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"The turkey of today is different than the Turkey of yesterday and tomorrow…Turkey is a country of water, in a region of the world where water is very valuable. It is through the management of water that Turkey will prosper economically and earn its place in the western world."

– Heather Cross, Turkey and Water Resources Management

International Association of Hydraulic Engineering and Research
Association Internationale d'Ingénierie et de Recherches Hydrauliques

Engineering Graduate School Environment Water

Short Course

International Perspectives in Water Resources Management

Turkey, May 21- June 4, 2005

organized by

IIHR-Hydroscience & Engineering
The University of Iowa, USA

Middle East Technical University
Ankara, Turkey

Course Overview

International Perspectives in Water Resources Management (IPWRM) is a study abroad program that focuses each year on a country or a world region for an intensive and in-depth exposure to historical, cultural, social, economic, ethical, and environmental issues impacting water resources projects to prepare students for careers in a global marketplace. IPWRM course is on water resources, a subject that, in today's world, requires keen appreciation of these aspects of water problems to design and execute a successful project. Ongoing and future water resource development projects are subject to worldwide scrutiny, and it is proper that today's student, and tomorrow's water professional have first-hand knowledge of the realities and complexities of issues that extend well beyond hydraulics, hydrology and related engineering disciplines. Since 1998, IPWRM has focused on particular water resources projects in selected world regions, including the Narmada Valley in India, impact of extreme events in the island nations of Taiwan & Japan, the Three-Georges Dam in China, emerging international water issues in Hungary, Poland and Romania, and the Itaipu Dam on the border of Brazil and Paraguay. Starting in 2005, the course is placed under the International Association of Hydraulic Engineering and Research's (IAHR) Engineering Graduate School Environment Water (EGW) auspices.

Academic Program

The course will start with preparatory lectures by experts on the history, culture, and water resources projects in Turkey. Lectures will be held on The University of Iowa campus during March - May 2005, but video taped for viewing by off-campus participants. The course finishes with post-visit written reports by participants. During the visit abroad, participants will interact with local students and attend seminars by local experts. The seminars will emphasize the planning, socio-economic and environmental impacts, rehabilitation programs and problems, legal, cultural and institutional aspects of water resources projects. Participants will visit technical, historical, and cultural sites.

Specific Activities Tentatively Planned

The short course is organized by IIHR in cooperation with Middle East Technical University, Ankara, Turkey. All involved organizations have broad experiences in water resources related research and education and are active participants in specialized international organizations. Activities are planned to encourage interaction of course participants with local university students. Workshops and lectures will be held at government agencies with participants from academia and industry. The technical focus will include field visits to major hydraulic structures on the Firat (Euphrates) and the Dicle (Tigris) rivers, including large-scale flood prevention and mitigation projects and hydro-power plants; irrigation systems in Harran (or South-eastern Anatolia) ; mitigation projects for water land protection in Zeugma; and water treatment plants, maritime ports. In addition, cultural and

historical tours of various sites are planned in Ankara, Istanbul, and South-East Turkey. Other unique sites that will be visited include Bosphorus and Grand Bazaar.

Eligibility
The course is directed to seniors and graduate students who wish to become engineers, economists, planners, legal and management specialists, and environmental, social and political scientists. It is also suitable for professionals and young faculty members working in these fields. The course provides preparation for the increasingly international scope of practice and service in water resources planning and management.

Academic recognition
All course participants will receive a participation certificate with the description of the course program and activities. Each participant can earn 0 - 3 semester hours of credit (0-3 in the ECTS system) depending on agreement with the instructors regarding assignments and methods of evaluating student's work.

Course Instructors
Dr. Marian Muste, IIHR-Hydroscience & Engineering, The University of Iowa
Dr. V.C. Patel, IIHR-Hydroscience & Engineering, The University of Iowa
Dr. Larry Weber, IIHR-Hydroscience & Engineering, The University of Iowa
Dr. Dogan Altinbilek, Middle East Technical University, Turkey
External experts from Turkish government, academia, and industry.

Cost
The estimated cost for the short course is $1,450, including fees, lodging, meals and travel within Turkey, and all educational and administrative costs. *Participants are expected to obtain the appropriate travel visa and pay for their travel to and from Turkey.* Estimated costs for round-trip airfare for Cedar Rapids to Istanbul and Frankfurt to Istanbul are $850 and $450, respectively. Participants may apply for financial aid from IIHR and from the University of Iowa's Office for Study Abroad (UI students only) at http://international.uiowa.edu/study-abroad Available financial aid will be distributed within two weeks of February 28, 2005.

Application Procedure and Deadline
Completed applications must reach The University of Iowa's Office for Study Abroad by February 28, 2005. The application includes the application form, available from OFSA, the most current transcript of grades, a letter of recommendation and a non-refundable application fee of $35. As the number of participants is limited and applications will be reviewed as they are received, early application is encouraged.

Send completed application and requests for further information to

Office for Study Abroad
28 International Center
The University of Iowa
Iowa City IA 52242
Phone: (319) 335-0353; Fax: (319) 335-0343
e-mail: study-abroad@uiowa.edu
http://international.uiowa.edu/study-abroad

Course website
The latest information on the course can be accessed on the internet at: http://www.iihr.uiowa.edu/education/international-perspectives/ . If you need further information, please contact the course organizer Ceyda Polatel.

IAHR-EGW Activity
The Engineering Graduate School Environment Water (EGW) of the International Association of Hydraulic Engineering and Research (IAHR) is a network of institutions offering high academic level courses in water and sustainable development areas. Initiated in Europe as a pilot project of the IAHR Section on Education and Professional Development, the School extended its activities to non-European members/universities at the beginning of 2004 to reflect the ongoing globalization in continuing education. The present course is among the first activities that expand the scope of IAHR-EGW at global scale. IAHR-EGW activities (short courses, summer schools, professional development workshops) are dedicated to graduate students, post-graduates, and professionals. The objectives and scope of IAHR-EGW and the complete course calendar may be found on www.iihr.uiowa.edu/education/international-perspectives/.

International Perspectives in Water Resources Management is a study abroad program that offers intensive and in-depth exposure to students about issues impacting water resources. Each year, the program focuses on a different world region, preparing students for careers in a global marketplace. The course in Turkey was organized by IIHR in cooperation with Middle East Technical University, Ankara, Turkey. The 2005 course was included in the International Association of Hydraulic Engineering and Research's (IAHR) Engineering Graduate School Environment Water (EGW) series.

Turkey

International Perspectives in Water Resources Management

May 21 - June 4, 2005

			May 22	May 23	May 24	May 25	Istanbul
			May 26	May 27	May 28		Ankara
		May 29	May 30	May 31			Sanliurfa
		June 01	June 02				Gaziantep
	June 03	June 04					Istanbul

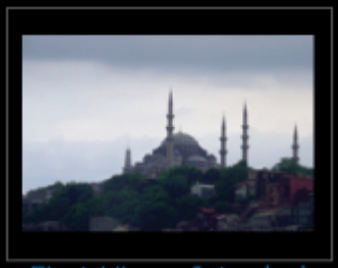
Turkey

International Perspectives in Water Resources Management

May 21 - June 4, 2005

Istanbul May 22

Flight to Turkey



First Views Istanbul

Taksim Square

First Meal

May 21-22

The experience began on the 21 st as each of the participants boarded their respective fights for an arrival in Istanbul on May 22. With only a few minor complications, such as temporarily lost luggage, and redirected flights, the group had a successful arrival at Istanbul 's International terminal. The first stunningly unique characteristic of Istanbul , that was visible from our decent into the city, was the multitude of minarets filling the skyline. Previously arranged transportation brought the participants to a hotel located in Taksim square. Although, as a whole, the group was exhausted from hours spent in transit, many took the opportunity to explore the region around the hotel for a good meal before retiring to their beds.

Turkey

International Perspectives in Water Resources Management

May 21 - June 4, 2005

Istanbul May 23

ISKI Presentation

Kirikkemer Aqueduct

Uzunkemer Aqueduct

Sedimentation Pool

May 23

The first full day, after the group's arrival in Istanbul , began with an informative presentation at Istanbul 's Water and Sewage Authority (ISKI). The information presented pertained to Istanbul 's historical and modern water supply systems. Following the presentation the group was taken to a number of aqueducts and dams that had been discussed during the presentation. Specifically, the sites visited contained the following: Kirikkemer Aqueduct, Uzunkemer Aqueduct, Sedimentation Pool, Büyükkbent Weir, and the Mahmound II Weir. After the conclusion of these activities the day was completed with a reception dinner in which the participants were regaled with traditional Turkish cuisine. In addition to meeting our gracious hosts, who are distinguished alumni of IIHR, introductions were made with University of Iowa 's Dean of

Engineering who was in attendance.

Büyükkbent Weir

Reception Dinner

Mahmound II Weir

Turkey

International Perspectives in Water Resources Management

May 21 - June 4, 2005

Istanbul May 24

Bosphorus Cruise

May 24

The day began with a three hour cruise on the Bosporus strait. As the boat progressed between the Asian and European continents there were many historical sites to be seen. At the mid point of the cruise, the boat stopped at Maiden Tower where the group was given the opportunity, to view the strait from the top of the lighthouse. Following the conclusion of the cruise, a traditional Turkish cuisine was provided at the Restaurant Salik. The next destination was the mosque Hagia Sophia which was built in the sixth century. Covering the interior walls are numerous Christian mosaics which reveal the mosques origins as a Christian cathedral. The day was then concluded with a trip to the Grand bazaar and Spice Bazaar. In close proximity to the spice bazaar, the New Mosque offered the opportunity, for participants to enter into a mosque, unlike Hagia

Maiden Tower

Salik Resturant

Hagia Sophia

Sophia, that is actively used for worship services.

