Australian National University

Enhancing research collaboration between The Australian National University and Humboldt-Universität zu Berlin

Report

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Executive summary

In December 2023, I spent two weeks on an academic exchange at Humboldt University's Integrative Research Institute on Transformations of Human-Environment Systems (IRI THESys). It was an honour to receive the HU-ANU travel grant and a privilege to have travelled to Berlin and be hosted at HU.

My exchange focused on understanding how integrated research institutes can accelerate transformative approaches to complex sustainability challenges, including the 'nexus' - the name given to the world's intersecting land, water, energy, and food system issues. Handling the nexus requires transdisciplinary research, with many questions about how the research needed should be funded, organised, and delivered. These ideas are expanded on in sections 1 and 2 of this report.

As its name clearly indicates, IRI THESys focuses on integration and transformation and has many parallels with the ANU's Institute for Climate, Energy & Disaster Solutions (ICEDS) and Institute for Water Futures (IWF). This is because all three institutes have the explicit purpose of contributing to societal change through integrated research, outreach, and teaching. They express their similar missions as:

- IRI THESys aims to forge new paths towards sustainable futures, conducting transdisciplinary research and teaching on land use change, integrative food systems, global water cycles, climate change adaptation, and infrastructures.
- ICEDS aims to advance innovative solutions to climate change, energy transitions and disasters through integrated research, teaching, and engagement.
- IWF brings together natural and social science researchers to explore water futures, understand change and enable transformations.

During my exchange, I organised and facilitated two workshops aiming to:

I. Generate mutual understanding of the work of our institutes.
II. Identify ways to enhance research on Anthropocene and nexus challenges.
III. Explore collaborative research on transformative climate adaptation.

At the workshops we probed these and related issues, developed ideas about research prospects including scoping plans to evaluate integrated research institutes (IRIs). Researching IRIs could provide important insights into the research structures, approaches and capabilities needed for accelerating transformations.

This report documents the exchange and my subsequent reflections. While unfortunately, I failed to write the shorter report I intended, I hope this more expansive report adequately captures the key proposals and insights generated through the exchange.

KEY FINDINGS

A striking feature of the exchange was discovering the common challenges faced by ICEDS, IWF and IRI THESys. These institutes have similar ambitious mandates. They work largely through the powers of persuasion and influence of bold ideas. Working with diverse partners and scholars from disparate disciplines they catalyse integrative research, teaching, and outreach. Their approaches to integration span topics, disciplines, and the methods used to co-

produce and apply knowledge. They are forging new ways of doing research, appropriate to our post-natural Anthropocene world.

IRI THESys has the clearly stated ambition to institutionalise new models of scientific practice that support transformations towards sustainable planetary habitability. This resonates with the ANU's aspirations to contribute to the international communities' grand challenges through institutes like IWF and ICEDS. Thus, these institutes share common ambitions and challenges, including integrating big-purpose, transdisciplinary research within institutionalised structures and practices of universities. With these shared ambitions and structural challenges, we can learn much from working together. These challenges revolve around reforming research organisation and delivery while engaging society in understanding and governing the Anthropocene. Section 2 sketches some dimensions of these challenges.

The three institutes face similar structural challenges in integrating transdisciplinary research within and across the universities' institutionalised structures. Discovery of these similarities inspired the idea about comparative evaluations of similar institutes, while also scoping interest in an international network of IRIs (IRINet). Establishing an effective international network of IRIs would enhance ANU's and HU's reputation as leaders in the quest for sustainable solutions. However, ensuring available solutions are widely and appropriately adopted requires radical innovations in research and policy practice. A transformation accelerator is proposed as a way of meeting this pressing challenge.

FUTURE COLLABORATIONS

During the exchange we identified several prospects for future collaborations that may result in joint research projects and longer-term partnerships, including on:

1. Understanding the hydrology, chemistry, and sociology of coal-pit lakes.

2. Equitable, efficient, and adaptive water planning under climate change.

3. Cooperation on socially responsible, politically aware water modelling.

4. Scoping an international IRI network – IRINet.

5. Strategic evaluation of IRIs work in societal change.

6. Cooperation on using serious games as techniques in policy labs.

7. Comparative river basin research – developing the Basin Peer proposal.

8. Designing and testing internationally networked transformation accelerators.

Each of these prospects is described briefly below and more extensively in section 3.

1. THE HYDROLOGY, CHEMISTRY, AND SOCIOLOGY OF COAL PIT LAKES

Research into coal mine site rehabilitation is more than a technical water quality or quantity exercise. As part of the transition to a low carbon future it means coming to terms with the consequences of the 20th century's fossil fuel technologies. Research on lignite mine remediation is a demonstrable way for HU and ANU to collaborate on accelerating adoption of solutions, while engaging with the social and technical restitution of the damaged sites arising at the end of the fossil fuel epoch.

2. EQUITABLE, EFFICIENT, AND ADAPTIVE WATER RESOURCE PLANNING

Equitable, efficient, and adaptive water resource planning has global relevance, particularly if this incorporates biodiversity conservation, social justice, competition for water resources, drought and flood risk mitigation and sustaining environmental flows. Collaborative research is needed on refining the methods and practices for assessing and preparing for climate change across these multiple dimensions of water governance. ANU should pursue international collaboration on this important topic.

3. SOCIALLY RESPONSIBLE, POLITICALLY AWARE WATER MODELLING

Models are pervasive and critically important to water resources management, with many types in use. Researchers at IWF and IRI THESys have deep interest and expertise in researching the politics and sociology of water models. This research could enhance models and modelling practice in policy and practice.

4. AN INTERNATIONAL IRI NETWORK – IRINET We scoped collaboration on designing a network of IRIs (IRINet) and undertaking comparative and evaluative research on enhancing IRIs effectiveness. A network provides opportunities to promote integrated, transdisciplinary, and a-disciplinary methods and approaches. It would provide an entry point for national and multi-lateral agencies and enable multi-site collaborations. An active network of IRIs could support staff and student exchanges and the development of joint projects.

5. STRATEGIC INTERNATIONAL EVALUATION OF IRIS

Evaluation is an applied discipline that utilises a range of social science methods to determine what works and why. However, systematic evaluations have rarely been applied to IRIs, despite their prevalence as institutional responses to sustainable development and sustainability imperatives. A systemic evaluation would aim to understand IRIs, enhance their impacts, and support learning on how IRIs could be more catalytic in changing the world. There are multiple justifications for evaluation, including to ensure accountability and collective learning across research institutes.

6. SERIOUS GAMING AND POLICY LABS

Serious gaming and policy labs offer significant scope for research collaboration. The IWF is developing a project on gaming and policy labs with the objective of designing innovative reforms. This project aims to build communities of practices and drive aware of the social construction of water rules and options to modify them. Games are forms of participatory modelling that include peoples' beliefs and behaviours within the representations and simulations of systems. Therefore, they can support novel ways of reconfiguring system dynamics. Thus, they can be transformative particularly when participation protocols respect subjectivity, enabling the co-construction of principles, rules, and knowledge by those involved.

7. COMPARATIVE RESEARCH ON RIVER BASINS – BASIN PEER

Many river basins span multiple national or administrative boundaries. Often multi-organisational or multilateral initiatives emerge as champions of more integrated and coordinated governance. Cooperative and comparative research programs could accelerate learning and the exchange of better practice through systematic and coordinated evaluation between basin peers.

8. TRANSFORMATION ACCELERATORS – CO-PRODUCING RESEARCH AND REFORM

It is widely accepted that dramatic, urgent, and just transformations are required to avoid dangerous climate change. Accelerated transitions to low carbon futures have major

implications for every sector. The exchange reinforced my view about the need for research practices that accelerate transformations. Gathering more evidence of why these transformations are needed does not seem useful or necessary – the news media does this adequately. More urgent and important are research methods that enable the creative explorations of options and more robust processes of policy and institutional redesign. A transformation accelerator would drive R&D processes for co-producing policy and governance reforms and designing transformative options.

Section 1: Background and Context

1.1 Introduction

In early December 2023, I spent two weeks at Humboldt's Integrative Research Institute on Transformations of Human-Environment Systems (IRI THESys). The exchange program aims to improve collaboration between the Australian National University (ANU) and Humboldt-Universität zu Berlin (HU). My exchange focused on some of the Anthropocene's grand challenges, including 'the nexus' of managing water, food, land, and energy systems more sustainably in a climate change world.

During my exchange, I organised and facilitated two workshops, delivered two guest lectures/seminars, and had numerous meetings with students and researchers. We investigated the potential for collaboration between the research institutes visited, which share many mutual ambitions and interests.

This report outlines the matters investigated and documents some ideas for further cooperation. I am confident our relationships could become significant given the scale of the challenges our institutes work on, and the pressing need for more ambitious and internationally cooperative research programs.

This report summarises my findings and is structured in 6 sections:

I. Introduction and context, including COP 28 and the transformation imperative.
II. Researching the Anthropocene.
III. Prospect for research collaboration.
IV. Lesson on communications and outreach.
V. Some notes on logistics.
VI. Attachments that reproduce relevant project documents.

1.2 COP 28 and the transformation imperative

My exchange to Humboldt University, Berlin, and Montpellier, France coincided with the COP 28 meeting in Dubai. From here, the fascinating machinations of global science and multi-lateral policy development were broadcast 24-7 via every conceivable digital and conventional media channel. The drama of the last-minute negotiations and the broader spectacle of 70,000 plus international attendees travelling (mostly flying) to a petro-state to negotiate a climate agreement provided a stunning backdrop to my much more modest, but not unrelated project – attempting to understand integrative research institutes' roles in societal transformations.

During the trip, I watched (via the BBC) heads of states and fossil-fuel lobbyist talk of transformations, while also avoiding binding commitments to phase out fossil fuels. Accounts of COP 28's outcomes vary widely, with some claiming a ripping success, others a tragic failure or something in between. Was it tragedy, farce, or simply the theatre of international politics? I guess this depends on your politics, position, and perspectives.

Terms like *transformation* and *just transitions* are increasingly used in talk on climate change, including at COP 28. This may signal an important shift in the international political discourse or

signify that the language of transformation has been appropriated by the mainstream. Is it too dark to see this, in Orwellian terms, as 'double-speak'?

Given the risks that these terms are becoming empty signifiers supporting business-as-usual, I am cautious about using terms like transformation – including in this report – but we have few alternatives. I wonder therefore, how we can reclaim *transformation* or find alternative terms that can adequately describes the pressing changes needed. More importantly, I wonder how we can accelerate adoption of the deep changes needed.

With climate change impacts intensifying – and unprecedented droughts, floods, fires, heatwaves, and storms making human vulnerabilities starkly apparent – the transformation imperative is gaining wider public acceptance and therefore, political traction. International organisations, like UNCCC and CGIAR routinely express the need for accelerated policy, investment, and research to drive transformations. However, what does transformation mean, in theory and practice?

The word 'transform' derives from Latin *transformare* and means 'to metamorphose'. Metamorphous is fundamental change, unlike incremental change or enhancement it implies radical reforming or reshaping of things, materials, systems, and the lives of people and animals. The classic, children's textbook example is the dramatic metamorphosis of the caterpillar, who after entering a chrysalis, undergoes metamorphosis, before exiting as a butterfly. Therefore, by implication the transformation to a low carbon economy means radical change on a massive scale, with implications for all sectors. Understanding, preparing for, shepherding, and accelerating these metamorphic changes are (or should be) reshaping research and policy agendas. Transformation imperatives are fundamentally altering the context for research. When this is combined with the ideal of research integration or integrative research it means we must re-form much of our research practice. The term integration comes directly from Latin *integro* which means *I make whole, I renew, I repair, I begin again*. In common usage its means *to form into a whole; to make entire; to complete; to renew; to restore; and to perfect.*

Integrative, transformative research can therefore be interpreted as investigations into understanding dramatic, fundamental change engaged in restoration, repair, and renewal. My exchange to HU was a quest to discover how research integration can support the transformation imperative, and accelerate the metamorphosis, we are (hopefully) experiencing. Part of my attraction to Humboldt's Integrative Research Institute on Transformations of Human-Environment Systems is their focus on integration (to make whole) and transformation (to metamorphose). Writing this report involves reflecting on and synthesising what I learnt, and mapping where we might best explore next. I apologise, that I failed in delivering the shorter report I intended, but I believe the topics involved justify this more expansive treatment.

1.3 Integrative research and the nexus

As outlined above, COP 28 further legitimised, socialised, and normalised the idea of accelerating societal transitions, including by formally acknowledging the need to start phasing out of fossil energy use. Not only is the transformation imperative reshaping international energy policy it also alters a suite of related polices and therefore the context and practice of research. When applied to research on large-scale societal challenges – like food and water

security in a changing climate change – integrative research approaches can be seen as alternatives, or complements, to reductionism (Zeitoun et al., 2016).

My exchange project focuses on advancing understanding how integrative research institutes can better contribute to the Anthropocene's interlinked sustainability challenges across water, energy, food, and biodiversity conservation. These interconnected challenges are increasingly referred to as the 'nexus' – a shorthand term for these cascading, connected and complex global issues. Like transformation, the nexus is also increasingly used as shorthand in international policy. For example, my colleague at ICEDS, Anna Sanders, examined the most recent IPCC reports to determine the use of the term. She found that nexus is used 25 times in the Working Group I report "Climate Change 2021: The Physical Science Basis." In contrast, the authors of Working Group III report "Climate Change 2022: Impacts, Adaptation and Vulnerability" used nexus 343 times. It is also prevalent in the Working Group III report on mitigation, with 232 uses. This total of 600 uses indicates that the nexus is thoroughly embedded in the international policy discourse.

It is generally accepted that the nexus challenges need more integrated approaches. In practice this remains challenging for many traditional sector-focused agencies due to their programmatic and disciplinary structures and institutional and professional inertia, with integration rhetoric exceeding practice (Allouche et al., 2019). There are many questions about the kinds of transdisciplinary research and development programs needed and how these can and should be funded, organised, and delivered, including the role of partnerships and co-production in supporting societal transitions (Norström et al., 2020). Bolger (2021) examined integrative research institutes finding that many research agencies and funders recognise that inter- and transdisciplinary research is essential for solving the world's many wicked problems. Further, it is widely accepted that "global sustainability and environmental challenges require research at the boundaries of scientific disciplines. While widespread adoption of interdisciplinarity has become an institutional goal amongst universities … most organisations still struggle to deliver the transformations needed to shift to more collaborative interdisciplinary structures and practices within their universities" (Bolger 2021).

Therefore, more rigorous examination of the actual practices of existing integrative research institutes – like IRI THESys, IWF and ICEDS – is called for. These institutes are like many throughout the world's universities, in that they were established with the explicit purpose of contributing to societal change through integrated research, outreach, and teaching programs. Systematic evaluations could provide important insights about research priorities, capabilities, and challenges, and guide enhancement of future similar initiatives.

