University of Iowa Study Abroad Programs

International Perspective in Water Resources Planning in India

December 29, 1997 – January 17, 1998

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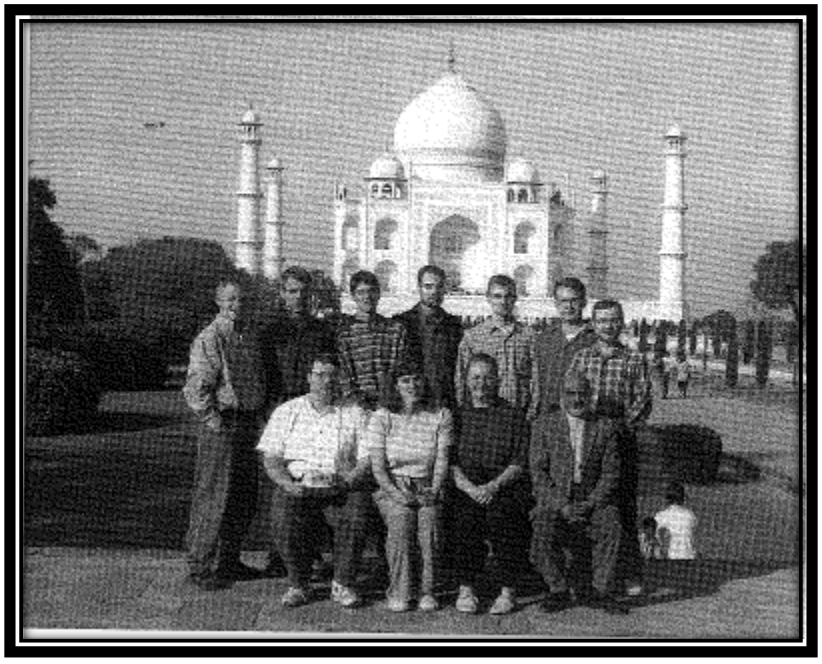
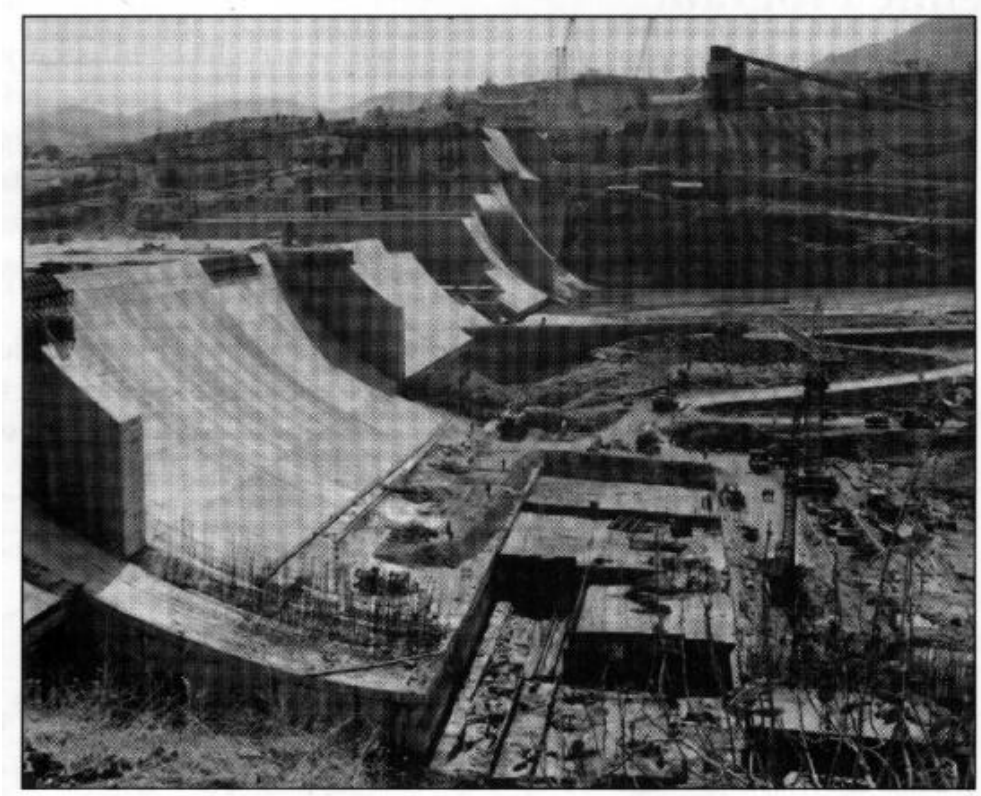


"Students gained invaluable international experience and an appreciation of the many factors that influence water resources planning and management in a developing country. This experience impacted students not only in ways that are easy for them to articulate now, but surely, too, in ways for which they will gain more full appreciation as their careers develop."

- Subhash Jain, IIHR Limited Distribution Report No. 270

University of Iowa Study Abroad Programs

International Perspective in Water Resources Planning in India



December 29, 1997 – January 17, 1998

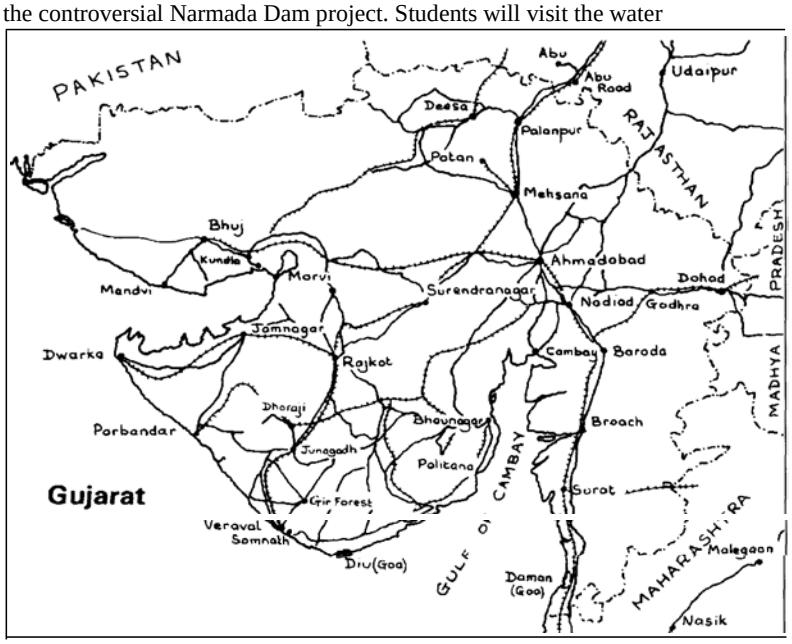
An initiative of Iowa Institute of Hydraulic Research
The University of Iowa College of Engineering, Iowa City USA
in collaboration with
Dharmsinh Desai Institute of Technology, Nadiad India

Purpose

The University of Iowa International Perspective in Water Resources Planning study abroad program focuses each year on a country or a world region for an intensive and in-depth exposure to historical, cultural, social, economic, ethical, environmental, and political conditions that impact water resource projects. The 1997-98 winter break program takes place in India.

Academic Program

The course will start with preparatory lectures on The University of Iowa campus from December 29-30 during the winter break, and finish with post-visit written reports by participants to be completed by April 17,1998. The international visit this year is scheduled to India, from December 31,1997 to January 17,1998. During the visit, students will attend seminars by experts on history, culture, and water resources of India, with special emphasis on planning, socio-economic and environmental impacts, rehabilitation programs and problems, legal and institutional aspects of water resource projects of Gujrat, including the controversial Narmada Dam project. Students will visit the water



resources projects that are operational at the Mahi River and under construction at the Narmada River, an archeological site of the Harappan era in Lothal, and the historical monuments in Agra, Delhi, and Amdavad. Development of this course is a collaborative effort between Iowa Institute of Hydraulic Research and Dharmsinh Desai Institute of Technology, located in the city of Nadiad in India.

Credit and Instructor

Each participant can earn O-3 semester hours of credit depending on agreement on assignments and methods of evaluation of student's work with the instructor, Subhash C. Jain, Research Engineer at Iowa Institute of Hydraulic Research and Professor of Civil and Environmental Engineering at The University of Iowa.