Grand Bazaar

New Mosque

Spice Bazaar

Turkey

International Perspectives in Water Resources Management

May 21 - June 4, 2005

Istanbul May 25

Egyptian Obelisk

Serpentine Column

Blue Mosque

Topkapi Palace

May 25

Due to the close proximity of Istanbul 's most stunning historical attractions the morning of the 25th began with a return to the area surrounding Haggia Sophia and the Blue Mosque. Adjacent to the blue mosque a central line of monuments remains, reminiscent of the grand stadium, that's walls once encompassed these monuments. The first of the monuments that once stood in the center of the Hippodrome is the Egyptian Obelisk. This grand column is then followed by the serpentine column, and the Column of Constantine. After learning briefly about the rich history of this site, the group had the opportunity to enter into the Blue Mosque. After exploring the interior of the Blue Mosque the next destination was Topkapi Palace . This palace contained many different attractions ranging from ceramics and Imperial costumes to an impressive Treasury. Following

lunch at the palace the group was given enough time to briefly explore the near by Archeological Museum . This Museum visit was then followed by a trip into the depths of the Basilica Cistern. This unusual tourist attraction is a beautiful piece of Byzantine engineering that in 532AD strove to fulfill the growing demand for water in the Great Palace . After treading the walkways of the Basilica Cistern to the sound of classical music and dripping water we returned to our bus and ended the day with a brief Turkish fashion show offered to us by our private tour guide.

Archeological Museum

Basilica Cistern

Fashion Show

Turkey

International Perspectives in Water Resources Management

May 21 - June 4, 2005

Ankara

May 26

Drive to Ankara

Presentations at METU

Deriner Dam model

May 26

The morning of the 26th was spent traveling to Ankara by bus. The trip was approximately 5 hours and we were able to see the countryside for the first time as we moved away from the hustle and bustle of Istanbul . Our route took us along the Marmara Sea and throughout the green hillsides where we caught glimpses of small villages and towns as we ventured towards the middle of the Anatolia region. Anakara is the capital of Turkey and while not as large as Istanbul , it was still a very busy place and it definitely has a more modern feel.

After a quick check-in at our hotel we raced off to our appointment with some of the Civil Engineering faculty at the

Middle Eastern Technical University (METU) http://web.ce.metu.edu.tr/ . Two presentations were given by METU faculty on our arrival. The first presentation was given by Dr. Sahnaz Tigrek , an instructor at the Hydraulics Laboratory. Following this presentation Dr. Nuri Merzi, a professor in the Water Resources Department, spoke to the group about Turkeys water resources. The second presentation, by Dr. Tigrek, was on the Southeastern Anatolian Project (GAP). This project is initiated by the Turkish government and is a sustainable development project that covers a large area in the river basins.

Two of the graduate students in the Hydraulics department, Onur Dundar and Ilker Tonguc Telci, were gracious enough to show us around their research laboratory after the presentations. As most of us are students involved with the hydraulic research at IIHR, this portion of the tour was quite interesting. Following the laboratory tour, we were given a tour of the METU campus.

METU Campus Tour

METU Campus Tour

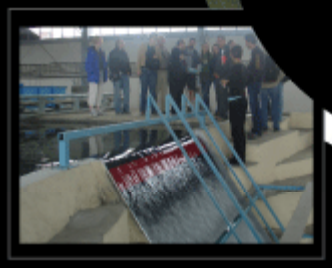
Group at METU

Turkey

International Perspectives in Water Resources Management

May 21 - June 4, 2005

Ankara May 27



DSI Research Facility

Model Demonstration

Deriner Spillway

May 27

We traveled to the Technical Research Laboratory, TAKK, operated by the General Directorate of State Hydraulic Works, DSI (http://www.dsi.gov.tr). DSI is under the Ministry of Public Works and Settlements and is responsible for many areas of Turkey 's water resources including: irrigation projects, flood control, hydropower development and municipal water supply. The research campus was quite large and had many buildings where testing and ongoing research occurs for not only hydraulics, but also for water quality and geotechnical applications. We were given a detailed tour by the Deputy Director of DSI, Yakup Darama,

and the Director of the DSI Hydraulic Lab. We were able to view their physical hydraulic models in operation and learn the purpose of each in relation to DSI projects. The models are being used to solve current problems on reservoirs and spillways and are also being used to develop new ideas for future projects. After the tour, DSI provided us with a great lunch and a time for us to socialize with the research staff.

Our tight schedule slipped a little in the afternoon as we were supposed to visit the Ankara Ivedik Municipal Water Treatment Plant and two nearby lakes. We had to leave the water treatment plant tour for the next trip as we went on to visit lake Mogan and lake Eymir . The primary purpose of these lakes is for recreation and flood control, but they again offered a great tourist photo opportunity while our METU guides gave us the history and relevance of the lakes. We stopped at a café called Bagevi, which was a longside one of the lakes and enjoyed the peaceful environment over a cup of tea. Later that evening we met up with the Dean of the METU Engineering College and some of his colleagues for dinner at the METU alumni restaurant Visnelik.

Lake Mogan

Lake Eymir

Dinner With Faculty

Turkey

International Perspectives in Water Resources Management

May 21 - June 4, 2005

Ankara

May 28

Ataturk Mausoleum

Museum of Anatolian Civilizations

Streets of Ankara

May 28

The day began with Ankara 's most imposing site, the Atatürk Mausoleum, which commands a hill to the west of the city. The second activity of the day consisted of a trip to the Anatolian Civilization Museum . This restored 15 th century Ottoman building houses a collection of astoundingly old artifacts tracing the history of Anatolia from the 6 th millennium BC to the Ottoman Empire . From the museum it was a steep climb up narrow streets to the area surrounding Ankara Castle . After a satisfying 5 course meal the group was given the opportunity to explore the quaint surrounding streets and view the city from the top of the castle.

Ankara Castle

Turkey

International Perspectives in Water Resources Management

May 21 - June 4, 2005

Sanliurfa May 29

Arrival in Sanliurfa

Attaturk Dam

Sacred Fish Pond

May 29

The flight from Ankara to Sanliurfa offered beautiful views of a landscape that was progressively getting flatter and dryer. On arrival the participants were taken to the DSI guest house and were given the opportunity to drop off luggage before heading to Atatürk Dam. Atatürk Dam is the 6th largest Dam in the world and the group was fortunate enough to receive a private presentation about the dam's specifications and the GAP project. After our tour of Atatürk dam our Sanliurfa tour guide gave the group a briefing about Sanliurfa's biblical history. Urfa is the putative birthplace of the prophet Abraham as well as home to 10 other Biblical figures [2]. Specifically we were taken to a pond of sacred carp in which Abraham was saved from the wrath of King Numrut. As the

story goes, Abraham was to be thrown from the castle turrets into a burning pile of logs. As Abraham fell to the ground God took pity on him and turned the fire into water and the logs into carp (for full story see Sacred Fish Pond). The day was then completed at a traditional Turkish restaurant where we were served our meal on the floor to the sounds of middle eastern music.

Sanliurfa Mosque

Traditional Turkish Meal

Turkey International Perspectives in Water Resources Management

May 21 - June 4, 2005

Sanliurfa May 30

Irrigation Canals

Old Harran University

May 30

Breakfast in Sanliurfa consisted of the usual; cheese, bread, tomatoes and cucumbers. This was followed by a trip to see the surrounding irrigation canals created by the GAP project. Subsequently we traversed a distance of 29 miles to the ancient town of Harran . The Village of Harran is one of the oldest (5,000 years old) Mesopotamian settlements where Abraham is believed to have spent several years of his life. The most distinctive aspect of Harran (pop. 7000) is its mud beehive houses which are amazingly cool and well suited to the climate of the region [3]. These houses were built in the early nineteenth century on the Harran ruins, and are still inhabited today. In the environs of the village lay the ruins of the ancient city with the remains of a fortified wall and seven gates. It was built on the site of a very old pagan temple dedicated to the Moon God Sin [4]. The group also had the opportunity to explore

the site of the Old Harran University. The Mongols destroyed the city and university in 1270 and Harran never regained its past splendor. Once the tour of Harran was completed the group returned to Sanliurfa to experience the markets and visit the cave of Abraham's birth.

Downtown Sanliurfa

Birth Place of Abraham

Turkey

International Perspectives in Water Resources Management

May 21 - June 4, 2005

Sanliurfa May 31

Drive to Mt Nemrut

Mt Nemrut

Mountain Views

May 31

The drive from Sanliurfa to Kahta took approximately an hour and 45 minutes. Unfortunately this is the location where one of our participants became ill. However, once arrangements were made for the care of this group member the drive to the summit of Mount Nemrut began. The distance from Kahta to the summit was approximately 46 miles which were filled with fantastic panoramic views. Upon the highest peak in the region, King Antiochus I ordered the erection of a 75m pyramid of loose stones, flanked by colossal statues [5]. Unfortunately the heads of these statues have long since been decapitated by earthquakes and are now posed below their respective torsos. Although archeologists have been thwarted from excavation by both bureaucrats and the construction's fragile nature, they have contented themselves with the interpretation of the sites sandstone reliefs, among them possibly he

worlds first horoscope dating to 109 BC [6].

Ancient Writings

Turkey

International Perspectives in Water Resources Management

May 21 - June 4, 2005

Gaziantep June 1

Bird Sanctuary

Birecik Dam

Zeugma

Turkish Bath

June 1

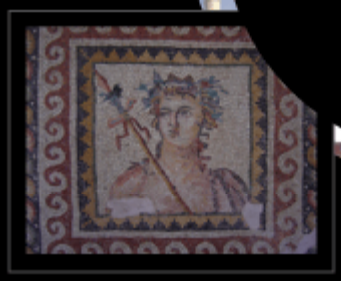
Today, the group traveled from Sanliurfa to Gaziantep . Along the way we visited a bird sanctuary in which 75 rare ibis birds were housed. Further along our journey, we stopped at the Birecik Dam. When this Dam was constructed an ancient city called Zeugma was covered in water. At one of the facilities near the dam, the group was presented with an informational video on the excavation and the history of this site. They also had a number of prints in a gallery depicting many of the famous mosaics found on location.

Turkey

International Perspectives in Water Resources Management

May 21 - June 4, 2005

Gaziantep June 2



Archaeological Museum

Castle Hill

Interesting Restaurant

Mosque

June 2

The first activity of the day was a visit to the Archaeological Museum . Although the museum was under construction we were lucky enough to gain a sneak preview of the Zeugma mosaics. Following our museum tour we were taken to the site of an old castle that overlooked the city. This was followed by one of our spectacular dining experiences where we were treated to a five course meal. In addition, as we prepared to leave, the restaurant owner decided to show us his pet ostriches. The rest of the day was then given to us for some free time to explore the city.

