter 2.2) and APEC projects (Study 1) are good examples of this.

2.4 Future Interdisciplinary Opportunities and Cross-Sector Collaboration

INTERDISCIPLINARY DIVERSITY & ACTION

The data below shows a snapshot of the average interdisciplinary score for APRU institutions, along with their international collaboration rates on research.

Several of the institutions within APRU are known for their speciality as indicated by the title of the institution, e.g. California Institute of Technology. These institutions often have lower interdisciplinary scores, but may be highly active in international or cross-sector collaboration.

Several APRU member institutions have strong scores for interdisciplinarity; those with a score above the APRU average

are indicated in Figure 8. Many of these universities have models that encourage interdisciplinary research and/or capacity-building. Examples include:

- Identifying strategic interdisciplinary initiatives or common challenges for potential focus
- Creating networks or interdisciplinary research units operating virtually on a selected topic
- Forming physical interdisciplinary centers with full or joint appointments for faculty and a department position
- Support for career advancement for those working across disciplines, including support to find funding for interdisciplinary work beyond the institution

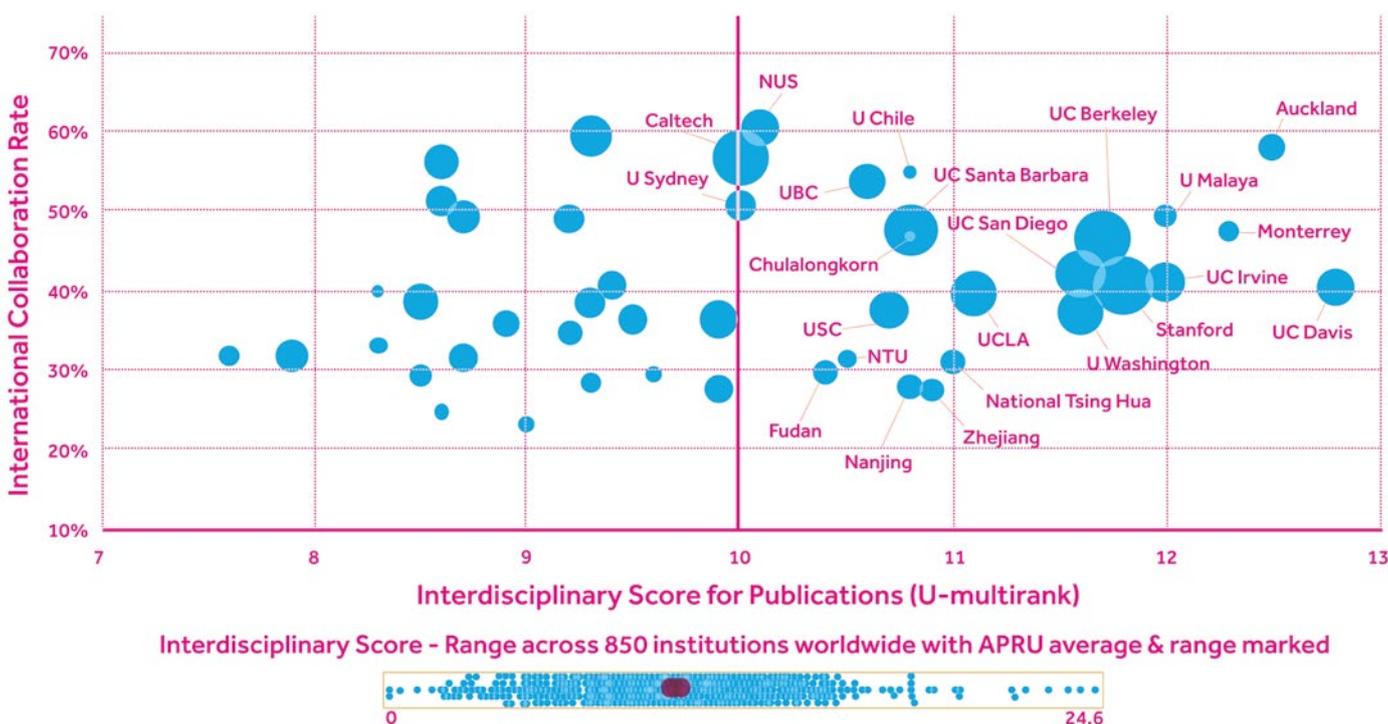


Figure 8: Interdisciplinary and international research collaboration among APRU institutions. Bubble size is proportional to rate of highly cited publications from institution. Data gathered from: U-Multirank¹⁶.

¹⁶ Interdisciplinary score definition (see glossary) and data extracted from U-Multirank. Charts are the responsibility of the author of this document. Further detail on the methodology for this indicator can be found at: (<http://www.umultirank.org/cms/wp-content/uploads/2016/03/Bibliometric-Analysis-in-U-Multirank-2016.pdf>).

Cross-Sector Collaboration

APRU members are highly collaborative with cross-sector partners compared with APEC and global averages. The highest collaboration rates are typically seen with Government researchers. However, each APRU institution collaborates with different stakeholders and for some institutions collaboration with industry or medical establishments are higher.

Since the formation of APRU, the rates of government and medical collaborations have been rising across the network. In the five years to 2015, mean collaboration rates across APRU stood at 15.4% of publications and 8% of publications respectively, up from 11% and 5% in the first 5 years of APRU (1996-2000). APRU corporate-academic collaboration has dipped slightly in 2011-2015, however this trend is also seen in the equivalent global data (Figure 9, top).

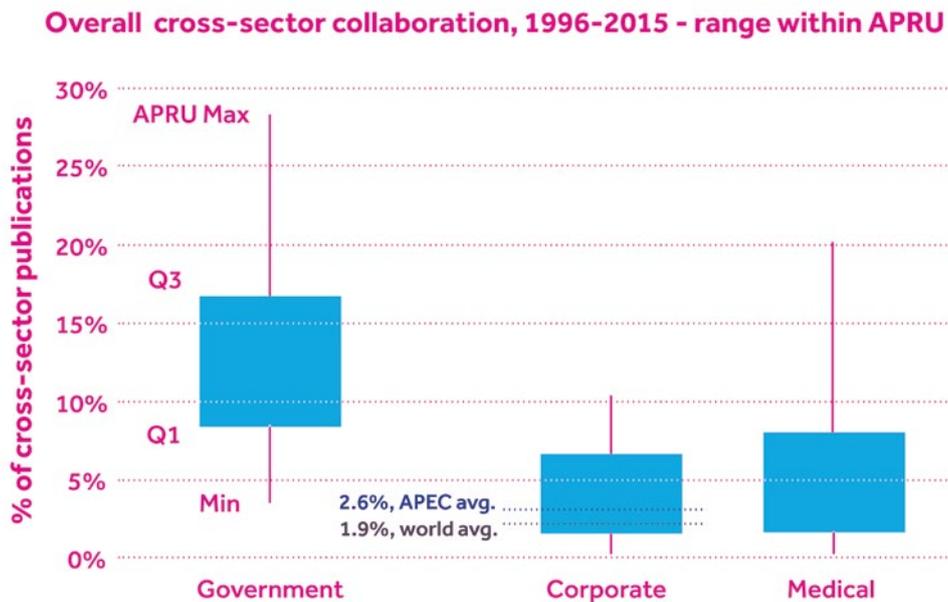


Figure 9: APRU Cross-sector Research Collaboration: split by sector.

Top Chart shows changes in collaboration over time, Bottom Chart shows range across APRU members of Government, Corporate and Medical collaborations (based on percentage of co-authored publications). Global and APEC average shown for comparison in corporate data.



3. IN FOCUS: SOCIAL SCIENCES AND HUMANITIES EXPERIENCE AND APPLICATION IN THE APRU NETWORK

CHAPTER SUMMARY

The social sciences and humanities (SSH) contribute immensely to solving complex problems faced by society today. This chapter highlights:

- Models developed by SSH researchers, many of which have application in a wider, internationally collaborative context.
- Social science and humanities research output for regional issues, such as demography, planning and urban studies, transportation, development, finance, political science and subjects more often found collaborating with STEM disciplines on societal challenges, such as psychology, economics, life course studies and health sciences.
- Innovative collaborations, such as applying a humanities lens to urban development and bringing digital skills together with the humanities.

The final section of this chapter focuses on APRU's strength in diversity.



3.1 Social Sciences and Humanities: Overcoming Challenges and Adding Value in the Asia Pacific

Social sciences and humanities (SSH) have much to contribute in the context of complex problems faced by society today. Researchers have developed experience and techniques that transcend borders and have wide contextual applications, overcoming regional challenges. Three specific challenges are considered in this section.

Firstly, language barriers can be particularly pertinent to SSH disciplines where local context is often essential.

Secondly, unlike STEM subjects where the laws of physics are universal, context is also often key to understanding. Comparing information across cultures is particularly challenging and requires a nuanced approach if appropriate lessons and policies are to be developed.

Finally, SSH research requires and benefits from strong relationships with the community, for example, in gathering information, understanding context, or realizing legitimacy of work.

Social sciences have a history of practicing “engaged scholarship” through community co-production of research. This has the benefit of intentionally integrating community needs and academic perspectives, while enabling researchers to interrogate or understand the wider context of their work.

APRU members are innovators with respect to these issues, as the case studies in this chapter will illustrate. The stories presented are relevant beyond their context and demonstrate how APRU members work across international boundaries to explore perspectives and paradigms that are embedded in other cultural and linguistic traditions.

The soft diplomacy role of APRU is evident in the examples in this section, as is the impact of international collaborations for enhancing intercultural understanding. APRU initiatives enable exchange between economies despite the political histories of the nations concerned. When common goals are determined, research can narrow political and cultural divides and offer a diplomatic bridge.

Language and Cultural Diversity

The Pacific Rim is a region diverse in spoken languages. Indonesia alone, for example, has 707 living languages spoken today.¹⁷ This diversity is true both in terms of the number of languages represented in the Pacific, Asia and the Americas as a proportion of the global total (Figure 11), and in terms of the differences between the origins of these languages.

At the international level, the English language has historically dominated social sciences. However, broader capacity is growing and APRU members are involved in initiatives to bring together a range of cultural and linguistic perspectives. This is important, as different perspectives and paradigms are embedded within languages, not all of which are easily translated. Study 11 describes innovative approaches to sharing

theater performances across nations by APRU members. Over the past 10 years, the group learned about different interpretations across socio-cultural contexts and has many lessons for best practices in translation.

International organizations, such as UNESCO, have publicly recognized the need for linguistic diversity: “A more culturally and linguistically diverse approach by the social sciences would be of tremendous value to organizations such as UNESCO in our efforts to foster mutual understanding and intercultural dialogue.”¹⁸

While this quote focuses on the social sciences, it also applies to the arts and humanities. As shown in Study 11, the arts also have volumes to contribute toward enhancing intercultural understanding.

¹⁷ 2015, statistica

¹⁸ World Social Science Report, 2010.



Figure 11: Global spoken languages split by region.

STUDY 11: Bridging languages and cultures with Asia's largest digital theater archive

Ten years in the making, and continually evolving in step with the digital revolution, the Asian Intercultural Digital Archives (AIDA) is building a resource across cultures and languages. It provides an excellent example of overcoming the challenges of intercultural collaboration, and offers lessons in diplomacy relevant far beyond this context.

Commissioned by the AIDA project, the archives contain full-length video recordings of productions with accompanying translations in multiple languages, enabling observers to switch between languages on the fly. The development team ensured that no one language or style is dominant. This is particularly important for enabling intercultural dialogue and fostering mutual understanding in a region of multilingual and multicultural history. In the political context of Asia, APRU member National University of Singapore is a natural choice for a leadership role in this work.

Obvious challenges aside, there is a richness of working in different languages with embedded perspectives and concepts that are not always easily translated. Allowing readers from other countries and cultures to interpret the extensive accompanying data, the team has worked iteratively on the material rather than a more typical sequential approach. The data covers the art forms, and also the reception and socio-cultural contexts for each performance.

The original "parent" archive, the Asian Shakespeare Intercultural Archive (A|S|i|A, a-s-i-a-web.org) was at the forefront of digital archiving when it began in 2007.

Today it contains 62 performances of Shakespeare's plays adapted in 17 languages of the East/Southeast Asian region. Viewers can switch between the four parallel language interfaces in the archive: English, Chinese, Japanese and Korean. It offers a resource for new ways of teaching in the region, enabling students in Korea and Japan, for example, to watch the same production and exchange perspectives. As evidence of its success, A|S|i|A is used for teaching at 30 universities in Singapore, Malaysia, South Korea, Japan, China, Taiwan, UK, Ireland, US, Canada, Australia, Denmark and Cyprus over the last three years.

A|S|i|A laid the foundation for the subsequent archives under the umbrella of AIDA, focusing on Contemporary Wayang theater (cwa-web.org), in English and Indonesian, and on theater-makers in the region (Theater Makers Asia, tma-web.org). Over the last 30 years, East and Southeast Asian theater practices have developed diverse and sophisticated combinations of artistic styles, genres and influences from different countries. Theater research and education has been severely limited in its understanding of changes in theater practice by two major obstacles: the time- and place-bound nature of live performances, and language barriers. The archives bring together disparate research groups, enabling regional impact in their fields and archiving important Asian theatrical traditions, such as Wayang, for future generations.

APRU INSTITUTION:
National University of Singapore

Measurement Across Borders

Context is key to understanding in the social sciences and humanities. Data gathered may be complex, without clear causative relationships. Nevertheless, the importance of gathering data to inform policy and practice is paramount. Comparison between regions or economies can be particularly challenging for cultural, contextual and political reasons. Comparing across cultures requires a nuanced approach if appropriate lessons and policies are to be developed from the evidence at hand.

Led by APRU member The University of Hong Kong, Study 12 highlights research and development of measurement tools of early childhood development. This work has been recognized for its innovative approach to developing culturally appropriate tools across more than seven Asia-Pacific economies. Early childhood

development (ECD) is an important topic for APRU and the UN, as demonstrated by the UN's Sustainable Development Goals (SDG) 2030.

Barriers to developing culturally appropriate measurement tools across international borders include the lack of mechanisms, such as working groups or strategic initiatives, and financial support. Here, APRU is a natural partner, creating the necessary environment of trust and forming the mechanisms to enable such exchange. APRU has also leveraged the geographic breadth of its membership to gather data directly on the behavior and attitudes of two million students across 17 economies in the network (Study 22 in Global Health for further information).

STUDY 12: Early childhood education: lessons for research and assessments across borders

The UN Sustainable Development Goals include ensuring that all girls and boys have access to quality early childhood development (ECD), care and pre-primary education by 2030. As countries begin or continue to invest in early childhood programs, how do we gather evidence to understand what settings and policies best benefit our youngest citizens? How do we gather evidence to inform early childhood educational policy in a regional Asia-Pacific context, and how do we exchange lessons of what works across cultures?

Reliable measurements and data on early childhood development are an essential first step, yet there are currently no globally accepted tests due to concerns that western assessment tools may not be valid in other countries. Any measurement and subsequent evaluation need to take into account the cultural and linguistic context of the country concerned. Asking preschool children questions of equivalent difficulty across these boundaries, for example, is a significant challenge.

Researchers at APRU member The University of Hong Kong (HKU) led an innovative research program to assess the developmental progress of children from three to five years of age. Stakeholders across the region now have common, psychometrically robust measurement tools known as the East Asia-Pacific Early Child Development Scales (EAP-ECDS). These tools were developed in a culturally appropriate way, in administration and materials, and in reflecting the values and skills important within the cultural or national framework of the countries concerned.

Collaborating with policymakers, academics, and researchers within each country, their work currently spans seven Asia-Pacific economies and in the next

phase is expected to expand across more countries in the region. UNICEF has recognized the team for their potential policy impact, replicable model, and innovative methods.

The team did not transplant an existing "Western" assessment tool but started with over 1,700 indicators derived from the standards for achievement across seven Asia-Pacific nations, prioritizing those that appeared in more than one country. Engagement of policymakers in each country from the outset enabled access to data on such indicators typically held within Ministries. Their statistical "bottom-up" approach enables collaboration across cultures without domination of one group over another and reflects values for child development within each society.

The EAP-ECDS takes a holistic view of early childhood development beyond merely cognitive factors (such as development of reading and writing) into areas such health, hygiene and social development. Do children know when to wash their hands, what food is safe to eat, and how to interact with adults and with peers? The team draws from interdisciplinary expertise involving child psychologists, early childhood educators, developmental pediatricians, alongside other social science researchers.

The work focuses on understanding and reducing the disparities in early childhood outcomes within each country, whether these differences arise between urban and rural populations, boys and girls, different ethnic groups, etc. This is one of the factors that has led to success and driven adoption of the tools.

Local researchers are essential in supporting cultural adaptation of measures, data collection and

dissemination of findings. The methodology is time-consuming, particularly as the work involves training in lower-resource countries in the region; however, the process has empowered local researchers and the results have enabled local policymakers to access evidence for informed decision making.

Reflecting their success, policymakers and researchers in Cambodia, Papua New Guinea and China have asked for further studies and analysis on specific population groups or repeat surveys following a period of policy change. By taking multiple time points in the same country, the researchers are better able to understand the causative, rather than merely correlative, factors that affect outcomes.

Across countries, the research has shown the potential for early childhood education to reduce gaps between children and the importance of maternal education; within countries, it has brought to light gender differences, urban-rural differences and priority areas where children are not achieving their potential.

OUTPUTS: Assessment tool (long and short form), country-specific analysis and policy briefs

PARTICIPATING COUNTRIES: Cambodia, China, Mongolia, Myanmar, Papua New Guinea, Timor-Leste and Vanuatu

APRU INSTITUTIONS: The University of Hong Kong; Stanford University

Community Engagement

Solutions must be relevant to their context and local community engagement can determine the success of potential solutions to challenges. Social science and humanities disciplines are already practicing “engaged scholarship” through community co-production of research and have much to add to interdisciplinary STEM and SSH teams.

In both Studies 2 and 13 (below), the leadership of SSH scholars was essential to bring in the community as an active participant in their work. Other interviews with interdisciplinary teams as part of this report have echoed this strength.

While the value of this work is high in realizing impact for society and increasing the quality of outputs, the time required for engaged scholarship is not always aligned with incentives for faculty to produce high volumes of publications in a world of competitive funding allocation.

To understand local context and impact, APRU draws on the relationships and work of the over 150,000 faculty within its network. Community engagement is also evident in APRU programs and interdisciplinary research; exemplified by Study 6 on disaster risk reduction and communication.

STUDY 13: Universities as catalysts: empowering communities to improve rural livelihoods

APRU member Tecnológico de Monterrey began its Cooperatives for Development initiative in 2011 due to a perceived opportunity in Mexico for communities to better profit from native plants and products. Local food products are often wasted throughout the year; tons can be seen rotting by the roadside in rural areas as this produce is not commercialized and trust barriers lead to limited cooperation between producers.

The initiative aims to foster collaboration among citizens for an impact-driven development approach. The project brings together communities and experts from both the social sciences (law, business, economics) and STEM disciplines (food engineering), to improve livelihoods of rural communities to significant effect. Empowered communities across the four pilot municipalities have, to date, seen 10 percent increases in the income of approximately 3,000 inhabitants. In this case, the involvement of a third party was essential to building a foundation of trust between producers, thereby enabling the sharing of resources and changes in agricultural practice. The legal professor in the group provided leadership by bringing together parties around the table as well as

technical expertise in cooperative legal structures. Her commitment, as well as the commitment of others, to regularly visit and report back, demonstrated the reliability of the team to the communities concerned.