Cost

The estimated cost for the program is $2,690 for University of Iowa participants, and $2,890 for participants not affiliated with the UI. This fee includes round-trip airfare to India, lodging, meals and travel expenses in India all educational and administrative costs.
Financial aid may be applied toward program costs. Students currently receiving federal, state or institutional aid will remain eligible for most forms of support while participating in this program. In addition, selected students may qualify for financial assistance of up to $1,200.

Eligibility

The course is designed for seniors and graduate students who wish to

become engineers, economists, planners, legal and management specialists, and environmental, social and political scientists, and should prepare them for the increasingly international scope of practices and services in the field of water resources planning and management. It is also open to professionals working in these fields.

Application Procedure and Deadline

Completed applications, including a non-refundable application fee of $50, must reach the Study Abroad Center no later than Sept. 30,1997.

For further information and an application, please contact

Office for Study Abroad
28 International Center
The University of Iowa
Iowa City, IA 52242
Phone: (319) 335-0353
Fax: 319-335-2021
e-mail: janis-perkins@uiowa.edu

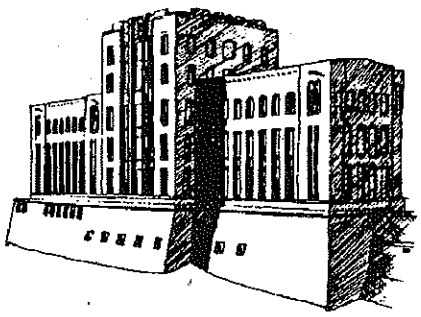

CHINA
PAKISTAN
Roorkee
Delhi
Haridwar
NEPAL
BHUTAN
Udaipur
Agra
Ahemdabad
Nadiad
BANGLADESH
INDIA
Narmada
Dam
MYANMAR
Mumbai

REPORT ON A COURSE ON INTERNATIONAL PERSPECTIVES IN WATER RESOURCES PLANNING

By

Subhash C. Jain

IIHR Limited Distribution Report No. 270



Iowa Institute of Hydraulic Research
College of Engineering
The University of Iowa
Iowa City, Iowa 52242

April 1998

ACKNOWLEDGMENTS

This project owes a great deal to many individuals and organizations for its notable achievement. The contribution of Dharamsinh Desai Institute of Technology, particularly of Prof. G. N. Gandhi, in organizing the Workshop on Irrigation Schemes of Gujarat, coordinating the guided tours to Sardar Sarovar and Mahi Projects, arranging meals, lodging, and travel for the participants, and printing the Workshop Proceedings is very gratefully acknowledged. The assistance of University of Roorkee, particularly of Prof. P. K. Pande, in coordinating seminars on Water Resources of India, arranging guided tours to Ganga Canal Projects and boarding and lodging for the participants, and printing the lecture notes are greatly appreciated. The lively seminar and reception in New Delhi, sponsored by the Central Board of Irrigation and Power under the direction of Mr. C.V.J. Varma, contributed to provide an overview of India's water resources planning well into the next century.

The illuminating lectures on cultural, religious, social and historical aspects of India by Professors P. A. Lutgendorf, F. M. Smith, J. Silliman, and S. Dube of The University of Iowa were greatly appreciated by the participants.

The help of Ms. Judy Holland of Iowa Institute of Hydraulic Research and Becky Embree of Shorts Travel in making travel arrangements is greatly appreciated.

The project jointly was supported by funds from International Programs, College of Engineering, and Iowa Institute of Hydraulic Research of The University of Iowa, Iowa City, Iowa and Summers Engineers, Inc. of Hanford, California.

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REPORT ON A COURSE ON INTERNATIONAL PERSPECTIVES IN WATER RESOURCES PLANNING

I. INTRODUCTION

In practically all engineering-curriculum-related documents emanating from federal agencies and professional societies, mention is made of the need to internationalize our academic programs. In response to that need Iowa Institute of Hydraulic Research (IIHR) took an initiative to develop and implement a new course, "International Perspectives in Water Resources Planning," to focus each year on a country or a world region for an intensive and in-depth exposure to historical, cultural, social, economic, ethical, environmental, and political conditions that impact water resource projects. The course is designed for seniors and graduate students, who wish to become engineers, economists, planners, legal and management specialists, and environmental, social and political scientists, to prepare them for the increasingly global scope of practices and services in the field of water resources planning and management. It is possible for participants to earn up to three semester hours of credit in the Civil and Environmental Engineering Department, depending on agreements with the instructor on assignments and methods of evaluation of student's work.

The first course in a planned series focused on India and was offered during the 1997-98 winter break. It was developed in collaboration with two academic institutions in India: Dharamsinh Desai Institute of Technology (DDIT), Nadiad, Gujarat and University of Roorkee (UOR), Roorkee, Uttar Pradesh.

The main objectives of the course were the following:

(i) Develop international perspectives in water resources planning.

(ii) Provide exposure to planning, design, and management of major water resources schemes in India in general and in Gujarat State in particular.

(iii) Focus on the social, economic, and environmental conditions that impact water resources projects in India.

(iv) Promote better understanding of the historical and cultural aspects both of rural and urban India.

(v) Provide opportunities for exchange of views between Indian and U.S. students.

The assistance of the Office for Study Abroad was sought to announce and promote the course and to process applications for admission to the course. Announcement

brochures were mailed to most USA universities that offer courses in water resources engineering. A copy of the cover of the brochure is included in Appendix A.

II. PARTICIPANTS

A group of about fifteen was considered optimum. Eleven students applied for admission to the course, all of whom were admitted. Two faculty members joined the group. The list of the participants is given in Table 1. The students came from diverse backgrounds. Among them were three females and eight males; two undergraduates and nine graduates; ten from The University of Iowa (UI) and one from Pensacola Christian College; eight engineers and three liberal arts majors; and ten USA citizens and one India citizen.

III. ACADEMIC PROGRAM

The course was led by Dr. Subhash C. Jain, Professor of Civil & Environmental Engineering. The program began in November 1997 with distribution to the participants of the reading material on water resources projects in India and with weekly meetings involving the participants. The weekly meetings were used for discussing the course program, for reviewing the reading material, for showing video tapes on India, and for conducting a series of introductory lectures, by invited speakers on cultural, religious, social and historical aspects of India. The program then culminated in a visit to India from December 30, 1997 to January 18, 1998. Technical lectures were presented in India through a workshop on "Irrigation Schemes of Gujarat" held from January 1, 1998 to January 7, 1998 at DDIT and a seminar on " Water Resources of India" held from January 12 to January 14, 1998 at UOR. The participants visited water resources projects that were operational at the Mahi River and the Ganga Canal and under construction at the Narmada River. They also visited an archeological site of the Harappan era and places of historical and cultural importance. They had opportunities to participate in cultural events. A copy of the detailed itinerary in India is included in Appendix B.

A. READING MATERIAL

A bibliography of recommended reading material is given in Table 2. Participants visited two major water resources projects in India, namely, the Sardar Sarovar and Mahi

River Projects, and reading material was provided for each. References 1 to 3 are related to these two projects. The effect of water resources projects on the environment is gaining ever-increasing importance in planning of these projects. References 4 and 5 deal with the topic of environmental impact assessment. The World Bank finances most of the large water resources projects in developing countries. Considerations in World Bank Projects are discussed in Reference 6. UNESCO policy on environment and development is included in Reference 7. The development of a water resources project invariably leads to the displacement of people from the river valley. The issue of resettlement of displaced people is addressed in References 8 and 9. The participants also visited several historical places in India. Descriptions of historical sites also were provided to the participants.

B. INTRODUCTORY LECTURES

A series of introductory lectures was arranged to provide the participants some historical, cultural, religious, and ethical background of India. The speakers' names and affiliations, and titles of their talks were announced in a flier which is attached as Table 3. Four of the speakers are faculty members in The University of Iowa (UI) College of Liberal Arts who had spent significant amounts of time in India and are well known experts in their respective fields. The other speaker, Ms. Janis Perkins, is the Director of UI's Office of Study Abroad. She advised students about traveling abroad. The talks were informal and speakers interacted with students to answer many questions. Some staff members of IIHR regularly attended the talks and found them to be very informative. The participants found these introductory lectures to be of immense value and help in preparing them for their trip to India.