Turkey

International Perspectives in Water Resources Management

May 21 - June 4, 2005

Istanbul June 3

Sabanci Central Mosque

Mosque Interior

June 3

After an extremely early wake up call the group boarded the bus for the airport in Adana . The drive took three hours and on our arrival the largest mosque in the Middle East was visible. The Sabanci Mosque was completed in 1998 and follows the architectural style of the Blue Mosque. In fact only Sabanci and Blue mosques feature the hallowed six minarets. Following a short tour of the interior of the mosque the group was driven back to the airport for the final arrival in Istanbul . The rest of the day was spent in transit to the hotel in Taksim square.

Flight to Istanbul

Turkey

International Perspectives in Water Resources Management

May 21 - June 4, 2005

Istanbul June 4

Sabanci Central Mosque

Topkapi Palace

June 4

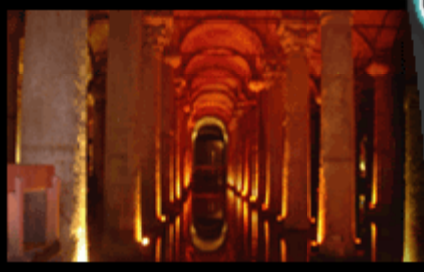
The last night was spent in a hotel in the center of Taksim Square . The majority of the group had flights leaving in the morning and everyone said their goodbyes to those departing to different destinations. The trip as a whole was an amazing opportunity for everyone involved to learn more about both the culture and the technical aspects of Turkey 's water resources. Our gratitude must be given to all of those who helped to make this trip possible. Thank you IIHR, METU, the University of Iowa Faculty , and all of the others that helped to make this trip an experience of a lifetime.

METU

Turkey

International Perspectives in Water Resources Management

May 21 - June 4, 2005



Course Highlights

- Pre-Departure Activities
- Course Presentations
- Water Resources
- Sight Seeing

Turkey

International Perspectives in Water Resources Management

May 21 - June 4, 2005

Pre-Departure Activites

April 5

Kickoff Meeting

	Presentations by:
	Autumn Talman
	Marian Muste

April 12

Social, Political, and Economic Aspects of Today's Turkey

	Leslie Winter
	

April 19

South-Eastern Anatolia Project (GAP)

	Jay Boshara

April 24

Turkish Student Association of the Univeristy of Iowa Picnic for IPWRM participants.

April 26

Organizational Meeting

	1.Project assignments
	2. Financial Issues
	3. Itinerary Details

April 30

Orientation for International Summer Study Abroad

	Office of Study Abroad

May 3

Virtual Tour of the Course in Turkey

	Talia Toyay
	Ryan Taugher
	Gokhan Kirkil

Turkey

International Perspectives in Water Resources Management

May 21 - June 4, 2005

May 23

Istanbul

ISKI Presentation

The History of Water Management in Istanbul

M.Tevfik GÖKSU ISKI Deputy General Manager

Istanbul is one of the world's great ancient cities. Linking the continents of Asia and Europe , Istanbul is Turkey 's biggest city in terms of history, trade, and culture. It was the capital of many great eras, including the Byzantine and Ottoman empires. Historically, Istanbul has been a city of strategic importance, and as a result, water supply and management has always been a central issue.

The History of Water Management in Istanbul is Comprised of Five Main Periods

- The Roman Period
- The Byzantine Period
- The Ottoman Period
- The Companies Period
- The Istanbul Water Administration Period

Turkey

International Perspectives in Water Resources Management

May 21 - June 4, 2005

May 23

The Byzantine Period

ISKI Presentation

The Roman Period (31 B.C. – 330 A.D.)

During the Roman Period, Istanbul 's water needs were met by wells, small springs, and underground reservoirs (cisterns). In the second century A.D., the existing water infrastructure could no longer meet the needs of Istanbul 's people. The first water transmission line was constructed under the rule of Emperor Hadran between 117 and 138 A.D. to supply water to the districts along the Golden Horn . Nothing of this line remains today.

In the 4 th century A.D., under the rule of Constantine , a water transmission line (242 km long) was built from the Strandja Forests to Istanbul 's Edirnekapi district. Under the rule of Emperor Valens, the Mazul and Bozdogan Aqueducts were constructed. A fourth transmission line was built during 379 to 395 A.D. under Emperor Thedosius' reign to bring additional water from the Belgrade forests (which lie north of Istanbul) to the Sultanahmet area.

The Mazul Aqueduct was built in 346 A.D., is 110 m in length, and spans the Uzundere Stream to bring water to Beyazit from Halkali.

Built in 368 A.D., the Bozdoğan Aqueduct consists of two tiers of 43 arches each, and channeled water from the Belgrade forests to Beyazit.

The Belgrade Forests are located north of Istanbul.

Turkey

International Perspectives in Water Resources Management

May 21 - June 4, 2005

May 23

Istanbul

ISKI Presentation

The Byzantine Period (330 A.D. – 1453 A.D.)

Yereban (Basilica) Cistern

The Philoxenus (Binbirdirek) Cistern

After the schism of the Roman Empire, Istanbul became the capital of the East Roman (or Byzantine) Empire. The growth of the new capital city was accompanied by increasing water shortages. Due to political turmoil and wars, water transmission lines could not be constructed, and were sometimes even difficult to maintain because they were targeted by foreign armies. After the Latin Invasion of 1204, which damaged the old water supply system beyond repair, the Empire built a massive network of underground reservoirs, or cisterns.

During the Byzantine Period, the number of cisterns in the city reached seventy. These reservoirs proved to be immensely beneficial to the city's inhabitants, particularly during times of war and times of drought. The most famous cisterns are the Yereban (Basilica) Cistern, the Philoxenus (Binbirdirek) Cistern, and the

Acimusluk Cistern. The total annual capacity of Istanbul 's underground reservoirs reached 200,000 m 3 .

In addition to the elaborate cisterns, above-ground open reservoirs were also constructed during the Byzantine Period. The total annual capacity of these reservoirs totaled 800,000 m 3 .

Yereban (Basilica) Cistern

Turkey

International Perspectives in Water Resources Management

May 21 - June 4, 2005

May 23

Istanbul

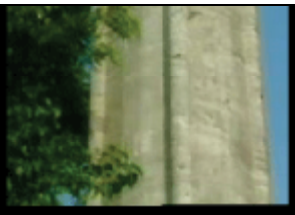
ISKI Presentation

The Ottoman Period (1453 - 20th Century)

The Ottoman Empire brought with it a great expansion of public water infrastructure in Istanbul . Under the rule of Sultan Mehmet the Conqueror in the mid-fifteenth century A.D., the existing Roman and Byzantine water supply systems in Istanbul had been dilapidated by wars and earthquakes beyond the point of repair. The Ottomans considered running water to be much cleaner than stagnant water, so transmission lines were again constructed in and around Istanbul .

The five main water supply and distribution systems built during the Ottoman Empire were:

- The Halkali Waters
- The Kirkçeşme Waters



The Üsküdar Waters

The Taksim Waters

The Hamidiye Waters

Water discharge in the Ottoman water supply system was measured by means of “l üles”. The discharge (flow rate) of water through a brass pipe (26 mm in diameter) was defined as a l üle. The discharge of 1 l üle was roughly equivalent to 52 m 3 /d, or 13,700 gal/day. Discharge from the water supply reservoirs could be managed through the use of brass “stoppers”

1 Lüle		13,740 gpd	52 m3/day
1 Kamış	1/4 Lüle	3,434 gpd	13 m3/day
1 Masura	1/8 Lüle	1,717 gpd	6.5 m3/day
1 Çuvaldız	1/32 Lüle	431 gpd	1.63 m3/day
1 Hilal	1/64 Lüle	219 gpd	0.83 m3/day

Turkey

International Perspectives in Water Resources Management

May 21 - June 4, 2005

May 23

Istanbul

- Kirikkemer Aqueduct
- Uzunkemer Aqueduct
- Sedimentation Pool
- Büyükbent Weir
- Mahmound II Weir

Turkey International Perspectives in Water Resources Management

May 21 - June 4, 2005

May 23

Istanbul

Kirikkemer Aqueduct

Kirikkemer Aqueduct

The Kirikkemer Aqueduct is comprised of three stories with a total length of 207m and a height of 35m. This Aqueduct has survived hundreds of earthquakes due to construction techniques of slightly inward sloping arches. Consequently, this structure is still used today bringing roll water from the Belgrade Woods into the city for treatment. The foundation was created by Theodosius, who ruled from 379-395, during the Late Roman Era. This construction was then supplemented in the 16th century when the Ottomans added a third storey. The interior walking route has a width of 113 cm and a height of 220 cm. [2]

Turkey

International Perspectives in Water Resources Management

May 21 - June 4, 2005

May 23

Istanbul

Uzunkemer Aqueduct

Uzunkemer Aqueduct

Standing 25m high this two storied aqueduct spans a distance of 711m. The structure contains 50 arches on the upper story and 47 arches on the lower story. The upper arches have a span of 4.50 meters while the lower arches span 5.33 meters. Uzunkemer Aqueduct (Translation: the Long Aqueduct) was constructed by the Architect Sinan as part of the Kirkcesme waterworks in 1554. Sinan presented over five hundred architectural works to the Ottomans during the golden era. The water works transmission line, considered one of Sinan's greatest works in terms of finance, spans a distance of 55,374 meters and includes 35 aqueducts.