Despite the significant growth of these kinds of institutes, it appears that there is only limited work undertaken in researching their form and functions and evaluating their impacts. According to Bolger (2021)

> *"Despite the potential for research institutes to advance interdisciplinary research on university campuses, there have been few studies on how interdisciplinary research centres integrate multiple disciplines in practice, how they influence the collaborative behaviours of scientists and how they establish collaborative communities."*

At the workshops and meetings at IRI THESys, we explored ways to overcome this deficiency, including establishing a network of integrated research institutes and scoping a proposal to

survey and evaluate these kinds of institutes more systematically. These and other proposals for future collaborations are outlined further in section 3.

Figure 1: Poster at IRI THESys about designing the Humbolt Centre for the Anthropocene.

1.4 What is IRI THESys?

IRI THESys was *"founded as a project within the university. It has successfully evolved into somewhat of a hybrid structure between research cluster, project and institute, that is hard to place within the German research landscape"* (IRI THESys 2020).

IRI THESys is ten years old. At a recent strategic planning forum, they announced that it will itself transform (or at least be rebadged) to become the Humboldt Centre for the Anthropocene (figure 1).

IRI THESys is a cross-faculty endeavour or initiative, founded at Humboldt University (HU) in 2013. It aims to address the challenges of understanding and transforming human- environment systems towards planetary sustainability. IRI THESys involves scholars from diverse faculties at HU and partner research organisations, who undertake research, train early career researchers (from under- to postgraduate), and make sustainability science public through co-production, engagement, and exchange (IRI THESys 2020).

IRI THESys focuses on significant human-environment challenges, creating models of scholarly collaboration and training suited to the Anthropocene's stressed and changing human-environment relations. IRI THESys is not like many other university institutes. It has a strong research portfolio, but no core research staff or research budget. It runs early career training programmes (from bachelor to postdoc) yet has no dedicated teaching capacities and its

international and interdisciplinary programmes have no formal powers to award degrees or doctorates. IRI THESys has administrative and professional staff based in a physical office, within a modern science and technology park at Adlershof, about 50 minutes by train from central Berlin, (figure 2).

Figure 2: IRI THESys offices are located within a modern technology park.

1.4 My exchange at IRI THESys

At IRI THESys I was generously hosted by their director, Tobias Krueger – a welcoming and thoughtful host. We established a good working relationship and through discussions found we share common perspectives on subjects like water resources management, the need for critical examinations of hydrological modelling and research innovation.

With staff and post-graduate students we explored the challenges and opportunities facing integrative research institutes, and scoped research which may provide a platform for ongoing collaboration. Hopefully, we charted the future of cooperation between our institutes. We sketched some of the 'what' 'why' and 'how' of possible research. These ideas will be refined in various project proposals arising from the discussions. Part of the art in this work is the analysis, synthesis, reporting, communication, and the filtering and refining that enables the conversion of initial ideas into longer term and effective projects. Section 3 outlines some ideas on possible collaborations.

1.5 The workshops at IRI THESys

We held two workshops at IRI THESys. Despite our plans to attract attendees by holding the first workshop on the morning of the IRI THESys Christmas party (December 8), the world intervened with a snap train drivers strike. This old-fashioned industrial action crippled Berlin's public transport and the Christmas party was postponed so we rearranged the planned face-to-

face workshop, reformatting it as a hybrid zoom conference. About a dozen IRI THESys staff participated, with half on zoom and the balance in person.

The enthusiastic, nuanced, and far-ranging discussions indicated their appreciation for the opportunity provided by a stranger arriving from the southern hemisphere, who asked open ended questions about the challenges they encounter and ways to overcome these. The workshops were organised around the questions listed below. The second workshop (12th December) provided an opportunity to delve deeper into the ideas emerging from the first workshop.

Prior to travelling to Berlin, I prepared a background paper, a workshop primer distributed to those invited. This paper is at attachment 2. The workshop agendas and notes are provided as attachments 3-6. Figure 3 displays the whiteboard mapping that Tobias and I used to refine the first workshop's agenda.

1.6 Guest lectures

I was invited to give guest lectures at the IRI THESys Kolloqium and to Humboldt University geography students. After I told the students that I was impressed with the scale of wind generation observed on the train trip across northern Germany (see figure 4) I was quizzed about why Australia did not have the same investment given its abundant of world class wind resources. In these talks, I outlined the challenges of managing water resources and ecosystems under escalating rates of climatic and related change. Together these changes are challenging traditional approaches, resulting in a "crazy" world full of complexities, uncertainties, and indeterminacies. I profiled the situation in Australia's Murray Darling Basin (MDB) to illustrate the changing nature of the Anthropocene and why adaptive research and policy are needed. The abstracts are reproduced at attachment 8 and 9.

Figure 3: large scale wind generation across the agricultural landscapes of northern Germany.

1.6 Berlin via Montpellier

My exchange to Berlin was via Montpellier, France – a major international centre for agricultural and water R&D – where numerous French and international agencies are located. In in

Montpellier, my host was Andrew Campbell, acting CEO of the Consultative Group on International Agricultural Research (CGIAR). CGIAR is a major global research partnership dedicated to creating a secure future through transforming food, land, and water systems (see https://www.cgiar.org). Andrew and I discussed R&D's many roles in meeting the global challenges of food and water security and averting the cascading crises that some define as a polycrisis (Homer-Dixon et al., 2021). These Anthropocene traps could stall sustainable development (Søgaard Jørgensen et al., 2024). For example, climate changes in the greater Himalayan region, amplified in the great Asian rivers – the Mekong, Ganges, and Yangtze – will impact billions of people (Pomeranz et al., 2013; Molden et al., 2022).

In addition to CGIAR, in Montpellier I meet with staff from:

- The French Joint Research Unit on Water (G-Eau)
- French National Institute for Agricultural Research (INRAE)
- The French Institut de Recherch pour du Development (IRD)
- French Agricultural Research Centre for International Development (CIRAD)

The G-Eau provides a useful example of an initiative with strong parallels to IWF. G-Eau's research aim is to understand water management systems and their social dynamics, including understanding competition for water resources. They research, develop, and propose water management options at various scales (catchment area, irrigation scheme, farm, plot), in efforts to optimise water use and reduce the environmental risks. Their objectives include ensuring more coordinated land and water planning in the face of the multiplicity of demands, climatic uncertainty and changing public policies.

The opportunity to visit Montpellier was valuable in terms of meeting with the influential French water researchers Nils Ferrand and Francois Molle. Francoise is the founding editor of Water Alternatives, a journal deeply relevant to the work of IWF. Its manifesto states:

> "*water problems have often been framed in too narrow and too disciplinary ways, despite the apparent emphasis on integrated management. … the political dimension of water resources development and management at all scales has been underplayed. As a result, perhaps, debates have often revolved around, and been stifled by, 'social engineering' concepts and models.*
>
> *Critiques of dominant modes of addressing water issues have been limited … Water Alternatives provides space for creative and free thinking on water, fostering debate, eliciting innovative alternatives, promoting original analyses and constructive critiques."*

Francois and I discussed how the water sector constrains and disciplines the thinking of its cadre of professionals and the resulting problems of group think. We explored the ways governmentality works to normalise acceptable practice, limits conceptualisation and narrow the working episteme to acceptable constructs. Francois and I continue our dialogue on governmentality in the water sector and its influence on water futures. My notes on the meeting with Nils and the prospects for collaboration on serious gaming are provided at attachment 7.

Section 2: Researching the Anthropocene

2.1 Introduction

This section provides an overview of how IRI THESys, ICEDS and IWF are approaching the challenges of researching sustainability in the Anthropocene. Understanding and governing in the Anthropocene's requires adaptive, engaged, trans-disciplinary modes of research. Institutes like IRI THESys and ICEDS provide important models as incubators of inter- and trans-disciplinary engaged, problem-focused research, and as accelerators for change.

Prior to travelling to Berlin, I compared IRI THESys with ICEDS and IWF using publicly available material on their websites. This analysis identified similarities in their aims, foci, and approaches. Table 1 below provides a summary of the research foci of the three institutes, with more information in attachment 2.

Table 1: Research focus of the three institutes

IRI THESys
IRI THESys conducts scientific research into the dynamics of human-environment relations. Against the backdrop of climate change, researchers pay particular attention to the intersections between land use practices and issues of water and energy use and governance. This includes research on food-fuel-fibre production, resource extraction and biodiversity management as well as investigations into the relationship between urban centres and their regional and global hinterlands as connected through technical, economic and regulatory infrastructures.
ICEDS
ICEDS provides leadership on climate change, energy transition and disaster-risk research. ICEDS initiatives deliver real-world solutions and a framework for understanding the challenges of climate change, the energy transition, and disaster risks. ICEDS brings together over 600 researchers and students from 25 Schools across ANU. the ICEDS research clusters enable researchers to work together to build communities of practice across diverse subject areas and disciplines including science, engineering, economics, policy, law, psychology, and communications.
IWF
The IWF foster forward-looking, cooperative, and anticipatory water governance. It acknowledges that water is not simply a stand-alone research area, but one which crosses into sociological, hydrological, and ecological study and beyond. Research themes are not organised by discipline, but into three primary outcomes: (i) understanding uncertain futures though combining social and natural sciences; (ii) creating greater resilience and transformative shifts in how we share and benefit from water (iii) working with partners to co-develop and co-produce deliberative strategies to adapt, transition, and transform in anticipation of changing demands, climatic shifts, and technological opportunities.

2.2 The IRI structures within universities

IRI THESys' Status Report – prepared for the evaluation of their second funding round - 2018-2022 contains two pertinent ideas. The first is that IRI THESys is a project within the university because it relies on short term funding and has no discrete research staff or the capacity to award higher degrees. Like ANU's institutes, it remains dependent on short term funding and is thus subservient to the more powerful and established disciplinary based schools.

These structural and institutional conditions are not unique. Bolger (2021) reviewed sustainability institutes in the US universities, finding that their numbers have swelled over the past two decades. Many universities have environmental, or sustainability focussed research centres with these comprising approximately 8% of all US research institutes. These span many disciplines enabling "universities to increase research productivity, industry partnerships and collaboration and networking." These centres "strengthen how universities address sustainability challenges" contributing to "the development of interdisciplinary teaching approaches and the establishment of interdisciplinary schools in areas such as environmental science or sustainability science" which support students with key twenty- first century skills.

Many universities added layers of "interdisciplinary research on top of existing disciplinary structures" attempting to support interdisciplinarity through establishing new research institutes. They suggest this expansion may be a signalling device that a university's mission and strategy "have evolved to allow universities to increase their responsiveness to societal needs and to attract external research funding." A distinctive feature of these "institutes is the intention to span disciplines and boundaries and foster collaboration amongst researchers to overcome the compartmentalisation of scientific knowledge".

Bolger (2021) adds that the emergence of the department-institute matrix (with disciplines/schools represented by vertical lines and cross-cutting institutes by horizontal lines) enables connections to be made across disciplines thus "allowing universities to retain traditional departments that facilitate disciplinary depth whilst also bringing academics together to work on problems of common interest. This matrix structure enables institutes and centres to be a beneficial addition to schools and departments adding and furthering activity without competing for departmental resources." However, resources and hierarchical control structures are typically maintained within the departments, while the integrative institutes rely on grants, communications, and influence to further their ambitious agendas.

Bolger (2021) suggests that the institute and their agendas for change are boundary objects or organisations that facilitate dialogue and enable exchange across disciplinary boundaries, providing "trading centres" where academic pidgin is spoken.

The second key idea from the IRI THESys Status Report is quoted at length below because it eloquently describes the fundamental challenges of researching sustainability in the Anthropocene:

> *"In the coming decades, a simple question will lead to significant social-ecological struggles across the planet: How do we want to live together? A new social contract will likely be negotiated in a process more transformative even than the enlightenment and early industrialisation in Western Europe. Reconfigurations of human-environment relations will lie at the heart of this process and will inevitably upset modern Western foundational convictions: the nature-culture dichotomy, the central role of human agency, the idea of linear progress and growth, and the universality of scientific rationality and*

mechanistic causality. This is what the Anthropocene means: reconfiguring and trying to sustain more-than-human livability in a postcolonial world under conditions of volatile planetary environmental change. The outcome may be uncertain, but responses from within the scientific community are urgently needed. Humboldt University's response has been to set up IRI THESys as a cross-faculty institute. In 2013, this was a bold move for a public German university. Since then, IRI THESys has developed internationally visible research across disciplinary boundaries, comprehensive early career training strategies and novel ways of making science public. Yet, our aspirations go further. We want to build on our achievements while institutionalising a new model of scientific practice – a model that will make Humboldt University an integral part of the global transformation towards sustainable planetary habitability."

This clearly stated ambition – to institutionalise a new model of scientific practice supporting the global transformation towards sustainable planetary habitability – resonates with the ANU's aspirations to tackle the international communities' grand challenges through institutes like IWF and ICEDS. Thus, ANU and HU share common ambitions and are dealing with common challenges of integrating big-purpose, transdisciplinary research within the university system's institutionalised structures and practices. Based on these shared ambitions and faced with similar structural challenges, we have much to learn from working together. These challenges revolve around issues of organising research to support adaptive governance, reforming the way research is organised and delivered, and developing more flexible and effectives ways of engaging with society on understanding and governing in the Anthropocene.

With increased recognition of the global sustainability challenges, many universities are resourcing integrated, transdisciplinary research institutes that span traditional disciplinary boundaries. Establishing institutes with broad mandates for inter- and transdisciplinary problem-focused research can assist in accelerating wider societal change and catalyse more equitable and innovative transformations. Yet these institutes face different challenges to the more established and traditional disciplinary based and faculty located research institutes. During the exchange we agreed that is useful to examine IRI's capacities and modes of operation. Further, there are likely to be ways of learning from the experience of institutes with similar mandates operating in the different countries.

Figure 4: large scale wind generation across the agricultural landscapes of northern Germany.

Section 3: Future research cooperation

3.1 Prospects for collaborative research

This section outlines the prospects for collaborative research identified during the exchange. Some of these – like coalpit lakes – are specific project ideas, while others are more general research ideas, from which future collaborations could evolve. The prospects of research collaborations were floated at the two workshops where the consensus was that researchers with interest in specific research topics or questions should come together to develop specific proposals. For each of the proposed ideas outlined below, specific planning processes and meetings are required to progress these further, to apply for funds. Therefore, this kind of exchange could be seen as the broad mapping of prospects for further collaborative work.

Prospects for collaborative research are:

- Understanding the hydrology, chemistry, and sociology of coalpit lakes.
- Equitable, efficient, and adaptive water planning under climate change.
- Socially responsible, politically aware water modelling.
- Scoping an international IRI network – IRINet.
- Strategic evaluations of IRIs.

- Cooperation on serious games and water policy labs.
- Advancing comparative river basin research – through Basin Peer.
- Transformation accelerators.

