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An Interdisciplinary Graduate Program in Water Resources Planning: Summary and Critical Appraisal

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At the end of the 20th century, the Chief of Planning of the U.S. Army Corps of Engineers acknowledged an alarming trend: during the next 5 years the Corps would likely lose a significant proportion (35%-40%) of its experienced water resources planners through retirement; and the complex challenges waiting for their replacements would imply the need for planners who are more sophisticated in disciplines outside of traditional engineering such as law, economics, biology, hydrology, statistics and political science, than those they replace. Part of the Corps' response to this prediction was to begin work on providing its employees with the opportunity to obtain a multi-disciplinary Master's degree in water and environmental planning as an incentive for new people to join and for the retention of first-rate sophisticated analysts and planners already in place.

Development of the Multi-Disciplinary Master's Degree

At the request of the Corps, during the fall of 2000, the Universities Council on Water Resources (UCOWR) surveyed its member institutions about the existence of multi-disciplinary water and environmental Master's degree programs, and the institutions' interest in participating in the development of a program if none were currently available. Based on an overwhelmingly positive response, the Corps requested that UCOWR form an advisory committee to provide guidance in the development of a curriculum leading to a Master's degree with the degree being completed in as short a time as possible. The committee formed included university professors representing engineering, economics, law, biology, and political science as well as representatives from the Corps. The committee met in May 2000, and agreed that a Master's degree program should be designed to produce a generalist planner with a solid multi disciplinary foundation as opposed to one specialized in a single discipline.

The committee's guidelines for the development of such a program were based upon assumptions that the future of water resources planning would be characterized by:

- A decrease in emphasis on large-scale engineering projects;
- An increase in modifications of existing projects to address new problems;
- The deauthorization of a significant number of existing projects;
- A greater emphasis on optimizing system-operating performance;
- A greater reliance on institutional approaches to dealing with water resource issues;

- A broader and more detailed analytical review of the potential for private sector work complementing government actions; and
- The need for more thorough and sophisticated analysis in the development and implementation of policy.

With these assumptions in mind, the committee put together a 30 semester-hour multi-disciplinary program that included a background in theory as well as opportunities to apply theory in practical settings. The level of sophistication was intended to be appropriate for post-baccalaureate students coming from programs in the biological, physical or social sciences or from engineering. The curriculum included 8 fundamental courses (24 semester-hours), an independent study (3 semester-hours) and a final practicum course (3 semester-hours). The required courses were:

- Philosophy and history of water and environmental planning;
- Water law and institutional considerations;
- Theory and mechanics of social and political decision-making;
- Ecology and biology in water resource planning;
- Engineering in water resource and environmental planning;
- Economics in water and environmental planning;
- Quantitative methods essential to planning;
- Hydrology, hydraulics and climatology.

Numerous Corps employees and academic professionals then reviewed the program. A focus group that included Corps employees from both the District and Division levels discussed the proposal at a meeting held in Dallas, Texas. In addition the program was presented to attendees at the annual UCOWR meeting June 2001. The proposal received enthusiastic support, and many useful recommendations were made concerning its implementation.

Implementation of the Program

With the blessings of the Headquarters of the Corps, and encouragement from academics and Corps' employees, the next step was to provide information about the program to more than 100 universities along with an inquiry about their interest in participating. The results of this outreach were disappointing, though not entirely surprising. First, most universities were not able to offer the full range of courses included in the required curriculum. Second, even where a university had the capability, it might be precluded from participating by one or more institutional constraints. Such constraints included: residency requirements, pre-requisite course requirements for existing relevant courses, and simply the time and expense of getting a new degree program approved. Third, several universities were stymied by internal resistance to inter-departmental collaboration in offering a multi-disciplinary program. (For a more general discussion of this problem, see Cliff Russell's chapter, "Interdisciplinary Research and Education in Rhetoric and Reality" in this volume.) There were, however,

approximately 18 candidates able to consider seriously becoming part of the program. Discussions with this set led to agreements with five schools that were to become the initial offerors:

- University of Arizona;
- University of Florida;
- Harvard University;
- Johns Hopkins University;
- Southern Illinois University.

While each university was able to offer the formal degree in a specific existing department, the students were required to take only those required courses specified in the multi-disciplinary curriculum, not the other requirements of that department. Thus, for example, the required economics course would be taken in the Department of Economics and water law from the Law School. In order that each student would have a similar educational experience, regardless where s/he attended school, an “illustrative course guideline” was prepared for each of the required courses in the curriculum. (See the attachment for economics as an example.) With few exceptions, each of the participating universities was able to offer a course that came close to the recommended curriculum and for the exceptions, the schools agreed to work on devising ways to meet the objective.

In addition, to meet the objective that each student would have to deal with a problem approximating one that might be found in the real world, a case study was developed by a group of academics and Corps employees supported by funding from the Corps. Each of the students was to be provided with information on-line about the selected case, with numerous tasks to be completed prior to attending a week-long capstone seminar at which their individual work would be reviewed and evaluated. The capstone seminar was designed to draw together all the various disciplinary threads of the student’s prior coursework with the case study a focal part of the seminar. An initial version of the seminar for the first class of students was scheduled to be held at the Johns Hopkins University in January 2006. Papers were prepared by 12 experienced water resource professionals to broaden their background relevant to issues raised by the case study, and these were to be presented as part of the seminar.

As another complement to the content of the Master’s Degree program, a summary and critical appraisal of the development and implementation of U.S. water policy, and the analytical methods used in these contexts, especially during the last half of the 20th century, was written by a group of respected academic researchers representing engineering, economics, law, biology/ecology, philosophy, hydrology and political science. The book was reviewed by each contributor, plus Corps personnel and other water resource professionals and was ready for use in the program by the spring of 2004.