Turkey

International Perspectives in Water Resources Management

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Istanbul

Sedimentation Pool

Sedimentation Pool

Turkey

International Perspectives in Water Resources Management

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May 23

Istanbul

Büyükbent Weir

Büyükbent Weir

Construction Year	1724
Length	8,450 m
Depth	1,215 m
Crate Width	2,30 m
Base Width	9,70 m
Drainage Area	6,93 km^2

Turkey

International Perspectives in Water Resources Management

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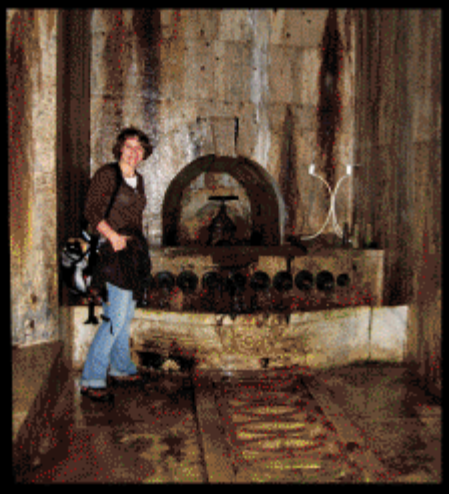
May 23

Istanbul

Mahmound II Weir



Mahmound II Weir

Turkey

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Sight Seeing

Reception Dinner

Bosphorus Cruise

Maiden Tower

Hagia Sophia

Egyptian Obellisk

Serpentine Column

Basilica Cistern

Ataturk's Mausoleum

Sacred Fish Pond






Turkey

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Reception Dinner

Turkey

International Perspectives in Water Resources Management

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Istanbul May 24

Bosphorus Cruise

Bosphorus Cruise

The Bosphorus cruise awarded the group with an excellent vantage point from which to view the many

historical landmarks of Istanbul . We went past such landmarks as the Fortress of Europe that is situated at the narrowest point on the Bosphorus which was used by Mehmet II in 1452 before his invasion of Constantinople . We also learned that every ship must raise a Turkish flag when it enters the strait and have a Turkish captain. Further along our cruise we went under the two bridges that join the two continents. One of the suspension bridges is the 9th largest in the world and was built in 1973.

Turkey

International Perspectives in Water Resources Management

May 21 - June 4, 2005

Istanbul May 24

Maidens Tower

Maidens Tower also known as kiz kulesi (maiden's Tower) the building is one of the romantic symbols of Istanbul . It is located where the two continents of Asia and Europe meet. It was built on an island at the mouth of the Bosphorus erected within a distance of an arrow's shot from the Asian coast. Because of its strategic location the tower is one of the distinctive landmarks of Istanbul and stands among the unique monuments of the world.

The history of this small tower dates back 2500 years and has witnessed the history of Istanbul

It has lived through the historical periods such as the Ancient Greek period of the Archaic ages, the Byzantine and the Ottoman Empires.

About the tower, numerous tales are told involving love, war politics No one knows the real past of the tower just as no one knows its future. What is certain is that the tower has an important

cultural heritage. The name of the tower originated from legends based on two mythological lovers celebrated in Greek legend.

Hero, a virgin priestess of Aphrodite leaves the tower to attend a festival where she meets Leander. They fall in love but since she was forbidden to marry, Leander visited her secretly swimming across the strait every night. Hero carried a torch up to the top of the tower where she lived. On a stormy night, torrential rain extinguished the torch and Leander unable to find his way exhausted by the waves and drowned. At dawn, Hero saw Leander's ragged shirt in the sea and drowned herself as well. The two lovers were finally united in death. For centuries the light of the tower had illuminated the darkness giving sailors a landmark.

Turkey

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Istanbul May 24

Hagia Sophia

The construction of Hagia Sophia was started by the Emperor Justinian in 532. Justinian commissioned the mathematicians Anthemius of Tralles and Isodorus of Mileus to design and build the Christian church. After five years of construction the exterior of the church was painted blood red to serve as an unambiguous warning to would-be revolutionaries. When the church opened in December of 537 it was the grandest building in the world, covering an area of 7570 sq meters and rising to a height of 55.6 meters. Unfortunately twenty years later a major earthquake revealed a major mathematical miscalculation and the original dome came crashing down. From this point the building began its millennium long position as the most impressive building in the Byzantine world. It was then 200 years later that Mehmet the Conqueror converted Hagia Sophia to a mosque by removing all of the Christian symbols and mosaics and adding a wooden minaret. It was then in the late 16 th century that the mosque was given four additional minarets during a renovation. Hagia

Sophia remained a mosque until 1932 until Attatürk established it as a museum[4].

Turkey

International Perspectives in Water Resources Management

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Istanbul May 25

Egyptian Obelisk

This column was erected by the Pharaoh Thutmosis III in 1500 BC and brought from Egypt to Constantinople in the 4th century by the Emperor Theodosius I. At that time, the base was carved with depictions of the life of Theodosius, Byzantine chariot races, and war victories [7]. The column however is broken and is probably only one third of its original height [8]

Turkey

International Perspectives in Water Resources Management

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Istanbul May 25

Serpentine & Column of Constantine

The Serpentine column was shipped to Istanbul from Delphi and is believed to date from 479 BC. The heads of the Serpents were knocked off in the 18th century by a drunken Polish nobleman.

The final column of unknown date referred to as the Column of Constantine because of the emperors restoration of the monument in the 10th century AD. It is also thought to have been sheathed in a case of Bronze. This column's dilapidated state owes much to the fact that Janissaries would routinely scale it as a test of bravery. The Ottoman Empire reached its Zenith under the leadership of Sultan Süleyman. This advance was due to a well organized administration and military organization. A key practice required rural Christian subjects to give one son to the service of the sultan. The boys converted to Islam and were educated to become civil servants or Janissaries. These soldiers were subject to strict discipline, including celibacy, but could gain high-ranking privileges equivalent to bureaucrats. [9]

Turkey

International Perspectives in Water Resources Management

May 21 - June 4, 2005

Istanbul May 25

Basilica Cistern

This vast underground cistern is a beautiful piece of Byzantine engineering and one of the most unusual tourist attractions in the city. This cavernous vault was laid out by Justinian in 532. For a century after the Ottoman's conquest of the city they did not know that the cistern existed. It was rediscovered after people were found to be collecting water and even fish by lowering buckets through holes in their basements. The group was lead on walkways with the sounds of classical music and dripping water. The cisterns roof is held up by 336 columns each over 26ft tall. Also in the far left corner two columns rest on medusa head bases. These show evidence of plundering by the Byzantines from earlier monuments. They are thought to mark a shrine to the water nymphs [10].

Turkey

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Ankara

May 28

Atatürk's Mausoleum

At the mausoleum's entrance, six unhappy statues of men and women represent the grief of the Turkish nation upon its father's death. Twenty-four lions, paired Hittite-style and symbolizing power, line the broad stone promenade leading to the mausoleum.

Turkey

International Perspectives in Water Resources Management

May 21 - June 4, 2005

Sanliurfa May 29

Sacred Fish Pond

In a cave in Urfa, the prophet Abraham was born in secrecy at a time when King Nemrut had decreed that all children should be put to death. Abraham was fully cognizant of having escaped Nemrut's wrath, and at age 10, seized with monotheistic fervor, he began smashing the city's pagan idols. Nemrut, infuriated with Abraham, ordered a massive bonfire to be lit in the plain below the citadel and had Abraham tossed from the castle turrets into the inferno below. God took pity on Abraham and called on nature to protect him: "O fire, be gentle to Abraham, keep him safe and the fuel cool." A rose garden sprang up around Abraham, the fire became water, and the burning wood turned into fish in the ponds. The pillars, carp and cave were visited by the group, and many even fed the sacred fish with purchased fish food.

Turkey International Perspectives in Water Resources Management

May 21 - June 4, 2005

Projects and Teams

Team 1	
Course Website	
	Jenna Kusmierek
	Jaime Nivala
	Zach Brownson
Team 2	
University of Iowa's International Perspectives in Water Resource Mangement Course (Presentation at XXXI IAHR Congress, September 11-16, 2005, Seoul, Korea)	
	Joseph Daraio
	Michael Cloos
Team 3	
American Students Abroad -Current Trends	
	Brady McDaniel
	Benjamin Fennelly
	Milenka Sojachenski Pantoja
Team 4	
Water Resources Management in Turkey	
	Heather Cross
Team 5	
Socio-cultural aspects of Water in Turkey	
	Ryan Toughter
Team 6	
Economics of Water Resources	
	Yudai Tadaki

TURKEY AND WATER RESOURCES MANAGEMENT

By Heather Cross

International Perspectives in Water Resources Management

Summer 2005

Executive Summary

Turkey is located in the Middle East near Syria and Iraq. It is the only country located in both Europe and Asia and is the gateway to Europe from Asia. Turkey is bordered by the Black Sea, Aegean Sea, and the Mediterranean. The Tigris and Euphrates rivers originate in Turkey.

Many different civilizations of people have lived in Turkey throughout the ages. The Hittites, Greeks, Romans, and Turks are some of the key civilizations. Istanbul was the second capital of the Roman Empire, the capital of the East Roman Empire, and the capital of the Ottoman Empire. Turkey became a republic at the end of World War I. The first president of Turkey was Mustafa Kemal, who adopted the name “Ataturk,” or Father of the Turks.

The original Turkish people were from Central and East Asia. They had a unique culture and dialect. They were forced to move westward by invading Mongols and settled for a time in the areas of present day Iraq and Iran. When they were settled in these areas, they adopted the religion of Islam. When they first entered Turkey, they brought their language and religion to the people there. The Turks of today are descendents of these original Turks from East Asia.

There have always been issues with water supply in Turkey because of the harsh climates in the desert regions and the tremendous populations of the cities. Various empires have dealt with the water management in different ways throughout the ages. There has always been an issue of keeping the infrastructure of Turkey updated. The struggle of the rulers of Istanbul to supply water to the ever-growing population is an excellent example of how water resources management affects the people of Turkey. The GAP Project in Southeast Anatolia is an example how water management practices are being used to improve the lives of people in the arid desert region.

Heather Cross
IPWRM, 2005

Introduction

Water resources management has affected the quality of life for people in Turkey since the beginning of the civilization. Some of the most important factors that have influenced water management throughout the ages are related to the geography, history, and culture of Turkey. It is important to understand these aspects of Turkish life in order to understand the importance of water resources. The history of water in Istanbul demonstrates how governments throughout history have dealt with changing times and booming populations. The Southeastern Anatolia (or GAP) project is a demonstration of how water can be used to benefit people and give them a sustainable life for centuries to come.