3.2 Specific prospects for collaborative research

3.2.1 The hydrology, chemistry and sociology of coalpit lakes

There is potential for research collaboration on the water resources impacts of the 'end of coal'. Brandenburg-Berlin has water resources problems like the Latrobe Valley in Gippsland, Victoria due the need to fill old lignite (brown coal) mines with water. This new demand results in increased competition for the water resources in fully allocated systems. Unless the redundant brown coal mines are filled with surface water, they inevitably fill though ground water leaching in and causing a range of pollution problems. Complex water quality problems arise if old mines fill mostly from ground water intrusion because this water is generally acid and carries a heavy load of pollutants derived from the coal layers. Water resource planning and allocation for these substantial pit-lakes are complex, with competition from other water resource users including streams and wetlands, urban users, and irrigators. Water resources planning is made more complex by climate change. The extract below from my 2017 paper on coal and water in the Latrobe Valley describes these problems. It is also worth noting that the 740 Gl required to fill the Hazelwood pit is roughly equal to the entire annual outflows of the Latrobe Basin. There are two other massive pits to fill when the Loy Yang and Yallourn stations close between 2026 and 2030.

Figure 5: Coal fired power stations operating in Northern Germany.

Figure 6: Hazelwood fired power station – now closed in Victoria.

> *The Hazelwood station closure highlights "the need for mine rehabilitation. A pit or 'void' lake is planned providing a regional focal point and monument to mining past, but many specific water quantity, quality and groundwater issues need to be resolved (Hussey et al. 2008; Victoria Parliament 2016). The Hazelwood Mine Inquiry (Victoria Parliament 2016 p 93-97) found that there is a pressing need for Victorian Government agencies to plan the water needed for the proposed 740 gigalitre lake, which at about 1.5 times the volume of Sydney Harbour, may take decades to fill depending on how the required water is to be allocated. However, Southern Rural Water (2014) states that the "Latrobe River Basin is fully allocated, so no new licences can be issued," clearly implying that the water required would need to be transferred from existing licence holders" (Alexandra 2017).*

Research into mine site rehabilitation is far more than a technical water quality or quantity exercise. It is part of the transition to a low carbon future with recognition of the full range of the consequences of the 20th century's fossil fuel technologies. These technologies created common problems, including the well recognised carbon pollution problems, but also many smaller, local, and regional impacts. International research collaboration on lignite mine remediation is a demonstrable way to collaborate on accelerating adoptions of solutions, while engaging in the social and technical restitution of the polluted and damaged sites from the fossil fuel era.

3.2.2 Equitable, efficient and adaptive water resources planning under climate change

The Climate and Water under Change (CliWaC) is a transdisciplinary research initiative of the Berlin University Alliance. The project focuses on understanding challenges and strategies for coordinated action in the Berlin-Brandenburg region. CliWaC is coordinated by IRI THESys but involves a broader alliance of universities and stakeholders. The project combines social and

natural science, and stakeholders' practical expertise to support mitigation and adaptation measures in response to climate change.

CliWaC focuses on climate and water governance – including investigating water resource options for the future of the rapidly growing Berlin-Brandenburg region – and is strongly aligned with IWF's work understanding climate risks in the MDB (Alexandra 2023a&b; Pittock et al., 2023; Samnakay et al., 2024).

CliWaC focuses on four overarching research questions:

- How will climate change affect different human-environment systems with respect to water-related hazards and the availability of good quality water?
- What potential solutions exist for managing water resources and making human environment systems resilient to water-related hazards?
- Which forms of governance are available for coping with emerging challenges and implementing solutions and how can these be coordinated between stakeholders across administrative borders?
- Which legal issues, administrative constraints, public perception form barriers to adaptive practices and how can they be overcome?

The Berlin-Brandenburg region has complex natural, societal, and political conditions. Research focuses on (i) ecosystems, biodiversity, and ecosystem services, (ii) flood and wastewater management and (iii) water resource management using three case studies: a lake system; the Spree River catchment; and urban infrastructure impacted by extreme rainfall.

The situation in the Berlin-Brandenburg region is not unusual. Climate change is driving far-reaching changes in catchments and water resources management, with more intense droughts and unprecedented floods becoming routine news.

In Australia since 2004, numerous enquiries into water policy recommended more is done to prepare and plan for climate change (Wyborn et al., 2023). For example, in 2019 the SA Royal Commission called for urgent reforms to the Murray Basin Plan to overcome deficiencies in planning for climate impacts (Walker 2019). In 2021 Australia's Productivity Commission (Productivity Commission 2021) called for further reforms to handle climate change, recommending that, "water planning processes need to be upgraded to best practice. And they need to have a strong focus on dealing with climate change" (Productivity Commission 2021, p.8). The Productivity Comission's recommnedation echoes the Water Act's requirements to use the best available science for climate risk management (Commonwealth 2007). However, achieving these objectives depends on developing the requisite capabilities, techniques, and procedures. However, systemic deficiencies within Australia's public sector have resulted in failures to develop these capabilities at the multiple scales of water governance. There is a major adaptation deficit, with IWF research documenting the significance of these failings, including in the MDB (Alexandra 2023a; Pittock et al., 2023).

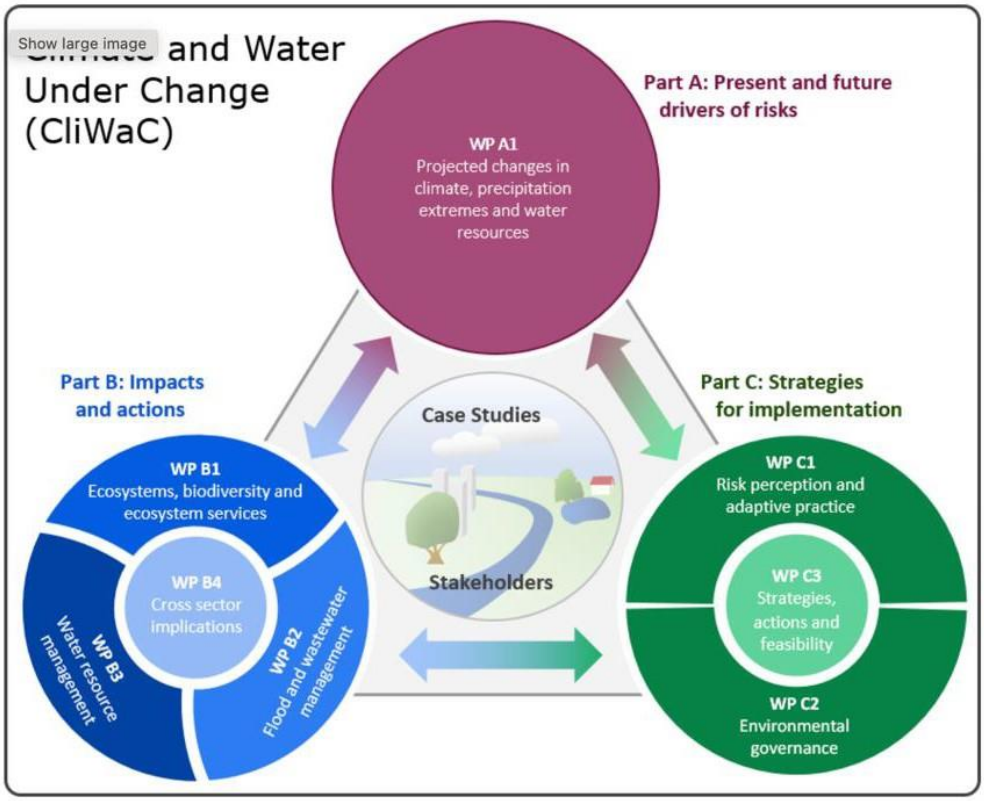

Figure 7: schematic representation of CliWaC research.

Many reviews of adaptive governance are overly general with few studies exploring specific options for innovative, equitable and adaptive institutional reforms (Alexandra 2019). Exceptions include investigations into alternative allocation regimes such as Alexandra's (2023) and Samnakay et al. (2024) study which proposes principles to guide adaptive water reforms. Importantly, there is insufficient investment in co-production and socialisation of adaptive approaches and therefore in engaging stakeholders in this kind of planning work. Despite the pressing need, there are few ways of testing innovative policy options, and the scale of investment is insufficient to drive the research and policy innovations needed, or in developing the professional and institutional capabilities required.

Integrated water resource planning in the face of climate change uncertainties has global relevance, particularly if it aims to incorporate multiple values and outcomes such as biodiversity conservation, irrigation and urban water resources, flood risk mitigation and environmental flows (Alexandra et al., 2023). There are strong prospects for collaborative international research on refining methods and practices for assessing and preparing for climate change impacts across multiple dimensions of water governance.

IWF is well place to participate in international research engaged in water futures under climate change because it already has a recognised group of researchers involved in assessing climate risks and adaptive policy responses (Alexandra 2023a&b; Pittock et al., 2023; Samnakay et al., 2024; Wyborn et al., 2023).

ANU should pursue further international collaboration – with Humboldt and other universities – on water resources planning under climate change and is well place to provide international leadership on these pressing needs, as evidenced by the recent work highlighted above (eg Alexandra 2023a&b; Pittock et al., 2023; Samnakay et al., 2024; Wyborn et al., 2023).

3.2.3 Socially Responsible, politically aware water modelling

Models are pervasive and critically important to water resources management with many types and applications from flood prediction, to the those used in ecohydrology and optimising environmental flows. Tobias Krueger, (2016) director of IRI THESys and Tony Jakeman (ANU) are recognised experts on hydrological modelling. Thus, IWF and IRI THESys have deep expertise in water modelling and are interested in researching the politics and sociology of models and their applications.

This research interest extends beyond the typical questions about utility, application, and translation of models, into questions about the concepts and assumptions that underpin modelling and what gets included or excluded, to how stakeholders and experts interact via models (Krueger 2016). Future research would critically evaluate models and modelling practice and aim to improve the practical and social application of water models. As example of this interest, two of the IRI THESys PhD projects ask questions about water models, calling for politically aware and power sensitive modelling with a reflective, understanding of how the models influence the world beyond the model. See Krueger & Alba (2022).

These interests align broadly with those at IWF where a report (1) argues that model development can and should be a social and deliberative process capable of bringing different forms of knowledge and values to the task. This report outlines concerns about model limitations and why policy makers and managers need to better understand models' purpose, limitations, and reliability. The deliberative and social aspects of models are important, determining how they get used. Therefore, building understanding and trusting relationships with users, like policymakers, is critical to model performance. Modellers and researchers need to be concerned about models and their use because knowledge about many water systems is codified in models that are used to inform water resource decisions.

Modelling practice is typically highly technical and often insulated from wider scrutiny. While hydrological modelling is multi-disciplinary, natural science and engineering disciplines dominate models which incorporate climate, catchment and flow parameters, and other biophysical parameters of systems. Models rarely represent human values and social dimensions well. Therefore, research into whether water models can better account for the complex social values of water are justified.

Universities play important roles in researching socially responsible, politically aware water modelling. Use of more deliberative and participatory processes are justified in the designing, refining and use of models, and may improve trust between modellers, policy makers and stakeholder groups. IWF is facilitating discussions with members of the water resource modelling community in Australia, exploring ways of improving water resource modelling practice, in the context of uncertain futures. Variables such as climate change, changing

[1] For this section, I am grateful to Dr Nadeem Samnakay for providing his unpublished IWF report on modelling discussions at ANU

demographics and increasing recognition of diverse social values attached to water present opportunities to critically evaluate the practice of water resource modelling and identify ways to improve model development, refinement, utility, and applications. The ANU is establishing a group to guide its efforts to improve modelling practice. This could become a collaborative program of work, with a wider range of case study locations.

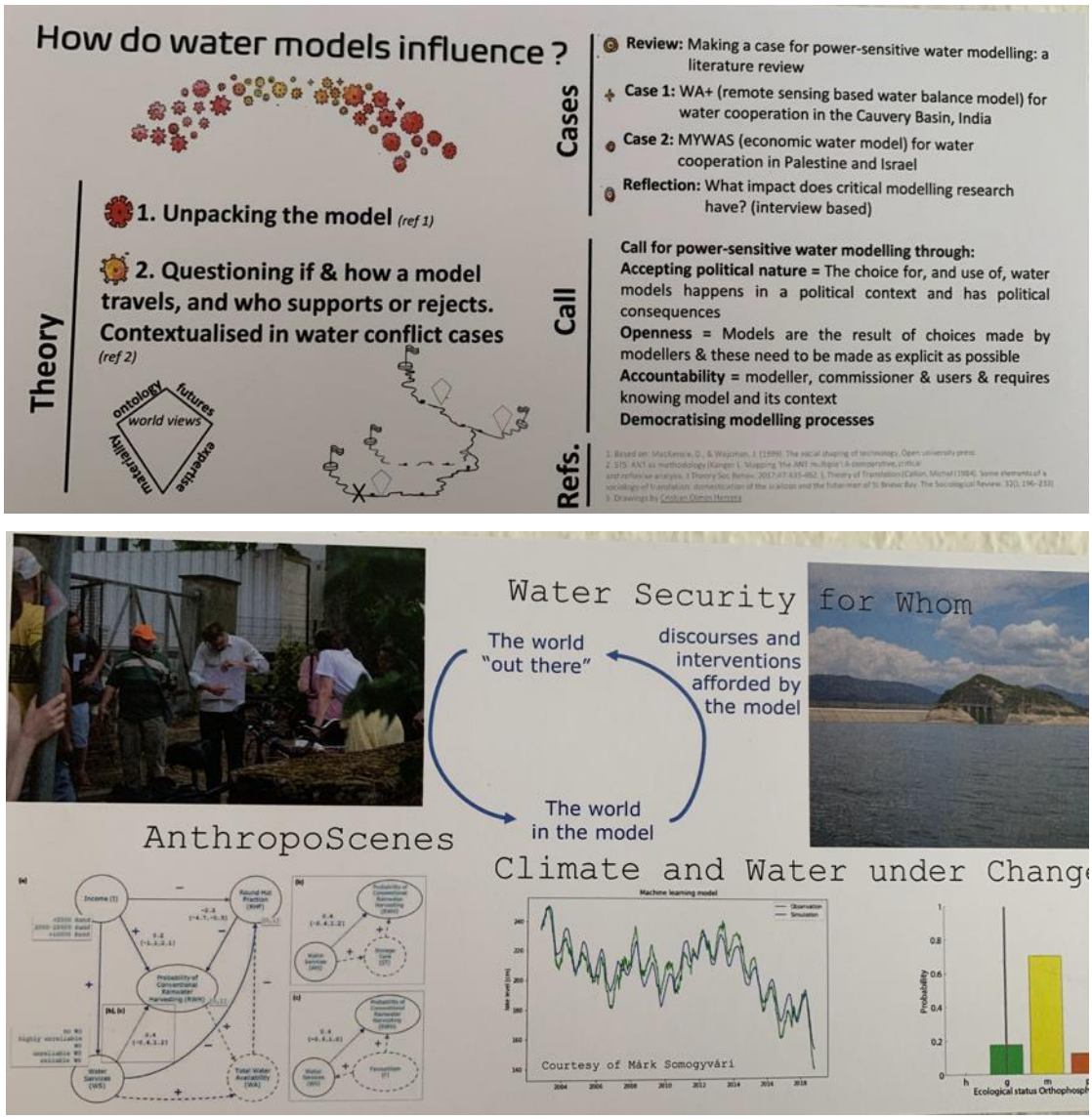

Figure 8: IRI THESys researcher's postcards on modelling research

3.2.4 Scoping an international IRI network

The workshops at IRI THESys identified the prospect for future collaboration on establishing a network of IRIs and undertaking comparative, evaluative research on understanding and enhancing IRIs. The evaluation research and network establishment are connected, as are the

prospects for a 2024 or 2025 international workshop on integrative research institutes and their roles in transformations.