C. TECHNICAL LECTURE SERIES

Two technical lecture series, one at DDIT and the other at UOR were arranged. The DDIT workshop on "Irrigation Schemes of Gujarat" focused on two major water resources projects of Gujarat State, namely, the Sardar Sarover and Mahi River projects. Selection of these projects was based on the facts that the former has attracted global attention as one of the biggest multipurpose water resource projects under construction in India, and the latter is the most successfully completed and managed irrigation schemes of India. The seminar held at UOR emphasized the water resources of the country as a whole rather than case studies. In addition, a very informative talk on water development in India was presented

by a distinguished speaker from Central Board of Irrigation and Power, during a reception they hosted in New Delhi.

WORKSHOP AT DDIT

The workshop was attended by about sixty participants (Photo 1) which included students and faculty members from UI and DDIT, faculty members from other engineering colleges, engineers from Gujarat Irrigation Department, and other civil engineering professionals. A bound volume of the papers presented in the Workshop was handed out to each participant at the beginning of the workshop session. A copy is available in the Reference Room of the Iowa Institute of Hydraulic Research.

The technical lectures in the Workshop were presented over two days. The first set of lectures was on Saradar Sarovar Dam and covered the following topics:

(i) History, Planning, and Need; Technical and other hurdles
(ii) Social and Ecological Impact
(iii) Design and Quality Control of Dam & Allied Structures
(iv) Canal Distribution System
(v) Canal Automation
(vi) Environment Protection and Rehabilitation & Resettlement Policy and Progress

The second set of lectures was on the Mahi Irrigation Project and covered the following topics:

(i) Planning and Management Aspects
(ii) Operation and Maintenance of Head Work and Canal Systems
(iii) Economic and Social Impact
(iv) Environmental Impact

SEMINAR AT UOR

The seminar was held over three days. Lectures were presented on the following topics:

(i) Water Resources of India
(ii) Some Aspects of Groundwater Scenario in India
(iii) Potential for Hydro Energy
(iv) Policy for Water Charges

(v) Development Alternatives - The Environmental Issue

(vi) Sustainable Development of Water Resources

Copies of the lecture notes were distributed at the beginning of the seminar. As the participants were to visit the Ganga Canal Works, a lecture on cross drainage and diversion structures for canals also was organized.

D. VISIT TO WATER RESOURCES PROJECTS

Three technical tours to visit water resources structures were organized: first, to Narmada Project in Southern Gujarat, second, to Mahi Project in Northeastern Gujarat and third, to Ganga Canal Project in Northwestern Uttar Pradesh. The USA participants had been given substantial historical and technical background about these projects during their orientation lectures at IIHR and the workshop at DDIT and seminar at UOR. Some students and faculty members from DDIT also joined the participants on the first two trips.

NARMADA PROJECT

A two-day tour to Narmada Project site was arranged. On the first day, the group visited the Model Room, Sardar Sarovar Dam (Photo 2), Canalbed Powerhouse, and Riverbed Powerhouse at Kevedia Colony. Engineers from Sardar Sarovar Narmada Nigam Limited (SSNNL) explained the technical features of the dam and allied structures. On the second day, the group visited the canal distribution system, which included the head regulator, main canal, intake structures to branch canals, and various cross-drainage works. The major aqueduct on Mahi River, which was under construction, was also visited. The technical tour terminated at a resettlement colony of Narmada Project. This was one of the colonies where the people whose villages were submerged by the construction of the Sardar Sarovar Dam were rehabilitated. The group members saw the facilities provided to the displaced families.

MAHI IRRIGATION PROJECT

A one-day tour to Mahi Irrigation Project included a visit to the diversion weir at Wanakbori and the main dam at Kadana. Irrigation engineers from Mahi Irrigation Project accompanied the group and described the technical aspects of the project. At the weir the

group saw the Hydroplus fuse gate system and the repair work in the Mahi Canal. The group got a chance to visit the inspection gallery in the main dam at Kadana.

GANGA CANAL WORKS

The Ganga Canal is one of the oldest canals in operation in India. The group visited a number of cross-drainage structures on the canal that are over 150 years old. Some of these structures are no longer safe and a 20-mile reach of the canal is being replaced by a new canal reach. The group saw the construction on the new canal, including the construction of a new aqueduct. The tour terminated at the canal headworks at Hardwar. An engineer from the Irrigation Department of Government of Uttar Pradesh accompanied the group and explained the technical details of the canal structures.

E. VISIT TO HISTORICAL SITES

One of the objectives of the course was to promote better understanding of the historical and cultural aspects of rural and urban India. Visits to the following historical places and cultural events were organized.

IN AND AROUND AMDAVAD

Lothal - This place is about 80 km south of Amdavad and is known for the remains of a city which stood here 4500 years ago (Photo 3). The ancient city had a neatly laid-out street pattern, an intricate system of surface and underground drains, carefully assembled brickwork, and a very large rectangular basin probably for docking trade ships. The artifacts found at the site are displayed in a museum there.

Sabarmati Ashram - This ashram was founded in 1918 by Mahatma Gandhi and was his headquarters during the Indian independence movement. Gandhi's spartan living quarters are preserved as a small museum.

Adalaj Vav - This is one of the finest of the Gujarati step wells, built some 500 years ago, and is located about twenty kilometers from Amdavad.

Sidi Saiyad's Mosque - This small mosque is noted for its beautiful carved stone windows, formed by the intricate intertwining of the branches of a tree.

Hathee Singh Temple - This Jain temple, made of white marble, was built in 1848.

Vishala - An interesting place where one dines in Indian fashion, seated on the floor, with food served on leaves, while watching local dancing and a puppet show. The participants took part in the dancing.

IN AND AROUND UDAIPUR

Ranakpur Jain Temple - This huge and extremely beautifully crafted marble Jain temple (Photo 4), built in 1439, is located in a remote valley of the Arravalli Range and is about 98 kilometers from Udiapur. It has 29 halls supported by 1444 pillars, no two alike in carving details.

City Palace - This is the largest palace complex in Rajasthan. The main part of the palace is now preserved as a museum with a varied collection.

Lake Palace - This palace was built in 1754 on an island in the Pichola lake. Today it has been converted into a luxury hotel. The easiest way to see this is to eat buffet dinner there, which the participants did.

Saheliyon Ki Bari - This is a small garden with fountains, kiosks, marble elephants, and a lotus pool.

DELHI

Qutab Minar - It is a 73 meters high tower which was completed in 1368. The tower has five stories; the bottom three are made of red sandstone, and the top two of marble and sandstone.

Humayun's Tomb - This tomb was built in mid-16th century by the wife of Humayun, the second Moghul Emperor and is an early example of Moghul architecture.

India Gate - The 42-meter high stone arch of triumph stands at the eastern end of Raj Path.

Raj Ghat - Mahatma Gandhi was cremated in 1948 at this place. It is visited by most dignitaries of the world.

HARDWAR

Har Ki Pairi - It is the most important bathing ghat for Hindus, as it is supposed to be at the spot where Ganga leaves the mountains and enters the plains. It is interesting to watch the Arati ceremony at sunset.

IN AND AROUND AGRA

Taj Mahal - A trip to India is never complete without visiting this most famous Moghul monument, which was constructed in white marble (Photo 5) during 1631-53 by Emperor Shah Jahan in memory of his wife Mumtaz Mahal. Semiprecious stones are inlaid into the marble in beautiful patterns.

Agra Fort - The fort was constructed by Moghul Emperor Akbar in 1565. There are many fascinating buildings inside the massive 20-meter thick walls which stretch for 2.5 kilometers and are surrounded by a moat over 10-meter wide.

Akbar's Mausoleum - At Sikandra, 10 km from Agra, the tomb of Akbar lies in the center of a large garden. A combination of Muslim and Hindu architectural styles, the building is built of red sandstone inlaid with white marble polygonal patterns.

Fatehpur Sikri - Between 1570 and 1586, during the reign of Emperor Akbar, the capital of the Moghul Empire was situated here, 40 km from Agra. It was abandoned due to severe water shortages. There are many well-preserved monuments and buildings that are worth visiting.

Bhartpur Bird Sanctuary - A variety of birds, 117 of which migrate as far away as Siberia and China, can be seen in this bird sanctuary which is about 50 km from Mathura.

F. CULTURAL EVENT

As a part of the workshop, a three-hour cultural program was arranged at DDIT. Folk dances from different regions of India were performed by young people of Hindu Anath Ashram (orphanage), Nadiad. The USA participants reciprocated with impromptu performances of their own (Photo 6).