Geography

Turkey is the only country in the world that is located on two continents, Europe and Asia. The European side of Turkey is called Thrace and includes part of the city of Istanbul and the city of Edirne. Thrace occupies less than five percent of Turkey's 779,452 square kilometers. The Asian side of Turkey is called Anatolia, from the Greek word for east. Anatolia is bordered by all natural land barriers. The Black Sea lies to the north, the Aegean Sea is to the west, the Mediterranean Sea is to the south and there is a formidable mountain range to the east. The eastern mountain ranges are not the only mountains in Turkey, in fact, less than ten percent of the country is flat. The Anatolian Plateau is bordered by the Pontic Mountains in the north and the Toros (Taurus) Mountains in the South. Both of these mountain chains join the eastern mountain chain, practically surrounding the plateau. The countries surrounding Turkey are; Greece and Bulgaria on the west, Iran and the former Soviet Union to the East, and Iraq and Syria to the south, the northern border is completely occupied by the Black Sea (Cook, 1994).

Geographic Regions

Turkey has four distinct regions; the Black Sea Region, the Aegean Region, the Mediterranean Region, and the Anatolian Region. The Black Sea Region is the thin

strip of land between the Black Sea and the Pontic Mountains. This area is relatively secluded due to its geography. The main industries of the Black Sea Region are fishing and wood products. The Aegean Region is the portion of the country that borders the Aegean coast. This is the most advanced area of Turkey. It has a major tourist industry due to its warm climate, beautiful beaches, and the vast collection of remains from the ancient empires. The Mediterranean Region is the entire Mediterranean coast of Turkey, stretching all the way to the border of Syria. The region is mostly mountainous, with some accessibility to beaches. Antalya is a popular beach area in the Mediterranean Region. The Anatolian Region is the center of Turkey, it has no coastline. The Anatolian Region is subdivided into smaller regions. The central portion of the region is desert and grassland with hot summers and freezing winters. The South is characterized by lakes between mountains. The Southeast is desert land. The Tigris and Euphrates rivers both run through Southeast Anatolia. The East of Anatolia is mountainous and it is the most sparsely populated area of Turkey (Sheehan, 1993).

Climate

There are three distinct climatic regions in Turkey; Irano-Turanian, Euro-Siberian, and Mediterranean. Central Anatolia is the Irano-Turanian climatic region. As stated previously, the area experiences very hot summers, and very cold winters. In fact, the winters are so extreme, that snow cover can last up to 120 days and temperatures may fall to -105 degrees Fahrenheit. The Black Sea Region and the Aegean region have Euro-Siberian climates. Temperatures in these areas are very mild, but can be very wet in the winter. This Euro-Siberian climate supports European-style deciduous forests that are found throughout the area. The rest of Turkey is a Mediterranean climate. The coastal areas have more lush vegetation than the deserts to the south and to the east, but the common factor is the extreme hot temperatures experienced in the summer months. It is not uncommon for temperatures in the Mediterranean region to reach 115 degrees Fahrenheit in the summer (Darke, 1997).

Surface Features

In the evolution of Turkey, there have been many earthquakes and volcanic eruptions. This is how its mountains, lakes, and important water passages were formed. The Dardanelles, Bosporus, and even the Black Sea were formed by earthquakes. Much of the geology of Turkey is volcanic rock. Although there are no more active volcanoes in Turkey, earthquakes are still a problem.

Two large and important rivers find their origins in the mountains of Turkey. These are the Tigris (Dicle) and Euphrates (Firat) Rivers. Turkey and its neighboring countries rely on these rivers as a water supply and power source. These rivers play a significant role in water resources management, not only in Turkey, but in Syria and Iraq as well (Cook, 1994).

History

The Hittites and Lydia

The Hittites were the first civilization of record in Turkey. They were a fairly advanced civilization with a few appearances in the recorded history of ancient Egypt. The Hittites lived in Turkey from 1700 BC -1200 BC. The end of their civilization came when they were overtaken by invading tribes from the west. From the end of the Hittites rule until 546 BC, many small states appeared to have control over Turkey. Very few of these small states were notable, except the last one, called Lydia.

From 900 BC-700 BC, many Greek colonies were forming along the Aegean coast. It is a testament to the power of Lydia that its rulers were able to reign over these Greek colonies. However, this power proved to be Lydia's downfall. When the Persians learned of the power and wealth of Lydia, they conquered it, bringing Turkey under the rule of the Persian Empire in 546 BC (Sheehan, 1993).

The Persians and Alexander

The Persian Empire was a very oppressive governing body that ruled over Turkey until the time of Alexander the Great. Alexander was on a mission to free western

countries from eastern rulers and establish them as independent states under Greek rule. This period of history is called the Hellenistic age. Alexander the Great freed Turkey from the rule of the Persian Empire in 334 BC.

The time of Greek rule over Turkey was relatively peaceful. The Greeks colonists that had been driven out of Turkey by the Persians returned to the Aegean coast. A new foundation was laid for the administration of Turkey and the future city of Istanbul was named Byzantium by Alexander the Great (Sheehan, 1993).

The Romans

By 133 BC, Greek rule in Turkey had transferred to Roman rule. Christianity was spread as the official religion of the Roman Empire and was adopted by most of the population. Christianity was the first widespread religion in Turkey.

In 330 AD, the emperor Constantine chose Byzantium as the capital of the eastern portion of the Roman Empire. This made it the second capital, with Rome being the first. Constantine renamed the new capital, Constantinople, after himself.

Although Rome fell in 476 AD, the eastern portion of the empire, located on the Asian continent, continued to thrive. Constantinople effectively became the only capital of the remaining empire, called the Byzantine (East Roman) Empire. Although the rule of the Byzantine Empire did not end until the thirteenth century, a majority of Turkey was lost to another power in the eleventh century.

In 1071, Turkish tribes from central Asia defeated the Byzantines in Anatolia. This marked the arrival of the first Turks in Turkey. These people had been forced west by invading Mongols. During their westward movement, they had settled temporarily in Persia, Syria, and Iraq. It was in these countries that the Turks adopted the Islamic religion, and when they came to Anatolia, they brought Islam to the area. These first Turks were called the Seljuk Turks. The Seljuk Turks controlled Anatolia, leaving only the Aegean coast and Constantinople under the rule of the Byzantine Empire.

The rule of the Romans in Turkey came to an end in the thirteenth century, near the time of the end of the Seljuk Turks. The Seljuk Turks fell to invading Mongols, while the Byzantine Empire fell during one of the crusades. Strangely enough, the Seljuk Turks were the target of the original crusades, yet it was their enemies the Byzantines who fell in their place (Sheehan, 1993).

The Ottoman Empire

After the fall of the Seljuk Turks and the Byzantine Empire, there was no significant ruler for a few decades. The Turks were broken up into smaller tribes spread around Anatolia. It was out of one of these scattered tribes that a significant force began to grow. A particular tribe, calling itself the Ottoman Turks, began to gather forces and influence in 1288. This new empire grew to great power between 1288 and 1529, controlling North Africa, Turkey, Iraq, and large pieces of Eastern Europe. Constantinople fell to the Ottoman Turks in 1453 and was given the name of Istanbul. The Ottoman Empire experienced the first step toward its decline in 1529 when it was unable to capture Vienna. In 1683, westward expansion was stopped once again and the territory of Hungary was lost. This marked the decline of the Ottoman Empire. Finally, after over 600 years of rule, the Empire took the side of Germany in World War I, which led to its end in 1918 (Sheehan, 1993).

Ataturk

The hero of World War I for the Ottoman Empire was a colonel in the army named Mustafa Kemal. Turkey was marched on two times at the end of World War I, and both times it was Mustafa Kemal who led the resistance. At the end of the war, the Ottoman Empire was forced to sign over a great portion of its land. The only parts of the Empire that were retained by the Ottomans were Anatolia and Istanbul. These two areas comprise modern Turkey. Mustafa Kemal led a campaign to abolish the sultanate. He became the first president of the Republic of Turkey in 1923. He adopted the name Ataturk, meaning “Father of the Turks.” Ataturk made many reforms to Turkey to bring the country into sync with the western world, in order for Turkey to be able to compete in a global marketplace and to improve the

lives of its people. There were many important reforms that Ataturk made; a few of the key reforms were the separation of the government from Islam, a language purification process and adoption of the western alphabet, and the establishment of women's rights.

Ataturk encouraged the Turkish people to embrace being Turks and to embrace the country of Turkey. He established a feeling of nationalism that had never been inspired before. Turkey was a cultural melting pot and it was rarely unified as one state throughout its history. It was more often divided into two or more states, or was part of a much larger empire. Ataturk united Anatolia and Istanbul, two areas that were historically separated, to form the Republic of Turkey and established a sense of national pride that is unrivaled throughout the world. This is one of Ataturk's greatest achievements (Sheehan, 1993).

Culture

The Turks

The Turks originated from the Mongolian steppes stretching from the Caspian Sea to Mongolia. They possessed a unique culture and spoke their own Turkish language. They were driven out of Central Asia by invading Mongols and came to the Middle East in search of land and food. For a time, these tribes settled in Persia, Syria, and Iraq, it was in these countries that the Turks adopted the Islamic religion. When their westward journey brought the Turks to Anatolia, they were a relatively small group of settlers compared to the natives that were already there (Sheehan, 1993).

Before the arrival of the Turks, there had been many different ethnicities settled in Anatolia. All of these ethnicities were well mixed by the time to Turks came. The native Anatolians were a mix of Hittites, Greeks, Persians, Romans, Celts, Jews, and Armenians. They were almost entirely Christian and spoke either Armenian or Greek. It is a wonder of history that a small group of Turkish settlers were able to transform an entire population of Greek (or Armenian) speaking Christians into a Turkish speaking Moslem population. The Turks did not force change

and they did not expel other minorities, they simply assimilated with the people of Anatolia. Instead of being lost in the mix with other minorities that had come to the area, the Turks managed to spread their culture and produce an entire nation of Turks (Darke, 1997).

The Kurds

Although Turkish people can trace their heritage back to several different ethnic groups, and have different facial features depending on their region of origin, they have a common language, history, and nation that unite them all as Turks. There is only one significant ethnic group in Turkey, who do not speak the Turkish language or identify with the Turkish state, these are the Kurds.

The Kurds came to Anatolia in the seventh century, AD. They originated from a nomadic people located in central Asia. During the Ottoman Empire, they occupied a mountainous area located in present day Turkey, Iraq, and Syria, known as Kurdistan.