At the workshops we asked:

- How can integrative research institutes (IRIs) build more effective collaborations?
- What would be the functions and aims of an international IRI network?
- How could a network be organised and resourced?
- To enhance IRIs, we need to understand how they work. Would evaluative research on IRI enhance their roles in social change and transformations?

Rationale, aims and objectives

The IRIs at ANU and HU encounter similar challenges due to their similar purpose and ambitions and their roles linking disciplinary-based schools. A broad and comparative evaluation beyond these two universities may be useful. An evaluation project is an opportunity to test interest in establishing an IRI network and provides opportunities to better understand and promote transdisciplinary and a-disciplinary methods and approaches. A transboundary IRI network could provide strategic support to international partnerships, multi-site collaborations, cross-country comparisons, and support knowledge exchanges – through joint projects and staff and student exchanges.

IRNet's activities

An IRI network could (i) promote learning and exchanges amongst IRIs through PhD and post docs, ECR and research fellows (eg 3 to 6 months research exchanges) (ii) document and promote research methods and practices, suited to working in a deeply uncertain, post- natural world (iii) investigate how to meaningfully promote solutions while co-producing critical research (iv) embrace multiplicity and diversity while staying with messiness and with the problems (v) support critical evaluation of IRI performance (vi) understand different structural models of IRIs (vii) find seed funds to generate research projects on specific common themes (viii) develop educational material on Anthropocene challenges.

Deliverables

An IRI network would (i) promote learning that enhances IRIs effectiveness (ii) deliver theme-based research, including international comparative research on subjects of mutual interests (iii) find funds to sponsor exchanges (iv) pollinate ideas across countries and continents.

Network structure and communications

Any network's structure would need to be light, operate with low overheads, have minimal burden, and be based on members self-motivation and self-organising capacity. Any budget needs to be used to bring parties together.

3.2.5 Strategic international evaluation of IRIs

Evaluation is an applied discipline that utilises a range of social science methods to determine "what works and why" (Olejniczak et al., 2020). However, systematic evaluations have rarely been applied to IRIs, despite their prevalence in universities as responses to society's sustainability imperatives (Bolger 2021).

A networked and systemic evaluation would aim to understand IRIs and enhance their performance, paths to impacts, and policy relevance. The focus would be on understanding how to enhance IRIs effectiveness in accelerating social change, noting some complexities and deep tensions in the work of IRIs. For example, they promote adoption of "solutions" (the application of what is known) but also promote slow, serious, and sincere science that is critical and questioning. Therefore, the evaluative research is best undertaken by those who have experience within these organisations and understand how they operate.

Evaluations also "ensure the accountability of public investments, and… enables learning and therefore the improved utility of public interventions over time" (Olejniczak et al., 2020). Bolger (2021) argues that:

> "institutes could greatly benefit from more collective learning across their interdisciplinary research projects". Expanding on the need to build institutional capacity for interdisciplinary research Bolger (2021) proposes capacity building through "careful examination of successful interdisciplinary projects and the processes underpinning them, to internalise this knowledge within the organisation…. The focus should be on the process as much as the research and outcomes. Institutes could consider developing specific local frameworks for interdisciplinary research, a kind of methodological toolbox that harvests the lessons from institute faculty engaged in this work combined with project case studies."

An international IRI workshop

We plan to explore prospects for an international workshop on integrative research institutes and their roles in transformations. The timing and location are yet to be determined. The interviews and survey will determine whether there is support for this to proceed and whether it would be useful for evaluation. If it proceeds, the international workshop will be invitation only. Attendees will be invited to write short provocative reviews, reflections, and commentaries on specific themes for presentation and critiquing at the workshop. The workshop themes will be derived from the survey. We will aim to support publications and multi-sited, comparative R&D to enable learning and networked research.

Defining an IRI

The workshops identified the need to better understand, evaluate and enhance the work of IRIs. This led to questions about the classification and definition of IRIs, and who or what defines them if a network is formed, and which institutes would be involved? Van Kerkhoff (2014) defines integrative research as "research in the context of complexity, with an action imperative" that adopts complexity-based approaches through adopting generative relationships, focusing on enablers, and seeking diversity.

Building on this definition, the following criteria are offered to ensure coherence – a transformative IRI:

- Seeks to solve problems and propagate solutions while promoting critical scholarship, reflection and research that integrates the social and natural sciences, arts and humanities.
- Is transformative in intent and takes the imperative of societal change as its starting point, explicitly recognising both technical and political relationships.

- Seeks to use knowledge to activate and guide change, promoting a kaleidoscope of diverse solutions, refracted through the prisms of diverse, legitimate perspectives.
- Works in partnerships, across and beyond universities, with policy agencies, and the private and civil society sectors.
- Works across scales from global to local and local to global recognising the glocal nature of tele-coupled relationships (eg globalised supply chains).

Proposed IRI evaluation

At the workshops we scoped a one-year research proposal to evaluate IRIs, which is based on the following steps:

- Design interview questions and interview key people at selected IRI as an extensive data gathering stage.
- Undertake snowball sampling.
- Extract a set of key emerging issues as basis of survey questions.
- Develop an online survey as an intensive data gathering stage.
- Undertake analysis of responses.
- Write up results – publish findings.
- Identify merits and agenda for international/regional workshops.
- Hold regional and or international workshop/s.

We will attempt to write an academic paper on understanding integrative research institutes' roles in tackling sustainability challenges and researching adaptive futures across the Nexus with its multiple intersecting issues (land, water, energy, food, etc.).

Figure 9: water board game background mat (Nils Ferrand)

3.2.6 Serious gaming and water policy labs – Montpellier

With Nils Ferrand and Olivier Barreteau, I explored potential collaborations on serious gaming. Nils, Olivier, and their team have developed a suite of water games used as learning and modelling methods that incorporates human behaviour.

I briefly introduced the IWF's gaming and policy lab proposal, conveying that its objectives include innovating reforms, improving governance, building communities of practices, and driving awareness of the social construction of water rules and ways to modify these.

Nils profiled his research group's work on serious games to enhance water decision-making. My notes on these discussions are at attachment 7. Figure 9 is an example of the quality of the production of one of their board games. Nils outlined how serious games are forms of companion and participatory modelling and that this post-normal science endorses peoples' behaviour within the system's representation and simulations. They are therefore not attempts

at finding objective truths. Protocols for participation (participatory gaming, simulations, modelling etc) enable respect for subjectivity and the co-construction of principles, rules and knowledge that can induce change and is therefore transformative.

Companion modelling has expert modellers as mediators. Games are also models because they represent complex socio-ecological systems (SES). Games focus people on the human decision processes that influences the system's outcomes. Any game developer needs to have awareness of framing concepts and normative systems and the way these impose directions or assume universality of values. However, there is great potential for transfer of methodologies (and for adaptation of methods) that focus on peoples' potential to change.

Nils is sceptical of scenario planning as a method. He also believes that the "big modelling agenda" always fails because the world moves to quickly and unpredictably and these models rarely keep up with social and policy change. He warned about the serious risks that the big modelers' agenda takes over projects and consumes available funds.

Nils is keen to collaborate with IWF on joint research that involves serious gaming. His preference is for working in Australia in longer blocks of time to minimise travel. I can understand this position, given the time, energy and jet lag involved in international travel.

3.2.7 Comparative research on river basins – Advancing basin peer

Joseph Guillaume (IWF research fellow) is working with Nils Ferrand and his team at Montpellier to develop research collaborations which minimises international travel due its energy and personal costs. The proposed budget is 40k EUR/year for project facilitation and communications and 10k EUR/year for targeted travel. This is specifically proposed as a low carbon alternative, compared with equivalent face to face workshop travel. The aim is for proof of concept for future collaborations that reduce travel, using a facilitator with skills in online events, wrangling researchers, and blogposts. Any journal articles would be secondary to a regular engagement and communications. The proposal starts with comparing aspects of water resources management in the MDB and Rhone basins. Additional comparators are proposed for the Asia Pacific and would involve Rhone, MDB, Mekong and India enabling comparative research without lots of international travel.

The proposal is like the "**B**asin **A**ssessment **S**ystem **In**itiatives' **P**erformance **E**valuation **E**xchange and Review" (BASIN PEER), a proposal to enable comparative research on river basins. The key idea is that :

> *"Around the world there are many large, complex river basins with catchments spanning multiple national or administrative boundaries. In response to the need for cooperative, integrated and coordinated governance many multi-organisational or multilateral basin initiatives have been established. These share a range of common challenges. BASIN PEER is a proposal aimed at establishing cooperative programs of assessment and exchange between these initiatives. It aims to accelerate learning and exchange of best practice models through systematic, rigorous performance evaluation and review."*

3.2.8 An HU-ANU transformation accelerator – Beyond policy labs

My exchange at HU and Montpellier emphasised the need for research that accelerates transformations. This acceleration could take many forms, but gathering further evidence of

why this is needed does not seem necessary. More important is the creative explorations of options, followed by robust processes of policy and institutional redesign. A transformation accelerator would build on international experience with policy labs (Olejniczak et al., 2020) but drive the policy lab design processes towards transformative options.

Policy labs have emerged as safe working spaces bringing together policy makers and researcher to explore policy options, using a range of methods, tools, and approaches. They assemble available evidence and provide frameworks and processes for creative exploration without favouring specific techniques or disciplines. This combination of methods provides scope to move beyond incrementalism in policy development.

In Montpellier, Nils Ferrand's organisation has dedicated a large space for use as a policy lab. A network of these labs could work as a transformation accelerator, exploring and transferring reform innovations across national boundaries. Nil's work on governance re- engineering may be the useful starting focus for participatory investigations into accelerating transformation. There are many others, including drawing on the wider experience of policy labs which are becoming increasingly common.

Hinrichs-Krapel et al., (2020) define policy labs as activities or processes that:

- Provide forums for open, honest conversations on a wide range of policy topics.
- Support deliberation by providing synthesises of available evidence in a robust and accessible format.
- Jointly define problems, identify policy options, and promote adoption of research.
- Create new networks, trusted collaborations and working partnerships between academics and policymakers.

Policy labs have mostly emerged in the last decade "with a mission to support policy practitioners with innovative solutions, grounded in empirical research" (Olejniczak et. al., 2020). They are diverse in their locations, subjects, methods, and approaches (Lee and Ma 2020). However, McGann et al., (2018) argue that design thinking or design methods differentiate policy labs from other processes of policy innovation, like evidence-based policy. Participatory processes help define or reframe policy problems and formulate solutions, while 'design' approaches elicit participation from stakeholders enabling co-production of nuanced solutions. Policy labs apply principles of design thinking, networked governance, co-production, and negotiated and relational approaches to problem-solving (McGann et al., 2018). These methods enbale the weaving together of the multiple strands of evidence needed in complex and interconnected policy domains (Head 2008), in which simplistic, technically oriented solutions may not work or result in technical entrapment (Nightingale 2020). Policy labs go beyond the dominant, incremental approaches based in rationalist managerialism, or administrative rationalism (see Wyborn et al., 2023; Samnakay et al., 2024). These technically orientated approaches can compound wicked problems by attempting "to render complex problems technical in ways that can exclude or marginalise the social and political dimensions of problem definition and in the process shape the solutions that are deemed feasible" (Alexandra et al., 2023).

ICEDS, IWF and IRI THESys could use policy labs as design processes that use deliberative methods, and which aim of reshape policies by creating an architecture to deal with climate change. These should make rules, principles, and assumptions clear and enable the mapping of the reform beyond the boundaries of current approaches. This is a mapping (problem definitions) and planning exercise (options exploration and ideation), so it is both exploration

and design. There are prospects for comparative experiments using networks of policy labs to explore adaptation options. Any experimental work on policy and governance reforms would be both training and experimentation. Confidence in results will depend on participatory methods that enable deliberations and build trust.

Water governance re-engineering under climate change could be designed as an intensive set of experiments with groups focused on extreme innovations, with design deliberations undertaken in coordinated policy labs. These labs could be forums for agitating for extreme ideas on transformations and ways of fast-tracking policy experiments.

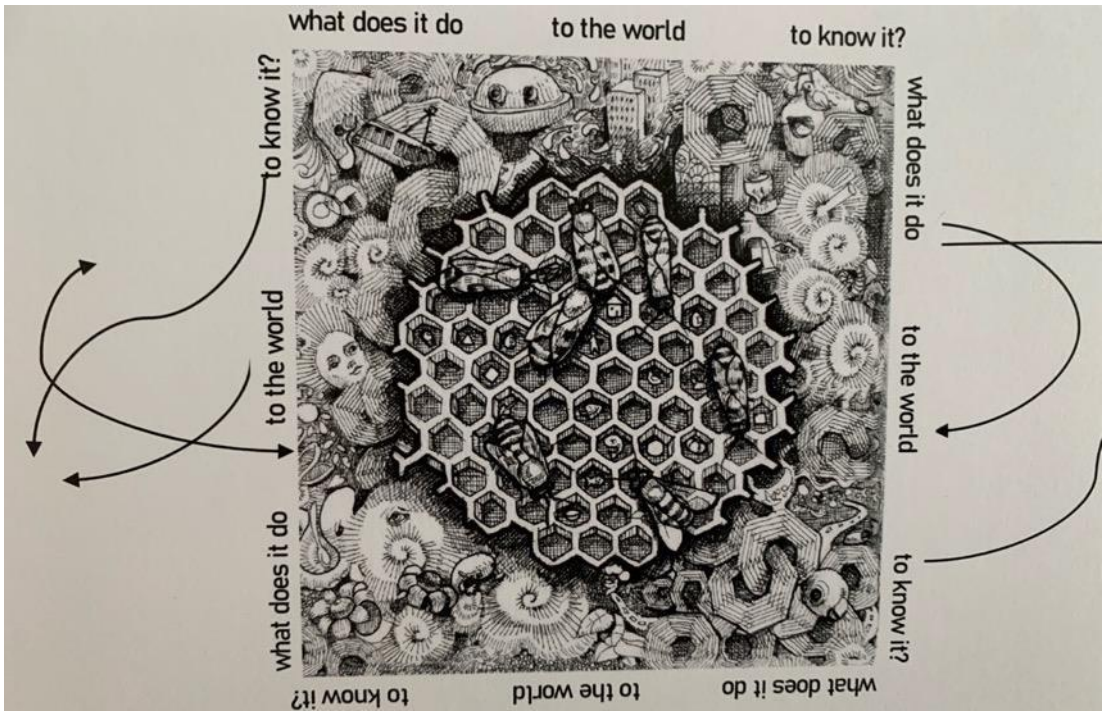

Figure 11: PhD students' post cards

Figure 12: example of PhD poster

Section 4: Research communication and outreach

4.1 The three institutes' outreach goals

The Institutes share common outreach and communication goals

Table 2: Outreach and communication goals

IRI THESys
At IRI THESys, science communication aims not only to disseminate, but to connect and integrate stakeholders from society, academia, policy and beyond. Through various methods such as events, exhibitions, press work and science–art projects (e.g. https://www.anthroposcenes.de/), IRI THESys works to increase awareness, engagement, and participation with transformation research. IRI THESys also collaborates with the university-wide communication initiative Open Humboldt.
ICEDS
ICEDS is engaged with policymakers at international, national and state / territory levels on an ongoing basis. ICEDS regularly conducts public events and private briefings for parliamentarians and government departments on a wide range of climate, energy, and disaster-risk related topics.
IWF
IWF sees outreach as integral to its research approach by fostering co-production of knowledge, decision support and learning-by-doing. IWF works with stakeholders to envision socially feasible futures through in-depth understanding of governance, institutions and social norms and values. We combine scientific and social insights to create multi-dimensional understandings of how different actors and organisations navigate uncertainty and plan for uncertain futures.