Food engineers from the university have identified new potential uses for some of the native plants concerned, and processes to derive higher value-added products (such as antioxidants), offering potential opportunities for the cooperatives, and others like them, to further augment their rural livelihoods in the future.

The interdisciplinary team not only engaged with adults in the communities but also with the children, enabling continuity of ideas across generations of family businesses. Guides for cooperative development and local development strategies, together with data from results of the pilot program, offer opportunity for wider application of these models. For this community however, as for others, it is essential that communication is provided in the local language.

APRU INSTITUTION: Tecnológico de Monterrey

STUDY 14: Migration of Russians in the Pacific Rim: language, culture, religion, community and historical memory

History is punctuated with events, natural and man-made, which inspire waves of migration of groups within the Asia-Pacific region. What determines the choice of destination for these migrants? How do different waves of migrants perceive themselves today? To what extent have they assimilated with or adapted to the local culture? The purpose of emigration (political, ideological or economical), language, religion and the size of community all have a role in the answer to these questions.

APRU member, Far Eastern Federal University, led research looking at migration of various Russian communities over the 19th and 20th centuries within the Asia-Pacific Rim (China, Japan, Korea, South America, West Coast America and Australia), which have been significant recipients of Russian émigrés, particularly since the start of the 20th century. Part of this work was conducted in residence at University of Hawai'i at Mānoa, considering Russian migration to the Hawai'ian sugar plantations after the Russo – Japanese War. Through taking a comparative approach with other migrants, such as Chinese and Korean, the research highlighted the different rates of language loss between these groups and the potential role of language in the latter's continuation as a distinct cultural group.

More recent work has focused on the culture, language and religion of migrant waves leaving Russia; for example, Russian Muslim and Russian Eastern Orthodox Christian (Old Believer) migrant groups. Comprehending the history of these communities is key to conducting research on this topic. For groups distrustful of outsiders, family memories are important and demonstrating knowledge of their background, history, religion, and culture is essential. Such work also takes time, talking and eating with hosts to truly understand their lives and beliefs.

The study of the history of the Old Believers helps to identify many of the factors of formation of multi-ethnic cultures in the contemporary world community. In the USA, for example, they have maintained a strong cultural and historical memory despite living for many years in a foreign cultural environment. Religion and attitude to the state play a defining role in explaining their unique identity. Clothing and food help retain a form of identity, while old Russian songs preserve the language for generations born outside of Russia. Another important factor is self-identification or border consciousness.

Russians often preferred to migrate close to home, particularly before World War II. An example of this is Russian migrants to China, particularly to Harbin, Tientsin and Shanghai, where they created distinct communities. Current research centers around understanding the Russian Diaspora in the Far East. Are they part of a European or Asian culture? Also, after World War II, many Russian Muslims moved to Turkey and the USA. Where do these migrants remain as distinct cultural groups and why? How are they connected with their homeland? How does the past help to understand the present and future?

Overall, the comparative approach taken in this work has the potential to tell us much about why certain groups assimilate quickly and how others maintain a strong cultural identity within society. History is a human story and it is through such study that we can better understand the multi-ethnic communities of today and tomorrow.

APRU INSTITUTIONS: Far Eastern Federal University; University of Hawai'i at Mānoa

3.2 APRU Research and Education in the Social Sciences and Humanities

Social Sciences and Humanities Publications - Overview

BOX 2: Metrics and the social sciences and humanities

CAVEATS TO THE USE OF PUBLICATION DATA

The social sciences and humanities have a different publishing culture and history compared to many of the STEM disciplines. The story of the social sciences and humanities is a heterogeneous one. For example, the single-authored monograph is still the common currency in many but not all SSH disciplines.

Historically, a lack of indexing of books in the main databases of peer-reviewed literature (Scopus, Web of Science) has presented a challenge for some disciplines. Recognizing the issue, Scopus began work in 2013, to increase book coverage in the database, with over 166,000 books, 1.3 million book items and 613 book series included as of January 2018. Coverage of humanities journals has also increased, with greater emphasis on improving this component of the Scopus database over the past eight years. At the present time, Scopus has extensive coverage of humanities titles published after 2002.

Representation of some SSH areas in publication databases, such as Scopus, is nevertheless substantial. As many as 25 percent of publications in Scopus are from the Social Sciences (compared to 15 percent in Life Sciences, 28 percent in Physical Sciences, and 32 percent in Health Sciences).

With different incentives and traditional rates of publication output, disciplines are best compared,

not relative to each other, but relative to the world contribution in that field. This is the approach taken in this report to identify areas where APRU and APRU members appear to be strong compared to counterparts worldwide.

Apparent strengths described in this chapter are supported by the quantitative data and by qualitative analysis and case studies described in this chapter. The latter extend beyond publications to consider the impact of the research on society.

OTHER POTENTIAL METRICS

Outputs or outcomes that go beyond publications for SSH scholars include:

- Artistic or creative work, including public performances
- Peer recognition (e.g. prizes, election to academy positions or similar)
- Advisory roles (e.g. in a policy context, exhibit curators etc.)
- Community engagement and impact
- Other digital media and digital scholarship (i.e. online material beyond traditional scholarly books, journals, and articles)

Data on outputs is also gathered in different ways and to variable extent across the Pacific region. Indeed, as SSH disciplines are set in a cultural context, appropriate measures may vary between societies.

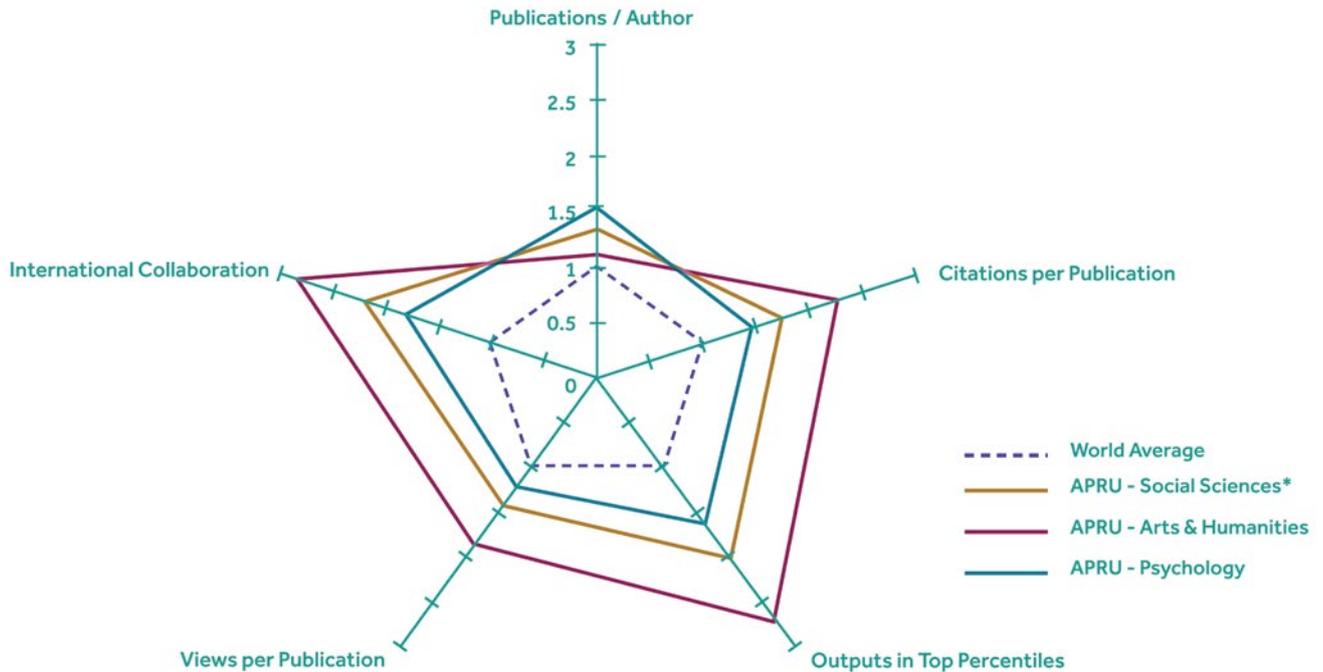
APRU authors are highly productive. In economics, social sciences and psychology these researchers produce more than their share of publication outputs, close to 1.5 times the global average publications per author.

Reflecting the visibility and reach of work by researchers, APRU also sees similar trends in average citations per publication at between 1.5 and over 2 times the global average for that discipline. Views per publication are also around 1.2 to 2 times the global average for the discipline. APRU is even more strongly over-represented in "star publications" in each field. Twenty

percent of APRU's output in social sciences is in the top 10 percent of global publications by citation (i.e. a rate twice the global average) while for arts and humanities this rate is similarly high, both for all publications (approaching 30 percent) and for books (over 16 percent).¹⁹

Finally, APRU members are more collaborative internationally across all disciplines, with rates 1.75 to 2.8 times the world average in social sciences, psychology, economics and arts and humanities disciplines.

¹⁹ Note, the books figure and the publications figure should not be directly compared. More informative is the comparison to the world and other university groups, shown in Box 3.



*Data for economics and business and management studies closely resemble the data presented for social sciences overall.

Figure 12: APRU Publication Metrics benchmarked against the world average for each discipline

(shown as 1 on the chart). APRU members are more than twice as internationally collaborative in the social sciences and humanities compared to the global average for these disciplines.

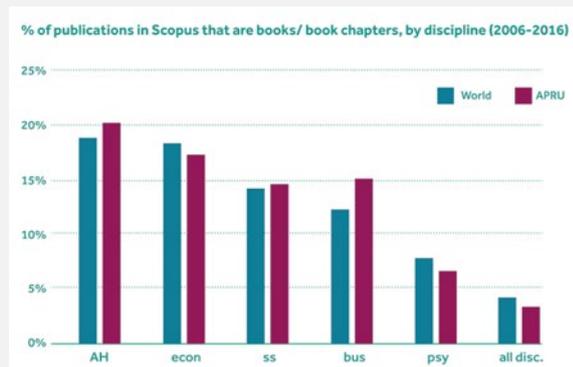
BOX 3: Book output in a global and APRU context

Given the importance of books for some SSH disciplines, the following charts look at the Scopus database for APRU and worldwide book outputs included by discipline. Data is focused on recent years (2011 to 2016), due to the improved coverage of books over time.

As shown in the figure (below left), APRU closely follows global trends by discipline in terms of percentage of outputs that are books or book chapters in the database.

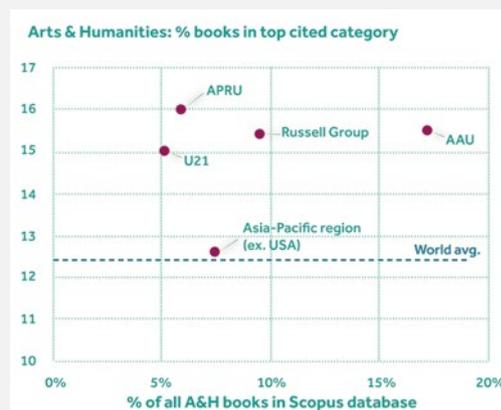
Caveats for this work have been provided in Box 2.

Figure 13: APRU share of world authors (red) and of global publications (blue), by sub-discipline



Looking more closely at arts and humanities book outputs, APRU has an impressive performance in terms of book citations, with over 16 percent of books highly cited compared to a regional and world average close to 12.5 percent. This is also higher than several other university networks examined, including AAU, U21, and the Russell Group.

Figure 14: APRU Institutions' performance in terms of A&H book citations



Highlights and Examples from Across the Sub-Disciplines

When publication data is examined at higher levels of granularity, as shown in Figure 15, areas of significant SSH research output by APRU appear in sub-disciplines highly relevant to issues in the region. These include demography, planning and urban studies, transportation, development, finance, and political science. High research output is evident in SSH sub-disciplines collaborating with STEM scientists on societal challenges, such as psychology, economics, life-course studies, and social sciences related to health. These areas appear as peaks in the blue line (publication output) on Figure 15. This represents an aggregate of data across the network and therefore within the group. Some institutions also have strengths in areas not apparent across APRU as a whole. Data highlighting such variation within the network can be found in the following section.

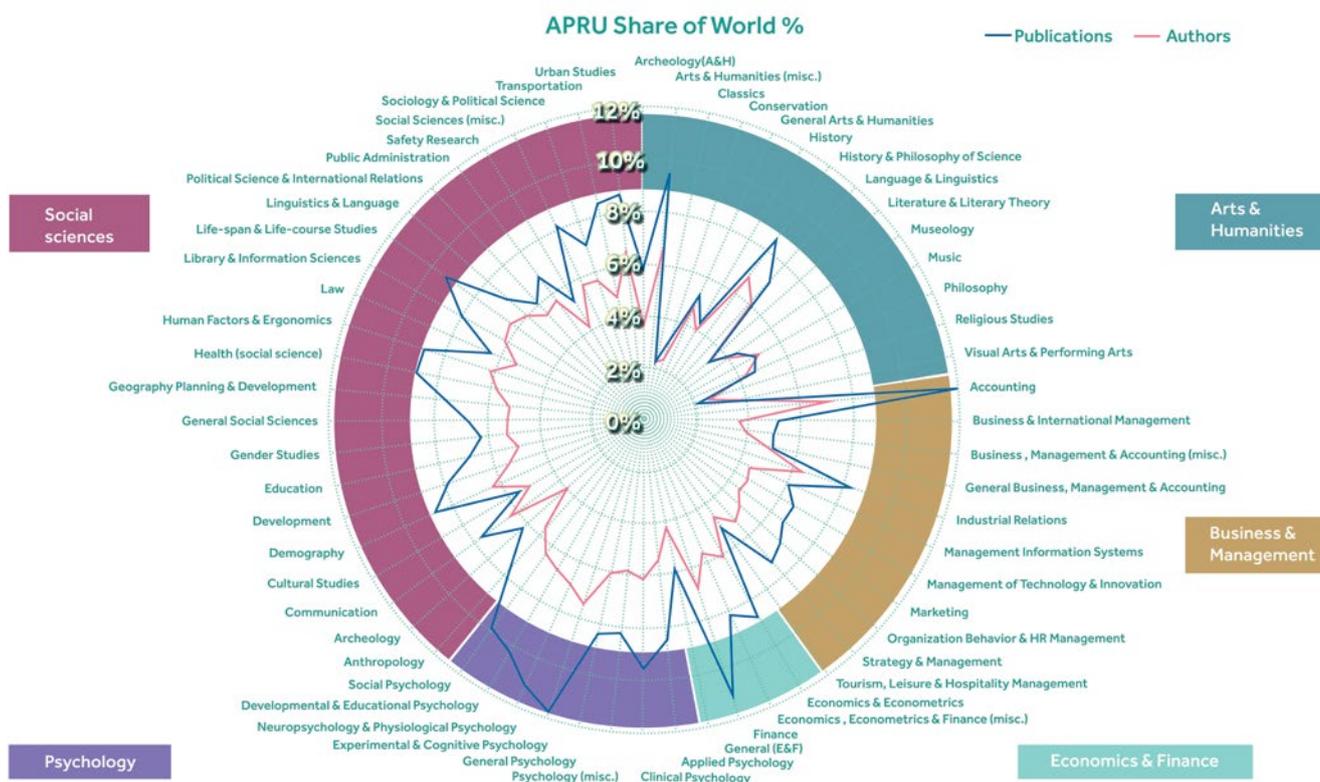


Figure 15: APRU share of world authors (red) and of world publications (blue), by sub-discipline.

HOW TO READ FIGURE 15: All data shown is presented as a share of output in the selected field. Peaks represent areas where APRU’s share of world publications (blue) or world authors (red) are higher, troughs where the share is lower. The difference between peaks in the red and blue lines also shows where APRU authors are particularly productive with respect to publication output. This chart is reflective of quantity of output. For quality or impact of publications, other analysis is necessary.

To understand the impact of APRU members in society, we need to look beyond academic publications. The remainder of this section looks at examples from across the region, providing qualitative evidence of innovative research linked to some of the research peaks shown by the quantitative data. These case studies highlight examples of regional impact and leadership. Many of the examples bring together different sub-disciplines to consider the challenges at hand.

EXAMPLE 1: PSYCHOLOGY, SOCIOLOGY, & EDUCATION: UNDERSTANDING HUMAN RESPONSE TO DISASTER

APRU produces significant outputs in psychology, as shown in Figure 15; an area of study which often falls at the natural intersection between STEM and SSH disciplines. It is essential that we consider psychological perspectives as we seek solutions to some of the greatest challenges of today. Earlier case studies show the value of such inclusion in interdisciplinary challenges and in knowledge creation.

The following case looks at combining expertise from psychology, sociology, education, and neuroscience to understand humans' ability to live with disasters. APRU, bringing

together cultures from the Americas, Asia, Oceania, and the Pacific, offers a natural forum to consider what unites as well as divides us in this context. Furthermore, this forum enables sharing of lessons across jurisdictions, to understand response to adversity, and to support those affected by disaster. One particularly relevant area of research is the inter- and intra-country differences in personal characteristics and relationships. Response to natural hazards is a topic of particular salience throughout the Pacific Rim. How, for example, might different individuals, communities and cultures respond to adversity or disaster? Work on psychological resilience to disaster in the US dates back into the 1980s and includes more recent work following events such as Hurricane Katrina (2005). Less work, however, has been carried out in an Asian context to date. Study 15 adds an Asian perspective.

STUDY 15: The power to live with disasters

RESEARCH: UNDERSTANDING COMMUNITY RESILIENCE

People perceive, judge and behave differently in disasters and difficult situations depending on their personal characteristics and relationships to those around them. Objective data and concepts explaining what makes some individuals and groups more resilient has historically been lacking. Understanding the most important factors may contribute to systematic preparations for future disasters, by helping in the creation of education or training programs that aim to enhance people's resilience, or by enabling the design of social systems that accommodate people who have different profiles.

Six years after the 2011 Great East Japan Earthquake, researchers at IRIDeS, Tohoku University (the lead center for APRU's Multi-Hazard Program) gathered evidence from event survivors. The interdisciplinary team involved psychologists, sociologists, neurosciences, and experts in disaster education. The group took a holistic view of the power to live with disasters, examining immediate response, problem solving in refugee situations, recovery during reconstruction, physical health, and mental health. Personal interviews with 78 survivors formed the foundation of the work and underpinned the development of a questionnaire that was completed by 1,400 survivors. This provided a unique resource of both qualitative and quantitative data to improve our understanding and to bring perspective to the scale and breadth of the event itself.

The research identified eight important factors:

leadership, problem solving, altruism, stubbornness, etiquette, emotional regulation, self-transcendence, and active well-being. Six of them showed significant associations with one or more measures of survival success, including immediate tsunami evacuation, problem solving in refugee situations, recovery during reconstruction, physical health, and mental health. The research indicated which factors were important for different elements of the "power to live" with disasters (for example leadership, problem solving, and emotional regulation were associated with immediate tsunami evacuation).