The end of World War I left the Kurds without a homeland, even though a treaty had been signed to establish an independent Kurdistan. Ever since that time, the Kurds have been trying to gain a state. There have been several uprisings for an independent Kurdistan. The source of problems in Turkey has been the guerilla organization called the Kurdish Workers Party (PKK). This group has used violent tactics in its quest for autonomy.

Kurds have not always been accepted as a separate ethnicity by the Turkish government. Their language has, at times, been called a dialect of Turkish. The word Kurdish has often been replaced with “Eastern Turks” or “Mountain Turks.” In more recent times, more thought has been given to the plight of the Kurds and their livelihood. It is the hope of the Turkish government, that by providing irrigation to Southeast Anatolia, Kurds will be able to make a better living and that the prosperity of Southeast Turkey will grow. This will hopefully provide an acceptable life for Kurdish people within Turkey and curb the swelling migration of rural people into the cities (Sheehan, 1993).

Water Resources Management in Istanbul

For centuries, Istanbul has been one of the most important cities in Turkey. As Constantinople, it was the second capital of the Roman Empire and the only capital of the Byzantine Empire. After the fall of the Romans, Istanbul became the capital of the Ottoman Empire. Today it is a city of 15 million people. The population has been growing for centuries and the infrastructure has changed many times throughout the various empires. Istanbul has always been a challenge to the management of water resources. From delivery, to storage, to treatment, the water resources story of Istanbul is an important one. Water has shaped Istanbul and its people. The following verse is an illustration of the significance of Istanbul and water:

"Istanbul…The capital city shaped by water and faith…Istanbul…An unequalled collection of cultures, bearing signs of all the beauties of the world cities. Istanbul…The cradle of civilizations, with a constantly gleaming face of newly established cities, alive as if breathing all through the existence of the earth, and fertile so as to show off its greatness…Istanbul…The intersection of the East and the West, of the North and the South; the meeting point of Asia and Europe; the juncture of the different societies, cultures, beliefs and civilizations…Istanbul…The city that has preserved its characteristic of being a cultural, political, military and commercial centre of attraction, with the Bosporus the marvel of nature, with the estuary known as the Golden Horn; the city, the mostly precious heritage of an exceptional geographical setting among the world cities with its water and with its soil, of the seven hills and the seven streams; the dream city of the future…Istanbul…A city of water, a beauty of water. The unequalled harmony of history, that has given way to the establishment of a civilization, on a path shaped by water with its glamorous roar… (ISKI, 2003)"

<u>The Romans and Water</u>

Previous to the Roman Empire, the people of Istanbul were using underground wells, small springs, and underground reservoirs for water supply. When Istanbul

(then called Byzantium) became part of the Roman Empire, the population began to swell, and the old water systems could not support the new demand. A new water supply was needed for the city. The first transmission line into Byzantium was commissioned by the Emperor Hadrian in the second century. The pipe stretched from the west of Istanbul. This transmission line solved the current water supply problem and Byzantium began to build popularity as an urban area.

Byzantium was renamed Constantinople by the Emperor Constantine in the fourth century and it became the second capital of the Roman Empire. The population of the new capital continued to swell. It was around this time that another water shortage was experienced by the people of Constantinople. Constantine commissioned the city's second transmission line to be built extending from the northwest direction. Once again, the city had ample water supply.

The response to growth continued in this way throughout the Roman Empire. The city grew steadily throughout the ages, and whenever a water shortage was experienced, a transmission line was built. The successor of Constantine, Emperor Valens, completed a third conduit and his successor, Theodosius, brought a fourth line to the city. Whenever new water was brought into the city, the population would grow in proportion to the amount of water available. There was potential that this pattern of building lines in response to population growth would continue indefinitely throughout time, however, history changed the way in which the government would be able to respond to water needs (ISKI, 2003).

The Byzantines and Water

When Rome fell, Constantinople became the sole capital of the Byzantine Empire. The capital was under attack from many different forces during this time, and parts of the transmission lines were destroyed during attacks on the city. It was no longer possible to use or build transmission lines into the city. It was necessary to find alternate means of supplying water. The solution was to store water in reservoirs within the city walls.

Open and closed reservoirs were built to store the city's water. 800,000 cubic meters were stored in three open reservoirs and 200,000 cubic meters were stored in cisterns, or closed reservoirs. The need for water was so great that some households built makeshift cisterns out of their basements. The water quality in the still storage basins was not nearly as high as that coming from the transmission lines, but there were no other options at that point in time. Constantinople was in major decline, and it was unknown what would save its people from the serious lack of water (ISKI, 2003).

The Ottomans and Water

When the city fell to the Ottomans, the water was let loose from the storage basins and used to water gardens and grow flowers. The entire city turned green with foliage. This was a sign of conquest and signified the good times to come. The first order of business for Mehmed the Conqueror was to restore flowing water to the city. Invaders were no longer attacking the transmission lines, so those that had been built by the Romans were repaired, rebuilt, extended, and enlarged. New lines were built throughout the reign of the empire to keep up with the booming population of Istanbul.

It is clear that an adequate and consumable water supply was essential to the survival of Istanbul's people and to the success of its rulers. Water was highly integrated into the day to day life of the people. The waters of Istanbul were believed to be very special waters with medicinal uses and the fountains throughout the city were an essential part of religion and culture. The fountains of Istanbul were a major part of the character of the city. Without water, the fountains were merely ornaments and lost their importance. In this way, water was essential to the character, religion, and culture of the city. There were 1,553 fountains built during the reign of the Ottoman Empire. Water flowed freely throughout the entire city.

Had time not progressed, this type of water resources management practices may have provided water for Istanbul until the end of time, but with the advance of time and technology, the old ways become inadequate and a

civilization must look at new ways of managing its infrastructure. By 1869, Istanbul was in need of water again. Not only had the population outgrown the current water supply, but multi-story buildings were beginning to become common. In order to supply water for multi-story structures, pressurized water was needed.

In order to update the water system to provide pressurized water, the government hired foreign companies. The companies were charged with the task of using springs, aquifers, and surface waters to provide new supplies of treated, pressurized water for the city. The changes that were set forth by the private companies deprived the citizens of Istanbul of water, even though there had been water before. Things only got worse while these companies controlled the water. Istanbul suffered a severe water shortage at the end of the Ottoman Empire due to the misconduct of these foreign contractors. The future of the water was uncertain during the transition from the Ottoman Empire to the Republic (ISKI, 2003).

The Republic and Water

In 1937, the control of the nation's water was turned over to the authority of the Istanbul Board of Waterworks. The board made many updates and improvements to the water supply system, but their efforts were not enough to provide for the cities growing population. The population was once again growing in proportion to new water supply. The Board could not provide for the industrialization and urbanization of Istanbul. In 1994, a new organization, called ISKI, took responsibility for the water problem.

It was the goal of ISKI to return Istanbul to the city of water that it had once been. They completed a master plan projected out to the year 2040 for the management of the city's water. Water supply improved dramatically in the nine years between 1994 and 2003. The water supply was larger than it had been in any previous years and dramatic improvements were made to the city infrastructure.

One of the first tasks of ISKI was to determine the amount of useable water supply in and around Istanbul and find ways to dramatically increase the water supply. Very quickly they added underground water treatment and new

wells to increase the amount of available water in the interim. After water supplies had been increased for the short term, work began to provide larger quantities of water for the long run. Seven dams were built on seven creeks to provide water for Istanbul. This was all completed in less than nine years.

Giant steel transmission lines were put in place to convey water to Istanbul. These were the first steel lines to be placed in Turkey. All pipes of the ancient empires had been earthenware. The new lines are at least twenty kilometers long and convey raw water to treatment plants where the water is made potable. Water treatment was a relatively new problem for Istanbul. The original water came from untouched sources in forests and springs. In later time, water had grown so scarce that quality was a secondary issue. Raw water quality was at a low that had never been experienced before. Old water treatment systems were obsolete and had to be rebuilt. Many new treatment plants had to be built to treat the increased water supply.

Today, Istanbul is once again a city with water. The efforts of ISKI have resulted in returning a reliable potable water supply to the city and major renovations will continue into 2040 to make room for future systems, and restore the water resources of the past. Istanbul has grown to an amazing fifteen million people. The water quality is such that the water can be drunk from the tap and the taps always flow. The infrastructure of Turkey has been saved and its great people will be able to flourish for generations to come (ISKI, 2003).

Water Resource Management in the Southeastern Anatolian Region

Water resources management is not just an important topic in the highly populated cities of Turkey. In Southeast Anatolia water management is being used to help advance the economy of the area. Since the late 1970's, Turkey has been working on a project called the Southeastern Anatolia (or GAP) project. This project will provide irrigation for a large portion of Anatolia and hydroelectric power equal to half of the countries current demand. This project will dramatically change the lives of the people who live in Southeastern Anatolia. It is an

excellent example of how water resources management can shape peoples lives.

The GAP Project

The GAP Project is the largest-scale regional development project ever undertaken by the government of Turkey. The project has thirteen components, which are primarily for the production of hydroelectric power and irrigation. The expected outcome of the project is to develop the land of Southeast Anatolia for agriculture and provide economic prosperity for the people who live there, while providing hydroelectric power for the entire country.

During the entire course of the project, 22 dams will be built on the Tigris and Euphrates rivers along with 19 hydroelectric plants. The total power capacity of the full development of the project is approximately 27 billion kWh of electricity each year. The full area of irrigation is 1.7 million hectares.

The cornerstone of the project is the Ataturk Dam. The Ataturk Dam is the largest dam in Turkey and it is the sixth largest dam in the world. It is a rock-filled dam capable of producing 2400 MW of energy. The Ataturk Dam is the third dam to be completed along the Euphrates River (DSI, 2003).

Life of the Kurds

Southeast Anatolia has a large Kurdish population. The farmers of the area are primarily Kurdish. If the primary purpose of the GAP project is to provide electricity and more agricultural lands for Turkey, than it is the secondary purpose to give economic prosperity to the Kurds. Political reasons for this are to decrease the amount of rural citizens moving into the cities each year, and to assimilate the Kurds with the rest of Turkey.