I was impressed with several aspects of IRI THESys communications and outreach, including their projects integrating the creative arts and sciences. I was also fortunate to see how they had contributed to an exhibition at the Humboldt Forum – After Nature. This exhibition deals with the grand questions of what "climate change and species extinction have to do with the crisis of democracy?" This exhibition explores themes of how "global environmental changes not only pose a threat to the very basis of our livelihoods; they also have far-reaching repercussions for the political and social structures of societies. The Humboldt Lab's inaugural exhibition After Nature deals with the interdependencies of climate change and the loss of biodiversity and with worldwide challenges to democratic principles of order. The crisis of nature is closely interlinked

[2] Humboldt Forum – After Nature exhibition deals with the grand questions of what "climate change and species extinction have to do with the crisis of democracy?"

with societal crises. The liberal model of society, for example, with its promises of progress and prosperity has brought about enormous changes in people-environment systems. And it has led to considerable inequalities, both within societies and between countries. The exhibition puts together in the form of a modern chamber of curiosities an entire range of research approaches to these and other current issues and relates them to positions from the history of science." (2)

4.2 Feral hippos and worker bees – simple lessons in presenting research

The IRI THESys kitchen has one wall covered in PhD students' post cards. These 'projects on a card' are tight, skilful, and beautiful articulations of the student's research. In a brief examination while waiting for a coffee, I was able to get an idea of the suite of projects underway.

On another wall is a display of PhD students' posters. These adhere to standard format, with one picture and a paragraph explaining the research topic. Again, it was a way to get a rapid overview of the research underway.

IRI THESys employs a part-time (50%) communications specialist who helps in the format and design of these presentations. The student project postcards and posters conveyed strong impressions about the range of student work and enabled a rapid appraisal of the scope of topics under investigation. These are simple and effective communications methods that could easily be replicated. Figures 10 and 13 provide examples of these project summaries.

Figure 14 is relevant to some planned IWF work on river stories and it is insightful to find other institutes embarking on similar projects and engaging with then on the merits of this kind of work.

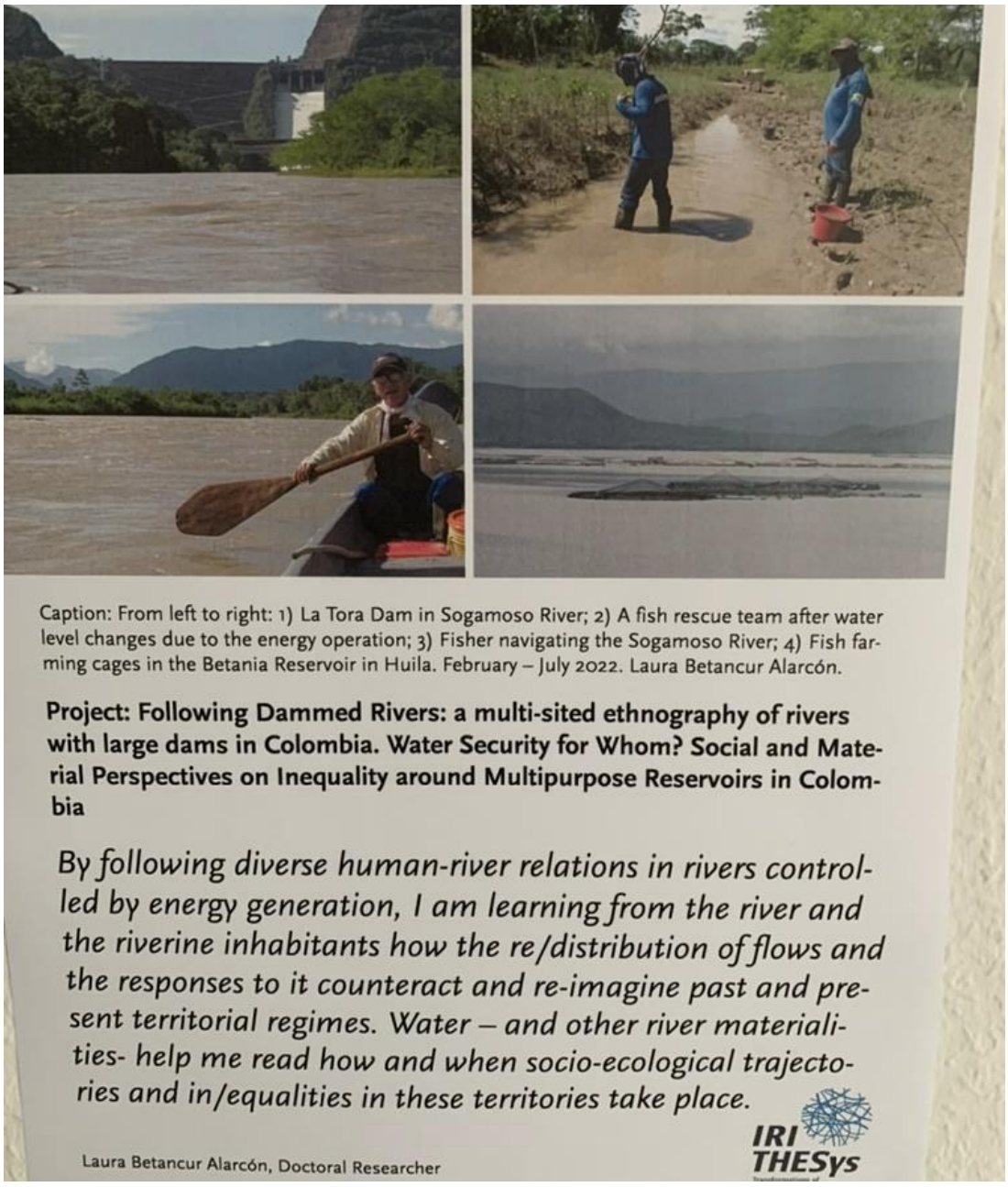

Figure 13: example of PhD poster

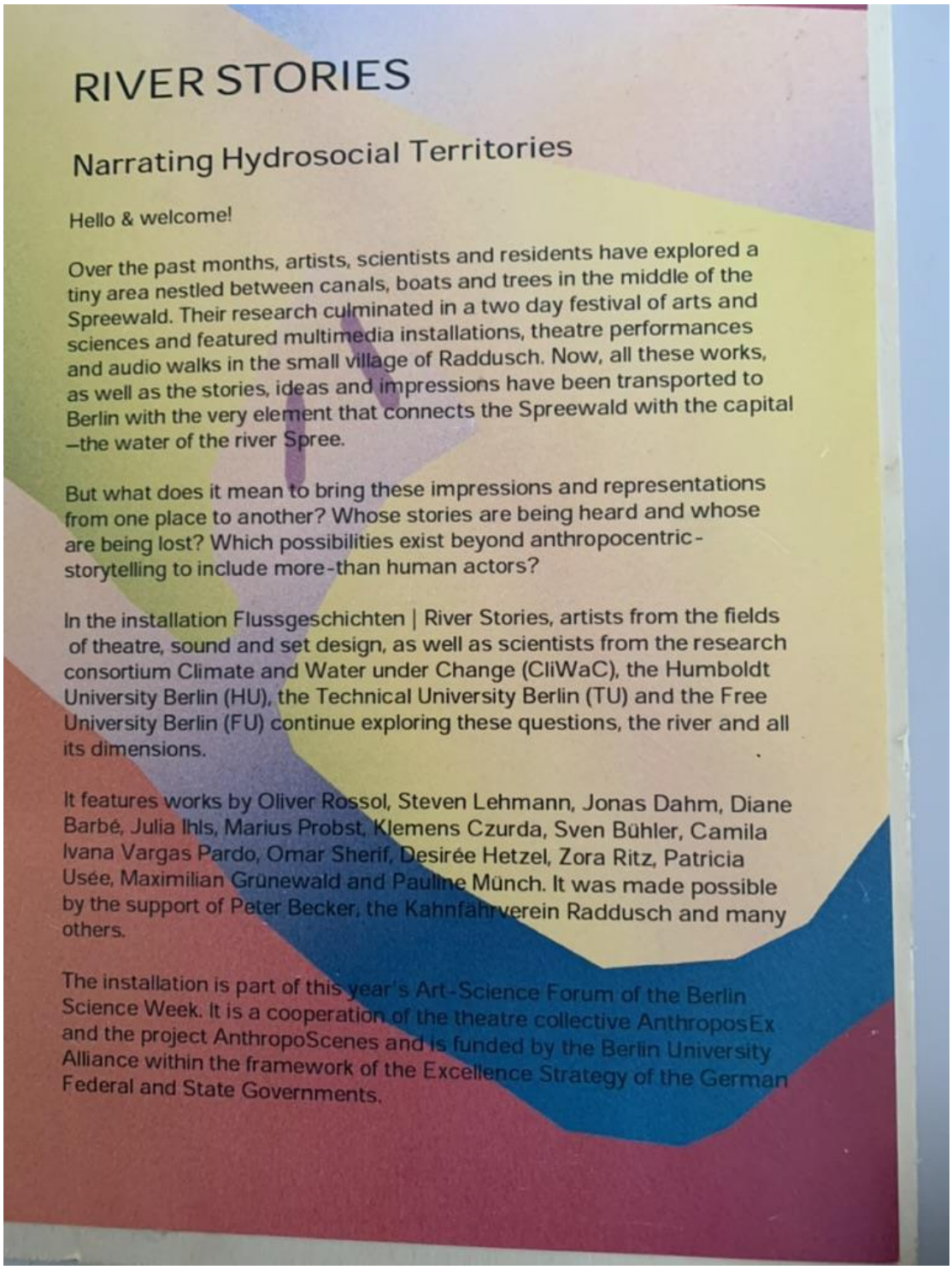

Figure 14: river stories poster relevant to planned IWF work on river stories.

Section 5: Travel and grant logistics

5.1 Project design and execution

The project was designed and executed iteratively with each stage being informed by subsequent ones. The following stages are listed below with supporting documents (listed in parentheses):

1. Initial project proposal as submitted to ANU (see attachment 1)
2. Exchange timing, logistics and planning via email and zoom meetings.
3. Document and website reviews – eg IRI THESys status report
4. Development of workshop background paper (attachment 2)
5. Introductions and planning meetings (workshop 1 agenda – attachment 3)
6. First workshop (December 8 morning)
7. Lecture to IRI Kolloquium (attachment 8)
8. First workshop report (attachment 3)
9. Second workshop agenda (attachment 4)
10. Second workshop (December 12 morning)
11. Lecture to HU Geography students (attachment 9)
12. Workshops debrief and action plans.
13. Project report preparation and submission (this document).

Table 3: Summary of the travel

Travel undertaken on 2023 from November 22 to December 18
Flights Australia to Barcelona
Train Barcelona to Montpellier
One week in Montpellier
Train Montpellier to Berlin via Brussels
Two weeks in Berlin at HU
Return to Australia via Singapore

5.2 Some observations on grant organisation and logistics

It was an honour to receive the HU-ANU travel grant and a privilege to have travelled to Berlin and be hosted at HU. Here are some ideas on improving the organisation of the grant.

1. ANU requires the travel grant to be executed by the end of the calendar year. To facilitate meeting of this deadline, the grant should be advertised, and grantee advised as early as possible in the calendar year.
2. International travel is a great opportunity for learning and developing connections. Working in the cultural and environmental contexts of colleagues is important, as is face to face contact. However international travel is expensive and time consuming, especially with planning, preparation, administration, and acquittal processes. The administration should be made as simple and effective as possible. Per Diem allowances improve the efficiency by providing a daily living allowance.
3. I stayed at the Adina apartments in Berlin Mitte where I was proudly informed that the company is Australian owned and managed. Adina also has apartments in Canberra. ANU and HU may well be advised to approach Adina to 'sponsor' the collaboration through discounted rooms. This might amount to nothing or might be a worthwhile prospect. Adina could gain some regular clients (HU & ANU) and grantees would have a lead on where to stay in each city.

Table 4: Report on specific activities planned and executed

Activity	Outcome
Hold two workshops at IRI THESys that identify future research collaborations and scope work.	Completed 2 workshops held on the 8th and 12th of December.
Identify priorities and funding opportunities for collaborative research on climate-adaptive futures across the land, food, water, and energy.	Collaborative research opportunities identified and documented in project report.
Using the workshops as the basis to draft two academic papers on (1) the catalytic roles of integrative research institutes and lessons from their experience in tackling sustainability challenges and (2) the challenges and opportunities involved in researching adaptive futures across multiple intersecting sectors (land, water, energy, food systems etc) drawing on expertise across multiple disciplines.	ANU and HU researchers agreed to prepare and submit a manuscript to the journal Nature Sustainability on the catalytic roles of integrative research institutes and lessons from their experience in tackling sustainability challenges. The second paper is being drafted and suitable journals explored.
Development of plans for a 2024 international workshop on critical water geography and adaptive climate futures.	The workshops scoped several proposals for an international workshop. Final foci and details will be part of planned research development work planned.

Next steps - Action arising

- Jason to write project report and pass on to institutes' directors and
- communications people, executives, and the universities international office.