IV. PARTICIPANTS' REMARKS

An obligation of the travel award required the USA participants to submit a report of their perspectives of the trip. Copies of their trip reports are placed in the course file at IIHR. The participants had a wonderful experience and all of them recommend such a trip to others. Here are some of their observations:

"...It has made me a better person, ... the preparation for our trip to India was quite commendable....I was pleased with our workshop at DDIT. These lectures gave us an entirely new outlook on the issues related to water resources in India... meeting with the

students at the DDIT was an invaluable experience. It was one of the most important part of the trip....this experience will be invaluable to me in my professional career....an area to be improved upon is the information given to us about immunizations"

".. selecting a diversified group of students for this course was an excellent idea....The sessions and meetings I attended prior to the trip were very worthwhile and interesting.....I really liked how every day was specifically planned with tours, lectures, meals and activities... I would suggest lightening up the schedule during the first few days ....One of my favorite parts of the trip was interacting with the students from DDIT. They were wonderful "personal tour guides".... It is difficult to express all that I gained through the program, not only as a future engineer in global business market, but as a person....."

".... my experience in India was altogether worthwhile and I was very much satisfied with my investment of time and money.....I hope this class will continue..... One of the specific activities that benefited most was spending extended amounts of time with students from the host country.... any such class in future should include time for students to become aquatinted with their peers ....Preparation for the course was adequate and it was good that we were provided with a lot of reading material before the trip....The trip could be improved by broadening the scope of the seminars...other possible speakers would include economists, people from the environmental movement, politicians, and contractors....spend less time traveling...bus rides were rather long ...."

"...I thoroughly enjoyed the trip and would recommend the course to anyone...The aspect I enjoyed the most about the trip was being able to interact with the students ....Informing students of the time required to get all the immunizations might help..."

".. . trip was extremely valuable both personally and professionally... well organized and executed.... interaction with the DDIT students to be very valuable asset...site visits were more valuable than the technical lectures....had been provided more and earlier guidance..(e.g., passports, visas, immunizations)...

"... It was an enriching experience both technically and culturally and exceeded all my expectations.....lot of time to interact and socialize with students and faculty from India...good mix of technical, cultural, historical, and religious aspects.... 20 days was a long time to be away .....days were fairly long and demanding....more access to familiar foods could have helped..."

"This study/tour was one of the grandest adventures that I have undertaken. ....the interaction with the students at DDIT was very good... was impressed how they opened their homes to us....reading before I went to India helped me immensely.... should continue this program... "

" ...Even though I am from India, most of the places that we visited were new to me and brought immense cultural variety of my country.... The meeting with Indian students at DDIT was also enjoyable ...."

V. ARRANGEMENTS

All the arrangements for the lodging, boarding, and travel were made by DDIT for the first nine days of the trip and by UOR for the last nine days of the trip. The speakers for the workshop at DDIT were selected by Professor G. N. Gandhi of DDIT. Professor P. K. Pande of UOR was responsible for selecting the speakers for the seminar at UOR.

VI. COST

The cost for the program was about $2450 per participant. It included round-trip airfare to India, lodging, meals, and travel expenses in India. The approximate distribution of the expenses is as follows:

Round-trip airfare to India	$1500
Travel in India	250
Meals	300
Hotel	200
Honorarium and traveling expenses for speakers	100
Miscellaneous expenses	100
Total	$2450

VII. SUMMARY

The objectives of this first offering of the course on International Perspectives in Water Resources Planning, which focused on India, were to help students develop international perspectives, provide students with exposure to the background and management of water resources projects and focus on socio-economic and environmental conditions that impact water resources projects in India, to promote better understanding of the historical and cultural aspects both of rural and urban India, and to provide U.S. students with opportunities to interact with their Indian counterparts. Prior to their departure for India, participants were given reading material and they attended a series of preparatory lectures. In India, they attended technical lectures, participated in workshops and visited several technical and cultural sites. Participants are unanimous in the opinion that the basic organization and conduct of this course was sound and that the objectives of the course were met. Students gained invaluable international experience and an appreciation of the many factors that influence water resources planning and management in a developing country. This experience impacted students not only in ways that are easy for them to articulate now, but surely, too, in ways for which they will gain more full appreciation as their careers develop.

The high praise that this course received from students and their opinions that the course should be continued encouraged IIHR immediately to launch organization of the next course, which will be held in May 1999 in Taiwan and Japan, and preliminarily to plan for a course in China for the year 2000.

It is felt that for future courses increased effort should be made to attract greater participation of students from outside UI and from other disciplines in order to enhance the experience of participants by giving them benefit not only of interacting with students from the host country, but of the views and perspectives of students from outside their immediate cluster. It also is felt that more financial support from outside sources is needed to underpin this activity in order to minimize the financial burden on students and make it affordable for them.

Table 1 - List of Participants

Name	Professional Status	Major	Institution	Address
1. Pratyusha Basu	Graduate Student	Geography	University of Iowa	810 W Benton Iowa City IA 52246
2. Mathew D. Cole	Graduate Student	Civil & Env. Engineering	University of Iowa	2801 Hwy 6 E #229 Iowa City, IA 52240
3. Blair P. Greimann	Graduate Student	Civil & Env. Engineering	University of Iowa	561 Hawkeye Ct. Iowa City, IA 52246
4. James E. Hollenbeck	Graduate Student	Biology	University of Iowa	179 Hawkeye Ct. Iowa City, IA 52246
5. Jennifer K. Holman	Graduate Student	Civil & Env. Engineering	University of Iowa	712 Bay Ridge Drive Iowa City, IA 52246
6. Elizabeth A. Youngwirth	Senior Student	Mechanical Engineering	University of Iowa	3534 70th St., #301 Moline, IL 61265
7. Brian R. Nelson	Graduate Student	Civil & Env. Engineering	University of Iowa	614 E Jefferson #9 Iowa City, IA 52245
8. Kevin D. Nielsen	Graduate Student	Civil & Env. Engineering	University of Iowa	101 Raven St. Iowa City, IA 52245
9. Jason E. Seeley	Junior Student	Physical Education	Pensacola Christian College	Box 1277 250 Brent Lane Pensacola FL 32503
10. Eric D. Shumate	Graduate Student	Civil & Env. Engineering	University of Iowa	2009 Davis St. Iowa City, IA 52240
11. James J. Yienger	Graduate Student	Civil & Env. Engineering	University of Iowa	1207 Semour Ave Iowa City, IA 52240
12. Subhash C. Jain	Professor	Civil & Env. Engineering	University of Iowa	914 Talwrn Ct. Iowa City, IA 52246
13. Virendra C. Patel	Professor	Mechanical Engineering	University of Iowa	60 Kennedy Pky. Iowa City, IA 52246

Table 2 - Bibliography of Reading Material

1. Paranjape, V., (1990). Economic Analysis of the Sardar Sarovar Project, Chapter 4 in High Dams on the Narmada: A Holistic Analysis of the River Valley Projects, Studies in Ecology and Sustainable Development 3, Published by Indian National Trust for Art and Cultural Heritage (INTACH), New Delhi.

2. Santhi, S., (1994). Sardar Sarovar: The Issue of Developing River Narmada, Published by Indian National Trust for Art and Cultural Heritage (INTACH), Southern Regional Office for Environmental Education and Research, Thiruvananthapuram.

3. Michael, A. M., (1987). Environmental Impact Assessment of a Major Water development Project in India: A Case Study of the Mahi Right Bank Canal System, Gujarat, Chapter 4 in Environmental Impact Assessment for Developing Countries by A. K. Biswas and Q. Geping (Eds.), Tycooly Publishing.

4. Biswas, A. K., and Geping, Q., (1987). Guidelines for Environmental Impact Assessment in Developing Countries, Chapter 7 in Environmental Impact Assessment for Developing Countries by A. K. Biswas and Q. Geping (Eds.), Tycoon Publishing.

5. McCully, P., (1996). The Wise Use of Watersheds, Chapter 7 in Silenced Rivers: The Ecology and Politics of Large Dams, Published by Zed Books, New Jersey.

6. Dixon, J. A., Talbot, L. M., and Le Moigne, Guy J. M., (1989). Dams and the Environment: Considerations in World Bank Projects, Annex. India: Narmada Projects, World Bank Technical Paper No. 110.

7. The Rio Declaration on Environment and Development.

8. McCully, P., (1996). We Will Not Move: The International Anti-Dam Movement, Chapter 10 in Silenced Rivers: The Ecology and Politics of Large Dams, Published by Zed Books, New Jersey.