Irrigation waters have already reached parts of Southeast Anatolia, and the results have been an increase in the average household income of the farmers. Families no longer have to farm all year long in order to make ends meet, and they are finding themselves with a small amount

of expendable income to spend on things like household appliances.

One drawback of the GAP project is that many families have had to be relocated in order to make room for the project. The role of feudal landlords has also increased. These people seem to be reaping most of the benefits of economic prosperity, however, the farmers are happy because they have more than they have had before, and that seems to be good enough. It is unclear what will happen to the role of small family farmers when the project is complete. It is likely that they will be growing fruits and vegetables on small plots of land, while a large quantity of the newly irrigated land will be for large scale farmers to raise cereal grains and cotton.

The women of the family are being taught how to contribute to their family incomes via social programs sponsored by the government. They are being taught how to start small business, like day care centers. It is not only the goal of these social programs to help women earn a living, but to modernize the Kurdish ideas of women's role in the world. It may be too early to tell how effective these programs are.

The role of children is also being considered during the course of the GAP Project. Currently there are many children pan handling in order to make money for the family. Ultimately, it would be ideal for children to go to school while parents provide the entire family income.

Environmental Impacts

The full scope of the environmental impacts of the GAP project seems to be unknown. There have been concerns raised about water quality, but on the topic of dams, there are many additional concerns that must be dealt with. During the first phase of irrigation, salinity and high water table problems began to persist; these can be expected to worsen as more of the project components come online. Effects of the project on channel geometry and flora and fauna are still unknown.

Downstream Neighbors

Although the GAP project is great for the economy of Turkey, Syria and Iraq have been less than enthusiastic at various stages. The origins of the Tigris and Euphrates are in Turkey, which means Turkey has primary control of the water flowing into Syria and Iraq. Neither of the downstream neighbors were pleased when the Euphrates was turned off for a month in order to fill the Ataturk Reservoir. It has been projected that when all of the dams are completed, Turkey will release thirty percent less water than it did previously. This has Iraq and Syria concerned about a possible water deficit.

Water quality is also a potential problem for Turkey's neighbors. The water used for irrigation will undoubtedly contain soil and agricultural chemicals. This water will drain back into the rivers and these wastes will be carried downstream to Syria and Iraq. These countries will not be thrilled to accept polluted water. The countries have already met together to discuss these issues. Hopefully a balance will be struck that will be acceptable to all parties and peace will remain intact between the three countries.

Conclusion

Turkey's unique landscape and ancient history have shaped it into the country that it is today. All through the ages, there has been a question of water. The advances made by ISKI in the twenty-first century have saved Turkey's infrastructure for future generations. The GAP project will transform Southeast Anatolia into an area of economic prosperity. The Turkey of today is different than the Turkey of yesterday and tomorrow. All through these changes there has been water. Turkey is a country of water, in a region of the world where water is very valuable. It is through the management of water that Turkey will prosper economically and earn its place in the western world.

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Heather Cross
IPWRM, 2005

Hydraulics Study Abroad

A look into the Motivation of American Students Studying Abroad

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This study looks at the motivation of American students to travel abroad. The specific subset of students studied was the participants of the International Perspectives in Water Resources Management program. The International Perspectives in Water Resources Management (IPWRM) course looks into the specific water resources issues of a particular region in an annual short course planned by the IIHR-Hydroscience and Engineering department of The University of Iowa. This year's course looked into Turkey with a concentration on the GAP project affecting the Anatolia region during the span of two weeks at the end of May 2005. This survey looks at what factors makes certain students want to participate in traveling abroad for such a trip compared to their fellow students. The concerns and factors that are used in the decision process such as time, money, safety and motivation are examined. The driving factors for studying abroad are examined such as experience, cultural diversity, site seeing, globalize work force, and break from everyday life are ranked and compared. A sample group of American student of similar academic standing and research interests were sampled and contrasted to the participants of the trip on these issues.

In general, the group's motivations for travelling abroad were to experience and to learn first hand about other cultures, about water resources issues in other countries (being of interest for future work options), to gain a perspective of the people outside of the United States, and to gain a deeper understanding of international environmental and social issues.

Some from the group had travelled abroad before and the ones who didn't listed reasons such as time or money constraints, but the whole group agreed that it is really important for a student to travel abroad. It was thought that travelling provides students with a broader perspective of life and gives a personal perspective of how one's culture is viewed from outside. It was mentioned that people in the U.S. are relatively isolated from the rest of the world and that travelling abroad is a good opportunity to break that. Understanding other people brings tolerance and respect for others. Experiencing the outside world and expanding horizons is necessary for growth of ideas, insight, and knowledge. It is a unique way to learn about other people, places, and ourselves and our own cultures because it helps to broaden our minds.

Before travelling the main concern for the persons travelling were financial constraints, then time and last was safety. The breakdown for the rankings is given below in Figures 1 and 2.

Figure 1

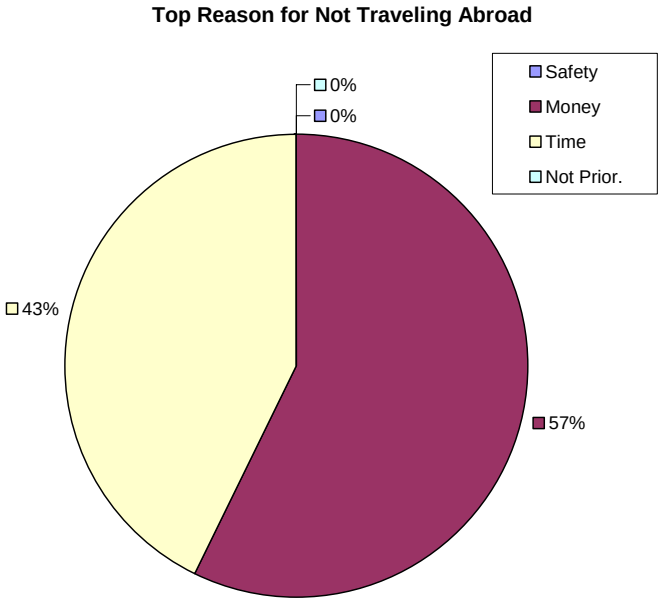
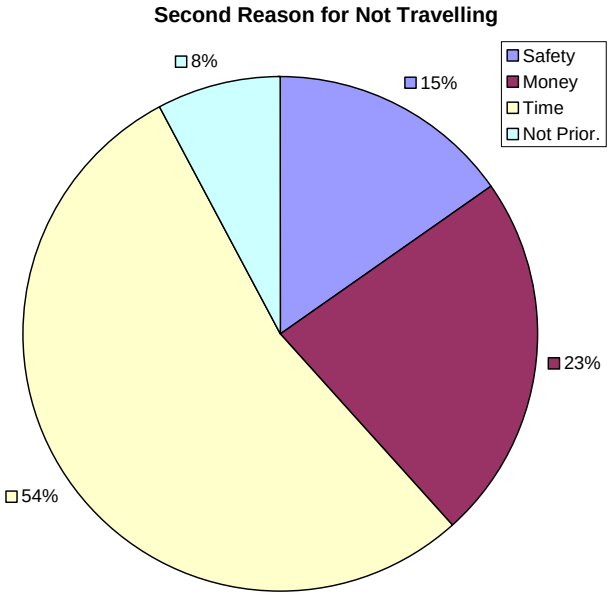
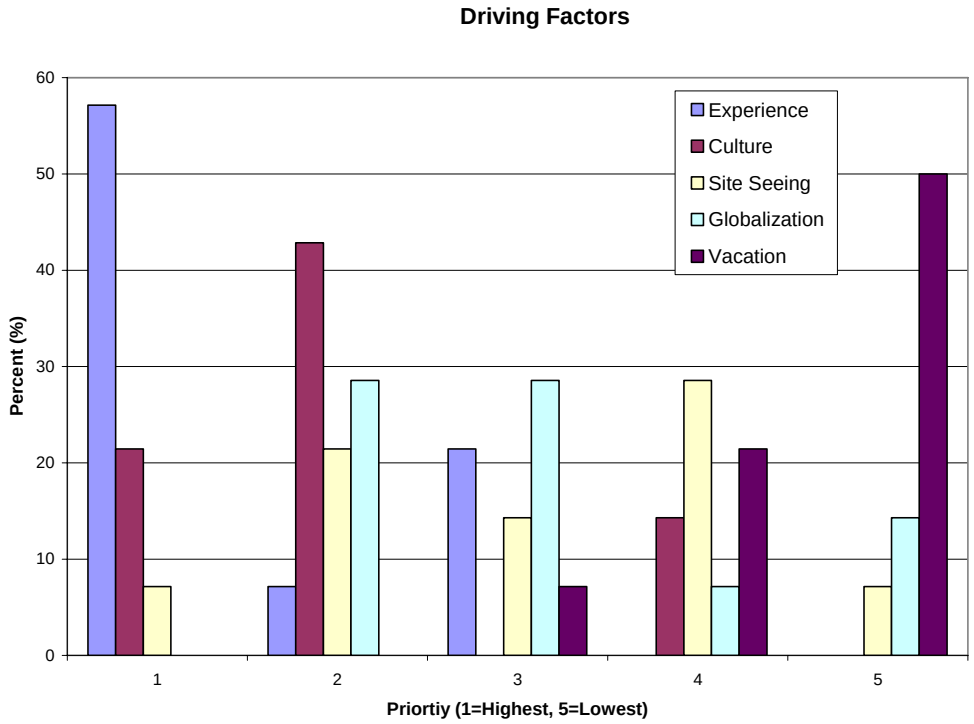