- Jason to prepare outline/draft of Nature Sustainability paper with main arguments – circulate to other contributors.
- Tobias to approach HU international office to explore follow up work and budget.
- Jason to approach ANU international office to explore follow up work and budget.
- Jason and Tobias to explore other fundings sources, including EU, philanthropic and Aust-German R&D fund.
- Jason to write first cut of proposals for evaluation work and workshop.
- Jason and Tobias to prepare initial survey questions to test in snowball survey.

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Guide to the attachments

The following attachments – generated as part of the HU-ANU exchange – are provided as supporting documents:

Attachment	Document type/name
1.	Initial project proposal as submitted to ANU and summary of outcomes against aims (attachment 1)
2.	Workshop background paper distributed to invitees.
3.	Workshop 1 agenda - Friday December 8 2024
4.	First workshop notes
5.	Second workshop agenda
6.	Second workshop report
7.	Notes from meetings at IRD- G-EAU Montpellier
8.	Abstract guest lecture to IRI Kolloquium
9.	Abstract guest lecture to HU Geography students

Attachment 1: Grant proposal

The Australian National University (ANU) – Humboldt-Universität zu Berlin (HU) International Connections Grant Application Advancing research collaboration on climate adaptative futures

Project aim: to improve the cooperation between ANU and HU in their research on global sustainability challenges linked to land, water, energy and climate change.

Project outcomes: greater mutual understanding of the Universities integrative Institutes and identification for opportunities for collaboration.

Host

Tobias Krüger is the Professor of Hydrology and Society at Humboldt-Universität's Geography Department and the Director of the Integrative Research Institute on Transformations of Human-Environment Systems (IRI THESys).

Proponent and travelling scholar

Jason Alexandra is a senior research fellow working on climate adaptation and adaptive water governance at the Australian National University's Institute for Climate, Energy & Disaster Solutions (ICEDS) and the Institute for Water Futures (IWF).

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Collaboration on climate adaptive futures – project overview

This project aims to strengthen cooperation between the Australian National University ANU and Humboldt-Universität zu Berlin (HU) through deepening collaborations in their integrative research on transformative approaches to global sustainability challenges across the nexus of land, water, energy and climate change.

With increased recognition of these global sustainability challenges, universities are increasingly resourcing integrated, transdisciplinary research institutes that span traditional disciplinary boundaries. Establishing institutes with broad mandates for inter and transdisciplinary problem-focused research can accelerate social change and catalyse equitable and innovative transformations. This project aims to investigate the potential for building cooperative and collaborative relationships between three integrative institutes that have similar missions. The institutes are:

IRI THESys – The Integrative Research Institute on Transformations of Human- Environment Systems at HU aims to forge new paths towards sustainable futures, conducting inter- and transdisciplinary research on land use change, integrative food systems, global water cycles, climate change adaptation, and infrastructure.

ICEDS – The Institute for Climate, Energy & Disaster Solutions at the ANU aims to advance innovative solutions to climate change, energy transitions and disasters through integrated research, teaching and engagement.

IWF – The Institute for Water Futures at the ANU brings together natural and social science researchers to explore water futures, understand change and enable transformations.

The three institutes share similar aims and operational challenges, given their broad scope of interests and engagement across disciplines. Jason Alexandra is a joint appointment at ANU's IWF and ICEDS. He will use the Connections Grant to visit IRI THESys for two weeks to explore options for how the Institutes can build and deepen collaboration between ANU and HU in their work on climate adaptive futures, across two hemispheres. The project will focus on two interrelated themes:

- Advancing understanding of how integrative research institutes can accelerate transformative approaches to complex sustainability challenges.
- Developing innovative approaches to researching adaptive futures across multiple intersecting sectors of land, water, energy and food systems.

SPECIFIC ACTIVITIES

The specific activities planned for the project are:

1. Holding two workshops at IRI THESys that aim to identify future research collaborations and scope work programs to deliver these.
2. Identification of priorities and funding opportunities for collaborative research on climate-adaptive futures across the land, food, water and energy sectors.
3. Using the workshops as the basis to draft two academic papers on (1) the catalytic roles of integrative research institutes and lessons from their experience in tackling sustainability challenges and (2) the challenges and opportunities involved in researching adaptive futures across multiple intersecting sectors (land, water, energy, food systems etc) drawing on expertise across multiple disciplines.

4. Development of plans for a 2024 international workshop on critical water geography and adaptive climate futures.

Future collaborations and outcomes

The project takes an open-ended approach to exploring future collaborations, including further exchanges, joint research projects, joint workshops, and investigating longer-term partnerships, including the prospects of a network of integrative research institutes.

Specific outcomes include:

1. Improved mutual understanding of the three institutes and their roles within ANU and HU and how they could strengthen working relationship, identify complementary strengths and synergies, and development of high-impact research and education projects.
2. A project reports detailing the findings and identifying specific options for further cooperation on research, education and engagement.
3. Two academic journal manuscripts on the subjects outlined above.
4. Plans for an international workshop on critical water geography's role in adaptive climate futures.

Plans to scale up the collaborations between the respective ANU and HU institutes as the basis for future collaborations within the ANU/HUB Strategic Partnership.

Timeline of activities

The flowing table provides an indicative timeline of activities.

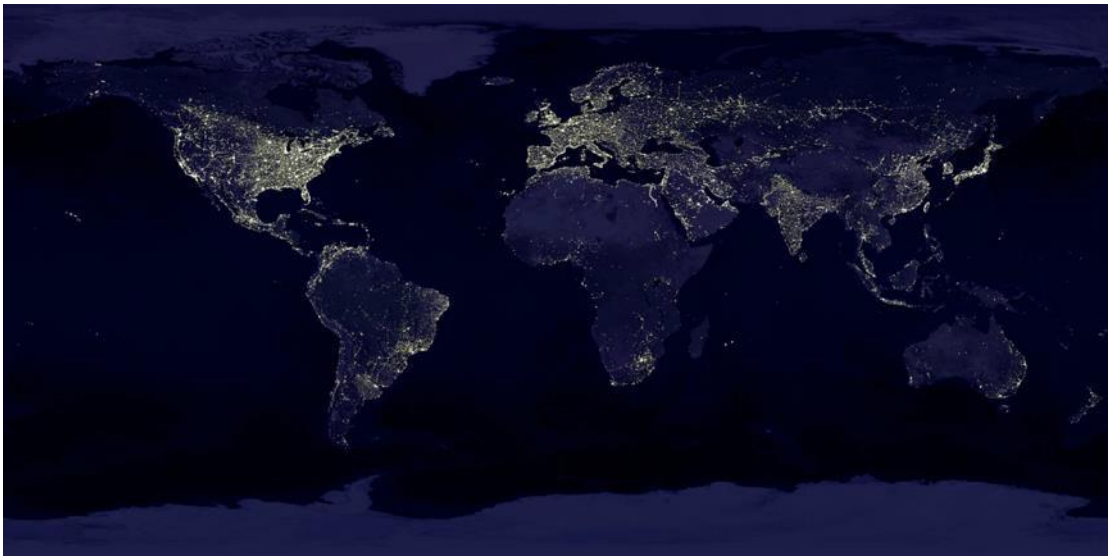
Date	Activities
July 2023	Confirmation of grant and detailed project plan and exchange of background documents
August 2023	Agreement on proposed dates of visit and detailed agendas of workshops, seminars and meetings
November	Travel and in-person exchange at HU
December 2023	Project report prepared and submitted
Feb 2024	Manuscripts submitted to journals
March to June 2024	Follow-up activities including a workshop on critical water geography's role in adaptive climate futures (subject to feasibility assessment and financial support)

Attachment 2: Workshop invitation and background paper.

Researching our crazy world – enhancing the roles of Integrative Research Institutes

IRI THESys Berlin December 2023

What are the major challenges and opportunities for integrative research institutes like IRI THESys?



You are invited to two workshops in December that focus on investigating these kinds of questions.

This short paper outlines the project background and poses a set of questions for the workshops.

Workshop 1: What are the major challenges facing integrative research institutes?

8 Dec 9:30-12:00 - followed by lunch and seminar 13-15.00, then Christmas event Place: IRI THESys, Rudower Chaussee 12b, room 3.25

Workshop 2: How can we enhance more effective international collaborations?

12 Dec 9:30-12:00 - followed by lunch and Geography Colloquium 15-17.00 Place: IRI THESys, Rudower Chaussee 12b, room 3.25

The workshops to be held at the Integrative Research Institute on Transformations of Human-Environment Systems (IRI THESys) are part of a joint project between the Australian National University (ANU) and Humboldt-Universität zu Berlin (HU). Both are committed to international research collaborations advancing understanding of the Anthropocene's interlinked

sustainability challenges across multiple related issues like water, energy, food and biodiversity conservation.

The wider project aims to improve cooperation between ANU and HU in their research on global sustainability challenges. As part of this project, we are exploring the major challenges and opportunities facing integrative research institutes. We hope to learn from each other to enhance the operations of our institutes and explore opportunities for collaboration.

WORKSHOP AIMS

- Generate mutual understanding of the work of integrative research institutes and identify the principle challenges they face and ways to overcome them.
- Identify ways to improve the contributions of transdisciplinary institutes to Anthropocene challenges.
- Explore opportunities for collaboration to enhance integrative research institutes, particularly across work on transformative climate adaption in the land, food, water and energy sectors.

WORKSHOP HOSTS

Tobias Krüger is Professor of Hydrology and Society at Humboldt-Universität's Geography Department and Director of the Integrative Research Institute on Transformations of Human-Environment Systems (IRI THESys).

Rossella Alba is a postdoctoral researcher at IRI THESys in the Water Security for Whom project and member of the Bosch Foundation Postdoc Academy for Transformational Leadership.

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ANU TRAVELLING SCHOLAR

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Project overview

This project aims to strengthen cooperation between the Australian National University ANU and Humboldt-Universität zu Berlin (HU) through deepening collaborations in their integrative research on transformative approaches to global sustainability challenges across the nexus of land, water, energy, and climate change. With increased recognition of these global sustainability challenges, many universities are resourcing integrated, transdisciplinary research institutes that span traditional disciplinary boundaries.

Establishing institutes with broad mandates for inter- and transdisciplinary problem-focused research can assist in accelerating wider societal change and catalyse more equitable and innovative transformations. Yet these institutes face different challenges to the more established and traditional disciplinary based institutes, and it is, therefore, useful to examine their capacities and modes of operation. Further, there are likely to be ways of learning from the experience of institutes with similar mandates operating in the different research and funding traditions of different countries.

With these prospects in mind, this project aims to investigate the potential of cooperative and collaborative relationships between three integrative research institutes that have similar missions:

1. IRI THESys – The Integrative Research Institute on Transformations of Human-Environment Systems at HU aims to forge new paths towards sustainable futures, conducting inter- and transdisciplinary research and teaching on land use change, integrative food systems, global water cycles, climate change adaptation, and infrastructures.
2. ICEDS – The Institute for Climate, Energy & Disaster Solutions at the ANU aims to advance innovative solutions to climate change, energy transitions and disasters through integrated research, teaching and engagement.
3. IWF – The Institute for Water Futures at the ANU brings together natural and social science researchers to explore water futures, understand change and enable transformations.

The three institutes share similar aims and have explicit objectives to drive change and overcome operational challenges, given their broad interests and roles in engagement with multiple disciplines and partners. The workshop will explore these similarities and the differences of the Institutes.

The following sections provide a summary of the research and outreach focus of the three institutes. This is followed by a summary of some other research institutes with similar aims and programs.

Questions for workshop 1: What are the major challenges facing integrative research institutes?

- How are the three institutes organised to achieve integrated outcomes across multiple themes and across their functions of research, teaching and outreach?
- What challenges do they face, and do they share similar challenges?
- Is it useful to characterise the institutes in terms of their structures, competencies (capabilities) and modes of operation?
- The three institutes are all involved in research, teaching and mobilisation of change. Are there specific methods and approaches to organising transdisciplinary research to accelerate social change and catalyse equitable and innovative transformations?

Questions for workshop 2: How can we enhance more effective international collaborations?

- Would it be valuable to establish formal ways of sharing staff and capabilities? And if so, how?
- Can we develop more effective and innovative approaches to researching adaptive futures across multiple intersecting sectors of land, water, energy and food?
- How can integrative research institutes build more effective collaborations in their work on climate adaptive futures, across two hemispheres?
- How can integrative research institutes contribute to accelerating transformative approaches to complex sustainability challenges?
- Is there merit in working to establish an international network of similar institutes?
- What would be the functions and aims of such a network? What opportunities exist to advance this idea? How could it be organised and resourced?

Possible future work

We plan to explore the prospects for a 2024 international workshop on integrative research institutes and their roles in transformation towards climate adaptive futures.
Attendees will also be invited to scope future directions including using the findings of the workshops as the basis for academic papers on subjects like:

- Enhancing the roles of integrative research institutes in tackling sustainability challenges and
- the challenges and opportunities involved in researching adaptive futures across multiple intersecting sectors (land, water, energy, food etc).

Future Collaborations

The workshops will take an open-ended approach to exploring future collaborations. Possibilities open for our development include further academic exchanges, joint research

projects, joint workshops, and longer-term strategic partnerships, and investigating the prospects of a network of integrative research institutes. Specific outcomes include:

- Improved mutual understanding of the three institutes and their roles within ANU and HU and how they could strengthen working relationships, identify complementary strengths and synergies, and development of high-impact research and education projects.
- A project report detailing the findings and identifying specific options for further cooperation on research, education, and engagement.
- Two academic journal manuscripts on the subjects outlined above.
- Plans for an international workshop on critical water geography's role in adaptive climate futures.
- Plans to scale up the collaborations between the respective ANU and HU institutes as the basis for future collaborations within the ANU/HU Strategic Partnership.

A summary of the research focus of the three institutes

This summary is based on the websites of each of the three institutes.

IRI THESys

IRI THESys conducts scientific research into the dynamics of human-environment relations. Against the backdrop of climate change, researchers pay particular attention to the intersections between land use practices and issues of water and energy use and governance. This includes research on food-fuel-fibre production, resource extraction and biodiversity management as well as investigations into the relationship between urban centres and their regional and global hinterlands as connected through technical, economic and regulatory infrastructures.

ICEDS

The ANU Institute for Climate, Energy & Disaster Solutions (ICEDS) provides leadership on climate change, energy transition and disaster-risk research. ICEDS initiatives deliver real-world solutions and a framework for understanding the challenges of climate change, the energy transition, and disaster risks. As an interdisciplinary institute with more than 600 members, ICEDS brings together researchers and students from 25 Schools across ANU. Researchers span many disciplines across science, engineering, economics, policy, law, psychology and communications and the research clusters enable these researchers to work together to build communities of practice across diverse subject areas.

