

The Ohio Basin Exploratory Committee Recommendations

1. Research on the Ohio Basin should include the linking of macro or micro level analyses pertaining to the hydrologic unit (HUC2) or watersheds in the State of Ohio that flow into the Ohio River. Because many physical, natural, and social phenomena transcend the boundaries of the Ohio Basin, approaches that incorporate the wider region are welcome.
2. Proposals should include a preliminary 3-4 month inventory of Ohio Basin data that already exists. Before final submission to the CWC, the core project idea should be taken to Mark Shanahan, Governor Strickland's energy advisor; Chris Korleski, Director of Ohio EPA; or others to determine potential buy-in from non-OSU groups.
3. Proposals should characterize the scientific understanding of the past, present, and future trends of the Ohio Basin by integrating climatology, earth sciences, biological sciences, and social sciences. A systems framework is encouraged that identifies complex adaptive systems with cross-linkages across multiple scales. The proposal should also deal with buffering and resilience to system perturbations and fluctuations that are abrupt and possibly disruptive.
4. Proposals should include scenarios, both positive and negative, and including present trends and alternative solutions, that will inform policy-makers on short and long-term issues. Technological needs, social impacts, potential leverage points, and a range of possible intervention options should be presented to enable the Ohio Basin to avoid severe disruptions and steer toward desirable scenarios. Equally, proposals may include how the decision-makers or stakeholders will influence the future direction of science.
5. Proposals should be clear about how the research will result in path-breaking results and future funding from granting agencies, patents, contracts, or other development monies.

r

Ideas for Proposal Development

The committee identified three complementary themes for research in the Ohio Basin that could be combined or investigated separately. The committee also welcomes other approaches.

Idea 1: Key Legacy and Emerging Issues in Water and Energy

The Ohio Basin has both legacy and emerging issues regarding the relationship between water and energy. Energy production, particularly as it relates to the historic use of coal, but also for ethanol production, is dependent upon water for part of the process. The use of coal and biofuels in Ohio is forecast to increase over the next ten years. This will affect the water supply in the basin. Equally, the outflow of water from the old and new energy processes will affect water quality in many ways such as water temperature which affects stream biota or filtration of surface water to underground water used for drinking. Historically there have been issues with acid mine drainage. Investigation of this research problem will follow the CWC proposal's three lines of thinking including how abrupt climate

change has and will affect the relationship between energy and water in the Ohio Basin.

Idea 2: Modeling Scenarios of Water Quality and Quantity in the Ohio Basin

Based on past, current, and future climate forecasts and water use in the Ohio Basin, what scenarios are most likely to occur in the next ten years? As a result of abrupt climate change, will Ohio receive more rainfall, and if so, what scenarios are likely to result? Both urban and rural areas in the Ohio Basin are presently experiencing water quality and quantity problems that include pharmaceuticals, bacteria, chemicals, and nutrients. The origin of these problems ranges from urban use to rural agricultural land use and loss of headwater stream and wetlands structure and function affecting the retention of water and nutrient cycling of carbon, phosphorus, and nitrogen. These have regional consequences beyond the Ohio Basin. A scaling approach using LULC ranging from HUC 14 digit watersheds such as Sugar Creek subwatersheds including headwater streams to larger HUC 4 digit basins such as the Muskingum and Scioto basins would be utilized to measure and model the effect into the larger HUC 2 digit Ohio Basin (USGS Water Resource Region 05) and Mississippi Basin and Gulf of Mexico. Although data from existing USGS gauge stations will be used, some additional gauges may be necessary. Policy recommendations for mitigation of the present trend scenarios will be incorporated into new scenarios.

Idea 3: Consequences of Ohio's Energy Future Under Abrupt Climate Change
Air quality and water in the Ohio Basin will be vulnerable to the consequences of possible energy choices. For example, based on David Tilman et al (*Science* February 7, 2008) article "Land Clearing and the Biofuel Debt", Ohio's choices regarding coal, biofuels from agricultural crops, or biofuels from waste biomass or biomass grown on degraded or abandoned agricultural lands will have significant consequences to the overall carbon debt and GHG. Scenarios amplifying the range of variability will be used to create a framework for practical solutions and applications of science in conjunction with Ohio Energy Advisor Mark Shanahan and the University Clean Energy Alliance of Ohio (UCEAO). The framework would include how science will be used to mitigate the impacts of scenarios and inform decisions regarding policy intervention.