The group is now working on behavioral experiments to test response in disaster settings to understand what is going on in the brain of participants, and to validate findings from the self-reported interviews and questionnaires.

Existing findings are already being tested in an educational context in Japan. Researchers aim to understand how students respond with respect to the factors identified, and track whether disaster educational programs change their scores in these areas.

In future work, the researchers hope to further understand the importance of the different factors identified and the extent to which these are rooted in nature or nurture. The team also hopes to understand commonalities and differences in factors across countries that determine the "power to live" for both individuals and communities.

APRU INSTITUTION: Tohoku University

EXAMPLE 2: FINANCE & ECONOMICS, POLITICS, LAW-APPROPRIATE REGULATION IN THE PACIFIC RIM

Finance appears as a distinct peak in Figure 16 and APRU members are providing significant contributions to debates in this area within the Pacific Rim. In the wake of the global financial crisis of 2007-2008, rapid and sweeping reforms to financial regulation have been enacted. New standards and regulatory frameworks are exerting influence on a global basis, even

though these are often created in a European- or US-centric process. How does the Asia-Pacific region have a voice in this context? When and how should global standards be adopted and adapted, particularly given the diversity of development and markets within the region?

The collaboration in the following case study combines the intellectual strengths of two APRU institutions to explore this topic, while also providing mutual access to their contact networks of industry and regulators to increase the reach of the work.

STUDY 16: Financial regulation and collaboration in the Asia-Pacific region

RESEARCH & APPLICATION: A NEW MODEL FOR REGIONAL COOPERATION

It is now timely to pro-actively identify lessons learned from the West's development and regulatory integration experience, and to consider the unique circumstances and risks present in increasingly sophisticated Asian financial markets. APRU members are leading discussion on how the region can achieve greater coordination and appropriate integration. Just as investors work across borders, so too should regulators and other parties.

As two of Asia-Pacific's leading institutions on financial regulation, The University of Melbourne and The University of Hong Kong are part of a research program examining the suitability of global regulatory frameworks in Asia and the value that regional cooperation could play in the development of Asian financial regulations. Since 2014, the team has covered a diverse range of topics including trade in financial services, deposit insurance, Islamic finance, FinTech, shadow banking, cross-border insolvency, and Basel compliance. Their work not only combines the intellectual strengths of the two institutions but also provides mutual access to their contact networks of industry and regulators.

With technological advancements, integration in the region is now happening at a faster rate than ever before. No market operates in a vacuum, and a complex array of changing bilateral and multilateral country agreements exist as capital flows through

the region. How do regulators keep up? The team has taken a comparative approach in order to understand what can be standardized and what can be learned from each other and from collective experience.

Since financial regulation and reform cannot be considered from one standpoint or discipline in isolation, the team combines legal expertise with understanding from international relations, politics, and finance. The group benefits from the exchange of content and sharing perspectives, offering a broader frame of reference and contextual understanding for both present and future challenges.

Involvement of industry participants (including major banks, industry bodies and ratings agencies) and regulators has been central to the success of this group in delivering pertinent analysis. The researchers produce publications, and also engage in dialogue and feed results back to parties concerned through round tables and seminars. Team members work directly with regulators on model programs for regional co-operation (such as the Asia Region Funds Passport, which facilitates cross-border marketing of funds in the Asia-Pacific region and is supported by APEC). Value is also demonstrated by an increase in requests from other unaffiliated parties in the region. For example, members of the team have been called upon by regulators to provide input on FinTech legislative reforms in Indonesia.

APRU INSTITUTIONS: The University of Melbourne; The University of Hong Kong

EXAMPLE 3: COMBINING STRENGTHS IN URBAN STUDIES & PLANNING WITH THE HUMANITIES

The Pacific Rim has experienced rapid urbanization with the growth of megacities across the region. Cities as living spaces have particular dynamics created by proximity: for example, different cultural hybrids emerge, interconnected networks

evolve, and both challenges and benefits of density arise. How do we best house growing urban populations? How do such environments shape our views of identity, culture, and history? Both the case study below and APRU's Sustainable Cities and Landscapes Program (SCL) recognize the value that perspectives from the social sciences and humanities can bring to our current and future cities.

STUDY 17: Urban humanities: rethinking how we live together in cities

RESEARCH & EDUCATION

APRU member UCLA has initiated an innovative cross-disciplinary hub for the collaborative study of urbanism. This hub bridges design and the humanities, and actively supports collaboration across the Pacific Rim. A comparative study of LA, Tokyo, Shanghai and Mexico City, for example, was carried out from 2012 to 2016 as a foundation for the initiative. Ongoing work focuses on broad conceptual themes which demonstrate overlapping cultural and historical dynamics, such as density, identity and risk, and resilience.

Contributions from fields such as Asian Languages and Cultures, Comparative Literature, Geography, History, and Public Policy all enrich the hub as the group challenges discursive norms and bridges different ways of knowing from across cultural boundaries. UCLA draws on its strengths in the humanities as well as architecture and urban planning to lead this initiative and to attract visiting collaborators, scholars and designers from megacities around the Pacific Rim.

In Architecture, for example, there is an increasing movement toward contextual sensitivity in design, more informed by research than in the past. Architects are increasingly encouraged to question a design brief. Meanwhile, beyond the applied disciplines, universities are increasingly aware of the need for students to be able to transfer their skills beyond academia as they seek employment following graduation.

The teaching model supports method sharing between disciplines. Using mapping approaches familiar to planners and architects combined with archival research and ethnographic work from the social sciences and humanities in a studio setting enable participants to both utilize existing skills and absorb knowledge from other areas.

Each year the program focuses on a different theme

and a different city, providing a common framework for the participants. Students and faculty combine practical dimensions with in-depth site analysis by deploying research methods from social sciences and humanities fields. The latter are particularly important for creating trust with local stakeholders and reflecting on the context of everyday life.

The hub operates in the academic realm and actively brings in practitioners and involves the communities concerned (for example through local activist groups). The fieldwork is also carried out in partnership with a local host institution. Work in Tokyo, for example, involved APRU member, Waseda University, which nominated students from their schools to participate in projects. The group explored the effects of preparations for the 2020 Tokyo Olympics, in particular the impact on homeless communities. This was a project driven from the humanities lens.

Outputs include public magazines, public performances, exhibitions, installations, and presentations as well as traditional academic publications. Innovative elements come to life when collaborators stop thinking within disciplinary boundaries but rather consider what a city needs and what the students can bring in this context. In Mexico City, for example, students identified a lack of public places for children to play. Students provided the analysis (both mapping and ethnographic) to explain the need, sketched out a concept, and worked with partners to enact change. Local champions helped realize community action and agreed to close the street to cars for one day per month so the children could play.

With the benefit of history, cultural studies, and the arts, and with collaboration from architects and planners, perhaps we can collectively rethink how we live together in cities.

APRU INSTITUTIONS: University of California, Los Angeles; Waseda University

EXAMPLE 4: EMBRACING DIGITAL TECHNOLOGIES IN THE HUMANITIES

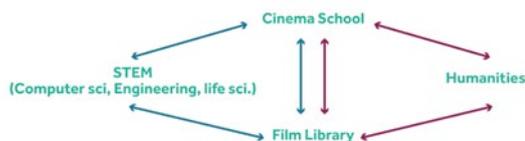
Studies 17 and 18 both reflect on the value of sharing methods and techniques between disciplines. These initiatives are educating a new generation which is able to draw from and translate traditional humanities methods while exploring new

tools from other places. Universities are increasingly aware of the need to take students outside of the academic bubble, particularly those seeking careers beyond academia. Hiring of urban and digital humanities graduates by industry and public sector groups, sometimes from unexpected places, also provides evidence that such skills are valued in society.

STUDY 18: Innovation and collaboration in the humanities: embracing the digital revolution

Several APRU members have embraced the digital revolution, bringing digital expertise together with the humanities to provide new tools and techniques and the rethinking of the nature and potential of information. The digital humanities program, based at APRU member University of Southern California (USC), is one such example.

Drawing on existing infrastructure and strengths at the university, the initiative focuses on bringing together the School of Cinematic Arts and film library infrastructure, with its recognized strength in humanities. It is aimed at creating a change in capability, opening the door to new possibilities for the latest generation of humanities scholars. It is an action-oriented approach without focusing on one targeted idea for application, providing training and support for integrating cutting-edge technologies and digital media directly into traditional humanities disciplines.



The university houses an extensive film library of high societal value. These resources include the Shoah Foundation's 55,000 video testimonies of survivors and witnesses of genocides. The School of Cinematic Arts, meanwhile, is known for developing first-of-a-kind visualization techniques and has a strong connection with the local film industry. It has STEM collaborations with engineering and computer sciences at USC, helping the school to innovate from

a technical side, but also has collaborations with the life sciences exploring how to use media to explain and explore difficult concepts. Projects in the World Building Media Lab, which is available to participants in the program, focus on exploring the boundaries of technology and storytelling, or immersing the audience in an imagined future. What happens when this capacity and capability is brought together with the humanities?

In some societies, the humanities subjects have lost some of the audience they once had. This loss is not reflective of the potential contribution of these disciplines but does require development of new innovative approaches to reach new audiences and enhance relevance in today's evolving society.

By facilitating students and faculty to utilize new technology, these and other initiatives hope to both broaden the intellectual horizon for humanities researchers and shift the cultural dynamic away from SSH disciplines being seen as second class to STEM subjects.

Graduates from the program will find their own ways to utilize and innovate with these new skills, taking humanities research in new directions. Some will remain in academia to mentor the next generation, while others are finding different career routes from joining policy think tanks to exploring the history of scientific discoveries as a university archivist for APRU member, California Institute of Technology.

FURTHER INFORMATION: <https://dornsife.usc.edu/digitalhumanities>; <http://worldbuilding.usc.edu/projects/>

APRU INSTITUTION:
University of Southern California

Sharing Innovations in Social Sciences and Humanities Education and Spreading Capacity Across the Network

Regionally, through educational collaboration and online learning, APRU institutions are synergistically offering students new opportunities. Each institution offers expertise according to its own strengths, and complements the others where appropriate. Through availability online, there is also potential for impact beyond the APRU network.

STUDY 19: Innovating with Social Sciences and Humanities education

ONLINE LEARNING, FLIPPED CLASSROOMS & BLENDED APPROACHES

APRU members are continuously innovating with respect to delivery of education in the social sciences and humanities. They are now collaborating to exchange experiences and use complementary teaching resources in order to mutually enrich their curricula.

As highlighted in the APRU Impact Report 2016, member The Hong Kong University of Science and Technology (HKUST) is one of the pioneers of massive open online courses (MOOCs) in the region. Courses in the social sciences and humanities have been available since their inception in 2012. These courses enable the spread of SSH education beyond the boundaries of the institution, and this investment is also being put to use on campus. The availability of online and recorded material is encouraging experimentation with different teaching styles. The emphasis in the social sciences and humanities on soft skills, such as written and oral communication, lends itself to options such as flipped classrooms (where students watch lectures at home and spend classroom time engaging in discussion, presentation and/or group activities). Online courses cover core material such as methodology, and are supported by up-to-date lectures applying these

methods to the latest research topics.

In an interdisciplinary effort, computer scientists at HKUST have worked with pedagogical experts to develop a visual analytical tool to analyze learning behavior and offer feedback to each student, comparing their behavior with other groups.

HKUST partners with other APRU members, including those in mainland China. HKUST and Nanjing University have formed an alliance to share online resources, focusing on complementary courses to enrich the curriculum in each institution. Similarly, Peking University is now piloting the use of a MOOC from HKUST and there are hopes for complementary engagement in future.

Four APRU institutions (National Taiwan University, Waseda University, Zhejiang University, and Nanjing University) also collaborate with HKUST on their flagship Global China Studies Program, which involves one such use of a flipped classroom model in the Chinese History element of the course.

APRU INSTITUTIONS: The Hong Kong University of Science and Technology; Nanjing University; Peking University; National Taiwan University; Waseda University; Zhejiang University

University museums also have a role to play in education and dialogue, both on campus and with the local community. Since 2012, APRU has supported exchange between museums, exploring their roles in society and sharing experiences and understanding on how technological and organizational innovation can increase their impact. Symposia have been held at Kyoto University, National Taiwan University and The University of Hong Kong, with the next event planned at The University of Melbourne in 2018.

Historically, museums in part of Asia have played a key role in marketing institutions and fostering a strong identity. Since 2012, there has been a shift in focus for several university

museums toward the role of museums in evolving pedagogy across campuses and their social responsibility with respect to the local community. The forum allows members to learn from each other as they innovate and branch into new areas. Institutions build on their individual strengths. For example, National Taiwan University is utilizing its entrepreneurial alumni network and connections with industry to create projects and future exhibitions.

Museums also have a direct role to play in interdisciplinary education on campus. In 2016, the meeting theme: "Teaching Beyond the Faculties" explored ideas such as the use of art to foster ethics development in health professional students.

Diversity: Research Activity, Specialization and Collaboration in APRU

DIVERSITY: SSH OUTPUT WITHIN APRU

Figure 16 breaks down output within APRU across the social sciences, humanities and related disciplines. Contribution from the Australian and US universities and from some Asian “hub” institutions, such as National University of Singapore and The University of Hong Kong are notable. Unlike the data in later figures, the figure here is not corrected to reflect institution size, nor should it be interpreted as reflective of quality of input from the institutions concerned. Some institutions with a low

volume share may have specialties in sub-disciplines and make significant contributions in their economies in these areas.

Another dimension of interest is the comparison between the bars for each institution, here we can see, for example, that UCLA produces high output in Arts and Humanities and is a significant contributor. As a general trend, Chinese, Japanese, and Korean institutions tend to have higher publication contributions in economics.

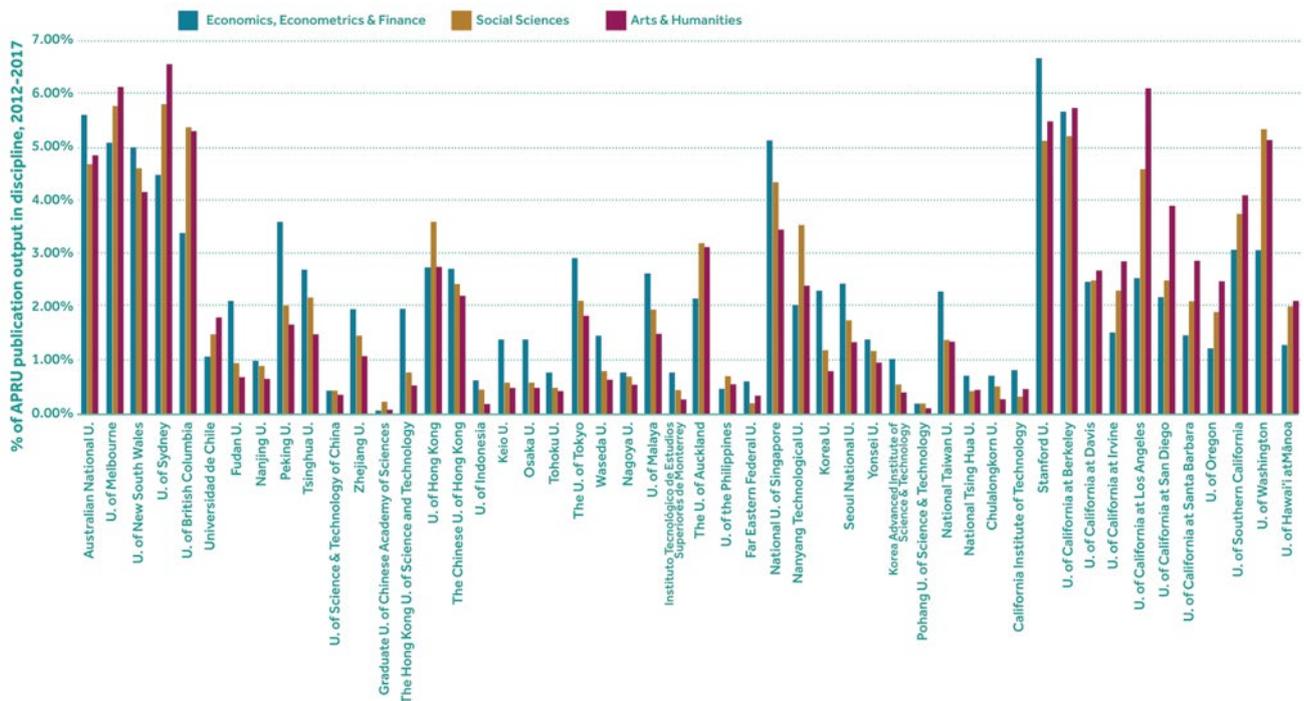


Figure 16: APRU Institutions’ share of total APRU output in each discipline.

One of the strengths of the APRU network lies in its diversity and the potential to draw from across the region to take a multicultural and interdisciplinary approach to some of the region’s greatest challenges.

Figure 17 compares two APRU institutions, demonstrating some differences and potential synergies between institutions.

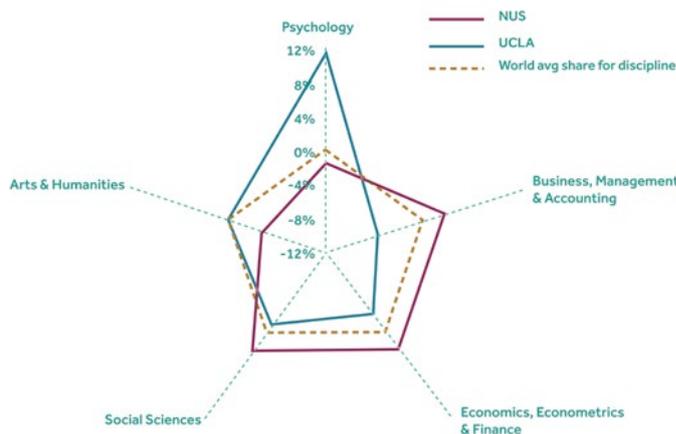


Figure 17: Example: Difference in research activity in SSH disciplines for two APRU members, based on the share of overall institutional publications for discipline. A value of zero means that the discipline has the same share in the institution as it does globally. The scale represents the difference between the share in the institution and the global average.

Variation and Specialization Across APRU

Overall, the average APRU institution produces more publications than expected (corrected for size of the group) in the fields of psychology, business and management, and economics as shown by the red bars in Figure 18, falling above the x axis. The range of activity for each discipline and sub-discipline within the membership is shown on figure 18.

Geography and urban planning is a sub-discipline where some institutions also have a degree of specialization; Nanjing University is a good example, where nearly half the social science publications produced over the last five years were in this sub-discipline.