IWF

The Institute for Water Futures (IWF) foster forward-looking, cooperative, and anticipatory water governance. It acknowledges that water is not simply a stand-alone research area, but one which crosses into sociological, hydrological, and ecological study and beyond. For this reason, our research themes are not organised by discipline, but rather into three primary outcomes, where work may fluidly operate across categories:

- Understanding uncertain futures though combining social and natural sciences
- Creating new options through innovations that can bring about greater resilience and transformative shifts in how we share and benefit from water.
- Enabling actions and decisions that prepare for uncertain futures through working with partners to co-develop and co-produce deliberate strategies to adapt, transition, and

transform in anticipation of changing demands, climatic shifts, and technological opportunities.

A summary of the outreach of the three institutes

- At IRI THESys, science communication aims not only to disseminate, but to connect and integrate stakeholders from society, academia, policy and beyond. Through various methods such as events, exhibitions, press work and science–art projects (e.g. https://www.anthroposcenes.de/), IRI THESys works to increase awareness, engagement, and participation with transformation research. IRI THESys also collaborates with the university-wide communication initiative Open Humboldt.
- ICEDS members are engaged with policymakers at international, national and state/territory levels on an ongoing basis. We regularly conduct private briefings for parliamentarians and government departments on a wide range of climate, energy, and disaster-risk related topics. IWF sees outreach as integral to its research approach by focusing on co-production of knowledge, decision support and learning-by-doing. IWF works with stakeholders to envision socially feasible futures through in-depth understanding of governance, institutions and social norms and values. We combine scientific and social insights to create multi-dimensional understandings of how different actors and organisations navigate uncertainty and plan for uncertain futures.

Structure and mission

IRI THESys fosters inter and transdisciplinary research and projects related to land, water and energy use as well as food production and consumption, against the backdrop of climate change. Founded in 2013, it stimulates cross-faculty research with HU departments ranging from Geography to Philosophy, Agricultural Economics to Theology. In addition, it cooperates with extra-mural partner institutes from the Berlin-Brandenburg region. With an institutional mission to enable sustainable transformations, IRI THESys aims to build bridges between:

- Disciplinary concepts, epistemologies, and worldviews
- Research and practices
- Quantitative and qualitative methods and explanatory, interpretive, and critical reasoning

Some selected research institutes with similar aims and programs

The following is a summary based on a short web search:

The Stockholm Resilience Centre (SRC) – https://www.stockholmresilience.org/

The SRC does research into the complex dynamics of people and the planet. The Centre also offers interdisciplinary courses at Undergraduate, Master's, PhD levels and for Executives and Changemakers. Their work in engagement operates across the science-policy-practice spectrum and at scales that range from UN dialogues to local resilience assessments. The SRC promotes research into socio-ecological resilience research and into assessing planetary boundaries.

The STEPS Centre – https://steps-centre.org/

The STEPS Centre at the University of Sussex (now closed) was hosted in the UK by the Institute of Development Studies and the Science Policy Research Unit (SPRU). Its main funding was from the UK's Economic and Social Research Council (ESRC). The Pathways to Sustainability Global Consortium was made up of six 'hubs' based in leading academic institutes in Africa, South Asia, China, Europe, Latin and North America. Until the STEPS Centre's closure in 2021, the Consortium provided a platform for working together on transdisciplinary research, policy engagement, teaching, impact and communications.

Sustainability Research Institute (SRI) – University of Leeds, UK

The SRI explores a wide range of issues including climate change, energy, transport, water, resource use, land use, conservation, cities and communities, business and lifestyles. Its participatory, action-oriented research brings together government, business, NGOs and local communities to enhance the relevance, quality and practical influence of research. SRI research is organised across six interdisciplinary research groups:

- Economics and Policy for Sustainability
- Environment and Development
- Social and Political Dimensions of Sustainability
- Business and Organisations for Sustainable Societies
- Energy and Climate Change Mitigation
- Climate Change Adaptation, Vulnerability and Services

More info: https://environment.leeds.ac.uk/sustainability-research-institute

Monash Sustainable Development Institute (MSDI)

MSDI brings together, academia, industry, government, and the community in trans- disciplinary partnerships to help achieve the United Nations 17 Sustainable Development Goals. Its research focuses on six domains:

- Climate action – Accelerating transitions to net-zero emissions.
- Advancing SDG literacy and action.
- Sustainable cities and regions – Enabling thriving places and communities.
- Environment and health – Improving environmental outcomes, health systems and advancing planetary health.
- Circular economy – Catalysing regenerative and closed-loop approaches to building economic, natural and social capital.
- Inclusive prosperity – Enhancing participation, belonging and inclusion.

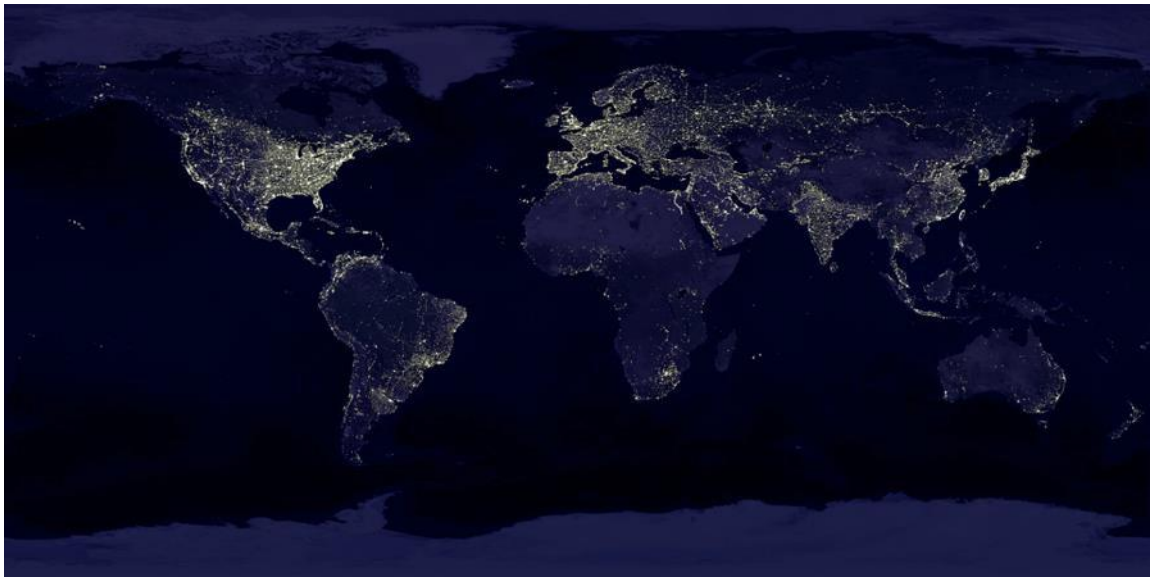
Melbourne Sustainable Society Institute (MSSI)

The Climate Futures Research Cluster hosted by Melbourne Climate Futures and facilitates research and engagement on a socially-just transition to a zero-carbon society. Climate change is a complex social and technical problem that requires interdisciplinary research efforts. The Cluster cultivates a network of cross-disciplinary climate change researchers across the University. It is also a point of connection for climate change practitioners, researchers, and the broader public. Our objectives:

- Strengthen relations within and between Faculties and Research Institutes on sustainability research.
- Create a network of cross-disciplinary climate change & sustainability researchers for collaborative research grant development.
- Connect researchers at the University to external research funding partners (academic, industry and government).
- Provide a portal and focal point for climate change and sustainability. practitioners, the public, and academics both at and beyond the University.
- Support research training and early career researchers.

Attachment 3: Workshop 1 Agenda

Enhancing Integrative Research Institutes – 8th December 2023



Exploring the opportunities for integrative research institutes like IRI THESys Workshop: Enhancing integrative research institutes – challenges and opportunities?

8 Dec 10:00-12:30 - followed by lunch and seminar 13-15.00

Place: IRI THESys, Rudower Chaussee 12b, room 3.25

10:00–10:20 Introductions, introductions to project and quick scan of IRI initiatives. What IRI type institutes are you aware of: name and location?

Global scan: how many are there? Workshop rules of engagement:

- Any challenge identified needs to be coupled with an idea about ways of overcoming these challenges.
- There are no bad ideas.
- This is scoping and brainstorming.

10:20 –10:40 What are the main opportunities for enhancing the work of integrative research institutes?

Understanding some of the key tensions –

- Knowing and/or changing the world
- Knowing and governing are intertwined.
- Promoting solutions and/or critical scholarship
- Policy impact and partnership

10:40 –11:00. Do we need a network of IRI type institutes? Or other opportunities to enhance collaboration and learning amongst IRIs and about their work of future making? For this we need:

- to define and find them.
- identify common foci and issues.
- map niches and main methods, and
- compare, evaluate, learn and strengthen.
- And if its good idea, why hasn't this happened already?

11:00 – 11:10 coffee/tea break

11.10 – 11.40 small group explorations of the following design questions for a network (or any other opportunity worth pursuing):

- Why – what is the main rationale?
- What for – what are the key roles and functions?
- How – how can we make this happen?
- Who – who do we involve?
- How much? What resources do we need?

11:40–12:00 Discussion on key design questions – key issues and opportunities emerging?

12:00 – 12.30 Next steps, execution, action planning

- Follow-up workshop on Tuesday – where we will go deeper and wider into future prospects.
- What can and should HU and ANU do next to give effect to their MOU on partnerships and collaborations.
- What will we – the project team do? Reports, papers, proposals etc
- Who wants to be involved?

12.30 workshop close

12.30–1:00 lunch

Attachment 4: Report on IRI Workshop 1

Workshop 1 at IRI THESys was a hybrid zoom/face-to-face meeting attended by 12 people. These notes follow the agenda with the questions discussed in bold.

A quick scan of IRI initiatives. What IRI type institutes are you aware of: name and location? Global scan: how many are there?

People nominated the following examples: IRI THESys, ICEDS, IWF, Steps Centre (closed), Stockholm Resilience Institute, Dutch Research Institute for Transitions. There are also many other related institutes, such as extra mural institutes in Germany, and university-based schools (eg schools of sustainability and sustainability leadership etc) or initiatives. Some are IRI in name only and others are substantial. Defining what an IRI is important and will depend on whether claims are taken at face value or if specific selection criteria are applied. What are the main challenges and opportunities for enhancing the work of integrative research institutes?

Some of the key tensions are:

- The knowing and/or changing the world dilemmas (pure science versus activist science)
- Accepting that knowing and governing are intertwined.
- Promoting known solutions and/or empowering critical scholarship
- Understanding policy impact and limits of working in partnerships

The challenges facing integrative research institutes include:

- The clear need to go beyond disciplines “get out of silos and ivory towers”.
- The rhetoric-practice gap. Mismatch between rhetoric and reality and the gap between claims and capabilities.
- Increasing impatience with science and the pursuit of knowledge – when the world needs changing urgently.
- The big problems-small funds problem and the big promises, small delivery models
- Mismatches between ambitions and competencies of many institutes
- The structural constraints within the university system and the sense of being ground down by legacy and lethargic structures.
- The potential to provide more supportive work environments and clearer career pathways.
- Double workload of working within disciplines and the transdisciplinary work, with career paths and incentives stronger within disciplines.

Some suggested opportunities/responses:

- Interdisciplinary training which helps create “multi-lingual” researchers equipped to communicate across disciplines.
- Training sessions to increased communication skills and to help outsiders understand techniques and theories in use within main disciplines.
- Include communications roles within traditional science exchanges.
- Develop examples and working techniques for linking across disciplines.
- Working with funders who want to development SES type capabilities.

Do we need a network of IRI type institutes to enhance collaboration and learning amongst IRIs in their work of future making?

Yes, but we need:

- to define and find them.
- identify common foci and issues.
- map niches and main methods, and
- compare, evaluate, learn and strengthen.

A network of IRI institutes was supported, in principle, because it could:

- Increase visibility and support branding.
- Show to universities the international interest in the work of IRI.
- Work with governments and multi-lateral bodies as form of R&D diplomacy.
- Support visiting scholars and intellectual exchanges.
- Match the needs of, or guide investment of international organisations. An IRI network would enable peer to peer learning across similar organisations.

Why – what is the main rationale for an IRI network?

- Cooperation on research, education, training and visibilities.
- Sharing common, generic challenges and approaches
- Career pathways
- Strategic positioning in relation to the state, civil society, partners and funders
- Discussion forum for shared learning and exchange of experience
- Greater scale, scope, credibility and infrastructure
- How to accelerate adoption of positive change (transformations) is a researchable question across scales and sectors.

Key roles and functions of an IRI network

Some key questions arose about key roles and functions of a network?

Would a network be open or by invitation only? Who would be the gate keepers? Would it deal with standards and credentialization or simply support development of the transdisciplinary community of practice?

A network could help match the international scale of some funders (UN, EU, CGIAR) and the need to work across generic global issues, like the SDGs etc. By focusing on universities' role in the SDGs a network could help develop a best practice guide" to universities contributions to sustainability challenges.

A network could seek funds for international exchanges – e.g. 3 moths visiting fellow programs.

How can we make an IRI network happen?

Need to scope and develop network proposal in a step wise fashion and not try to deal with all issues at once. This became the agenda for workshop 2.

Could plan on holding international workshops to advance network establishment. Position proposal with EU type institutions who could benefit from network in terms of delivery of their programs.

Who – who do we involve?

Need to argue case for different groups – e.g. PhDs, post docs, research funders, policy makers etc. The "change the world-know the world" tensions can lead to transformational leadership by helping to unsettle complacencies and rupture research.

Need to ensure the IRI programs are appealing to the activist and critical researchers alike. Need to have social change models included: how does science and society change?

How much? What resources do we need?

This is unclear, but a good case can be made for more international cooperation. The second workshop will focus on proposal development.

What are the key issues and opportunities emerging?

The idea of a step wise or staged work program was supported.

