Urban planning / Health and liveability

Q1: What are the climate relevant issues that this theme and sector face – impacts, threats, rivers, risks, etc.?

Climate Issues that affect modelling / Challenges

- Rainfall variability (variable shock, pressure)
- Temperature going up – ramp pressure → Changes to urban water demand.
- Historic land use versus compatibility with climate change impacts, ie. Flood water demand.
- Achieving resilience in context of climate variability needs a significantly greater degree of collective decision making about land use and infrastructure planning but this is rarely done and probably needs systemic change.
- Perceived need and lack of integrated approaches.

Climate Impacts on urban planning, health and liveability

- Heat, flood, drought, sea-level rise, storm surge and wind (to be considered together).
- Household flood risk. Changes in urban geography. Intra-urban retreat?
- Evapotranspiration and maintenance of urban green space. Urban heat will affect urban walking and cycling strategies and consequently health, especially of older people.
- Increased air conditioning and energy use.
- Cost of information of service increase delivery. Can we cope?
- Rising insurance costs/costs to the community – who pays? Equity issues.

Climate Threats to urban planning

- Resource availability and water demand - where will people live?
- Rates of water discharged and evaporation versus recharge, types of rainfall event, capture capacity existing versus planning storage.
- Sewer overflow issues – linkage between water infrastructure health and environmental issues. Stormwater network capacity issues.
- Riverine flooding / D.L. Flow, coastal inundation, development patterns and stds, legal liability, interconnected systems.

Drivers to the use of climate models in urban planning

- Wicked problem – one solution does not fit all.
- Intergenerational equity, balancing economic costs now versus future social impacts.
- Intersection between climate and other unknowns, for example where will people live, how many of them will there be and what will their values be?
- Current planning framework versus climate adaptation requirements. Lack of planning drivers creating inefficient adaptation – individuals and insurance.
- Setting the 'design std' that balancing safety, cost, liveability.

Climate risk to urban planning

- Fragility and durability of construction materials.

Barriers to applying climate models for urban planning

- Level of confidence in the outputs. Uncertainty of extreme events/impacts/changes, how do we plan for the unknown?

- Building back to the status quo – lack of betterment.
- Transition – policy systems build for past. Urban planning and engineering discipline approach 'conservative' in the wrong direction, ie. Precautionary principle not observed.
- Lack of public understanding.
- Role of decentralised water systems to support urban forms, but who manages and maintains them?

Q2: How can modelling help in accommodating to better understand the rises and help guide practice, etc?

Forecast

- Hazard and risk assessments. Real-time predictions (forecast) to support operational decision making and response (eg. Flood mitigation versus water supply).
- Provides a gauge for what is acceptable and tolerated risk (without action/status quo). Which area needs to take a hard-line approval to their anticipated/expected risk.
- Assist in identify step changes where progressive incremental adaptation will fail.

Alternatives

- Provide insights into possible scenarios and projections (ie the variability and uncertainty and the extremes) that can be used in decision making frameworks.
- Models can help to test ideas, test options, identify opportunities, help determine what may or may not work, confirms or reaffirms the need to do something, and where we need more information. For example, model an ideal scenario to work out way towards that and identify what needs to be changed and prioritised; or distribute catchment areas through urban areas rather than relying only on catchments of large dams – help build resilience.

Information rich

- In collective/whole of system approaches, models serve to determine the known knowns, help 'populate' the decision trees across a broad range of variables. Assists in determining what measures/policies/practices are effective.
- Provides an evidence-based approach to communicating need for actions (public and private). Starts the discussion.

Engagement

- Models can support engagement with consumers – small → large. Interactive models that show benefits of change versus not changing. "Models" or information tools, to help citizens or other stakeholders understand 'what might this mean for me, my family, household, business?' what can I do? Communicate and inform the community to support individual decision making and build individual's resilience.
- Visualisation and outputs that can be used by non-modellers to help build understanding of complex issues.

Q3: What needs to happen next to progress modelling practice for the sector?