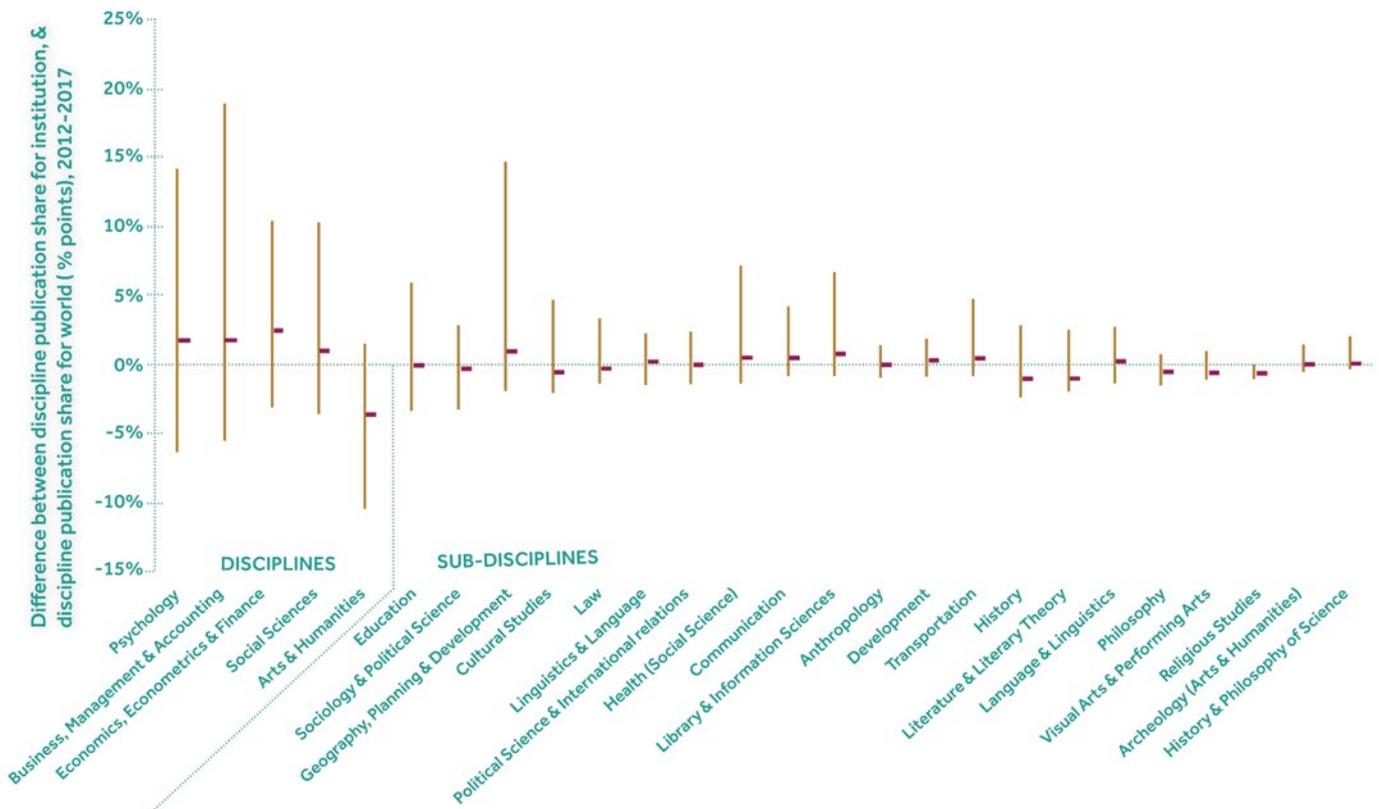


Figure 18: Variation relative activity in SSH disciplines across the APRU membership and compared to global average, based on share of total publication volume for discipline or sub-discipline, compared to global average for discipline. Chart shows range for APRU and average APRU institution (red bar). The institution with the highest score is labeled for each discipline. A value of 0 indicates the institution(s) produce the expected volume of publications for that discipline based on the world average share. Scale represents difference to world average share.

Collaboration within APRU: Social Sciences as an Example

As shown earlier in Figure 12, international collaboration in SSH disciplines is much higher for the APRU network. This section looks specifically at data on collaboration within the network itself, through examining publication data and co-authorship. This covers all types of publications included in the Scopus database (including any books indexed). Data was analyzed for the social sciences rather than humanities due to the higher quality of publication coverage in the database.

Some institutions act as “international hubs” connecting many institutions together. The University of British Columbia, National University of Singapore and The University of Hong Kong, Peking University and the Australasian institutions are notable connectors in the social sciences across international boundaries.

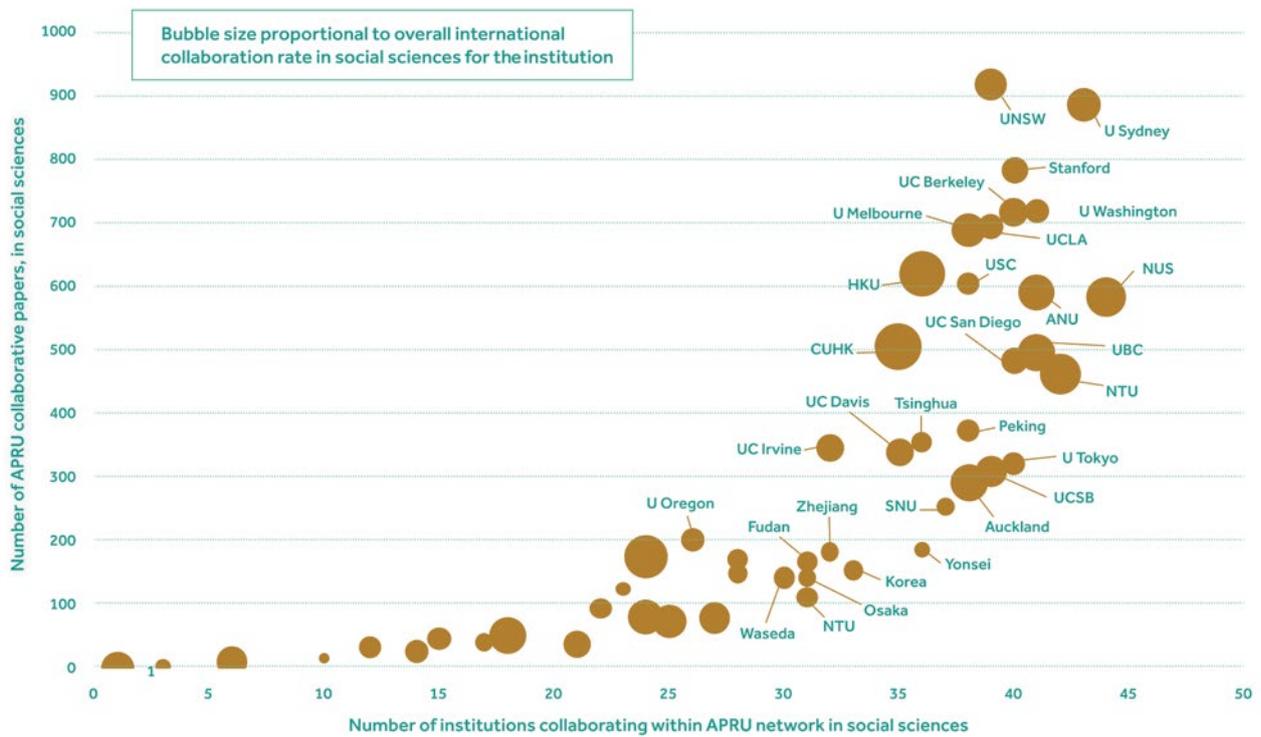


Figure 19: Collaboration in social sciences among APRU members
 Chart reflects both the number of collaborative papers, and breadth of collaborative partners for each institution (maximum = 49).

Some institutions are particularly strong national collaborators within the APRU network. Collaboration within Australian APRU institutions and within American APRU institutions is particularly strong in the social sciences. Figure 20 shows the strongest collaborations within the network, with both national and international links.

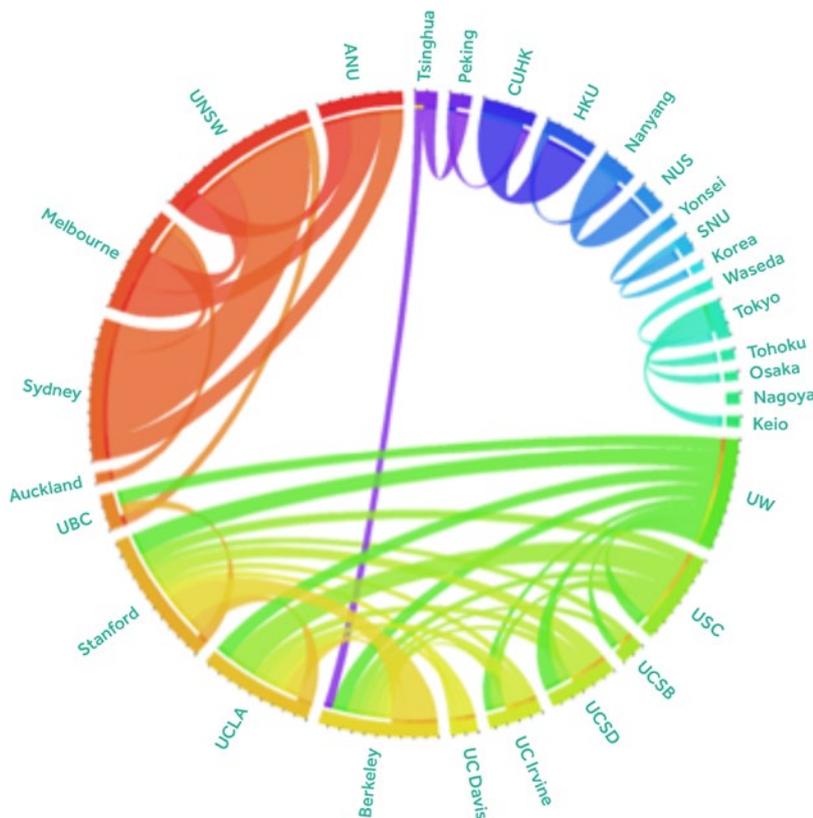


Figure 20: Top 100 social science collaborations between APRU institutions, by publication volume.
 The width of the line is proportional to volume of co-authored publications between two members. Institutions are arranged around the circle by economy. Most of the top 100 APRU collaborations are within economies, however some long-distance collaborations do appear in the top 100 (e.g. University of California, Berkeley and Tsinghua University; National University of Singapore and The University of Melbourne; and UNSW Sydney and The University of British Columbia). Only institutions with collaborations in the top 100 are shown.

4. IN FOCUS: GLOBAL HEALTH

CHAPTER SUMMARY

APRU has long recognized the need and benefit of multilateral dialogue in public health, with many shared health challenges across the Pacific Rim. As demonstrated in this chapter, APRU is well placed to offer leadership in the interdisciplinary field of Global Health, with world-leading research capabilities, responsibility for education of health professionals, and an established network of over 1,000 researchers, policymakers, and professionals across the region under the Global Health Program (GHP).

This chapter highlights:

- Global health challenges in the Asia-Pacific region
- APRU strengths in health research and education
- APRU collaboration in the Global Health Program (GHP)
- APRU in action, featuring eight case studies

The GHP is one example of an interdisciplinary program run by APRU, bringing together the necessary expertise to address health challenges from across the STEM and social sciences and humanities. As an example, more than 40 disciplines were represented at the last annual conference.

Like other programs, the GHP involves elements of research, capacity-building, and policy collaboration. The program has been particularly innovative and collaborative in the area of educating of the next generation of leaders. Distance education courses developed by the program involve participants from across the region, providing a richer perspective on complex global health challenges.

The GHP offers an excellent foundation for international research collaborations, and has harnessed interdisciplinary expertise on topics such as environmental health, non-communicable diseases (NCD), security and migration, mental health, and bioethics. Work has inspired leadership by the institutions through policy statements among the membership on topics such as tobacco control, substance abuse and workplace wellness. With more than 10 years collaboration history and an extensive network, the GHP and its members are increasingly involved in discussions beyond academia on questions of regional and global public health policy.

The determinants of health are complex, involving a multitude of social, economic, political and demographic factors. It is no surprise, therefore, that health research is recognized as one of the most interdisciplinary fields,²⁰ requiring collaboration and the application of knowledge from a wide range of research areas. Successfully working across borders on health challenges demands more than just medical, epidemiological or public health training; it requires competencies in topics such as global governance, medical anthropology, health economics, and global development, among others. Global Health is defined in this chapter as “research, training, and application of public health on a global scale” (after Koplan et al (2009)). While working across disciplines on health challenges is not new, APRU has a unique ability to bring together world-leading experts from across the network, regardless of where such talent resides. By providing a communicative structure and support for action, new participants and voices can be brought to the conversation. Discussions benefit from the socio-economic and cultural diversity presently seen across the Pacific Rim. Gaps in capacity, either from a disciplinary or geographical perspective, are being bridged as part of the unique feature of this global network.

Current and future global health problems also require a trained, global health workforce with expertise in an array of disciplines and contexts, from governmental, research, and clinical levels.

Diversity within tertiary institutions in terms of programs and disciplines promotes training, something which APRU’s leading institutions, with a broad range of expertise, are well placed to provide. The foundational trust and relationships established across the region through the APRU network offer future opportunities to address gaps in regional capacity in innovative ways, as they arise.

Global Health is an area of growing recognition and interest across academics, practitioners, and policy-makers worldwide. As part of this report, keyword analysis was conducted on more than 14 million publications in the Scopus database published since 2012, providing evidence of the rise of Global Health research.²¹ Publications containing the term global health have risen 61 percent globally, compared to a rise of seven percent of public health research publications and 4.4 percent rise in research publications on any topic. APRU is at the forefront of the research trend.

Data gathered by the APRU Global Health Program also shows the rise of Global Health education over the period within and beyond the APRU network. For further information and data on these topics, see Box 4.

Box 4: The rise of global health

RESEARCH

A keyword analysis of over 14 million publications in the Scopus database, published since 2012, gives us some indication of the current rise of “global health” research. Over the period 2012-2016:

Publications containing the term Global Health have risen 61 percent (compared to a rise of seven percent of public health research publications over the same period and 4.4 percent rise in research publications on any topic).

Over this period, 24,000 publications included the term.

Citations per publication and the views per publication are significantly higher for Global Health publications than for public health alone, also when corrected for age and type of publication. Field weighted citation impact for global health is 1.55 and field weighted view impact is 1.5 (by definition the value for both terms for public health as a field is one).

Many more publications have relevance to this topic but may not utilize the term and therefore are not

captured in this keyword analysis. As another proxy, international collaboration in public health has risen over the period both globally and regionally.

International collaboration in public health is higher than the average across all disciplines, but this is notably true for the Asia-Pacific region. The international collaboration rate in public health is consistently around 10 percent higher compared to the average across all disciplines. APRU members have a very high and increasing rate of international collaboration on public health. In 2016 around 38 percent of publications involved exchange across borders.

EDUCATION

Global Health education programs have also grown globally over the past 25 years. Work by the APRU Global Health Program interviewing member institutions and other partners in the region in 2016 highlighted that two-thirds of the academic programs on this topic in institutions surveyed were created after 1990, with the greatest number of new programs in the previous five years. Covered in the

²⁰ Interdisciplinary research by the numbers. *Nature* 525, 306–307 (17 Sept 2015) doi:10.1038/525306a

²¹ International public health

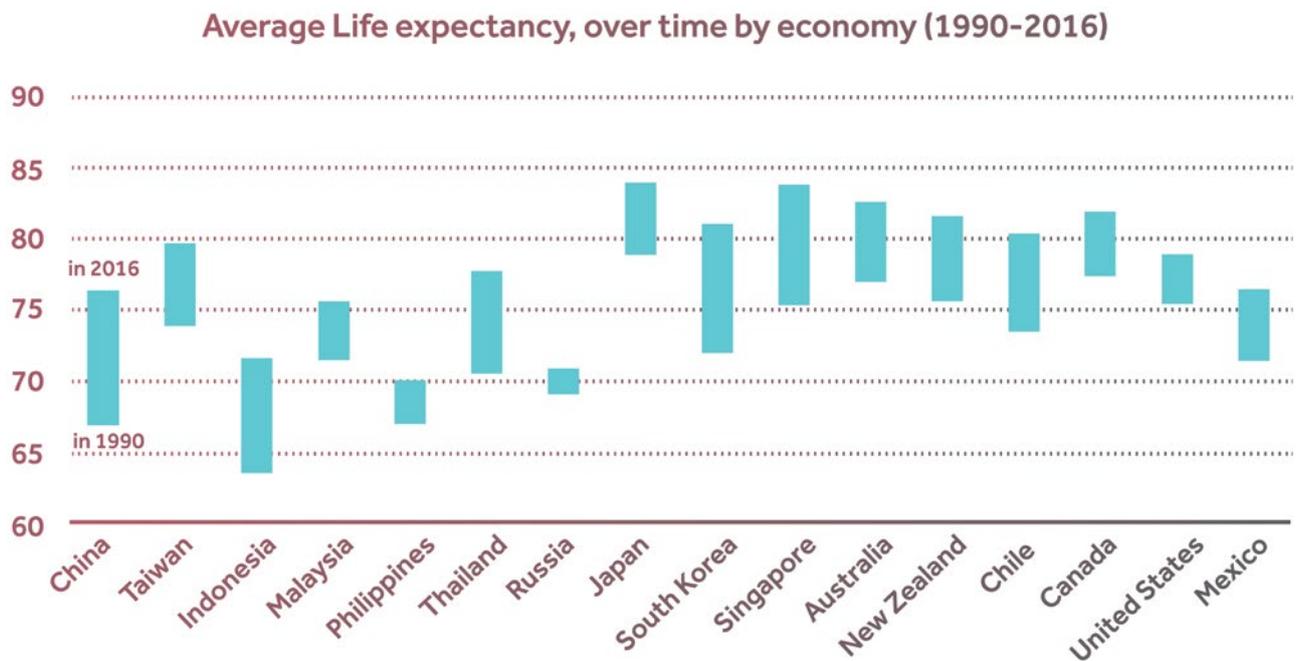


Figure 21: Life expectancy in APRU economies, in 1990 and 2016.

In many parts of the region, substantial increases in life expectancy have been realized over the past 25 years. Some of the most notable improvements are in places such as China where life expectancy in 2016 now exceeds the 1990 life expectancy for the USA.

Opportunity: APRU Strengths in Health Research and Education

APRU institutions, with their leading research capabilities and educational initiatives, act as catalysts for collaboration on global health challenges.

APRU punches above its weight in both quantity and citations of medical and life science research (Box 5). High volumes of research output are noted in the medical fields of epidemiology, geriatrics, mental health, and oncology. It is APRU's research capabilities, paired with its ability to harness its members' collective capacity and diversity of backgrounds, that position APRU to direct global health policy.

The APRU network stand out in the particularly relevant field of public health (including environmental and occupational

health), excelling in quantity of citations, and visibility (Box 5). APRU institutions are more globally collaborative in these areas, with an average international collaboration rate over the last five years of 38 percent, compared to the global average of 21 percent and the APEC average of 26 percent.

The APRU network also includes leading expertise in social sciences related to health and a variety of relevant disciplines highlighted in the previous chapter, including psychology, economics, data analytics, demography, politics, and development. Finally, the institutions involved have established processes and review committees versed in understanding of ethical and societal issues surrounding health research and those involved.

BOX 5: APRU academic strength and global health: quantitative evidence

PUBLIC, ENVIRONMENTAL, & OCCUPATIONAL HEALTH

The closest sub-discipline to Global Health is the topic of public, environmental and occupational health. The figure presents supporting data on the performance of APRU in this field across the areas of scientific impact, visibility, public interest, and engagement. APRU authors are twice as productive as the global average in this field, while also achieving twice as many citations per publication on average.

