



History of the Center for Hazardous Substance Research (CHSR)

Origins of the CHSR

In 1985 the Kansas Legislature approved funding for research in support of the management of hazardous substances because of new federal regulations including the Resource Conservation and Recovery Act (RCRA) and Superfund. Leaders from industry in Kansas expressed their concern with respect to the need for science and technology to comply with these new regulations on hazardous substances. An Office of Hazardous Substance Research was established as a part of the Engineering Experiment Station in the College of Engineering in 1985.

The goals and objectives were to

1. Provide leadership and foster the conduct of hazardous substance research,
2. Have a point of contact for industrial and government officials with hazardous waste concerns,
3. Develop a professional staff that can conduct contract and grant research for industry and government,
4. Maintain a safe environment for the conduct of hazardous and toxic substance research,
5. Furnish well equipped laboratories for hazardous substance research,
6. Generate opportunities for research training of students in the area of hazardous substance research, and
7. Enhance the climate in Kansas for economic development for the waste processing industry.

In 1986 the first Conference on Hazardous Waste Research was held at [Kansas State University](#) to present information on new developments and to help identify research needs in Kansas (Erickson, 1986). Conferences were held annually from 1986 through 2002. Conference proceedings are available at <http://www.engg.ksu.edu/HSRC/Proceedings.html>. The state funding was used to support research, which was conducted in academic departments.



Great Plains/Rocky Mountain Hazardous Substance Research Center

In 1988 the U.S. EPA invited proposals to establish five Hazardous Substance Research Centers. The centers were regionally distributed. Through peer review competition, Kansas State University became the headquarters for the [Great Plains/Rocky Mountain Hazardous Substance Research Center](#) (GP/RM HSRC) in February 1989. Montana State University and the Universities of Iowa, Missouri, Montana, Nebraska, and Utah were participating institutions. The center served the needs of federal regions 7 and 8; the states are Iowa, Kansas, Missouri and Nebraska in Region 7 and Colorado, Montana, North and South Dakota, Utah and Wyoming in Region 8.

Kansas State University requested approval to establish the Center for Hazardous Substance Research; Board of Regents approval was received in March 1989 and the Office of Hazardous Waste Research became the Center for Hazardous Substance Research. The State of Kansas funding was used as matching funds for the EPA center award from 1989 - 2002. Support services and a center office were established.

In order to better serve the needs in Regions 7 and 8, additional universities were approved to be participating institutions of the GP/RM HSRC. The U.S. Department of Energy was invited to provide supplemental research funds. The Research and Re-education of Displaced Defense Personnel (R2D2) program was established with Defense funding to educate individuals with military experience to become environmental professionals as they transitioned from military service to civilian employment.



The [Technical Outreach Services to Communities](#) (TOSC) program was established to provide public education to community leaders and other citizens with respect to the remediation of contaminated properties. This allowed a more informed community participation in decisions related to cleanup of these properties. The [Technical Assistance to Brownfields](#) (TAB) program was established to help communities that had properties that were underutilized because of known or possible contamination.

When the U.S. EPA requested help from the Hazardous Substance Research Centers to involve minority academic institutions in the program, [Haskell Indian Nations University](#) and [Lincoln University](#) were invited to become partner institutions and the [Native American and Other Minority Institutions](#) (NAOMI) program was established. The [Technical Outreach Services to Native American Communities](#) (TOSNAC) program was established to provide TOSC services to Native American communities. The GP/RM HSRC provided national leadership for the TOSNAC program, and the needs of all tribes were served through the program.

The Science Advisory Committee and the Technology Transfer and Training Advisory Committee for the GP/RM HSRC provided valuable recommendations and public services. Early in the life of the GP/RM HSRC, the science advisory committee recommended an emphasis on research related to contaminants in soil and groundwater. They also responded favorably to research proposals to investigate the beneficial effects of vegetation in contaminated soil. From 1989 to 2002 there were significant advances related to the use of plants in remediation and stabilization of contaminated soil. The field of phytoremediation was established, and a professional journal, [International Journal of Phytoremediation](#), was started. Multidisciplinary research was encouraged through workshops on the Beneficial Effects of Vegetation in Contaminated Soil and funded projects with investigators from more than one discipline. One of the investigators, Jerry Schnoor was elected to the National Academy of Engineering for his leadership and research on phytoremediation. Several students graduated and became professors with expertise related to phytoremediation. After receiving his Ph.D., Louis Licht established a company, [Ecolotree, Inc.](#), and planted vegetation at sites around the world to implement developments from the research. The American Council of Consulting Engineers selected Ecolotree, Inc. for an Honor Award in 1996 (Griswold et al., 2002).

From 1989-2002, more than \$34,550,000 was expended in support of research and technology transfer through the GP/RM HSRC. The commercial value of the research has been estimated to be more than \$10 for each \$1 that was expended (Davis, 1999). Vegetation has been used beneficially at a large number of sites with very significant benefits. This has included millions of dollars of savings at the Riley County Landfill near Manhattan where trees have been planted to contain the contaminants that leach from the landfill.