Integrated/cross collaboration approaches between spheres of power, influence and jurisdiction and across the developers and users of models to collectively improve understanding and tools. This sector is diverse and complicated, we need to know what models are available and what each of them is able to do and support.

- What: Generate consensus on: priorities, application of models

(what's appropriate, what's too uncertain), terminology.
- Why: To promote collective thinking and approaches setup a model that facilitates collaboration and resilient outcomes. (This is likely/possible a multisectoral model working at various scales).
- Example: LCAs have a shared flood dashboard to monitor flow and river rise.

Public funding

- Why: Resources produce better data and understanding produces better approaches, such as tools, address gaps, flood gauges.
- Continue knowledge building: research and improve uncertainty. There is a need to better incorporate variability in models, but not stop there. Are out planning and decision-making processes fit for purpose and able to respond robustly to increased variability in rainfall? Change the decision system not just the model.

Engagement

- What: Translating complex projection data into localised effects ie communication and engagement.
- Why: We need to understand how different types of people and organisations want to engage with climate impact mitigation and adaptation. Perhaps information – why, what and how, then co design communication and engagement tools to fit, suit and produce user centred design. Human behaviour and practices should be included. For example, future trends of resources use and mobility, then desired small changes could be modelled and to project the result and stimulate those changes in younger generations' behaviour.

Communication

- Why: to increase trust
- What: Need to be clear on purpose of model, also get better at explaining variability/uncertainty to users – what do the models mean?
- Who: Policy decision makers
- How: Guidance on use of climate data in water models: Translating complex models to clear communication. Educate policy decision makers. Use of and understand model outputs must not need special skills.
- Ie work the stakeholders perhaps a marketing type approach of modern tools. Engage a communications expert to develop a communication plan to identify non-modelling end users. For example. Planners, urban designers and make sure they understand the project and its outcomes.
- Interactive tools for exploring the influence of uncertainty on important mode drivers.
- Model interpretation for dummies – targeted at modellers and model users. Targeted training and awareness raising for decision makers to improve model literacy.
- Shortening the cycle between dissemination of research. Greater access and exposure to understanding of data produced, so public and different professions know what is happening. Improved availability of models and clear communication to wider audience to improve broader industry and community understanding and drive decentralised decision making.

Trust

- What: Transparency in modelling results and use. Build trust in discipline from community and politicians. Convince decision-makers.

Convince with confidence impact. Confidence in decision/solution.

- How: Greater independence of model results communication from present day policy positions and solicitors. Improving open source access.

Don't wait for models to improve – there are ways of developing adaptation plans that allow that. Don't have paralysis by analysis – we have ways to plan to adapt that enable us to deal with uncertainty.

Infrastructure 1

Q1: What are the climate relevant issues that this theme and sector face – impacts, threats, rivers, risks, etc.?

Climate Issues that affect modelling / Challenges

- Long-term versus short-term decision-making (political climate, climate variability, cost, population growth).
- Distribution of benefits

Climate Impacts on infrastructure

- Impacts on levels of service (including failure of existing infrastructure)
- Impacts on design life and location of infrastructure.

Drivers to the use of climate models in infrastructure

- Opportunities for innovation – integrated water management.

Barriers to applying climate models for infrastructure

- Data uncertainty feeding into models.

Q2: How can modelling help in accommodating to better understand the rises and help guide practice, etc?

- Forecast: Only tangible (?) way to plan for future, including unrecorded events.
- Alternatives: Form basis of decision-making framework.
- Information rich: Informs definition of risk and management strategies.

Q3: What needs to happen next to progress modelling practice for the sector?

<u>Integrated/cross collaboration approaches</u>

- Industry collaboration.

<u>Funding</u>

- Continued technologic developments. Example: Engines, hardware (cloud).

<u>Communication</u>

- Better presentation and communication to decision makers.
- Communicate range of uncertainty. Especially in policy.
- More information on climate projections.

Infrastructure 2

1: What are the climate relevant issues that this theme and sector face – impacts, threats, rivers, risks, etc.?