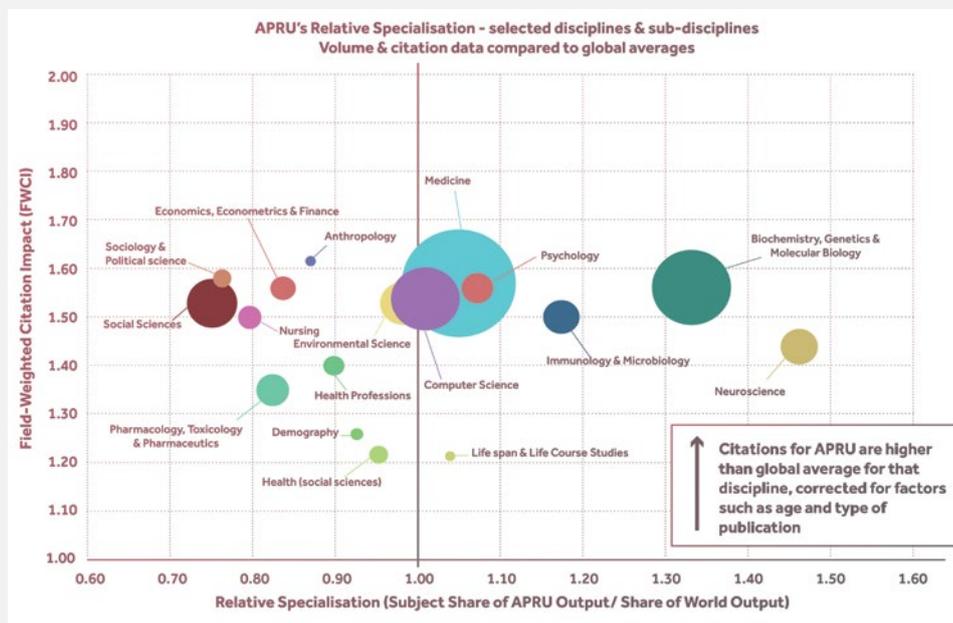
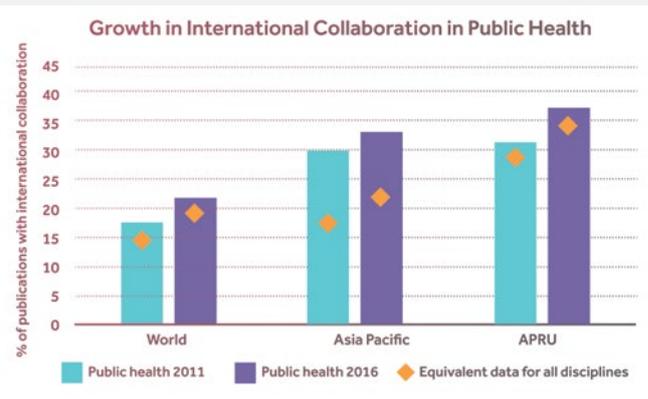
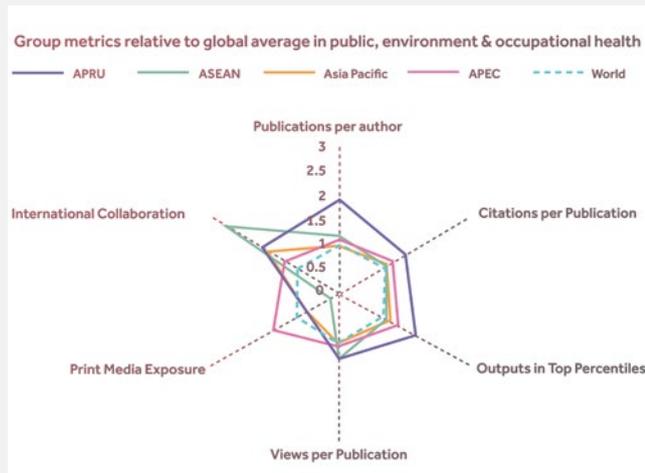
Statistics on the production of “star” publications in this area, those cited most often globally, are similarly impressive, with over 15 percent of the publications by the network found in the top 10 percent worldwide.

International research collaboration in public health provides proxy information for Global Health. APRU institutions are more collaborative internationally than the regional and world average in this area, and the gap has widened since 2011.

DIVERSITY OF DISCIPLINARY STRENGTHS

As mentioned, Global Health requires expertise and input from across a very diverse range of disciplines. Some key subjects are highlighted in the following figure (below left). As indicated on the y-axis, APRU disciplines have field-weighted citation indices well above the global average in the disciplines shown. In other words, each has a higher rate of citation than the global average for that field, corrected for the age and publication type.

Within the APRU network, STEM fields traditionally see more production of publications (relative to the global average). However, publication volumes are also particularly high in life course studies and psychology. Lower publication volume does not indicate lack of quality or value. Further, the network’s diversity allows the organization to fill gaps through synergistic collaboration.



APRU as Educational Providers

APRU institutions play a key role in providing doctoral degrees, professional practice degrees, and healthcare training (see Box 6).

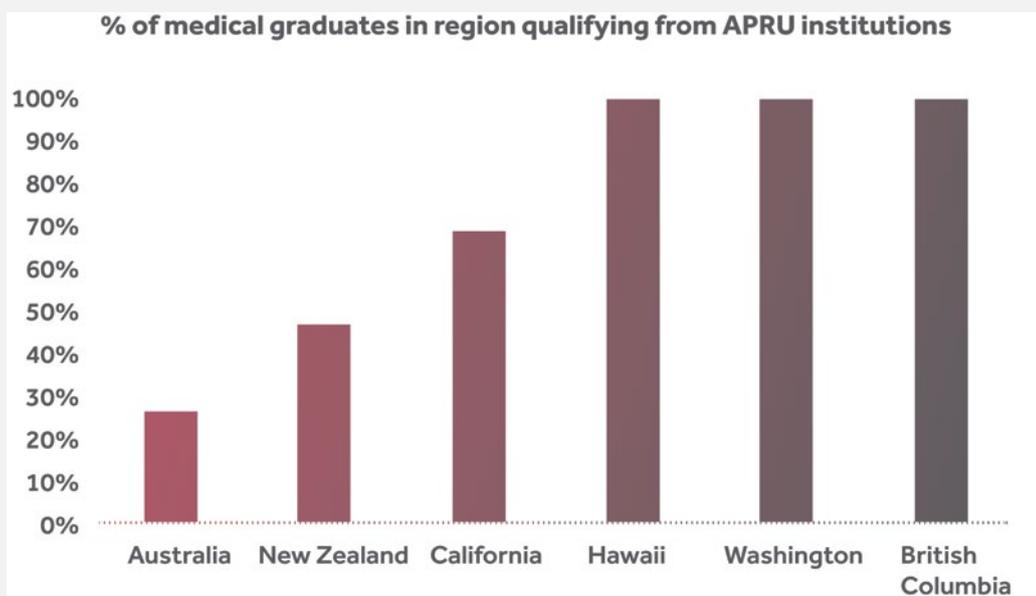
In addition to training medical professionals, APRU institutions call upon their teaching expertise to deal with the challenges of global health education. To understand how public health functions in the real world, students benefit from awareness of resource constraints, cultural and behavioral challenges, health system issues, and questions surrounding the increasing volumes of health-related data. These may include, for example, courses in medical anthropology, health economics, environmental health, psychology, demography, big data and health informatics, policy and management.

While globalization has brought challenges to public health, it has also brought new ways to collaborate in education. Chapter

4.2 outlines how APRU institutions are collaborating through the Global Health Program to best support the next generation of health care professionals and bring together their collective expertise to offer interdisciplinary education and exposure to other countries.

Exposure to other cultures and their health challenges provides opportunity for students to understand the true context behind constraints and barriers to change in a global context. It is this combination of a broad knowledge base and contextual understanding that is important for the development of future global health leaders seeking to reduce the current burden of disease and to address future health priorities.

BOX 6: Health education – examples: APRU members producing health professionals



4.2 APRU Global Health Program

The objectives of APRU's Global Health Program (GHP) are to foster:

1. Research collaborations: Harnessing interdisciplinary partnerships, bringing together different types of academic institutions, working across different regions, engaging in different forms of public and global health research.
2. Education: Facilitating discussion and collaboration among
3. Policy and university impact: Building APRU GHP's capacity to engage with international funding agencies, influence regional and global public policy, and make an impact on institutional codes of conduct.

APRU members with diverse approaches to address rising demand for education in global health, with an emphasis on emerging technology-based educational and training materials.



Figure 22: Global Health Program spans the six university roles outlined in the APRU Impact Report 2016

History and Objectives

Launched in 2007, the Global Health Program²² (GHP) creates a platform for research to inform health policy and enables collaboration for improved education of healthcare professionals throughout the Asia-Pacific region. Since its inception, the program has covered a significant range of topics including emerging public health threats, aging and chronic diseases, infectious diseases, and health security issues, among others.

The GHP overall has been highlighted by others within the scientific community as a good example of global health collaboration.²³ One of the greatest strengths of the program is the breadth and extent of its network, built over the past 10 years. Its reach extends beyond APRU members, furthering cooperation and dissemination throughout the Asia-Pacific region. Today, more than 1,000 current and emerging global health experts from more than 25 economies, 52 institutions²⁴, and 26 disciplines are connected to the GHP. While many of the academics are from medical and public health fields, other disciplines, including law, engineering, anthropology, communications, and political science are also represented. The GHP specifically harnesses interdisciplinary partnerships representing different types of academic institutions, working in different regions, and engaging in different forms of public

health and global health policy and research. The scale and breadth of the network also provides an opportunity for the GHP to reach multiple audiences and impact policy discussion at a high level.

The GHP leverages this expertise to offer insights into some of the region's health challenges and potential solutions. As highlighted in Chapter 4.1, the APRU network includes some of the world's leading experts in the fields of tobacco control, global health governance and trade, air pollution, climate change and health, bioethics migration, and non-communicable diseases. Researchers are encouraged to come together to share and develop best practices and conduct collaborative work, particularly across nations, aiming to inform current and future policy development. While barriers to international, cross-cultural research still persist, these are reduced by the existing structure, relationships, and communication routes established by the program over the past decade.

Another notable strength is the education and training component of the GHP, both in terms of direct capacity building through student-oriented activities, and courses developed within the program and through pedagogical innovation, which indirectly enhance students' education at APRU member institutions.

²² Formerly APRU World Initiative (AWI) Public Health Program

²³ Liu Y, Zhang Y, Liu Z, Wang J. Gaps in studies of global health education: An empirical literature review. *Glob Health Action*. 2015

²⁴ The GHP network extends beyond APRU members, including other institutions within the region.

Operation

The GHP is housed at the University Southern California Keck School of Medicine, with a dedicated Program Director (Dr. Mellissa Withers) and Chair (Dr. Heather Wipfli), who sit within the Institute for Global Health. An advisory group with 13 members from 11 economies provides leadership for the group. Members help define the mission and action plan of the GHP and assist with implementation. Each individual is actively involved in at least one of the major activities under the program, in close consultation and cooperation with University of Southern California, the APRU secretariat and the other members of the Advisory Group. These include both educational (e.g. student competitions) and research-related activities (e.g. leading working groups). Decisions on governance, funding, and strategy are taken collectively. Figure 23 highlights the different expertise and backgrounds of the Advisory Members.²⁵



Figure 23: The Interdisciplinary GHP Advisory Group.

Each word represents an area of expertise, larger font is used where there are multiple individuals with this background.

GHP: As Connectors

The Annual Conference is a cornerstone of the GHP, and over the past 11 years has matured into an event of regional importance. Each year, approximately 250 to 300 individuals from up to 19 economies convene to discuss critical topics in global health. The meeting brings together emerging and expert global health leaders, researchers, trainees, and practitioners from across the Pacific Rim, including faculty, students, researchers, community leaders, representatives from non-governmental organizations, and government officials. The conference enables stakeholders to share the latest research and advances, initiate collaborations to develop evidence-informed solutions for major health challenges, formulate policy recommendations, and foster regional leadership and sharing of best practice regionally.

A regular face-to-face meeting is key for promoting new and strengthening existing links within the network. APRU is

also committed to supporting capacity building in the region, both through active engagement of young researchers and of researchers from low- and middle-income countries. Each year, there is a special intensive capacity-building workshop on a key topic of interest, with topics covered such as migration, workplace wellness and global health practicums. The conference also acts as a venue for face-to-face meetings of the Working Groups and the GHP Advisory Group. The 2017 conference theme was cancer and environmental exposure.

The interdisciplinary nature of the meeting is evident from both the agenda and attendance. In the past five years, each conference brought together academics from diverse backgrounds. For example, the 2014 event brought together 17 distinct disciplines. Success of the conference is shown by its growth from 50 participants in 2007, to the current scale of around 250 to 300 participants per annum.²⁶

²⁵ See www.apru.org and <https://apruglobalhealth.org/> for further information on the Program and Advisory Group

²⁶ For further information: Abstract books from the past five years of the conference can be found on CABI's Global Health database <http://www.cabi.org/publishing-products/online-information-resources/global-health/>.

ONGOING COMMUNICATION: Between the meetings, a quarterly newsletter keeps the community informed of the activities of the GHP and its members.

WORKING GROUPS: The GHP currently has Working Groups (WG) on each of the following topics which meet face-to-face at the annual conference and via teleconference in the intervening period:

- Global Health Education and Technology
- Environmental Health
- Trade, security, migration, governance
- Non-Communicable Diseases (NCDs)
- Nurses
- Mental Health (new)
- Bioethics (new)

Each working group consists of 10 to 20 people and is co-chaired by two members of network. Activities of the groups include conducting collaborative research studies, writing policy statements and publishable papers, and disseminating ideas (e.g. through webcasts). The two largest WGs are on education and environmental health. For further information see www.apruglobalhealth.org.

GHP: As Educators and Innovators

Activities for students and emerging researchers have been part of APRU's focus since the outset of the organization, and education is naturally a major part of the Global Health Program, both directly through student-oriented activities and development of courses and through collaboration on global health teaching and pedagogical innovation. The network and its members have supported the development of new, more flexible models of learning, such as distance learning, experiential learning and collaboration between students of different cultures.

GLOBAL HEALTH EDUCATIONAL GUIDELINES AND PLANNING: Academic institutions have a key role in training a

competent Global Health workforce and in preparing leaders to address health issues. However, little agreement exists on what constitutes appropriate global health training. Members of the Global Health Program have worked together to:

- Develop a set of best practices in Global Health practicums for universities
- Create a set of recommendations regarding Global Health's core competencies for universities
- Outline the rising demand for postgraduate Global Health-focused education in the Pacific Rim region

Work was based on a survey of APRU member universities and some highlights of the findings are presented below.

STUDY 20: Global health practicums: recommendations for best practice

Many competencies for global public health training, such as appreciation for the challenges of different political and health systems, are best acquired through real-world experience rather than in the classroom. Well-delivered practical exchanges offer benefits to the host, fostering international exchange, and sometimes assisting to address gaps in local capacity. Poorly designed practicums can, however, pose a range of ethical, logistical and resource-related issues for the host, partner institution, and students concerned. To address these issues, APRU Global Health Program brought together key stakeholders including students, faculty members, program administrators, and NGO staff from across 13 economies to collaboratively develop a set of recommendations for program design. The full results have been published in the

Journal of Community Health, and some highlights are included here, seeking to increase positive impact of such programs for all concerned.

Identified problems included differing expectations between students, partners, and hosts and little consideration or understanding of true costs and benefits for host institutions and communities. Locally, scarce resources can be diverted from community work or patient care to assist students so the value of the exchange to the community should be carefully considered both in the short and long term. Student misconduct was identified as an issue, generally unintentional, but as a result of a lack of local cultural understanding or lack of awareness of best practice surrounding health research ethics issues such as

informed consent. On the flip side, students could be asked to perform duties beyond their training by hosts, placing them in an ethical dilemma.

Best practices included:

1. Strict student selection, including understanding motivations for participation, maturity, and willingness to learn and adapt.
2. Clear objectives/guidelines for all partners, with hosts determining the minimum time commitment required in the field.
3. Pre-trip orientation, including cultural sensitivity training.
4. Ethics training on, at a minimum, research with human subjects and community-based research.

5. Increasing funding to adequately compensate parties and enable equitable student access to such programs.

Also seen as essential:

6. Effective mentorship and supervision.
7. Evaluation of the programs.
8. Improved safety protocols.

APRU INSTITUTIONS: University of Southern California; National Taiwan University; National University of Singapore; University of the Philippines; Seoul National University; The University of Auckland; University of California, Irvine; The University of Sydney; The University of Tokyo

EDUCATIONAL OPPORTUNITIES WITHIN THE GHP: The GHP annual conference provides opportunities for students and offers exposure for early career researchers. Annual travel grants are offered specifically to enable students from APRU universities to attend the meeting. Most recently, APRU initiated a virtual Global Health Case Competition, open to students from any university in the world. Each team of five to six students is given a global health-related challenge and must prepare a 10-to-12-minute video response describing a realistic but creative solution. An international panel of judges selects the finalists, who are invited to attend the annual conference where their video submissions are screened live. The winners receive a cash prize, and more importantly, exposure and mentorship through the experience of the competition.

In 2016, the first year of the competition, 13 universities entered students from eight countries (Australia, Japan, Malaysia, New Zealand, the Philippines, Russia, Taiwan, and the United States), looking at how to improve disaster preparedness in the region. In 2017, 38 teams submitted solutions from 11 countries around the region. This time, the challenge explored using universities as platforms for tobacco control efforts (see also for other work in this area).

APRU Global Health **STUDENT AMBASSADORS** chosen from the member universities also assist with project activities, such as creating the newsletter, updating the website and social media, and helping to organize the annual conference.

Involvement of students in the case competition and organization of the GHP exposes them to gaps and challenges of health systems across the region, and offers practical experience working in a global research environment. Students are exposed to best practices in research, viewpoints from those with different disciplinary and cultural backgrounds, and they begin to establish networks beyond their own institutions.

APRU INNOVATING GLOBAL HEALTH EDUCATION: While globalization has brought challenges for health, it has also brought new ways to collaborate in education, offering new opportunities for flexible models of learning. Curricular materials can be shared; lectures are webcast globally; and cross-institutional course projects are increasingly feasible. Overall, there are multiple opportunities to increase the breadth, depth, and quality of education for the next generation of Global Health leaders. The GHP has taken on this challenge through the Global Health Education and Technology Working Group (the largest of the seven current working groups in the program) and through development of specific interdisciplinary, distance-education courses.

Co-developed and co-managed by members of the APRU Global Health Program, the first annual distance education course on Global Health Leadership began in 2015. A second course on Global Health Ethics uses a similar model and has been offered for the past two years (see Study 21).