9. Parkash, V. A., Indian Scenario on Involuntary Developmental Resettlement Past & Future Perspective, Publication No. 242, Central Board of Irrigation and Power, Malcha Marg, Chanakyapuri, New Delhi.

Table 3 - Announcement of Introductory Lectures

International Perspective in Water Resources Planning
Study Abroad Program

A group of students in the study abroad program is visiting India during the coming winter break. The following informal seminars have been arranged on historical, cultural, social, and religious aspects of India. Everybody is invited to the seminars.

Tuesday, November 4, 1997; 4:00 - 5:00 P.M.; Room 100, Hydraulics Laboratory
Philip A. Lutgendorf,
Professor, Department of Asian Languages & Literature
"Cultural Significance of Historical Sites"

Wednesday, November 12, 1997; 1:00-2:00 P.M.; Room 100, Hydraulics Laboratory
Federick M. Smith
Professor, Department of Asian Language & Literature
"Religion in India"

Thursday, November 20, 1997; 4:00 - 5:00 P.M.; Room 100, Hydraulics Laboratory
Jael M. Silliman
Visiting Professor, Women's Studies
"Ethical Issues of Sardar Sarovar Project"

Tuesday, December 2, 1997; 4:00 - 5:00 P.M.; Room 100, Hydraulics Laboratory
Saurabh Dube
Visiting Professor, Department of History
"Indian History"

Thursday, December 4, 1997; 4:00-5:00 P.M.; Room 100, Hydraulics Laboratory
Janis Perkins
Director, Office for Study Abroad
"TIPS for Students Traveling Abroad"

For additional information call Professor Subhash Jain at 335-5217.

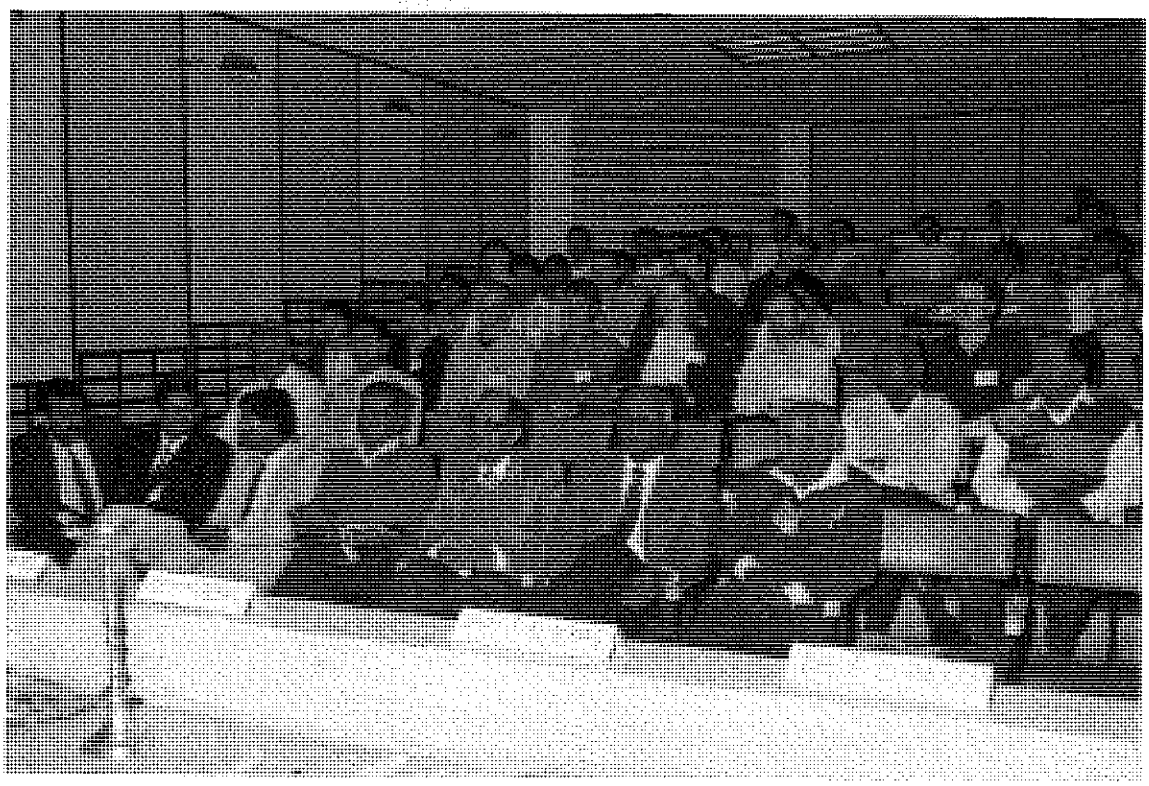


Photo 1. Participants in workshop at DDIT.