Midwest Hazardous Substance Research Center

In 2001, several new Hazardous Substance Research Centers were established. The Center for Hazardous Substance Research received \$1,730,000 in funding for TOSC, TOSNAC, and Brownfields services through the [Midwest HSRC](#), headquartered at [Purdue University](#), from 2001 through 2008. Because of the significant progress in developing the science and technology and because of other priorities, support for the Hazardous Substance Research Centers program was terminated in 2008. That same year, EPA awarded funds to Kansas State University for continuation of the Brownfields services that the Center for Hazardous Substance Research has been providing.

International Activities

In 2001, the Center for Hazardous Substance Research, [Haskell Indian Nations University](#), the [University of Kansas](#) and [Gorno Altaisk State University](#) in Russia began working cooperatively on a drinking water project. The goal of the project was to provide simple methods to test the quality of water supplies and public education on drinking water quality. This was followed by another project on environmental journalism education. Funding was provided by the U.S. government through the Association Liaison Office for University Cooperation in Development. Since 1999, there have been 24 exchange trips, involving 75 travelers. Additional funding was provided by the U.S. EPA and U.S. Dept. of Agriculture. A unifying element of this work has been establishing cultural connections between indigenous people in the U.S. and the Altai Republic, with respect to environmental issues (Griswold and Lukyanenko, 2007). Faculty investigators and center staff have participated in several other international conferences, and many international visitors have come to Kansas State University. Sabine Martin has participated in U.S. EPA cooperative efforts with the German government to advance environmental management and quality.

Nonlethal Environmental Evaluation and Remediation Center

In 2001, \$1,650,000 was received from the U.S. Dept. of Defense to establish the [Nonlethal Environmental Evaluation and Remediation Center](#) with the Center for Hazardous Substance Research as the administrative unit of K-State to lead the project. With this funding, a cooperative effort with [M2 Technologies](#) was initiated. The objective was to help the military develop nonlethal technologies by conducting environmental evaluations. Additional funding was received in 2002 to establish  the [Urban Operations Environmental Laboratory](#); the goal of the effort was to work cooperatively with M2 Technologies to advance environmental evaluations of developing technologies. More than \$13,000,000 has been received for urban operation research since 2002. The multidisciplinary approaches that were successful earlier are being used in the present work for the Dept. of Defense.



With Marine Corps funding, the [Environmental Knowledge and Assessment Tool](#) (EKAT) was developed for the evaluation of new technologies. It is used for environmental assessments and life cycle studies associated with the development of new technologies. Many of its features are useful for environmental management as well (Boguski et al., 2007). Whiteley et al. (2009) have developed features for emergency response and green engineering for use with EKAT. International environmental and regulatory information has

been added to EKAT for applications that are needed by the National Center for Medical Intelligence.

Consortium for Environmental Stewardship and Sustainability

During the last 30 years, environmental management has moved from end of pipe technologies toward pollution prevention, which first increased in importance about 1989. Environmental management systems that include pollution prevention and sustainability have grown in importance. Global climate change, energy conservation, energy efficiency, and renewable energy have become part of sustainability programs. The Center for Hazardous Substance Research has attempted to provide services that respond to the current needs of society. The [Consortium for Environmental Stewardship and Sustainability](#) (CESAS) was organized in 2006 in order to foster communication and cooperation related to sustainability. Dialogs on Sustainability in 2006, 2007, and 2008 have helped to enhance communication and identify opportunities for cooperative efforts. Monthly leadership meetings are held to encourage communication and cooperation among the participating organizations and units of CESAS.

In September 2008, EPA, the Center for Hazardous Substance Research, CESAS partner organizations, and others organized the "From Brown to Green: Sustainable Redevelopment of Contaminated Properties Workshop" which was hosted by Kansas State University. In January 2009, CESAS and the Center for Hazardous Substance Research cosponsored the KSU sustainability conference "Leading Kansas in Sustainability: The Role of K-State". The leadership for this conference was provided by the Director of Sustainability, and some support was provided by the K-State administration.

Substantial Funding and results

The Center for Hazardous Substance Research has participated in more than \$50 million of project funding from 1989 to 2009. More than 150 theses and dissertations have been authored by graduate students and many undergraduate students have worked on research projects. The work during this 20 year period has resulted in more than 600 professional publications. The economic value of the work has been very significant and many communities have been served. The Internet site <http://www.engg.ksu.edu/chsr/> is visited frequently by individuals from all over the world who find valuable information there.

Acknowledgement

The Center for Hazardous Substance Research has worked cooperatively with many K-State faculty, staff, and students, faculty and students from other universities, professionals from M2 Technologies, CABEM, and others. Many have contributed to the positive results that are described above. We wish to thank all who have participated and helped. Wendy Griswold, Sheree Walsh, and Larry Erickson assisted with this report.

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