Climate Threats to infrastructure

- Extreme weather variability and timing between the events.
- Extreme climate events. Example: flood, fire, storms, drought, sea level rise, storm surge.
- Capacity of infrastructure to pass extreme flood events.

Drivers to the use of climate models in infrastructure

- Designing infrastructure to withstand future climate conditions. Rainfall regime and intensity change → infrastructure design and maintenance implications
- Interdependencies between sources of energy and water. Water and energy security
- Power supply: Need for water, intake of raw water, climate resilient supply source needs.
- Water availability: inflows, evaporation, impact supply (variability), sediment loads, impact flood mitigation, asset inundation risk to flooding sea level.
- Need for bulk water infrastructure, flood mitigation, water supply. Sewerage systems: flow capacity, time of use changes, infiltration (or lack of from ground lead to flow problems).
- Temperature and water change influence the design and placement of new key infrastructure. Implications for old 'standard' infrastructure.
- Peaking demand movement damage. Usage spikes on networks. Changing diurnal patterns. Base demand increase (will it be slow steady or lumpy).

Climate risk to infrastructure

- Costs associated with dealing with rare but high impact events (especially when likelihoods are very uncertain). Water quality: temperature impact on water quality in networks, at storages, temperature algae impacts, risk of storage turnover.

Barriers to applying climate models for infrastructure

- Time to respond – long lead fixer needed for large infrastructure. Will this change?
- Asset management and integrity of infrastructure systems. Long term aspects and problems addressed with short-term outcomes.
- Availability of water in the future – design to make sure no flooding impacts, but what about retaining water for droughts?
- Augmented rainfall runoff not clear on how to deal with climate variability and or change.

Q2: How can modelling help in accommodating to better understand the rises and help guide practice, etc?

- Modelling can help understand the range of what is plausible, enable quantification, objectivity, probabilistic approach, get some idea about uncertainties.

Q3: What needs to happen next to progress modelling practice for the sector?

- Integrated/cross collaboration approaches: Integration across sectors and scales. Greater collaboration experiencing lessons learned. Augmenting data sharing appropriately.

- Funding: Significant support into model development. Currently not incentivised.
- Engagement: Defining of modelling.
- Communication: Communicate red flags in a range that affects the model. Understand the consequences of the answer you get from a model.
- Government drivers, what is standard practice.

Ecosystem Services

Q1: What are the climate relevant issues that this theme and sector face – impacts, threats, rivers, risks, etc.?

Climate Issues that affect modelling / Challenges

- Inundation/vegetation patterns.
- Maintaining in-stream flow requirements for salinity – fresh water coastal ecosystem.
- Different in-stream transport processes.

Climate Impacts on ES

- Temperature (On public health. Mosquitos – dengue, ross river; pest plants, larvae dispersal. On marine systems, coral bleaching, sea level rise impacts – saline intrusion), dissolved oxygen (Ocean acidification), stream flows, evapotranspiration (Impact water cycles and environmental flows), nutrients (high nitrogen and phosphorus, eutrophication, nutrient cycling, calcification).
- Water quality impacts. Water purification (drawdown)
- Shifts in species (movement). Migration of animals – risk to human health/
- Increased runoff – initiates different sediment generation processes.
- Impacts of reduced streamflow on assets. Floodplain ecosystem has longer impacts of droughts.
- Productivity of aquaculture and agriculture - Regeneration of natural resources (forestry)
- Impacts of nutritional food value, 7% declines per 1 C warming
- Atmospheric rivers waterholes.

Climate Threats to ES

- Extended dry periods. Reduced water levels. Water scarcity.

Barriers to applying climate models for ES

- Legislative frameworks
- Models of flood risk $770 billion by 2100 (?)
- Response to climate change – have we got good handle of that? Rainfall and temperature only – how about other aspects?

Q2: How can modelling help in accommodating to better understand the rises and help guide practice, etc?

<u>Forecast</u>

- Understand current conditions. Reliable predictions.
- Understand when where the thresholds are, and frequency of events. Demonstrating best practices adaptation. Understand possible frequency and severity of impacts. (length of dry spells, area of flooding events)
- Modelling helps in 'process simulation' → narrative for decisions – hydrological models – triage → option simulation and testing, codesign and coproduce.