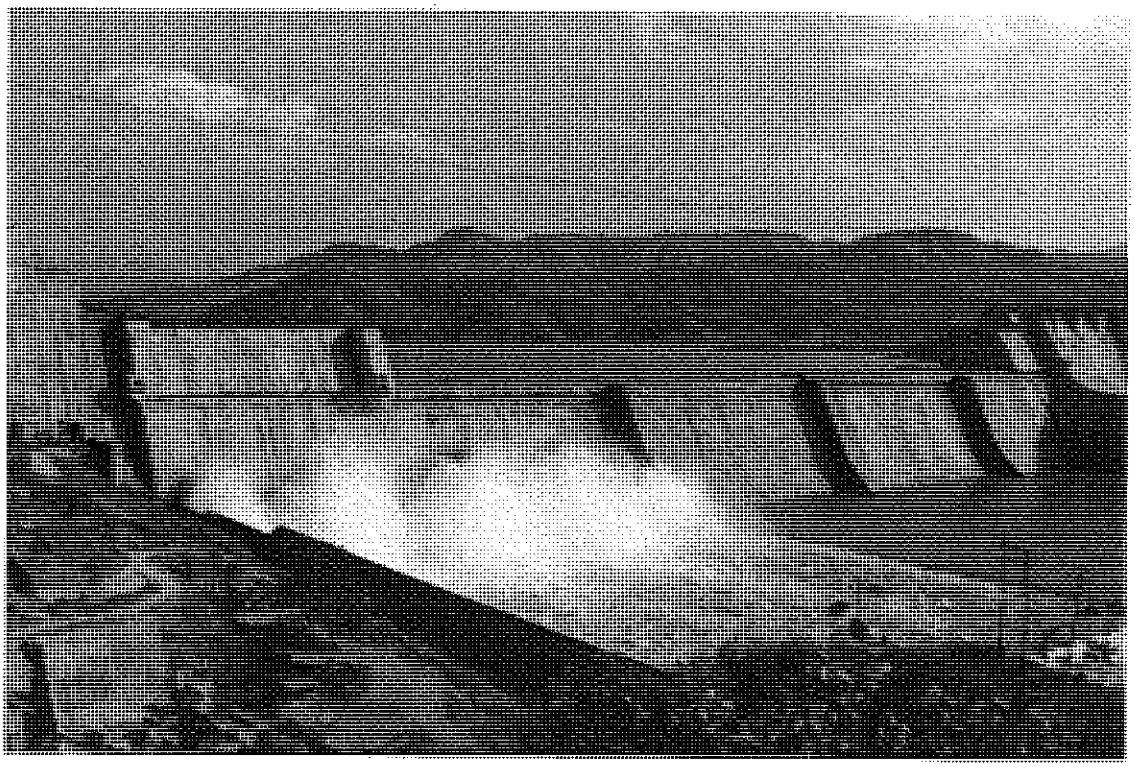


Photo 2. Sardar Sarovar Dam

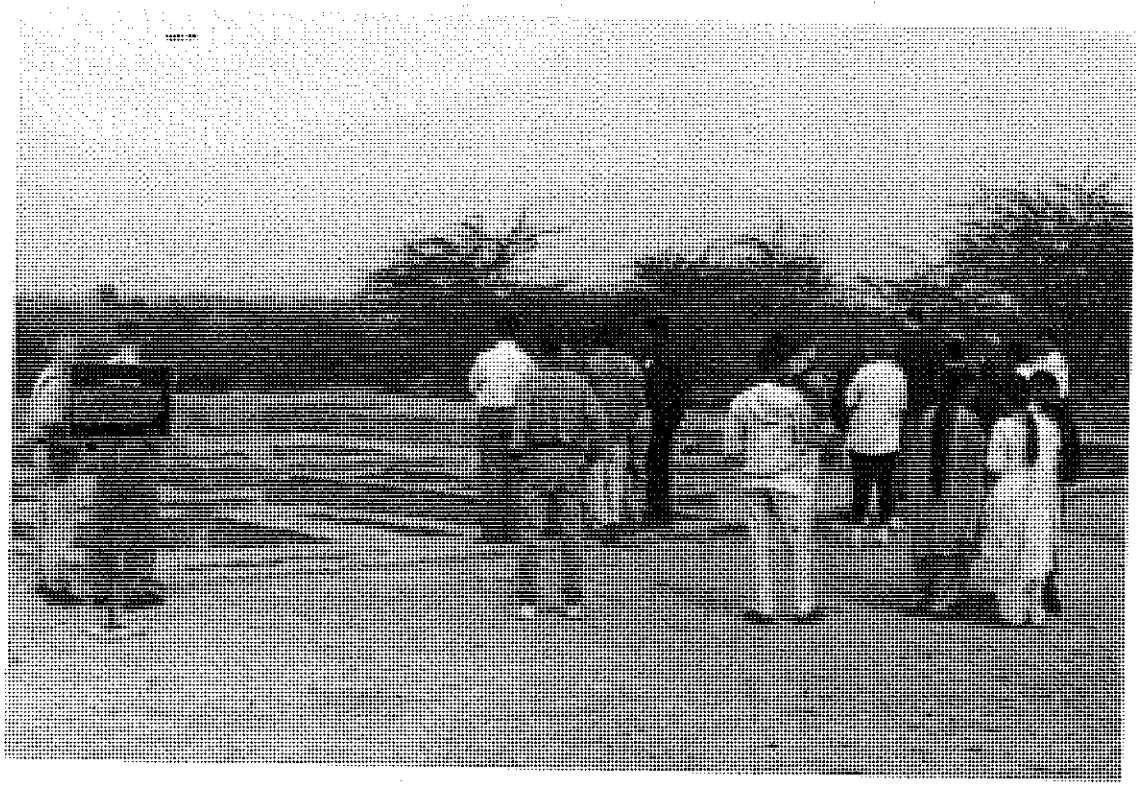


Photo 3. Archeological site of Harappan era at Lothal.

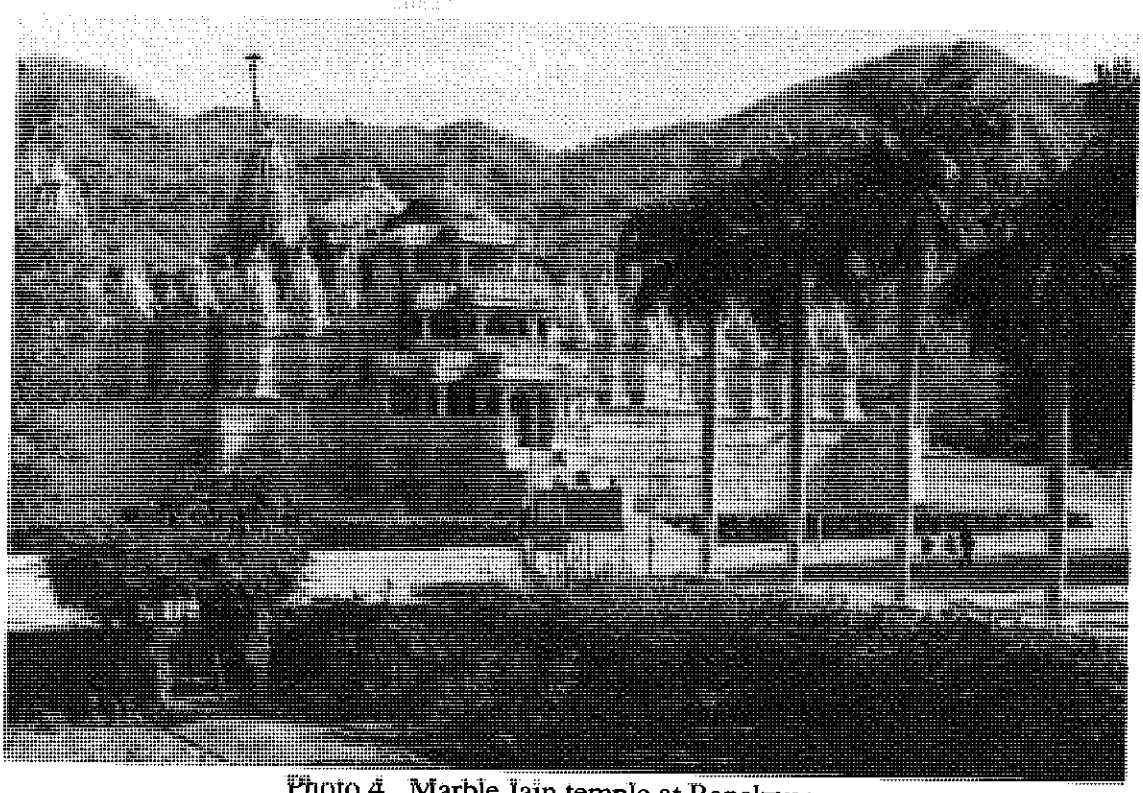


Photo 4. Marble Jain temple at Ranakpur.

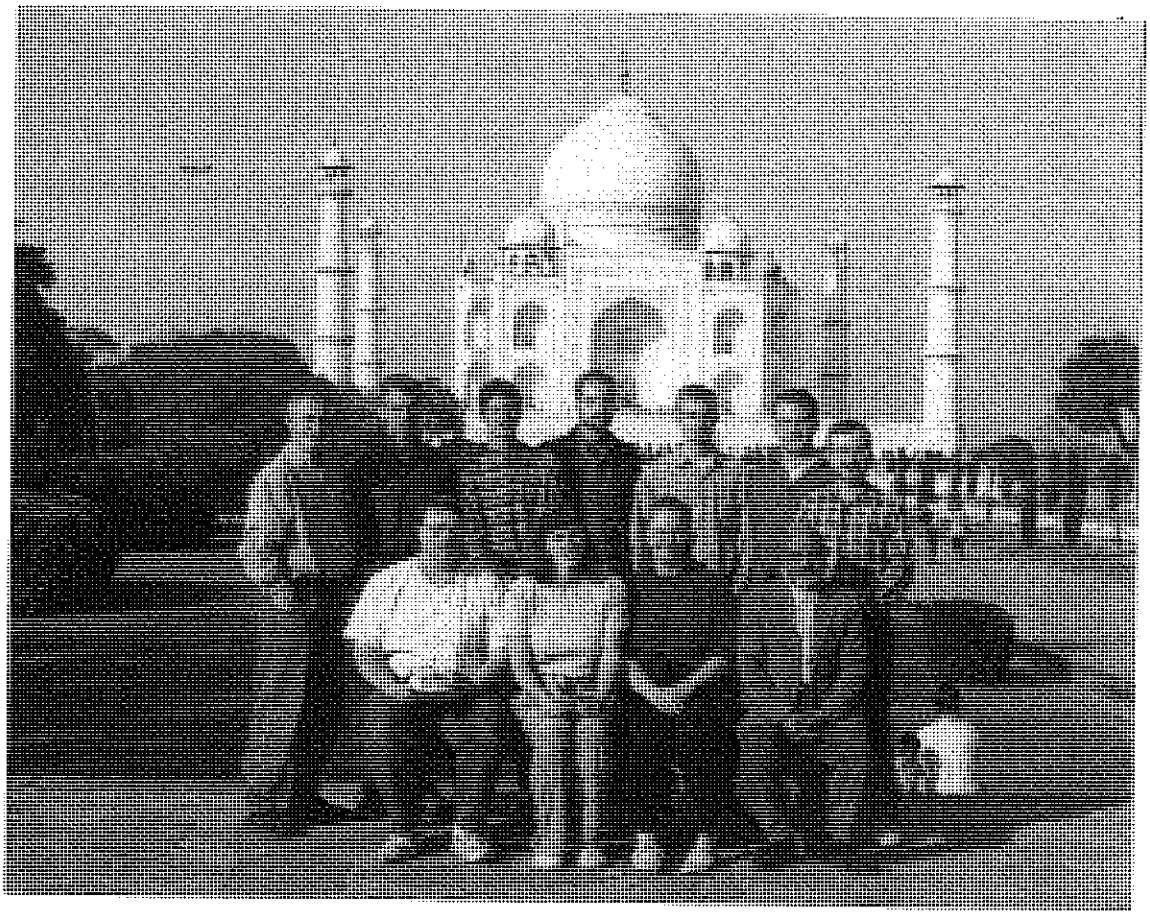


Photo 5. Taj Mahal at Agra.