Finally, the Corps desired to have an annual review in order to monitor the program's progress and to identify its strengths and weaknesses. An effort was initiated to develop a set of criteria for these evaluations. The overriding concern was the extent to which each university implemented the curriculum of the interdisciplinary program. In addition, the initial discussions were fairly straightforward and included questions about the instructor such as how well prepared and knowledgeable about the material, the effectiveness of assignments, and the clarity of the syllabus; additional questions concerned the effectiveness of the course and recommendations for improvement.. However, further development came to a standstill when the very survival of the program became the major concern.

Evaluation of the Program: Was it Successful?

There was variation among universities in the degree of success with which they fulfilled the original program design. But four of the five at least worked toward formulating a truly multi-disciplinary curriculum. (One university, unfortunately, did not arrange for the full participation of other departments but rather decided that the faculty of a single department could provide almost the entire program.) Yet, from the perspective of the initial objective the program can be said to have failed! Most obviously, although Headquarters at the Corp of Engineers informed the university representatives that each year there would be 35 to 40 students participating in the program, in reality there was virtually no support or funding for Corps employees to enroll. To date Johns Hopkins University has had a total of 5 students from the Corps, Southern Illinois University 3 students, the University of Arizona 5 students. Harvard University was in the process of completing the design of their program when it became evident that the Corps was not going to support the 35-40 students per year. Also symptomatic of lack of support was the decision made about the first capstone seminar. designed to draw together all the various disciplinary threads of the student's prior coursework. The case study was the focal point of the seminar. Although there were only a few students from the Corps even available to participate, six Corps students and six non-Corps students registered to take the seminar, a number in line with expectations. Yet, two weeks before the seminar, the Corps cancelled it because of the low number of registrants, even though \$60,000 had been incurred for travel, honoraria and reservation of the chosen venue.

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Though to some extent independent of the program itself, the book also languished. An opportunity to publish the book in 2004, and thus reach a wider audience, was not pursued. Indeed, virtually nothing happened until 2006, when a contract was issued to have the book edited again for clarity and coherence, with the authors given the opportunity to up-date their contributions. The contract was completed during the summer of 2007. In January 2008, word came back to the authors that the complete manuscript was about to be sent off to a commercial publisher.

The inescapable conclusion is that despite several hundred thousand dollars having been spent over 5 years, there is little to show: only a few Corps students were able to participate in the program and a book that may only now be published. It is worth asking why. The Corps initiated the concept, supported the development and failed to implement the program and reap the benefits. Have the problems that initially propelled the Corps to promote and fund a program to train existing and potential employees been resolved? There is no evidence that this is so. Did someone forget to budget for implementing the program? In defense of the lackluster support, some might argue that many new issues arose in this first decade of the 21st century that captured the Corps' attention and resources, such as the response to 9/11, the wars in Iraq and Afghanistan, and Hurricane Katrina. But new funds amounting to billions of dollars have been forthcoming for dealing with those financial and manpower issues. The full funding of 30-40 students was estimated to cost less than \$1 million per year—almost a rounding error in the overall budget. More likely, but also harder to prove, are the following: First, the program broke new ground and represented a major departure from the status quo and the traditional engineering perspective. Such efforts are always easier to stop than to push forward. Second, similar forces as observed in the resistance of university departments to collaboration in the design of multi-disciplinary programs may be at work at headquarters, where the engineering perspective that is entrenched and believed to have worked for decades (if not over a century) may be seen as capable of solving future challenges.

What can be learned from this experience? First, because of the near absence of accountability of public funds and trust, future work with the Corps of Engineers, or any government agency on programs designed to be long term, should be done on a contractual basis. Then as government bureaucrats retire or rotate, as in the army, the program will at least have a better chance of surviving. Second, from the beginning, the program was widely seen as important. In fact; the Chief of Planning, who retired mid-stream, reported serious interest in the program on the parts of members of a federal inter-agency committee of which he was a member. The discussions with this group were not seriously pursued after the retirement of the Chief of Planning, but university representatives could have independently tried to involve the interested agencies had they been informed or involved.. Third, the Corps of Engineers may be an agency particularly unsuited to making a commitment, for even the medium term, to something that may be seen as “only” peripheral to its core mission. Not only will the program be dependent on annual budget commitment, but also the Corps' leadership turns over quite quickly because of military rotation. Finally, according to the Corps, throughout the development of the program there were frequent expressions of international interest in taking advantage of it. It is not known to what extent the Corps pursued these contacts, but, in the increasingly global education economy, universities may desire to pursue that market with or without the support of the Corps or any federal agency. There is quite a large water resources research “industry” out there focused on such regions as the Middle East and North Africa (MENA), Sub Saharan Africa, India, China, and for now at least, Australia. With the passing of the dominance of giant engineering projects (hastened by the looming catastrophe of the Three Gorges project) comes the passing of the dominance of the US experience. An explicitly international water resources planning

and management program could be quite exciting and provide enormous opportunities for our research and educational institutions.

In closing, the most likely outcome is that the already high opportunity costs will continue to rise because the problem identified almost a decade ago by the corps' Chief of Planning will not disappear on its own. Although the younger professional employees saw the need and were eager to participate in the program, the obstacle was and is the resistance of the senior bureaucrats. So any future life for an interdisciplinary graduate program in water and environmental planning and management will likely depend on the initiative of one or more universities playing a key role with external support from government and/or the private sector on a strict contractual basis.

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