<u>Alternatives</u>

- ESS: utilitarian → air, water, food and liveability → climate – productivity and production, resilience and liveability, integrity regarding tip points. Ecosystem adapt and tipping point. Compliance and best practice on water use – adaptation
- Addressing drivers of building resilience

<u>Information rich</u>

- Inform decision-makers (value added).
- Understand variables inputs that need to be considered and those of highest

uncertainty (crop type, land use, OLF take)
- Understand where to invest and protect – physically better locations.
- Multicriteria decision analysis. Cost efficiency analysis (cost of actions and management options)

Q3: What needs to happen next to progress modelling practice for the sector?

Integrated/cross collaboration approaches

- Holistic view. Connections between systems.
- 'System of systems': connecting, communicating, collaborating.
-

Funding

- High resolution modelling include ecosystems' adaptation to climate change impacts. Enhance modelling capabilities – integration. Monitoring, improve and update models' capabilities. Improved spatial scales – better visibility. Improved response trajectories. Data assimilation
- Enhancing devices and dual purpose.

Engagement

- Engaging researchers. Communicate with universities about what needs are.
- Define the problem. Consensus on modelling approach. Scenario testing. Summary.
-

Communication:

- Frame predictions in ways that make them relevant for policy decisions.
- Communication of results. Framework and structure for the suite of models.

Climate

- Frame questions of develop models
- Market solutions on ecosystem services
- Recognising and acknowledging climate change
- Compensation for just transition?
- Confidence and uncertainty around all parameters → sensitivity analysis. More emphasis on relative risks as all models are uncertain. Ways of dealing with uncertainty
- Climate scenarios modelled as part of ecological models as downscaled projections improve.
- Water quality and water temperature modelling included in hydrologic models.

Regional Landscapes and Agriculture

Q1: What are the climate relevant issues that this theme and sector face – impacts, threats, rivers, risks, etc.?

Climate Issues that affect modelling / Challenges

- Uncertainty regarding climate: Short-term rainfall variability and predictability

Climate Impacts on Regional landscapes and agriculture

- Increased carbon in soils – not so easy. Land degradation

Climate Threats to Regional landscapes and agriculture

- Water governance. Policy changes.
- Increasing price of water, demand. Increase drought, increase in storm large flood events.
- Reduced water availability. Changing and unpredictable rainfall, frequency, distribution and intensity.
- Quality of water – safety
- Viability of agricultural businesses. Land prices – insurance. Business adaptation. Agricultural risk: ways to map reliability of future cropping type decisions
- Pasture management (?)

Drivers to the use of climate models in Regional landscapes and agriculture

- Profitability
- Economic instability for farmers and rural communities. Create policy to lead rather than regulate money – has it worked?

Climate risk to Regional landscapes and agriculture

- high land prices for marginal land drive over use.

Barriers to applying climate models for Regional landscapes and agriculture

- Unpredictable rainfall
- Product demand.
- Users not knowing what their questions are – being a step forward is needed. How to keep skills and knowledge through generations?
- Little relevance in grazing sector.
- Reliability of 'models'

Q2: How can modelling help in accommodating to better understand the rises and help guide practice, etc?

- Forecast: Threat to potential livelihood in the agriculture sector. Operation release decisions. Better efficiencies and information about the transfer and losses in these transfers. Buy and sell off properties and how climate change effects risks value in years to come.
- Information rich: Reinforcement of information.

Q3: What needs to happen next to progress modelling practice for the sector?

- Integrated/cross collaboration approaches: Long term multi-disciplinary teams.
- Funding: Maintaining resources – money. Economy – collaboration needed but a money figure makes the sell easier.
- Engagement: Involvement in modelling.
- Communication: Simplicity and accuracy. Understanding the needs. Education. Marketing of information products to users.
- Trust: Trust in the models.

Better models / information of future water availability and the likelihood of having it – to make their own risk decisions.