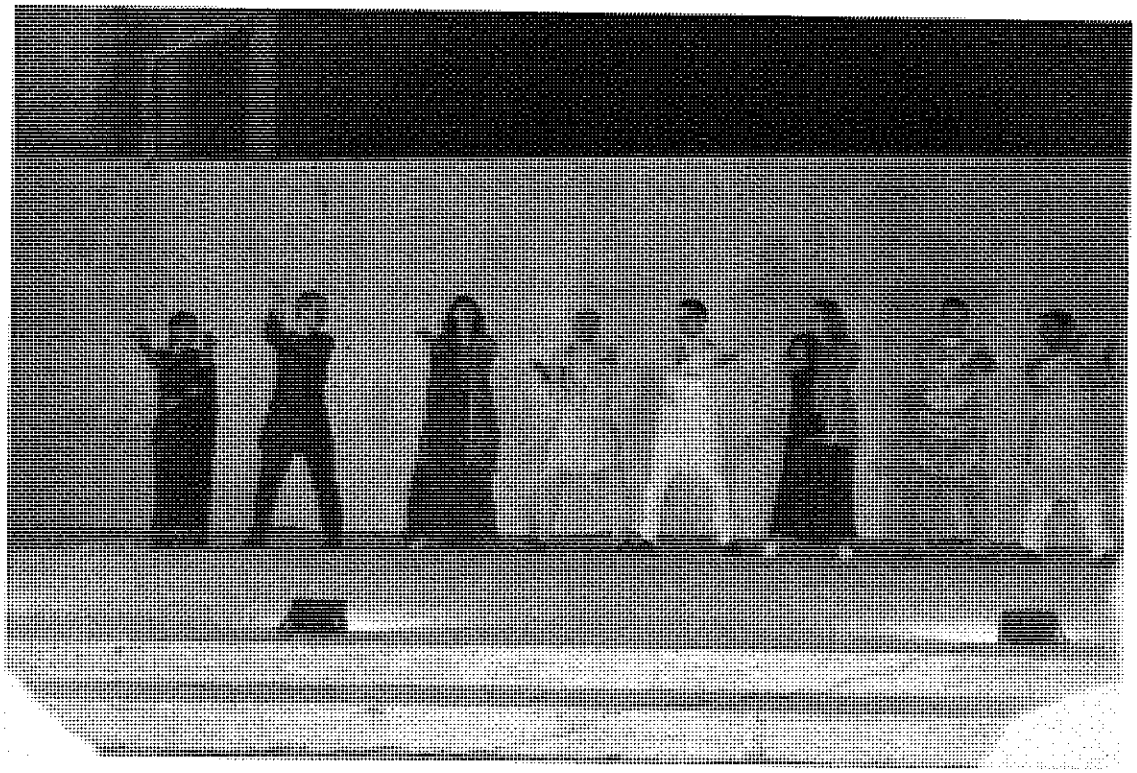


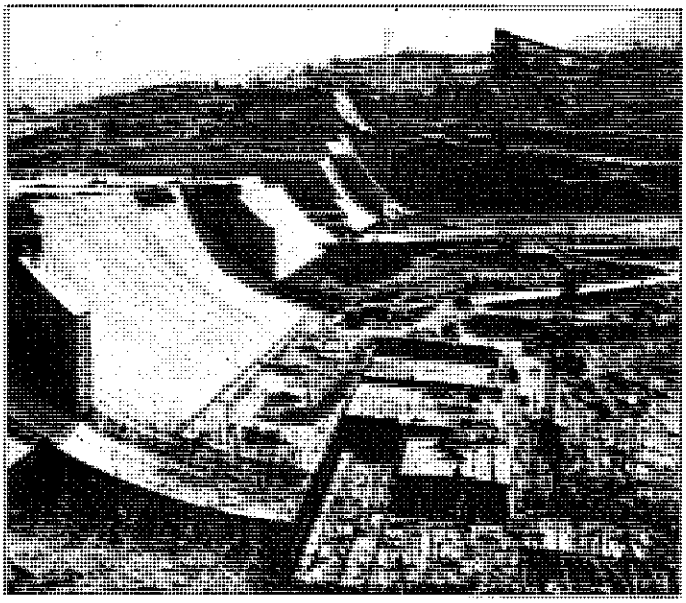
Photo 6. US participants in cultural program at DDIT.

APPENDIX A

BROCHURE

University of Iowa Study Abroad Programs

International Perspective in Water Resources Planning in India



December 29, 1997- January 17, 1998

An initiative of Iowa Institute of Hydraulic Research
The University of Iowa College of Engineering, Iowa City USA
in collaboration with
Dharmsinh Desai Institute of Technology, Nadiad India

APPENDIX B

PROGRAM FOR THE COURSE

"INTERNATIONAL PERSPECTIVE IN WATER RESOURCES PLANNING IN INDIA"

Tuesday 30th December 1997

1343	Leave for Chicago; UA 1756
1434	Arrival at Chicago
1915	Leave for Mumbai; AI 122

Thursday 1st January 1998 *Venue: Amdavad*

Time	***Topic***	***Speaker/Guide***
0020	Arrival at Mumbai	
0140	Leave for Amdavad; AI 612	
0245	Arrival at Amdavad Airport	
0245-0345	Custom Clearance	
0415	Check-in Hotel	
0930-1000	Breakfast	
1000	Departure for Lothal	Shri M. R. Bhagat
1200	Arrival at Lothal	Shri M. R. Bhavsar
1200-1330	Excavations and Museum	
1330-1430	Lunch	
1430	Leave for Ghandhinagar	
1700-1830	Visit Akshardham Temple	
1830-2030	Dinner at Vishala	

Friday 2nd January 1998 *Venue: Amdavad/Ujala*

Time	***Topic***	***Speaker/Guide***
0800	Check-out Hotel	
0800-0900	Breakfast	
0900-1015	Sabarmati Asharam	Shri M. R. Bhagat
10-15-1130	Adalaj Step Well	Shri M. R. Bhavsar
1130-1300	Bus Tour of Amdavad	
1300-1400	Lunch	
1400-1500	Bus Tour of Amdavad Continues	
1500	Leave for Nadiad	
1630	Arrival at Nadiad, Check-in Hotel	
1700-1830	Welcome Ceremony & Briefing Session	
1630-1830	Visit DDIT Campus	
1830-1930	Dinner at Rose Garden	
1930-2230	Movie "Gandhi"	

Saturday 3rd January 1998 *Venue: DDIT*

Time	*Topic*	*Speaker/Guide*
0800-0830	Breakfast	
0830-0910	**Inauguration**	
0910-0950	**Water Resources of Gujarat** (Keynote Address)	Shri C. C. Patel Secretary (Rtd), Irrigation Dept. Govt. of Gujarat, Gandhinagar
0950-1030	**Narmada Development Project** History, Planning, Need, Award of NWDT, Technical and other hindrances	Shri N. B. Desai Secretary & Director (Civil), SSNNL, Gandhinagar
1030-1045	Tea Break	
1045-1130	**Narmada Development Project** Social & Ecological Impact	Dr. S. D. Sabnis M. S. University of Baroda
1130-1230	**Narmada Development Project** Design & Quality Control of Dam and Allied Structures	Shri G. L. Jawa Chief Engineer (Design) SSNNL, Baroda
1230-1340	Lunch	
1340-1430	**Narmada Development Project** Canal Distribution System, C. D. Works	Shri P. M. Soni Chief Engineer (Design) SSNNL, Gandhinagar
1430-1520	**Narmada Development Project** Canal Automation	Shri A. B. Mandavia Chief Engineer (MIS) SSNNL, Gandhinagar
1520-1610	**Narmada Development Project** Environmental Protection Measures-Planned & Progress, Rehabilitation & Resettlement-Policy and Progress	Shri V. C. Trivedi, IAS Jt. Commissioner & Jt. C. E. O., SSPA Gandhinagar
1610-1630	Tea Break	
1630-1730	**Panel Discussion on Narmada Development Project**	Experts from SSNNL
1900	Dinner	