STUDY 21: Global health ethics in research and practice

A NEW COURSE BRINGS TOGETHER DIVERSE VOICES TO DISCUSS ETHICAL CHALLENGES IN GLOBAL HEALTH

Consideration of ethics is of increasing importance in the Global Health sphere in light of the increasing role of the private sector and corporate financing. The development, testing and dissemination of new medical technology, including that related to genetic research, is increasing focus on community-based participatory research, and encouraging research in developing countries by researchers in high-income countries. The multitude of complex ethical issues involved in research with human beings necessitates in-depth, interdisciplinary training on research ethics as part of the Global Health education and training curriculum. A course developed by an international network, such as APRU, enables consideration of public health research, initiatives, and practices across different nations, cultures, and religions. It also facilitates exploration of the ethical principles in the distribution of health resources, conduct of global public health research, and ethical questions for Global Health issues that transcend borders. Through a distance education model, the course helps fill a critical gap in bioethics training at academic institutions and offers exposure to international experts as guest lecturers (past guest experts included the Co-Head of the Center for Bioethics for the WHO, editors of major international bioethics journals, UNESCO advisory experts on ethics education, and the inventor of the cochlear implant who discussed medical device regulation). The course is structured to enable interaction with the speakers and between members of the group, including smaller group discussions and reviews of case studies.

In Fall 2016, the APRU Global Health Program developed a new online graduate course on global health ethics. Weekly for 10 weeks, an interdisciplinary group of students from six universities around the world signed on simultaneously to a web-based learning platform. In this interactive learning environment, the students from five countries (Hong Kong, Japan, Mexico, the Philippines, and the U.S.)

and multiple disciplines (law, public health, medicine, anthropology, and biomedical engineering) explored ethical principles in the conduct of global health research and practice.

The course helps students gain a practical understanding of 1) the characteristics of global health ethics and bioethics, 2) the international and local protocols and systems in place to ensure adherence to ethical principles; and 3) how ethics may be interpreted differently based on distinct cultural perspectives. Contentious topics such as end-of-life care, genetic testing, clinical trials, the use of social media in research, organ transplantation, assisted reproductive technologies, and the collection of bio-specimens are discussed.

Students also examine case studies on ethical challenges from real-world situations in order to assess and discuss the complexities of public health practice and research ethics in a global context. Weekly guest lectures by international experts from a wide range of disciplines allow students to interact with leaders in the field. Given that Global Health work often necessitates working with teams from various backgrounds and cultural contexts, this course provides the opportunity to work with peers across institutions and regions throughout the course, helping them to also develop and hone cultural competency skills. The APRU network offers an ideal foundation for such a model of collaborative distance education across economies and disciplines. Success of the 2016 course led to repeat courses in 2017 and 2018.

DISCIPLINES AND BACKGROUND OF GUEST

SPEAKERS: Philosophy, Law, Biomedical Ethics, Anthropology, Public Health, Medicine, Pharmaceutical Sciences, Biomedical Engineering.

APRU AND OTHER INSTITUTIONS: University of Southern California; Osaka University; The Hong Kong University of Science and Technology; University of the Philippines; National Autonomous University of Mexico; Instituto Nacional Salud Publica (Mexico)

Other APRU members are also collaborating on educational courses covering interdisciplinary topics, and linking students from different institutions throughout the region.²⁷ Sustainable Health and Environment, for example, is a long-distance course for students who are interested in health and environmental issues in a global spectrum. It is led by three universities (National Taiwan University, Seoul National University, and Yokohama National University). See Appendix for further information.

SUPPORTING STUDENT INNOVATION: APRU institutions actively support student innovation through the

forementioned Virtual Global Health Case Competition, run by the Global Health Program (GHP). Other examples within the membership include The Hong Kong University of Science and Technology's Student Innovation for Global Health Technology (SIGHT) platform, which aims to implement student-driven innovations through partnership with non-governmental organizations and local governments in Cambodia, Indonesia, China and Hong Kong. The projects range from low-cost biosensors and water treatment to eye disease screening with smart phone devices.

GHP: Research and Policy

The GHP supports and creates opportunities for comparative and collaborative research across the Pacific Rim. This includes building an evidence base to inform future preventive policies and programs (for example, understanding the incidence and distribution of disease and its underlying social, cultural and environmental factors), working toward solutions for our current and future health challenges, and sharing best practice and lessons between jurisdictions and practitioners.

The Working Groups and other meetings organized by the GHP Leadership, such as workshops run in conjunction with the Annual Conference, help facilitate new collaborations to generate multi-country studies, published papers, new grant applications, and to increase policy engagement among members. The latest annual conference in the Philippines (2017), for example, has led to "The Manila Declaration on the Drug Problem in the Philippines".

There is also opportunity for the network to lead by example, as in relation to employee health and wellness for the more than 360,000 employees of APRU institutions. A collaborative policy statement was put together on this topic in Sydney in 2016, highlighting the role and responsibility of universities to value and promote health, dedicate resources, share expertise, and work toward specific targets including tobacco-free campuses. This is also supported by agreement to conduct further research on well-being policies across APRU universities.²⁸ Currently, a survey assessing the breadth and scope of workplace wellness policies across the members is being designed and will be implemented in 2018. The GHP Leadership has engaged with APEC on this topic, presenting in a workshop in Vietnam as part of the Healthy Women, Healthy Economies Initiative.

EXAMPLE OF GHP ACTIVITY: TOBACCO, AIR POLLUTION & ENVIRONMENTALLY-RELATED CANCER

The theme of the 2017 Annual Conference was Environmental Exposures and Non-Communicable Diseases (NCDs) in the

Pacific Rim, which was selected due to its current importance in the region, as identified by members. Data provided by the Institute for Health Metrics and Evaluation²⁹ also highlights the importance in an Asia-Pacific context, where the rate of NCDs in Asia attributable to environmental risk factor was more than double that of Europe in 2015.³⁰ The United Nations Sustainable Development Goals (SDGs) also target reducing premature deaths from NCDs by one-third by 2030 (SDG 3.4), and focus on reducing deaths from air, water, and soil pollution and contamination (SDG 3.9), including strengthening implementation of the WHO Framework Convention on Tobacco Control.

The problem of cancer in Pacific Rim countries is heterogeneous, with gains being made in some economies (e.g. declining tobacco product use in the U.S.), while air pollution is a rising contributor in others. More attention is needed on cancer prevention and control in Asian countries,³¹ especially in low and middle-income countries, where cancer incidence rates are high. However intensive research into planning effective cancer control programs is lacking, and such programs are not easy to implement.

Collectively, the APRU GHP has some of the world's most-renowned experts on tobacco control and air pollution. Current and past members of the GHP Advisory group include: the author of the WHO Framework Convention on Tobacco Control, Wipfli; the Chair of the Clean Air Scientific Advisory Committee of the U.S. Environmental Protection Agency and the U.S. Food and Drug Administration's Tobacco Products Scientific Advisory Committee, Samet; the leader of cross-country studies on air pollution, an expert on commuter pollution exposure and Chair of East Asia Chapter of International Society of Exposure Science, Chan; an expert on tobacco control and policy in China, Zheng; and an expert on tobacco control, mass media, social determinants of health in New Zealand and the Pacific Islands, McCool. The Advisory group also includes globally-recognized expertise on the epidemiological transition and NCDs, particularly cardiovascular disease, cancer, and diabetes, Taylor.

²⁷ See also National Taiwan University study on educating global health leaders (APRU Impact Report 2016, Appendix, page 51).

STUDY 22: Understanding and reducing environmental risk factors for NCDs

Environmentally-related cancer deaths in APRU member countries totaled more than 577,000 in 2015 (IHME, 2015). Tobacco is, by far, the single most important risk factor for cancer (Eriksen et al., 2012). The Pacific Rim is home to 30 percent of the world's smokers, representing more than 400 million people. In China, over one-half (52.9 percent) of males are current tobacco smokers. The social aspects of change to tobacco use cannot be ignored, particularly as smoking has a long history in the region and today remains part of many personal exchanges and cultural practices. An interdisciplinary and culturally sensitive approach to this challenge is therefore essential.

While smoking is the most important risk factor for developing lung cancer, more than 20 environmental and occupational agents are proven lung carcinogens in humans (IARC, 2015). Estimates suggest that 14 percent of lung cancers are attributable to ambient air pollution and 17 percent to household air pollution (WHO, 2014a; WHO, 2014b). Air pollution is also rapidly worsening in many of the Pacific Rim's megacities, such as Beijing and Hong Kong, and regionally with serious air pollution affecting much of northeast China and Southeast Asia from agricultural burning.

HARNESSING THE POWER OF UNIVERSITIES TO RESEARCH & ADVOCATE FOR TOBACCO CONTROL

Additional advocacy efforts are urgently needed to spearhead campaigns to reduce tobacco smoking among young people in China, other Asian countries, and elsewhere. Research shows that most adult smokers in low- and middle-income Asian countries initiate smoking in their late teenage years. Electronic, or "e-cigarettes", are creating new challenges. This new generation of devices delivers a nicotine-containing vapor to users, representing an emerging public health problem in Asia. Many products are flavored and marketed to university-aged young adults.

APRU universities are collaborating through the GHP on tobacco control. Universities are an appropriate and potentially effective site for tobacco control advocacy for several reasons. Their mission is to educate and provide information. Faculty members are often trusted, well-respected members of the community. Universities also offer the opportunity to harness the energy and motivation of students, and their desire to change the world. Schools of public health, nursing and medicine promote health and well-being, and are well-situated to

take on the task of tobacco control advocacy.

1. UNDERSTANDING THE PROBLEM: STUDENT AWARENESS AND USE OF TOBACCO AND E-CIGARETTES ACROSS 18 ECONOMIES

The APRU Global Health Program (GHP) identified the need to learn more about students' awareness and use of tobacco and e-cigarettes. An online survey was created to obtain information on student's tobacco use, perceptions regarding e-cigarettes, exposure to e-cigarette marketing, and other related topics. The work is ongoing and results aim to help identify which policies may be most effective in reducing students' tobacco use and how to best limit student use of e-cigarettes. To date, over 2,100 students from 18 economies have completed the survey, and results have been analyzed by the GHP.

This work will help APRU members realize their commitment to 100 percent tobacco-free campuses (as per the Sydney Statement on Employee Health and Well-Being, signed by APRU GHP members). Beyond this, results will be used to develop specific recommendations on how governments should develop policies that will be effective in limiting student exposure to, and use of, tobacco and e-cigarettes in the Pacific Rim region.

2. ENGAGING STUDENTS IN THE CHALLENGE: COMMUNITY-LED SOLUTIONS

The 2017 case competition theme was "Promoting Smoke-Free Campuses in the Pacific Rim". Through engaging students in the challenge, new opportunities for dialogue were opened and ideas on how to enact change from the student body were captured for content analysis of the ideas generated, to support how to better use universities as platforms for tobacco control. Results will be sent for publication.

3. SUPPORTING WIDER CHANGE IN SOCIETY: ADVOCACY AND LEADERSHIP TRAINING

As highlighted in the APRU Impact Report 2016, members University of Southern California and Fudan University established a leadership course to train tobacco control leaders in China (funded by the Bloomberg Foundation). The 39 trainees on the four-day course included faculty, journalists, NGO staff, and government officers. A round table session brought in experts and opened dialogue on the challenges of tobacco control advocacy in the Chinese social and cultural environment.

²⁸ For further information, see the Sydney Statement on Employee Health and Well-being (http://apru.org/images/TP3/GlobalHealth/Sydney_Statement_on_Employee_Health_and_Well-being.pdf)

²⁹ <http://www.healthdata.org/>, IHME, University of Washington

³⁰ Latest year of available data

³¹ Park et al. (2008)

Participants in the course developed skills in media communication, health education, and communication and writing policy briefs. This course came at a critical time in the dialogue on smoking policy in China. Feedback from the training was positive and since the course in November 2015, trainees and providers have focused on advocating for a smoke-free Shanghai. In November 2016, Shanghai banned smoking in indoor public places and some sensitive outdoor locations (e.g. near kindergartens and sport venues), this policy came into force in March 2017. After instituting the new legislation, researchers conducted surveys and measurements to evaluate the effect and continued advocacy efforts to support public compliance.

AIR POLLUTION: RESEARCH & ADVOCACY

MULTI-COUNTRY STUDIES: As highlighted in the APRU Impact Report 2016, the Global Health Working

Group on Air Pollution worked to characterize air pollution regulation in the region and to compare particulate matter (PM) regulation in selected economies of the Pacific Rim, particularly PM2.5. Work involved a multidisciplinary team of experts from eight economies and identified critical issues to be considered for the management of PM2.5 air quality. The team made key policy recommendations for governments, policymakers and researchers for setting national standards in Pacific Rim economies to address this critical global health issue. Further information can be found here: "Regulation of Fine Particulate Matter: Perspectives from the APRU Global Health Forum". Description of other work by APRU members on air pollution can be found in the GHP Newsletter or by contacting the GHP or APRU Secretariat.

APRU INSTITUTIONS: University of Southern California; Fudan University

Further Member Activities: Reducing regional health disparities in NCD treatment

STUDY 23: Reducing regional disparities in treatment for cancer in Myanmar

INTRODUCTION OF EQUIPMENT ALONE IS INSUFFICIENT WITHOUT ALSO RAISING LOCAL CAPACITY THROUGH PARTNERSHIP

The University of Sydney and an Australian team of volunteer health workers have helped bring about a major improvement in health services in Myanmar, significantly reducing the waiting time for people seeking treatment for cancer. According to the World Health Organization (WHO), more than 60,000 new cancer cases occur each year in Myanmar, with breast cancer the most common form among women and lung cancer the most common among men. Eight Australian radiation therapy technologists (RTTs) took leave from work to take part in a three-month mission to help hospitals in Myanmar make the transition to medical linear accelerator radiotherapy machines. As the demand for treatment increases, many low-resource countries such as Myanmar are introducing more modern radiation therapy equipment without

a corresponding improvement in the education and training of professional staff. Radiation therapy, also known as radiotherapy, involves the use of high-energy radiation from x-rays or gamma rays to kill cancer cells and shrink tumors. It makes use of highly specialized machinery and complex computer systems which need to be operated with precise accuracy to ensure the best possible outcomes for patients. Safety is a major concern if the treatment is not administered properly. By the end of the program, treatment delivery had significantly improved and waiting times were reduced from five months to two months.

The volunteer program in Myanmar is supported by the Ministry of Health. It involved staff at Yangon General Hospital, Mandalay General Hospital and Nay Pyi Taw General Hospital. Sydney Medical School will continue its support of radiation therapy clinical training in Myanmar in 2016, and is planning to help establish a radiation therapy curriculum with local institutions, the Ministry of Education, and the Ministry of Health.

APRU INSTITUTION: The University of Sydney

STUDY 24: Pacific MANA (monitoring alliance for NCD action)

ENHANCING ACCOUNTABILITY & PROMOTING ACTION ON NCDs ACROSS THE PACIFIC ISLAND COUNTRIES & TERRITORIES

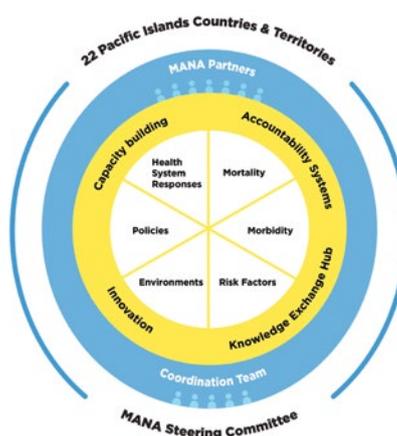
At the 2013 Pacific Health Minister Meeting in Samoa, there was a resounding call for “a regional and national NCD accountability mechanism to monitor, review and propose remedial action to ensure progress towards the NCD goals and targets.” In response, a region-wide initiative, Pacific MANA, has been developed to improve NCD monitoring, surveillance and accountability across the 22 Pacific Islands Countries and Territories (PICT). APRU Members, The University of Auckland and University of Hawai‘i at Mānoa, have been instrumental in this initiative.

Creating multi-stakeholder systems for improving NCD monitoring for low-capacity countries across a region that is geographically vast, resource-constrained, and has the highest burden of NCDs in the world is challenging. The aim was to coordinate and strengthen country capacity, regional expertise and resources, and innovation and accountability to improve NCD monitoring to promote action. Strategic goals for this initiative include: in-country support for NCD activities; boosting capacity in key areas where expertise is needed; sharing technical resources and innovation in NCD monitoring and translation of knowledge into action. A key component is the Dashboard for NCD Action, which aims to strengthen mutual accountability by demonstrating national and regional progress towards agreed upon NCD policies

and actions.

The initiative was conducted in partnership with the Pacific Community (SPC), World Health Organization and the PICT Ministries of Health, and has been endorsed at the upcoming Heads of Health Meeting in Fiji. This collaboration represents a major progress toward translating high-level goals and targets to action, as well as helping PICTs reduce the impact of NCDs in the region.

APRU INSTITUTIONS: The University of Auckland, University of Hawai‘i at Mānoa



Funding for the development of MANA was provided by the Health Research Council of New Zealand and the Center for Global Health, National Cancer Institute at the National Institute of Health, USA.

STUDY 25: Prevent elder abuse and neglect initiative (PEACE) - Malaysia

Elder abuse—physical, psychological, and sexual abuse, neglect and/or financial exploitation—is often not reported and little data exists on it in the Asia-Pacific region. There is even more limited knowledge of what interventions could prevent or reduce occurrence and enable those concerned to seek help. What evidence that does exist suggests this is a more universal phenomenon than societies admit. Individuals may be unable to report abuse or neglect, or may be unwilling to, for fear of bringing shame on the family. This is compounded by cultural challenges;

placing elders in institutions to obtain help and care is considered unacceptable in some Asian societies.

APRU member University of Malaya recognized this issue as a “Grand Challenge” in 2014, initiating a five-year Prevent Elder Abuse and neglect Initiative (PEACE). The interdisciplinary research team in this program is one of only three groups in the region currently working on this issue. Its members come from diverse backgrounds which include epidemiology, public health, family medicine, psychology, health economics, geriatrics, and law. They also draw on

experiences from other related fields, such as child abuse and aging research. PEACE engaged with various stakeholders, mainly the Negeri Sembilan State Health Department, Kuala Pilah District Health Office, Seremban District Health Office, Penang State Health Department, and Ministry of Health Malaysia.

PEACE involves the first population-based, prospective study in Malaysia and the South-East Asian region exploring various aspects of elder abuse and neglect. Nearly 3,000 older adults were surveyed at home by trained personnel using a face-to-face structured interview approach. In this self-reported data, the overall lifetime prevalence of abuse and neglect is one in 10. This is a likely minimum, given the associated social stigma of abuse. Over the three-year course of the initiative those reporting abuse and neglect have also been shown to have higher morbidity and mortality rates.

In projects like this, we see impacts at the individual level. For instance, for an isolated 76-year-old:

“Before her husband died, he had inflicted frequent psychological, physical, and even sexual abuse on her. According to her, her once-loving husband turned into a jealous and abusive person in the last four years of his life. From her account, we can only wonder whether he had dementia or some other untreated condition. If we had not visited her in this remote area, her story might not have come to be known.”

The work extends beyond gathering data, raising awareness of the issue, and recommending potential interventions. Among other PEACE activities are community engagement programs involving doctors, nurses, caregivers and civil society, workshops mainly for informal caregivers, awareness campaigns (World Elder Abuse Awareness Week and National Senior

Citizens’ Day), as well as public forums. PEACE also reaches out to a wider audience through the mass media (radio, newspapers, and TV). Lawyers on the team have worked to identify existing laws on elder abuse and neglect, to understand potential gaps, and to suggest refinements to reduce or remove them.

