

What needs can be met with present capabilities?

- Can meet a variety of needs such as: temperature ranges and impact on demands, outdoor demands, how temperature impacts snowpack, timing of runoff, etc.
- Needs are met because we work with what we have to meet some of our needs --- but data are going to keep changing - so what are our ultimate needs?

What are our concerns about present capabilities?

- Accuracy, uncertainty, risk, -- are we using them appropriately and caveat(ing) them appropriately?
- Issues with downscaling variables such as precipitation.
- Problems with using only one data spot (esp. with hydrologic models)– that is used for calibration over larger land areas -- same calibration begins with one model type then used in another --- is this enough info to drive hydrologic model?
- With hydro models: What happens when you calibrate with historic datasets --- if physics change – then you don't get entire picture.
- Are we capturing full process? Especially if only using precip and temp in hydrologic models?
- Lots of uncertainty within ensemble models – but uncertainties are also created because of the way we are using the climate information (these need to be addressed)
- Communications between modelers and users
- Connections between models and propagation of uncertainties (hydro and clim)
- Credibility issue --- need time or check on modelers and the meaning of the output they produce --- perhaps GCRP and IPCC could be determinant of credibility (but then problem of timing) (Perhaps climate service could provide this service)

What are our concerns about future capabilities?

- We're not sure what will happen in future with demands –e.g. ET (this was followed with a discussion of all aspects of the water demand formula) --- e.g, if there is a change in temp. – what happens to ET and soil moisture? We don't have past experience with how projected increases in temperatures will impact ET and soil moisture

What needs are not being met with present capabilities?

- Access to data - difficult to get what one needs in the scale and timing that fits needs (effort was to be made in Hamburg – but not staffed sufficiently)
- Improved understanding/training of use of current/future variables (including the ways they are created and use as well as the associated uncertainties and inter-relations)
- Correct use of model outputs - discussion of how a climate service could take model outputs and provide expertise to interface with potential users
- Above bullets are “value added” - one suggestion would be to create a value added handbook
- Want more ensemble runs
- Want to know about natural variability issues in more detail
- Each sector is different – may want to assess each separately – on the other hand, also have some commonalities – (e.g., tourism,) (so would be value added)
- Guidance as to which models to use– what are the best models for our region (right now no consensus of best models – so advice is to use them all) – community has not come up with a metric that restricts use of all models – a climate service could do this – narrow down scenarios – not been done systematically
- Including emissions with climate models.

What more can we get out of existing model outputs than we already do?

- For water utilities: heat wave intensity – it is available – but utilities haven't been using
- Land surface changes – vegetation changes – land use land cover changes
- Reliability of information – most models can get heat wave- but many people are not getting length of heat wave
- Are there changes in seasonality of precipitation? --- Issue particularly important in Pacific NW. (Notes missing for this item)
- Wildfire issues (notes missing)
- More info about extremes. This could be more important than looking at trends (for better understanding of climate and in case climate changes quicker)
- More info on ET and how it could change in future based on existing info
- Indices of major atmospheric patterns (e.g. jet stream) – would be useful to planners on a local scale making system more flexible --- This info could be qualitative – as qualitative approach may be more useful for planners than a quantitative one. Info could include influences such as teleconnections and ENSO, North Atlantic SST, etc. This is where a climate service could help
- Really good understanding of this information – from a decision makers viewpoint – when they come up against providing info to a Board – need to know more and have to be able to justify and explain in terms that a city council and the press would understand
- Would like advice on appropriate uses for data (having parameters on data would be helpful)
- WUCA recommendations:
 - Develop and enhance GCM ensembles
 - Improve use of observations to constrain climate models' projections
 - Improve modeling of the tropical Pacific
 - Evaluate decadal prediction efforts for water utilities' planning

Other – for future:

- Model Paradigm shift – from modeling to use of info --- Discussion of usability of information – need new thrust of how to frame models needs to be framed by questions being asked now
- Modelers need better understanding of how hydrologic modelers are using information and how it is being used after – need more dialogue at a detailed level
- Need to have water modelers involved in climate discussions
- Need to sustain efforts for 5-10 years --
- Needs funding – including scholarships and fellowships