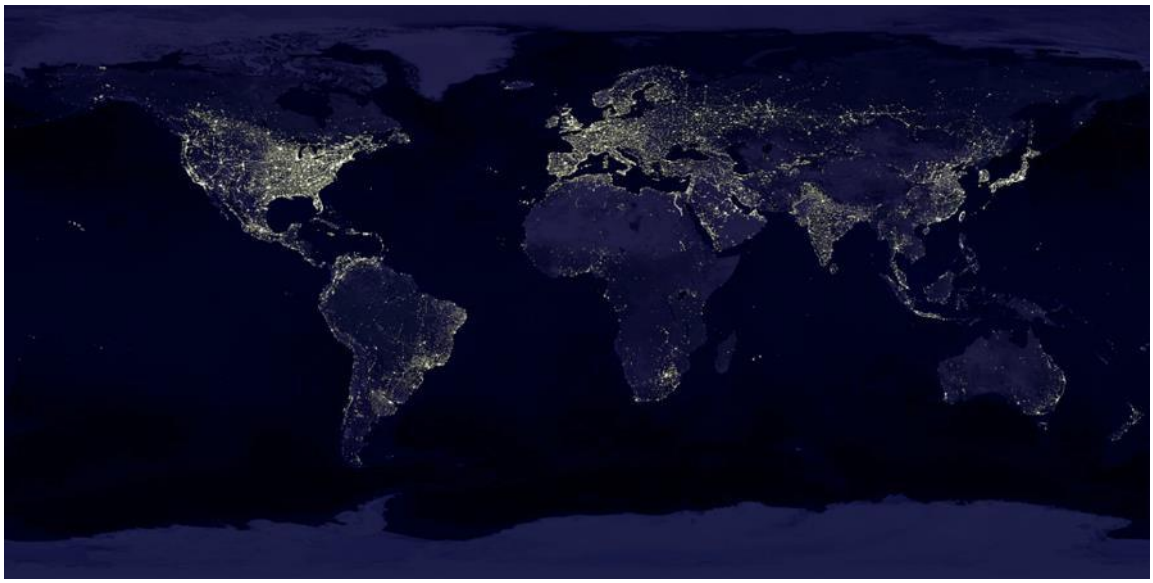
Staged work program could start with interviews with key people, use insights to design survey, and generate data via self-assessments. Aim for paper in research-policy journal. Could focus R&D on "the life and death of IRIs" and their evaluations to understand impacts. Understanding how IRIs come into existence, conception and initiation phases, their growth and development, consolidation and death or reform stages.

Next steps, execution, action planning

- Follow-up workshop on Tuesday – where we will go deeper and wider into future prospects.
- What can and should be done next?
- What will we – the project team do? Reports, papers, proposals, etc.

Attachment 5: December 12 Workshop Agenda

Enhancing more effective international collaborations between Integrative Research Institutes (IRIS)



How can we enhance more effective international collaborations? 9:30-12:00 - followed by lunch and Geography Colloquium 15-17.0

Place: IRI THESys, Rudower Chaussee 12b, room 3.25 This workshop will focus on questions like:

- Would it be valuable to establish more formal ways of sharing staff and capabilities?
- Can we develop more effective and innovative approaches to researching adaptive futures across multiple intersecting sectors of land, water, energy and food?
- How can integrative research institutes build more effective collaborations in their work across two hemispheres?
- How can integrative research institutes contribute to accelerating transformative approaches to complex sustainability challenges?
- Is there merit in working to establish an international network of similar institutes?
- Can we define the functions and aims of such a network and opportunities to advance this idea? How could it be organised and resourced?

9:30–9:45 Introductions - Workshop rules of engagement:

- Any challenge identified needs to be coupled with an idea about ways of overcoming these challenges.
- There are no bad ideas.
- This is scoping and brainstorming workshop.

9:45–10:15 Recap of workshop 1 and discussion on main issues and ideas raised (see report attached).

10:15 – 10:45 development of proposal outlines for future collaborations (first cut of main dimensions of a proposal).

- Rationale, aims and objectives (what are we trying to achieve?)
- Activities and methods (what we plan to do?)
- Main outputs or deliverables (definable results)
- Budget and timelines (when and how much $)

10:45 – 11 morning tea

11:00 –11.30 development of proposals (more refined and detailed second cut).

- Rationale, aims and objectives (what are we trying to achieve?)
- Activities and methods (what we plan to do?)
- Main outputs or deliverables (definable results)
- Budget and timelines (when and how much $)

Some possible foundational activities:

- Find and define IRI
- Survey and interview (for evaluations)
- International workshop
- Support more exchanges, PhD and post docs, ECR and research fellows.

11:30 –11:45 Pitching to prospective funders - tasking Proposal to external funders – eg EU; CGIAR, others

Proposal to HU and ANU partnerships for future collaborations

11:45 –12.00 Next steps and who will do what.

- What can and should be done next?
- What will we – the project team do? Reports, papers, proposals etc.
- Who wants to be involved?

12:00 -1:00 workshop close, followed by lunch.

Attachment 6: Notes on Workshop 2

Workshop 2 explored the prospects for a 2024 international workshop on integrative research institutes and their roles in transformations.

We committed to writing an academic paper on roles of integrative research institutes (IRIs) in tackling sustainability challenges.

- The challenges and opportunities involved in researching adaptive futures across the Nexus with its multiple intersecting sectors (land, water, energy, food etc.)

This workshop focused on questions:

How can integrative research institutes build more effective collaborations in their work across two hemispheres? Would it be valuable to establish more formal ways of sharing staff and capabilities?

An international network of IRI type institutes - what would the functions and aims of such a network be? How to advance this idea? How could it be organised and resourced?

Strategic evaluation of IRIs - To enhance we need to understand what is happening. Could research into IRIs help change the universities systems? Research on research practice – could this result in better research and education? How can we enhance IRIs roles in universities?

A proposal for future research collaboration - designing a network of IRIs and understanding and enhancing IRIs effectiveness.

1. Rationale, aims and objectives (what are we trying to achieve?)

Enhancing the work of IRI in making a difference and in their impacts and policy relevance

Accelerating change – transformations, understand how IRIs can be more effective, more catalytic in changing the world.

Promote slow and sincere science – both critical and caring Support knowledge exchanges - staff and student exchanges

Develop understanding of transdisciplinary and a-disciplinary methods and approaches

Provide an entry point for multi-lateral agencies through transboundary networks. Provide strategic value through international partnerships.

2. Activities (what we plan to do?)

- Document and promote critical, reflective research methods and practice.
- Support transdisciplinary research practice suited to the challenges of working in deeply uncertain, post-natural world.
- Understand how to hold in tension the promotion of solutions while also delivering critical research.
- Embrace multiplicity and uncertainty – start with diversity and stay with messiness, stay with the problems.
- Translate findings to teaching.

- Enable multi-site collaborations and cross-country comparisons.
- Understand different institutional and structural models in use for IRI.

3. **Main deliverables** (definable results)

- Design and execute a network of IRIs.
- Understand and enhance IRIs effectiveness.
- Provide a platform for research networks to develop based on interest and needs.
- IRI exchanges and careers
- Pollination of ideas across countries.

4. **Budget and timelines** (when and how much $)

To be determined dependant on funding sources.

Activities: a one-year research proposal on IRIs

1. Interview key people at selected IRI as an extensive data gathering stage.
2. Undertake snowball sampling.
3. Extract emerging issues as basis of survey questions.
4. Develop an online survey as an intensive data gathering stage.
5. Analysis of responses.
6. Identify merits and agenda for international workshop.
7. Write up results – publish.
8. Hold regional and or international workshop.

ACTIONS: Nature sustainability special issue – commitment to an article that serves to invite more responses. March 2024 deadline.

We also will attempt to write an academic paper on:

- Understanding the roles of integrative research institutes in tackling sustainability challenges and/or
- The challenges and opportunities involved in researching adaptive futures across the Nexus with its multiple intersecting sectors (land, water, energy, food, etc.)

An international workshop

We plan to explore the prospects for an international workshop on integrative research institutes and their roles in transformations.

Depending on findings we may aim to hold an international workshop.

Invite only with provocative inputs based on pre-set themes with invited commentary (e.g. three per theme)

Link work to multi-lateral agendas – e.g. SD goals Moderation and comparisons

Invite people into deep conversations.

Support development of R&D multi-sited proposals

Network structure and communications

Structure needs to be light, low overheads, no burden, based on self-motivation and self-organising. Budget needs to be for the glue to bring parties together.

Communications may need to be the network's main activities including via website, blogs, podcasts.

Product and issues focused networked research.

Some possible activities:

- Find and define IRI – document issues.
- Survey and interview (for evaluations)
- International workshop
- Support more exchanges, PhD and post docs, ECR and research fellows.

Nexus R&D issues and options

- Support research and education partnerships – 3 to 6 months research exchanges
- Support seed projects for research project development
- Master's courses on integration
- Develop research into education practice on Anthropocene challenges.

ACTIONS ARISING – WORKSHOP 2

1. Jason to write project report and pass by both institutes' directors and communications people, executives and the universities international office.
2. Jason to prepare outline/draft of Nature Sustainability paper with main arguments-circulate to other contributors.
3. Tobias to approach HU international office to explore follow up work and budget.
4. Jason to approach ANU international office to explore follow up work and budget.
5. Jason and Tobias to explore other fundings sources, including EU, philanthropic and Aust-German R&D fund.
6. Jason to write first cut of proposals for evaluation work and workshop.
7. Jason and Tobias to prepare initial survey questions to test in snowball survey.

Attachment 7: Notes from Montpellier

Introduction

Meetings with Nils Ferrand, Francois Molle and Olivier Barreteau and other researchers at Montpellier were held during the last week of November 2023 while enroute to HU Berlin.

Jason introduced the IWF gaming policy lab proposal and its objectives of pushing the boundaries of thinking about the potential for an innovative architecture of reform, improving governance, building community of practices on policy innovation, and driving awareness of the social construction of water rules and ways to modify these. Nils profiled his research group's work on using serious games and other tools to enhance water decision making. These are outlined below.

Serious games research and participatory water planning products

Nils presented the IRD- G-EAU suite of games (mostly cards and tokens) and participatory planning methods that include:

1. Generic water and river games
2. Waste management and sanitation - Waste wag
3. Coastal management game
4. Specific catchment and water allocation games used in southern France
5. Pollution management
6. Generic planning and monitoring and evaluation models
7. Rulemaking for game playing

These games have been played in many countries with many people, with many different NRM conflicts being dealt with over 280 finalised games in the wat-a-game suite that all have a pedagogical function. One of the aims of the game and method suites is to make the modeller redundant and minimise interventions.

They have a framework to measure capacity of people to change/transform called ENCORE that allows for consideration of major types of concerns:

E - equity

N - normative

C - cognitive

O - operational

R - relational

E – external

Strategy planning and governance re-engineering

Nils group at IRD has a system for applying justice principles, called just-a-grid. And a system for participatory action planning call Cooplan, which enables complex cooperative action

planning (matrix for actions). Cooplan tries to get people to inquire into the efficiency of policies and strategies through detailed action planning and the complementarity (and or antagonism) of actions. CooPlan works through stages of preparation, diagnosis, design, and M&E, specifying shared resources, impacts and functions.

Their governance assessment techniques use a system called SMAG (Self-Modelling for Assessing Governance) which aims to make multi-level governance options clear. This systems enables people to engage in diagnosis of current or past governance models and their impacts and enables ways of working to define governance reform options. SMAG is a participatory tool developed by IRSTEA in the frame of the SPARE Project. The objective of this tool is to model and analyse the governance process of a river basin over the past 30 years (see https://hal.inrae.fr/hal-02608367).

Collaboration options

1. Nils is keen to collaborate with ANU IWF

2. This can take two forms – joint research on cutting edge questions or export of expertise and training.

3. Preference for former and for working in Australia in longer blocks of time to minimise travel.

One current idea is the use of decision theatres. Allier transport funds are being revised by Joseph et al. The proposed model is like Basin Peer proposal – (sent to Joseph, Nils etc) and could involve Rhone, MDB, Mekong and India using a disembodiment of collaboration and travel minimisation.

Attachment 8: Adaptation challenges in Australia's Murray Darling Basin

This presentation explores the challenges of managing water resources and ecosystem under escalating rates of climatic and related change. Together these changes are challenging traditional approaches and resulting in a "crazy" world full of complexities, uncertainties and indeterminacies. I will outline the situation in Australia's Murray Darling Basin (MDB) to illustrate the changing nature of the Anthropocene and why more adaptive research and policy is needed. In the MDB, water resource and ecosystem management problems are escalating, despite decades of research and policy reforms. These problems are compounded by the search for solutions based in outdated conceptual models of conservation.

Research is part of the closely coupled scientific, legal and policy networks involved in governing. However, the structures and modes of policy and research operation that evolved gradually under conditions of hydro-climatic stationarity are being challenged by crazy rates of change. Narrow definitions of the roles of science focus on harnessing scientific capabilities to develop 'evidence-based' solutions. This administratively rational model of science serving the State is the dominant problem-solving model used by water and natural resource agencies. However, Anthropocene conditions undermine the conceptual foundations of traditional approaches to water and ecosystem management. Dynamic biogeochemical and ecological processes and the non-stationarity of hydro-climatic regimes are producing 'wicked' environmental problems, with science unable to provide absolute truths and confident solutions. In these post-natural settings, the problems are outstripping the ability to define and implement solutions. While adaptive governance models are often proposed for adaptively managing large complex socio-ecological systems, many factors constrain adaptive governance. These include poor theoretical conceptualisation, institutional inertia, the complexity of large systems and the real-politick of struggles for control of natural resources. Progress is further hampered by static conservation models or attempts to restore ecosystems when these systems are dynamic and changing.

Jason Alexandra is a senior research fellow at the Australian National University's Institute for Climate, Energy & Disaster Solutions (ICEDS) and the Institute for Water Futures (IWF). He works on climate adaptation and adaptive water governance. Jason has worked on Murray Darling Basin policy reform and reform since 1988 in a variety of roles. This includes holding senior roles in government with responsibilities for natural resource management, risk assessment and climate R&D. The presentation draws on my recent research into climate adaptation including:

Alexandra J. (2021) Navigating the Anthropocene's rivers of risk – climatic change and science-policy dilemmas in Australia's MDB *Climatic Change* 2021, 165(1-2), 1-21

Alexandra J., and Rickards L. (2021) The contested politics of drought, water security and climate adaptation in Australia's Murray-Darling Basin *Water Alternatives* 14(3): 773-794

Alexandra J. (2020) The science and politics of climate risk assessment in Australia's Murray Darling Basin *Environmental Science and Policy* Vol. 112, 17-27

Alexandra J. (2019) Losing the Authority – what institutional architecture for cooperative governance in the Murray Darling *Australasian Journal of Water Resources*

Attachment 9: International R&D collaborations on Anthropocene challenges

Jason Alexandra, Senior Research Fellow -Australian National University (ANU) Water Futures Institute and the Institute for Climate, Energy and Disaster Solutions Geographical Colloquium, Humbolt University Berlin December 2023.

In this presentation, I will summarise the climate risks and adaptation challenges facing South-eastern Australia, focusing on the need for more adaptive governance of water resources in the Murray Darling Basin. After this sketch of the challenges, I will outline two examples of planned research on climate adaptive governance of natural resources. The first research program aims to explore and test options for more equitable, efficient and adaptive water resource policies. To develop greater capacity to explore policy options, we are planning to combine collaborative scenario planning, innovative gaming methods and multiple types of modelling. This work will engage stakeholders in developing and testing policies suited to uncertain and rapidly changing climate futures. The second R&D program aims to increase carbon sequestration in the landscape and accelerate transitions to the bioeconomy. This national R&D program will work with the forest industries to substantially increase the growth and use of woody biomass as industrial feedstock for biofuels, biochar and biomaterials. Finally, I will propose some ideas about ways to catalyse international collaborations between trans-disciplinary research institutes working on Anthropocene challenges, including those institutes located at the Humboldt and Australian National University