Data demonstrated a lack of awareness of elder abuse within the wider community, including healthcare workers. Nurses and primary care doctors are prime targets for intervention strategies. The initiative includes education and training sessions for healthcare workers, followed by evaluation of effectiveness.

Abuse and neglect have complex origins and do not always begin intentionally. Many of those caring for the elderly are part of the so-called “sandwich” generation, simultaneously juggling young families, careers and caring for elderly parents. Family caregivers may also be unaware of certain needs of the elderly, particularly if they have debilitating conditions. Interventions seeking to prevent abuse and neglect therefore also included testing support schemes for caregivers. Preventative measures from the side of the elderly are also included, offering activities aiming to slow cognitive decline, improve physical functions, and reduce known risk factors for abuse, such as loneliness and depression.

Interventions—whether legal, educational or community-based—require multi-agency engagement and support. The team is now building relationships with experts from the Department of Social Welfare and Ministry of Women, Family and Community Development.

APRU INSTITUTION: University of Malaya

4.3 Case Studies Addressing Asia-Pacific Health Challenges

In 2016, the Organization for Economic Cooperation and Development (OECD) report on the region (Health at a Glance: Asia Pacific 2016), highlighted the following regional health challenges:

- Health disparities and scarcity of national statistics on quality of care
- Differences in health outcomes in the region, low supply of both doctors and nurses
- Improving but challenging maternal and newborn health outcomes

This section looks beyond the GHP at work within the membership to directly address regional challenges as identified by the OECD and 2030 United Nations Sustainable Development Goals (SDGs). See Appendix for further information on the OECD report.

The GHP hub has compiled a book: *Global Health Leadership: Case Studies from the Pacific Rim*, published by Springer through the Springer Briefs series (2018), which includes further examples of research on interdisciplinary Global Health topics by APRU members.

Improving Maternal and Newborn Health Outcomes (SDG 3.1 & 3.2)

STUDY 26: E-Health to improve maternal and child care among indigenous populations

Data suggests that indigenous communities in Mexico experience maternal mortality rates that are two- to three-times greater than national averages. Barriers to access to health services for this demographic, be they economic, geographic, linguistic or cultural, are also recognized. Starting from scratch, an interdisciplinary team at APRU member institution, Tecnológico de Monterrey, built, piloted, and evaluated an e-health system across multiple communities. Indigenous populations each have their own language, symbols and colors; targeted design taking account of context and culture is essential to make interventions that work in a rural indigenous setting.

In rural settings, access to medical personnel is limited with care typically provided by local midwives and health auxiliaries. The e-health system enables the proper monitoring of pregnant women and mothers of newborns in rural indigenous communities and identifies potential obstetric emergencies to reduce maternal deaths. Midwives and health auxiliaries are provided with an electronic guide to provide comprehensive prenatal and postnatal consultations with remote support from medical personnel. Information collected by community-based personnel is processed using a clinical decision algorithm that instantly generates medical alerts and recommendations. These are reported to the clinic so that medical personnel may advise and supervise obstetric risks.

Development requires engineers to work alongside demographers, doctors and medical service personnel. Social scientists (economists and demographers) have a key role in the project in aspects of the design of the product, intervention, and

in developing the pilot to enable robust assessment of the impact of this program.

Through experimental design with appropriate control groups, the team has shown that for an investment of around \$500 USD and similar investment in training, it is possible to reduce annual maternal deaths by 10 percent over a three-year period. If rolled out more widely in high-mortality areas, this could help Mexico to reach the UN Millennium Development Goals of minimizing deaths to 22.1 per 100,000 births within five more years.

To develop a tool with such impact, the interdisciplinary approach was key. Medical doctors, as well as community-level health personnel guided field trips for systems engineers who are accustomed to working in a laboratory environment, and they helped develop contextual understanding, enhanced by the involvement of a system developer from an indigenous community.

The research group has developed a close relationship with the Ministry of Health but to scale up and achieve state or national level impact, involvement of other parts of government is necessary. The team is now sharing their evidence with other relevant decision-makers to help inform policy. The solution is not "high tech," however some investment and significant local engagement is still required before roll-out. This poses a challenge: despite the demonstrated impact, the solution appears less glossy to some politicians than other higher-profile alternatives. As highlighted in Chapter 1, this appears as a recurring issue facing low-cost solutions driven by the social sciences.

APRU INSTITUTION: Tecnológico de Monterrey

Battling Epidemics, Infectious Disease and Drug Resistance (SDG 3.3)

The APRU Impact Report 2016 highlighted key roles played by APRU members in relation to existing and emerging infectious disease threats, including SARS, avian influenza, MERS (The University of Hong Kong), and dengue fever (National Taiwan University). It also highlighted examples of APRU institutions supporting the development of evidence-led interventions, such as harm reduction approaches to HIV in Malaysia, and providing models for other countries in the region. Study 26 looks at coordination to address a major, growing challenge for existing infectious diseases: the evolution of drug resistance, which threatens 70 years of progress made in treatment.

STUDY 27: ASEAN tuberculosis network

Tuberculosis (TB) is the leading cause of death from infectious disease in the Asia-Pacific region. Moreover, drug-resistant strains are emerging faster in Southeast (SE) Asia than elsewhere in the world, constituting a major public health challenge. The ASEAN TB Network is an international collaboration led from the Saw Swee Hock School of Public Health, National University of Singapore seeking to inform TB management and control in the region. It involves APRU Members University of Malaya, The University of Melbourne, and other institutions and policymakers from within the region and beyond.

The Network takes an interdisciplinary approach to the challenge, approaching the problem of drug-resistant tuberculosis from the angles of genomics, health systems research, economics, public health and policy, and behavioral sciences. A shared database of tuberculosis strains with both genomics and drug-susceptibility phenotyping acts as a foundation for the network. Beyond the biology, health systems factors play a part in the evolution of resistance, including drug quality, ease of access and prescribing practices. Behavioral factors, particularly patient adherence to treatment, are another concern. The team is currently analyzing whether patients can be incentivized to take drugs through the use of innovative mechanisms, such as mobile phone credits. This work is being piloted in Cambodia.

New technologies such as genomics offer potential opportunities to rapidly identify drug-resistant TB. However, it is important to understand questions of economic viability and technical capacity if such tools are to be implemented successfully. In an example of collaboration between STEM and social sciences, economists from National University of Singapore are running a cost-effectiveness assessment for a genetic strategy in a SE Asian context considering trade-offs with current practice.

A shared database with 3,000-4,000 samples has been characterized in the SE Asian region. One

of the challenges, and indeed, one of the major successes of this initiative, is the development of this shared database.

Data is provided on the basis that the rights of the originating researchers will be respected and data will be returned to the countries concerned. Creation of such platforms requires time and commitment to build trust within the network. Collaborators with strong historical ties in the region have helped with this process, enhancing the geographic coverage of samples, for example, relationships between Ho Chi Minh and members of the network from The University of Melbourne have been important for the inclusion of Vietnamese samples.

The development of drug resistance has a potential global impact and as such the ASEAN TB Network is contributing to the Global TB Surveillance Network. This international connection is important to avoid confusion between potentially drug-resistant strains and strains arising from a different geographical region. For pharmaceutical companies, this has a potential clinical implication for companion diagnostic tests for drug resistant TB.

Locally, connections have been established with key policymakers such as the Ministry of Health in Singapore. In Sabah, Malaysia, the network links into hospitals and clinical surveillance with actions taken based on the data.

While the focus of the group is on TB, much of the work and lessons learned from regional collaboration can be considered more broadly for other infectious diseases with evolving resistance such as malaria.

APRU INSTITUTIONS: National University of Singapore; University of Malaya; The University of Melbourne.

Funding and further information: The ASEAN TB Network is funded by Singapore, Sabah Malaysia and Australia.

Taking Action on Reproductive and Sexual Health (SDG 3.7)

STUDY 28: W-DARE women with disability taking action on reproductive and sexual health in the Philippines

Women with disability can experience poorer health throughout their lives and have limited access to health services, in particular sexual and reproductive health (SRH) programs. Statistically they are also more likely to experience physical and sexual violence. A three-year action research program (W-DARE) was developed by researchers in the Philippines and Australia, to improve understanding of factors influencing SRH for women with disability and to develop, implement, and evaluate intervention options. APRU partners University of the Philippines and The University of Melbourne brought their combined competencies to the initiative. The Center of Women's Studies at University of the Philippines provided expertise in women's health and violence, as well as development, sociology, epidemiology, and connections with local policymakers while The University of Melbourne contributed international expertise on epidemiology, social psychology, public health, gender studies, and disability.

W-DARE was co-designed and co-produced with key stakeholders from the outset. Key stakeholders include the Likhaan Center for Women's Health (an NGO service provider), disability advocates, and local government. The Women with Disability research team assisted with data collection and by providing valuable input on contextual interpretation of the results. Their enthusiasm as individuals with most at stake in the project further motivated team members and kept the project grounded in reality.

The interdisciplinary team and mixed methods approach are core to the success of this project. While the extensive quantitative survey provided the data, qualitative and participatory research brought insights as to why barriers and correlations occurred, and to what potential interventions might work. Time was necessary to develop shared language and trust between the different disciplines involved in the work.

While this may be seen as a transactional cost by some institutions, the team champions the additional value and quality of the research outputs, as well as the increased potential for benefits to be realized. Analogous challenges existed for the international collaboration elements of the team. In this case, time was necessary to understand pressures faced by each group and to identify what success looks like for all parties involved. Remaining mission oriented, rather than searching for examples to maximize publication numbers, helped the group to realize benefits on the ground.

Capacity building was a core element of the work, and has had lasting impact on those with disability who have since been employed within local government, and also on their colleagues, raising awareness and understanding of the valuable contribution from those labelled "disabled."

Tried interventions have also had lasting impact. On the supply side, training of health-service providers has changed attitudes and prejudices, and pilot models of what more can be done to enable physical access have given some clarity on possibilities with available resources. The latter has had a lasting impact for other groups with reduced mobility issues, including the elderly, physically injured, and pregnant women. On the demand side, peer-support groups established in the program were viewed as successful, as evidenced by local government decisions to financially and politically support their existence beyond the life of the project.

This project was funded by the Australian Government, with co-funding from the UNFPA Philippines Country Office.

Timeline: 2015-2017, Further information: doi: 10.1186/s12889-015-2308-y

APRU INSTITUTIONS: University of Melbourne; University of the Philippines

5. CONCLUSION

APRU is, in essence, a collaborative super-connecting structure. One way to understand and consider the impact of such organizations is by considering evidence of collaboration among the membership and through the wider region - not only in terms of quantity, but also in depth and value of collaboration.

Today, over 38 percent of research output by APRU members is internationally collaborative,

a rate far in excess of the regional and global averages of 24 percent and 21 percent respectively. It is also slightly higher than that seen in Europe, a region with formal structures for joint science funding and integration and closer shared history and cultures, at 37.5 percent. The rate of increase in international collaboration began to rise for APRU in the mid-2000s, a time when new meetings and programs such as the Global Health Program were beginning.

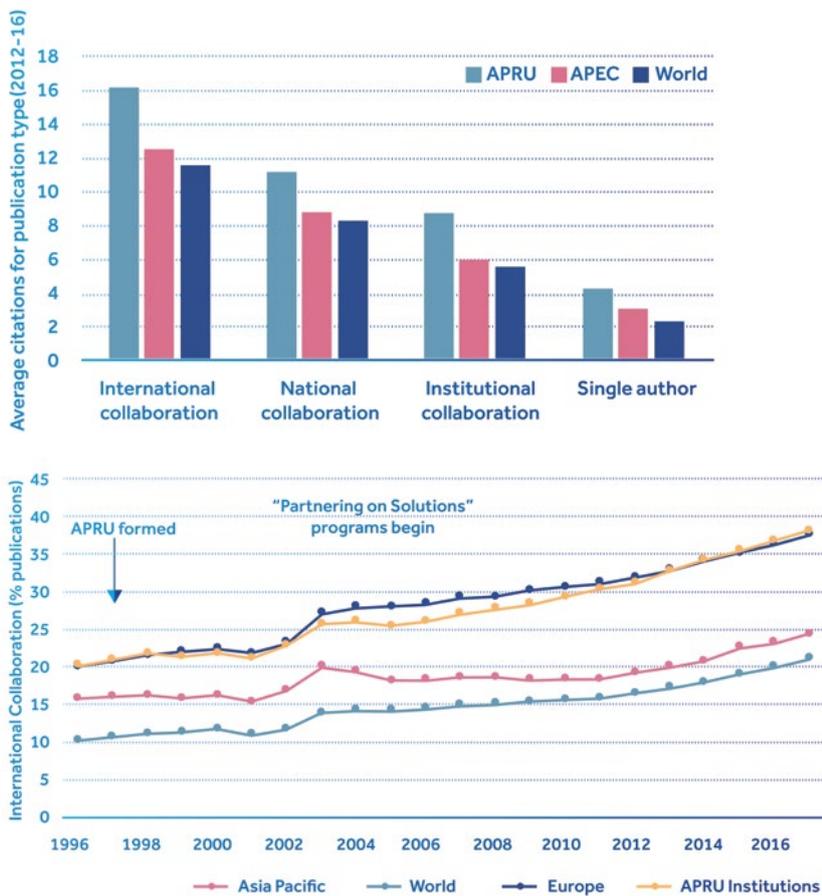


Figure 25: International collaboration rates for APRU and comparators (top) and citations per publication for international collaborative publications compared with national, institutional and single-author publications for APRU, APEC and the World (bottom)

What, then, is the value to both members and society from such increased international collaboration? If we consider quantitative data around publications we can see that international work receives greater visibility, both in academia and beyond (Figure 24). This, however, only provides some proxy for academic impact and does not properly articulate the full value to society of such engagement. Benefits of international collaboration, exchange, and dialogue should not be underestimated, and have been explored through case studies and the programs featured in this report. These cases also highlight the impact of cooperation in other areas such as innovative educational programs.

TO SUMMARIZE, THIS REPORT HIGHLIGHTS ADDED VALUE IN THE AREAS OF:

- **ACCELERATING KNOWLEDGE EXCHANGE AND INNOVATION:** Collaboration speeds up knowledge transfer between countries, and brings together complementary strengths to enhance research and innovation. Study 3, for example, discussed combining robotics expertise from Osaka with psychology expertise from California to further understand human cognition.
- **NARROWING CAPACITY GAPS OR REDUCING THEIR IMPACT:** Despite improvements over the past decade, capacity gaps in the Pacific Rim persist. APRU programs, such as the Global Health Program, have shown their support for event attendance from lower- and middle-income countries and small states, connecting researchers and practitioners to regional peers and enabling their voices to be heard. Studies show member activity in supporting practically and advocating human capacity training (e.g. Study 23, The University of Sydney and cancer treatment in Myanmar) and building systems for data collection and collaboration in resource-limited settings (e.g. Study 24: Pacific MANA – monitoring NCDs, Study 12: Early Childhood Development). These activities are essential if we are to make progress on reducing inequities in the region.
- **SHARING AND APPLYING LESSONS:** Even in the most prepared countries, unexpected events occur - from natural disasters such as the 2011 Great East Japan Earthquake, to the financial crisis of 2008. It is in sharing the lessons from such disasters that APRU members are improving resilience and response. The APRU Multi-Hazard Program, for example, shared lessons in disaster risk reduction between economies (Study 6: Communicating Disaster Science, focused on tsunamis and early warning systems); meanwhile Study 16 explored applying lessons from the global financial crisis in an Asia-Pacific context.
- **ENABLING CREATIVE RESEARCH AND PROBLEM-SOLVING ACROSS BORDERS:** Some of today's challenges are simply too great or too costly for one organization to solve alone. APRU is harnessing the diversity and creativity of its broad membership through programs such as Sustainable Cities, Global Health, and the latest activities on Ocean Sustainability. Sometimes transboundary considerations can offer new solutions as in Study 7, featuring APRU's work on labor mobility to address issues of population aging.
- **ENHANCING INTERCULTURAL UNDERSTANDING:** Soft diplomacy is important and oftentimes under-recognized. APRU is active through research collaboration on problems of common importance and through its educational activities. As demonstrated in multiple cases (e.g. Studies 5 and 11) and programs (Study 21), APRU is enhancing intercultural awareness among the next generation of students, developing new leaders with regional understanding.

International collaboration is on the rise in academia, and would arguably continue to occur without the intervention of APRU. However, the presence of such an organization promotes and accelerates exchange beyond bilateral conversations. It also enables the exploration of a variety of cooperation models, establishing semi-permanent structures such as programs and initiatives to enable trust and relationships to develop – which are essential as research moves toward action.

The existence of an umbrella network facilitates action for a variety of reasons including:

- **NEUTRALITY:** An independent Secretariat, such as the APRU Secretariat, has no particular incentive to advance the interests of one member over another. Neutrality assists in developing partnerships with other organizations; for example, APRU's evolving partnerships with Intergovernmental Organizations (IGOs) such as APEC and the UN.
- **RESPONSIBILITY:** The Secretariat provides clarity regarding roles and expectations, and also assumes management responsibility, enabling the group to collectively support accountability and build and maintain trust between members.
- **CONNECTIVITY:** By collectively drawing together resources into a focal point, the group has access to a greater network of contacts and expertise than any individual institution. APRU's ability to synthesize the voices of divergent groups and provide an overview on key issues to external audiences is of paramount importance to potential partners. As APRU matures as an organization, partners seeking a voice to influence policy are able to draw on APRU's expertise and connections. The number of such partnerships has grown since APRU's inception (Figure 27).

Collaboration is enhanced internationally across sectors, and between disciplines.

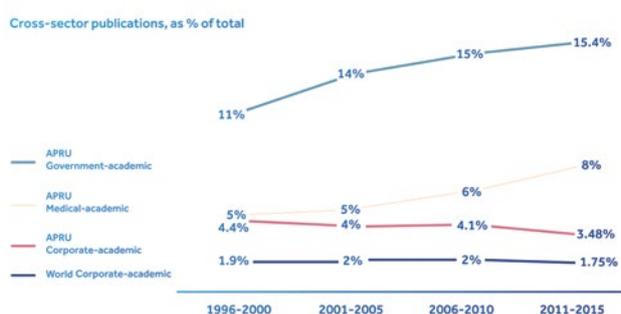


Figure 26: APRU cross-sector collaboration between academia and government over time

APRU has over two decades of experience in bringing together interdisciplinary expertise on challenges of the Pacific Rim. As described in Chapter 2, APRU programs typically involve interdisciplinary advisory groups, which also show a breadth of geographical representation. Activities beyond the programs are also drawing in STEM and SSH expertise through their mission-oriented approach (e.g. ocean sustainability).

This report has underlined the need for interdisciplinary collaboration in challenges both present and future for the Pacific Rim. Challenges do not recognize traditional disciplinary boundaries, and while it is hard to quantify the benefits of STEM and SSH collaboration through conventional metrics, studies and interdisciplinary programs included in this report highlight the value generated from such work. In particular, cases have considered the importance of the social sciences and humanities as true partners.