Sunday 4th January 1998 *Venue: Narmada Dam*

Time	*Topic*	*Speaker/Guide*
0700-0730	Breakfast	
0730	Leave for Narmada Dam Site	Prof. D. G. Panchal
1100	Arrival at Narmada Dam Site	Prof. A. V. Thomas
1100-1130	Check-in Guest House & Tea	
1130-1230	Visit Model Room	
1230-1330	Lunch	
1330-1800	Visit Main Dam, Power House, etc.	
1800-1930	Dinner	

Monday 5th January 1998 *Venue: Narmada Dam*

Time	*Topic*	*Speaker/Guide*
0800-0830	Breakfast	
0830-1000	Visit Head Regulator	Prof. D. G. Panchal
1000-1020	Tea Break	Prof. A. V. Thomas
1020	Leave for Aqueduct Site	
1130-1300	Visit Aqueduct	
1300-1400	Lunch	
1400-1500	Visit Resettlement Site	
1500-1700	Visit Main Canal	
1700	Leave for Nadiad	
1930-2100	Visit Braham Jyoti at Mogri & Dinner	
2130	Arrival at Nadiad	

Tuesday 6th January 1998 *Venue: DDIT*

Time	*Topic*	*Speaker/Guide*
0830-0900	Breakfast	
0900-1030	**Lecture on Design & Construction of Safe Dams, Safety of Dams**	Prof. G. N. Gandhi Head, Dept. of Civil Engg. DDIT
1030-1110	Tea Break	
1110-1200	**Mahi Irrigation Project** Background, Planning Features & Management Aspects	Shri O. T. Gulati Jt. Secretary, Irrigation Govt. of Gujarat
1200-1250	**Mahi Irrigation Project** Head Work & Canal System Operation & Maintenance	Dr. V. M. Yagnik Supdt. Engineer Mahi Irrigation Circle, Nadiad
1250-1400	Lunch	
1400-1450	**Mahi Irrigation Project** Economical & Social Impact	Dr. A. S. Patel Prof. of Economics S. P. University Vallabh Vidyanagar
1450-1540	**Mahi Irrigation Project** Environmental Impact	Prof. P.M. Modi Retd. Director WREMI (MSU)
1540-1630	**Discussion on Mahi Irrigation Project**	Experts from Mahi Irrigation Project
1630-1800	Local Visit	Prof. K. N. Sheth Shri R. A. Desai
1800-1900	Dinner	
1900-2100	Cultural Program	Prof. D. G. Panchal Shri M. R. Bhagat

Wednesday 7th January 1998 *Venue: Mahi Dam*

Time	*Topic*	*Speaker/Guide*
0830-0900	Breakfast	
0900	Leave for Mahi Project	Prof. K. N. Sheth
1030	Arrival Wanakbori Weir	Shri S. S. Khandelwal
1030-1100	Tea Break	
1100-1200	Visit Wanakbori Weir.	
1200-1300	Lunch	
1330	Arrival Kadana Dam on Mahi River	
1330-1500	Visit Kadana Dam	
1500	Leave for Udaipur	
1630-1700	Tea Break	
2100	Arrival at Udaipur, Check-in Hotel	
2130	Dinner	

Thursday 8th January 1998 *Venue: Hotel RTDC*

Time	*Topic*	*Speaker/Guide*
0830-0900	Breakfast	
0900	Leave for Ranakpur	
1200	Arrival at Ranakpur	
1200-1300	Visit Ranakpur Temple	
1300-1400	Lunch	
1400	Leave for Udaipur	
1800-2100	City Palace and Buffet dinner	

Friday 9th January 1998 *Venue: Hotel RTDC*

Time	*Topic*	*Speaker/Guide*
0830-0900	Breakfast	
0900-1200	City Palace and Museum	
1200-1300	Lunch	
1300-1330	Sahelion Ki Bari	
1330-1700	Free time	
1700	Leave for Udaipur Railway Station	
1805	Leave for Delhi	

Saturday 10th January 1998 *Venue: YMCA, Delhi*

Time	*Topic*	*Guide*
1305	Arrival at Delhi	
1500	Check-in YWCA	
1500-1830	Free time	
1630	Leave for Hotel Hayat Regency	
1900-2130	Reception and Dinner by CBIP	

Sunday 11th January 1998 *Venue: YMCA, Delhi*

Time	*Topic*	*Guide*
0830	Breakfast	
0900-1500	Sightseeing*; Lunch	
1500	Leave for Roorkee	
1730-1800	Tea Break	
2000	Check-in Guest House	
2030-2130	Dinner	

* Red Fort; Jami Masjid; Raj Ghat; India Gate; Rashtrapati Bhawan; Parliament House; Humayun Tomb; Qutab Minar.

Monday 12th January 1998 *Venue: Univ. of Roorkee*

Time	*Topic*	*Speaker*
0830-0900	Breakfast	
0900-0910	Opening Remarks	Dr. P. K. Pande Prof. of Civil Engineering University of Roorkee
0910-1010	**Water Resources of India**	Dr. Bharat Singh Professor Emeritus WRDTC, Univ. of Roorkee
1010-1110	**Some Aspects of Ground water Scenario in India**	Dr. Deepak Kashyap Prof. of Civil Engineering University of Roorkee
1110-1130	Tea Break	
1130-1220	Continuation of Dr. Kashyap lecture	
1230-1330	Lunch	
1330-1930	Ganga Canal Works; Trip to Hardwar	
2000-2100	Dinner	

Tuesday 13th January 1998 *Venue: Univ. of Roorkee*

Time	*Topic*	*Speaker*
0830-0900	Breakfast	
0910-1010	**Development Alternatives-The Environmental Issue**	Dr. Bharat Singh Professor Emeritus WRDTC, Univ. of Roorkee
1010-1110	**Sustainable Development of Water**	Dr. M. C. Chaturvedi Professor Emeritus IIT, Delhi
1110-1130	Tea Break	
1130-1230	**Sustainable Development of Ganges-Bramputra-Meghana Basin**	Dr. M. C. Chaturvedi Professor Emeritus IIT, Delhi
1230-1400	Lunch	
1400-1500	**Potential for Hydro Energy**	Dr. Arun Kumar Alternate Hydro Energy Center University of Roorkee
1500-1600	**Policy for Water Charges**	Prof. C. C. Desai Visiting Professor WRDTC, Univ. of Roorkee
1600-1630	Tea Break	
1630-1900	Free time	
1900-2000	Dinner	

Wednesday 14th January 1998 *Venue: Univ. of Roorkee*

Time	*Topic*	*Speaker*
0830-0900	Breakfast	
0930-1100	Panel Discussion	
1100-1130	Tea Break	
1130	Leave for Agra	
1330-1430	Lunch	
1900-1930	Tea Break	
2130	Arrival at Agra; Check-in Hotel	
2200	Dinner	

Thursday 15th January 1998 *Venue: Agra*

Time	*Topic*	*Guide*
0830-0900	Breakfast	Puneet Singh
0900-1100	Red Fort	
1100-1130	Tea	
1130-1300	Taj Mahal	
1300-1430	Lunch	
1430-1630	Sikandra	
1630-1900	Free Time	
1900-2000	Dinner	

Friday 16th January 1998 *Venue: Fatahpur Sikri*

Time	***Topic***	***Guide***
0830-0900	Breakfast	Puneet Singh
0900	Leave for Fatehpur Sikri	
1000-1230	Visit Fatahpur Sikri	
1230	Departure for Bharatpur	
1330-1430	Lunch	
1430-1630	Bird Sanctuary	
1630	Leave for Delhi	
1930	Arrival at Delhi, Check-in YWCA	
2000-2100	Dinner	

Saturday 17th January 1998 *Venue: Delhi*

Time	***Topic***	***Speaker***
0830	Check-out Hotel	
0830-0900	Breakfast	
0900-2300	Free day	
2300	Leave for Delhi Airport	
2400	Arrival at Delhi Airport	

Sunday 18th January 1998

0300	Leave for Mumbai; AI 411	
0455	Arrival at Mumbai	
0905	Leave for Chicago: AI 125	
1815	Arrival at Chicago	
2215	Leave for Cedar Rapids; UA 1551	
2309	Arrival at Cedar Rapids	