Examples have highlighted the following:

- **SKILLS AND RELATIONSHIPS BROUGHT BY THE SOCIAL SCIENCES AND HUMANITIES:** Social scientists and humanities researchers are often familiar with recognizing the cultural context in which they operate and have developed specific tools and skills over time. Study 12 provides an example of social scientists developing culturally appropriate, early childhood development measurement tools that transcend borders, while other interdisciplinary cases have emphasized that leadership from SSH researchers has facilitated meaningful community engagement (Studies 2, 13, and 17).
- **BENEFITS OF SHIFTING PERSPECTIVES AND PARADIGMS:** Study 11 emphasizes the richness and difficulties of working in different languages with embedded perspectives and concepts that are not always easily translated. This can be extended by analogy to the language and cultures of disciplines.
- **THE VALUE OF HOLISTIC CONSIDERATION OF COMPLEX ISSUES:** Many interviewees highlighted the benefit of viewing and understanding a challenge from multiple perspectives. Studies 2 and 15 highlighted communities living in a multi-hazard environments where solutions for one risk may exacerbate another. The Sustainable Cities and Landscape Program (Chapter 2.1) meanwhile highlights the interconnected social, ecological, and economic dimensions of sustainability, and reinforces the fact that solutions that fail to address multiple dimensions are prone to failure.

While case studies presented in this report show the value of involving a range of disciplines in confronting challenges, interdisciplinary efforts require additional time input and engagement that may, at least in the short term, impact on short-term quantitative metrics (such as publications or citations). Recent analysis shows this effect can reverse over time³², nevertheless this may not help in an environment with short-term pressure for results. Faculty may face different incentives across disciplines and cultures creating barriers to collaboration efforts, as highlighted in Chapter 1. This is important, as what is rewarded and counted influences behavior. If we want to generate the maximum value for society and harness the creativity available, we need to consider how to better measure and reward such success.

³² Nature publication

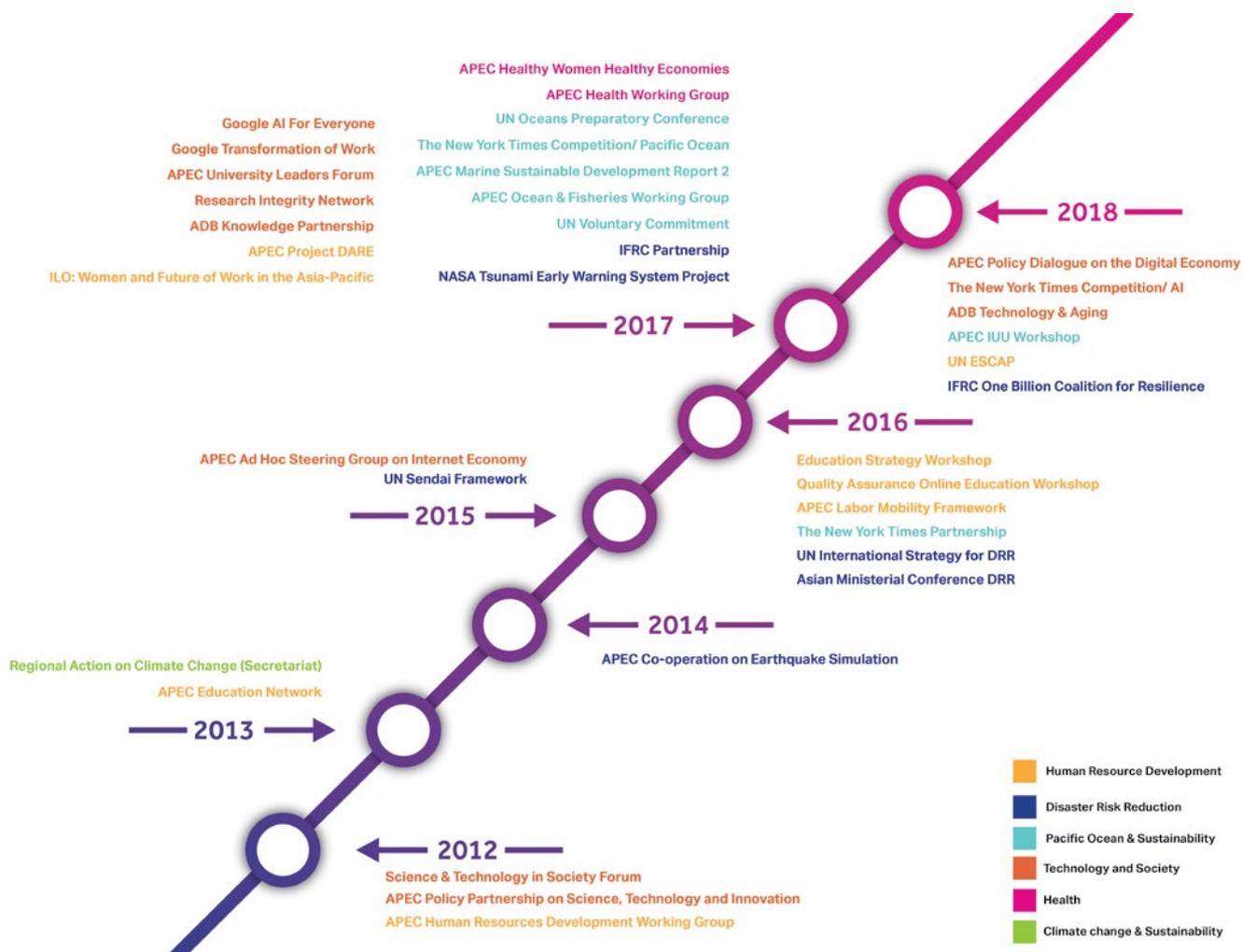


Figure 27: A selection of APRU's evolving partnerships over the last decade (2007-2017). Colors of lines are linked to the regional challenge of focus for the collaboration.

Report Takeaways for Higher-Education Leaders

APRU: CONNECTING NETWORK TO POLICY & INTERNATIONAL DIALOGUE

APRU is evolving, building on a strong foundation of communication, trust, extensive capacity and expertise of network. As shown by Figure 27, APRU is increasingly engaging in the international policy space, participating in policy workshops and beginning to provide evidence to inform progress on global challenges such as health, climate change, sustainability, and disaster risk reduction.

The network is also actively engaged in discussions on the future of education and development of the next generation workforce, as well as working on research and innovation policy throughout the region. In this way, APRU and its member institutions have a voice in proactively shaping debates on topics directly relevant to the future of universities in the region. By presenting a united voice, the group brings issues to the forefront with other stakeholders and enhances the visibility of higher education institutions.

APRU TRANSCENDING DISCIPLINES, CULTURES & SECTORS

APRU has largely focused on the challenges for the region which transcend disciplinary boundaries. This is not to say that disciplinary expertise is not important, but that harnessing different perspectives and viewpoints is necessary to find holistic solutions for the complex issues facing the region today. Contribution from both SSH and STEM disciplines essential. Diversity creates challenges but also provides opportunity for creativity, for learning from each other and for synergies as we share our strengths.

Work across disciplinary and geographical boundaries is not easy; both involve bringing together distinct cultures and different ways of communicating and knowing. Successful teams, interviewed as part of the case study analysis for this report, consistently highlighted the importance of developing personal relationships, regardless of the organizational structure for doing so, and for allowing time for mutual

understanding to develop. It is important to consider incentives for and barriers to collaboration across disciplines and cultures.

Social sciences and humanities have an important contribution to make, in their own right and also in collaboration with other disciplines. APRU and its members have a role to play in bridging gaps in these areas, in a region where capacity is mixed. This includes connecting emerging researchers to their peers around the Pacific Rim. Local representation is important if perspectives are to be heard in international dialogue.

APRU members are already substantially more collaborative than the regional average across sectors (Figure 25). APRU takes this to the next level, developing strong relationships with other intergovernmental groups, industry, and other strategic partners. Leveraging these partnerships with the collective expertise across the membership has the potential to increase the impact of higher-education institutions in Pacific Rim society.

IN SUMMARY, APRU:

- Amplifies voices through the network, bringing those otherwise not heard to the table and advocates for evidence-informed policy and practice in the region.
- Provides institutions and their experts with new opportunities to enact change, and unlocks doors to organizations and businesses that recognize the collective value of APRU.
- Accelerates exchange of the latest findings on regional issues, keeping institutions at the cutting-edge.
- Builds trust and connections between membership, facilitating future deeper interaction such as data exchange and research collaboration.
- Harnesses the expertise of the network for forecasting future challenges, sharing and highlighting emerging issues across the region.
- Offers opportunities for emerging scholars and students to increase their intercultural understanding and, through exchange of talent, enhance knowledge transfer between organizations and cultures.
- Enables innovation and lesson sharing on policies and practices on campus, sharing experiences across the network about what works and what does not in different cultural contexts.

Report Takeaways for Current and Potential Partners

The geographical range of APRU's network is unique: it is the only such organization spanning the Americas, Asia, and Australasia. With over 150,000 faculty across the region and responsibility for educating two million students today, the breadth and reach of the network is extensive. In some disciplines, such as psychology and even arts and humanities, the network contains a surprisingly high percentage of the total regional research capacity.

There is strength in diversity within the group, harnessed by APRU to explore a range of regional challenges. Each initiative takes an international, interdisciplinary approach, transcending both forms of boundaries to recognize the complex issues we face today. Over the past 10 years, APRU programs have brought together academics, policymakers, and practitioners to explore a multitude of issues. Each program has developed its own strengths and activities, balancing efforts between research, education, capacity building, and engagement in policy discussion. The established foundational networks are often extensive, exceeding 1,000 stakeholders, for instance, in APRU's Global Health Program. These relationships facilitate future activity.

Many issues facing the Pacific Rim today lacked a forum for regular international and cross-sector dialogue, illustrated by the Sustainable Cities and Landscapes Program featured in Chapter 2.1. Building on its human capacity and prior experience, APRU is able to catalyze such exchange.

Repeat and growing engagement with partners (Figure 27) highlights the value and maturing nature of APRU as an organization. APRU is working on new modes for collaboration with its membership to enable timely and responsive input, for example, towards achieving UN Sustainable Development Goals (Chapter 2.2).

IN SUMMARY, APRU:

- Provides access to the collective expertise of over 150,000 scholars, and is able to synthesize views from experts across the region, acting as a single point of contact.
- Offers insights into potential upcoming issues from the latest research developments before they arise - for example, interactions between emerging technology, society, and the need for regulation (see collaborations with Google on Artificial Intelligence, Chapter 2.2).
- Acts as a conduit to the membership, influencing and supporting research focus in response to policy needs.
- Helps frame problems in a Pacific-Rim context, with over 20 years of experience understanding different cultural perspectives and recognizing potential implications across international boundaries.
- Harnesses creativity and diversity, thinking beyond the boundaries of one economy or organization.
- Supports the development of the future workforce and leaders, proactively working with the membership to address forthcoming skills gaps (Chapter 2.2).

Future Plans and Opportunities for the Network

Given the need for collaboration and benefits described earlier in this chapter, the question becomes not whether we collaborate, but how best to do so. In an APRU context, what are the most effective models and what areas are the priorities for doing so? The ability to reflect on such questions demonstrates the maturity of the organization which has now established a strong foundation of member institutions and partners. New opportunities are developing and there is time to draw on lessons from the past. Existing structures are also maturing, leveraging more experienced partnerships. Those initially focused on research and education, for example, are engaging further in policy discussion. Those established later are able to draw from the lessons of their predecessors.

There is value not only in APRU expanding partnerships, but also in cementing and strengthening existing relationships. Repeat and growing engagement with partners over time (as shown in Figure 26), highlights both the partnership value and evolution of APRU as an organization. It has also contributed to work on new modes for collaboration to enable timely and responsive input from the APRU membership.

This report contains case studies and metrics to resource the further development of effective responses to the key issues of our time through partnership between research universities, multilateral organizations, businesses, governments, and communities.

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GLOSSARY

AAU	American Association of Universities
ADB	Asian Development Bank
AIDA	Asia Intellectual Digital Archives
APEC	Asia-Pacific Economic Cooperation: A forum for 21 Pacific Rim member economies that promotes free trade throughout the Asia-Pacific region. For context, the APEC region contains 2,616 publishing research institutions.
APIDE	Asia Pacific Institute for the Digital Economy
ASEAN	Association of Southeast Asian Nations
APRU	Association of Pacific Rim Universities
APWiL	Asia-Pacific Women in Leadership (APRU Initiative)
A S A	Asian Shakespeare Intercultural Archive
Bibliometrics	Statistical analysis of written publications, including journal articles, books and other academic literature. Analysis can be carried out on the subject matter, authors and affiliations, collaborators and references to or within the publication in question.
CPP	Citations per publication
Cross sector	In this context, work involving collaboration between academia and either industry and/or Government and/or medical personnel.
DRR	Disaster risk reduction: the concept and practice of reducing disaster risks through systematic efforts to analyze and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events.
ECD	Early Childhood Development
FWCI	Field-weighted citation index: the ratio of the total citations actually received by the output, and the total citations that would be expected based on the average of the subject field, also taking into account the age of the publication.
GDP	Gross domestic product: the monetary value of all the finished goods and services produced within a country's borders in a specific time period.
GHP	Global Health Program, an APRU initiative.
HRDWG	APEC Human Resources Development Working Group
IFRC	International Federation of Red Cross
IGO	Intergovernmental Organization: includes organizations such as United Nations and APEC

GLOSSARY

Interdisciplinary	In this report, specifically used to refer to research or education involving both STEM and SSH disciplines. Further explanation can be found in Box 1.
Interdisciplinary score	The interdisciplinary score for each institution is determined by evaluating citations in the publications. The more a publication refers to other publications belonging to different fields of science, and the larger the cognitive distance between these fields, the higher the interdisciplinary score of that publication. The interdisciplinary score equals the proportion of the publications of the institution that are regarded as highly interdisciplinary (i.e. the proportion of the publications of the institution that belong to the top 10% publications with the highest interdisciplinary score in their field per year).
IP	Intellectual property
IPCC	Intergovernmental Panel on Climate Change
IRIDeS	International Research Institute of Disaster Science
LMICs	Lower- Middle-Income Countries
MH Program	APRU Multi-Hazards Program for safer and more disaster resilient societies.
MOOCs	Massive open online courses: courses available via the internet
NCO	Non-Communicable Disease
NGO	Non-governmental organization: not part of government nor a normal profit-making concern, e.g. a charitable relief organization
OECD	Organization for Economic Cooperation and Development, a forum of 34 economies working together to promote economic growth, prosperity and sustainable development
Outputs in top percentiles	Publications in the top worldwide publications based on their citations (here taken as publications in the top 10 percent of the world by citations unless otherwise specified)
R&D	Research and development
Relative activity	Here defined as the volume of publications in a discipline by an institution or group as a share of the total compared to the share of the discipline in total worldwide publications. High relative activity refers to a group which produces a disproportionately high volume of output in this discipline for their size.
SCL	Sustainable Cities and Landscapes, an APRU Program.
SCYP	Sustainable City Year Program
SDG	Sustainable Development Goals as defined by the United Nations.
SSH	Social sciences and humanities disciplines
Star publications	Publications which can be found in the top 10 percent of world publications based on their citations
STEM	Sciences, technology, engineering and mathematics disciplines
U.	Used in this report as an abbreviation for University
UNESCO	United Nations Education, Scientific, and Cultural Organization
UNFPA	United Nations Population Fund

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Perspicuity Consulting is a specialist consultancy, focusing on understanding and developing pathways to impact of research on society. Through transparent analytics and contextual framing we provide an evidence-base to assist decision-makers as they prioritise use of resources and seek to accelerate realization of benefits.

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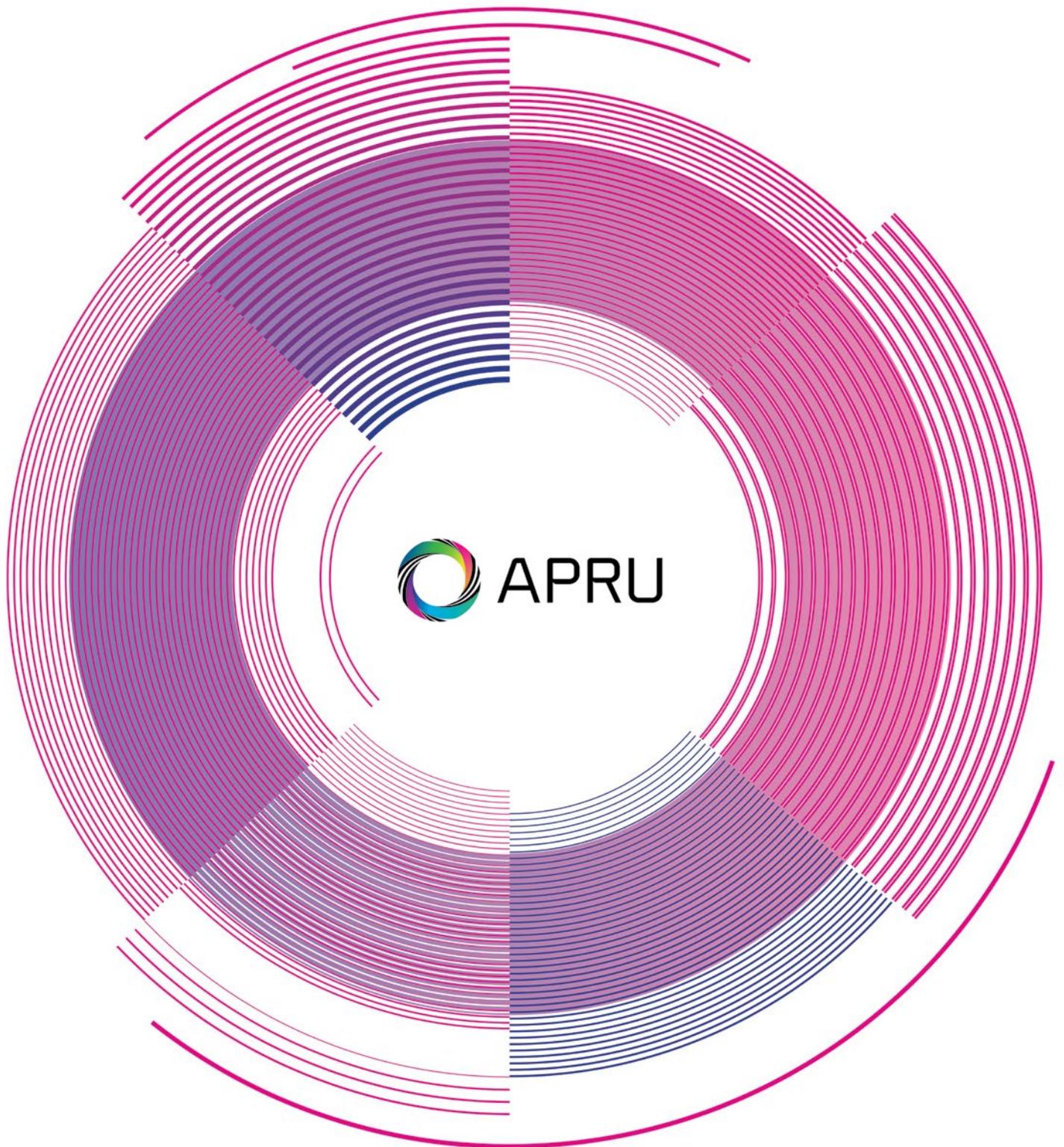
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