Figure 2



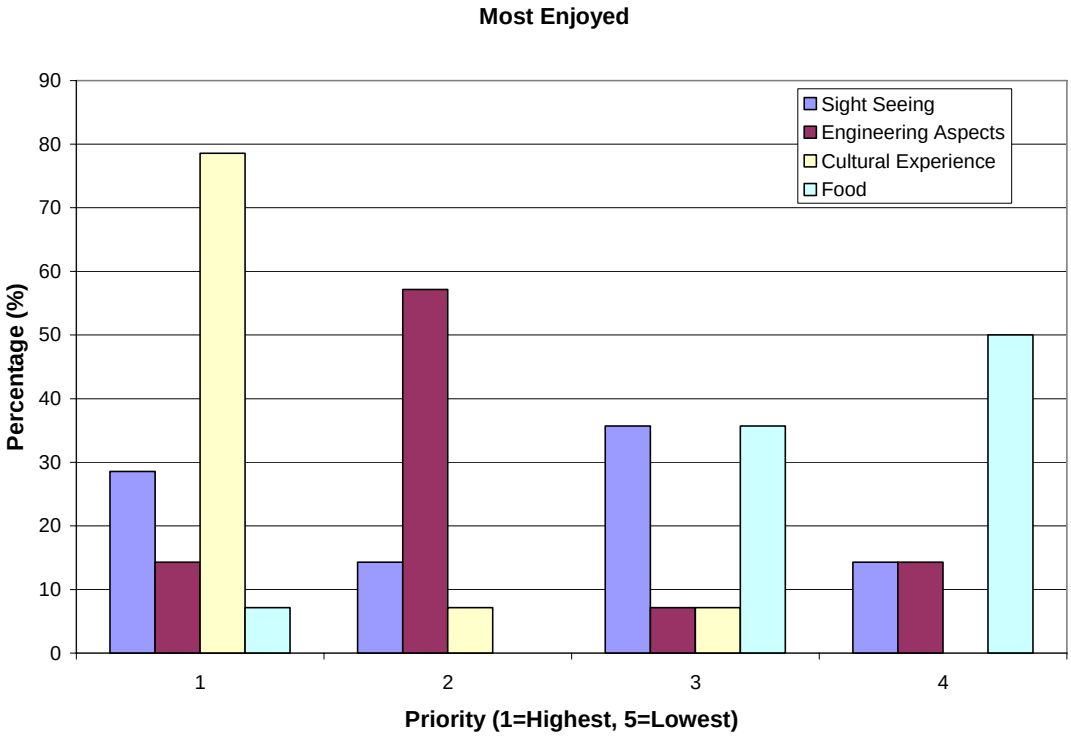
The driving factors for students travelling abroad were in order, to gain experience, cultural diversity, followed by a tie for 3rd between site seeing and global workforce, with a break from every day's life coming in last. The graphical breakdown is given below in Figure 3.

Figure 3



After the trip everybody responded saying that they had learned a lot about Turkey, the Turkish culture, an understanding of the way the Turkish people use their water resources, and how the need for water affects the development of a society. An insight into the lives and places that affect and are affected by the GAP project was also taken into consideration. Another thing mentioned was the gain of a new perspective on American culture viewed from outside the U.S. and how the world outside the U.S. differs. For all of the participants involved, his or her motivations were satisfied and there is a clear willingness to continue travelling abroad after the experience.

Figure 4



The participants in the study were asked to give their reflections on their host and home country after the trip to see how the trip affected them. In general what the group learned about the host country was that it is very welcoming to guests, and that the people of Turkey are very hospitable, friendly, and gracious people. The group became educated on how diverse the Republic of Turkey is with the different cultures that have passed through Turkey and its long and rich history with multiple historic civilizations and kingdoms. Because of these aforementioned reasons, the people of Turkey are extremely proud of their homeland.

The group mentioned some things they learned about their home country that were both positive and negative. It was a consensus that in the U.S., people take a lot of things they have for granted. These included the health care and sanitation systems. It was also interesting to see how little religion has an influence on the U.S. compared to a country like Turkey.

To review and test the results from the surveys given to those who traveled, a sample survey consisting of the same questions as the pre-travel survey was given to students of the same background and age who didn't participate in the IPWRM trip to Turkey.

When faced with the question, "Which are of a concern, or are limiting factors in your decision to travel abroad?" Those who didn't participate replied, with reasons such as time or money constraints. This was, for the majority of the group, the same reply received from the participants of the class. Overall, safety was still a distant reason for not traveling abroad. There was less of a desire to travel abroad from multiple participants who responded that they didn't think it was important to study abroad or viewed at as just another experience. The majority of the group however still felt that studying abroad was an important experience.

Figure 5

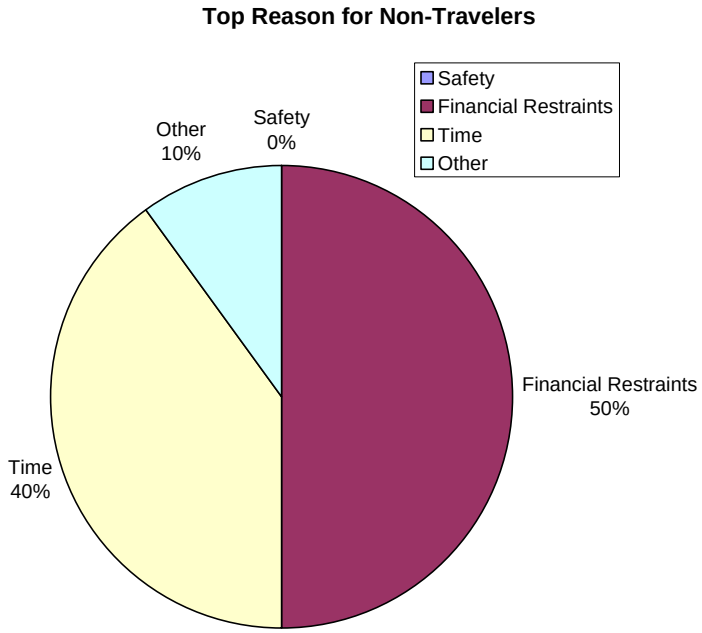
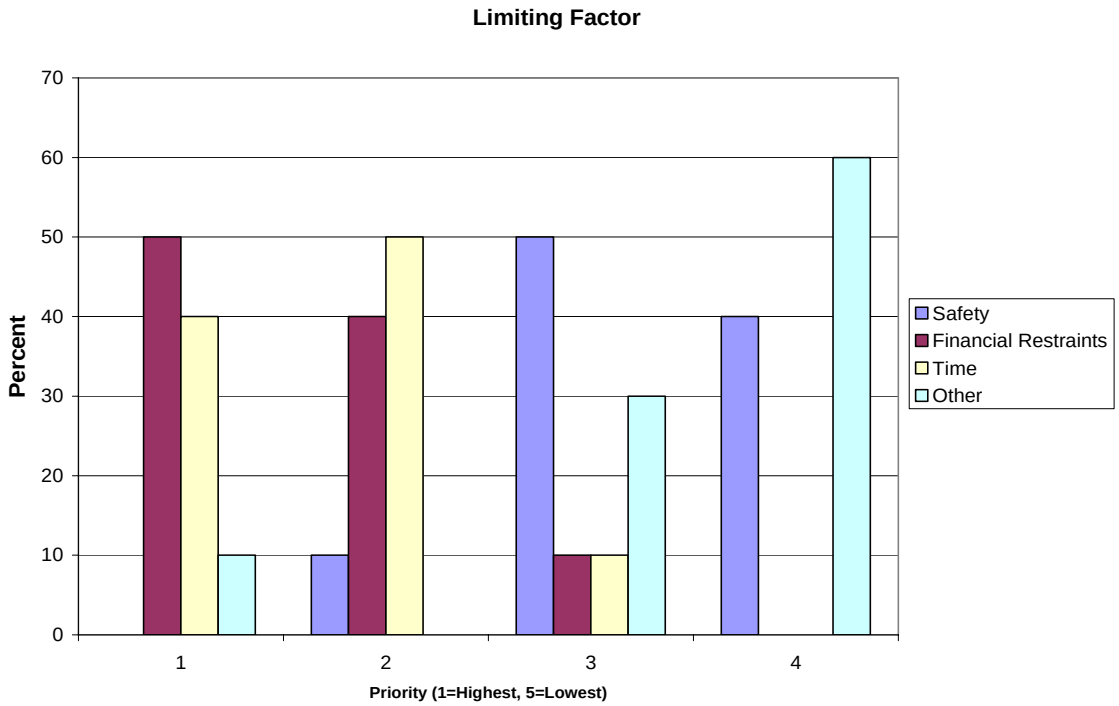


Figure 6



When asked what the driving factors are for a student fitting the subject's profile to travel abroad, the group's motivations for wanting to travel were basically the same as those who participated in the class. The top reasons were to experience and to learn first hand about other cultures, get an understanding for the level of water resources infrastructure in the country, to gain a perspective of the people outside of the United States, and to gain a deeper understanding of environmental and social issues on an international level.

Figure 7

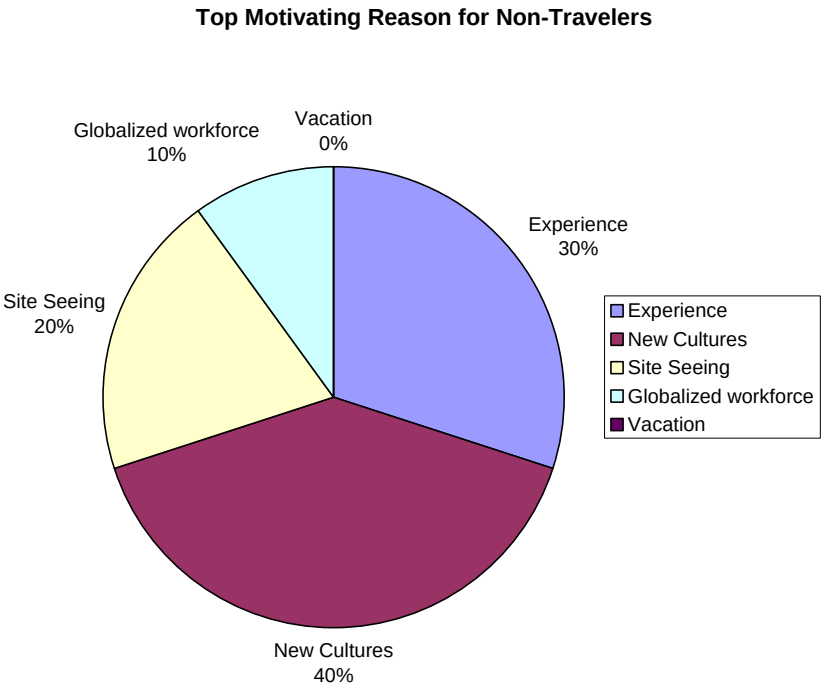
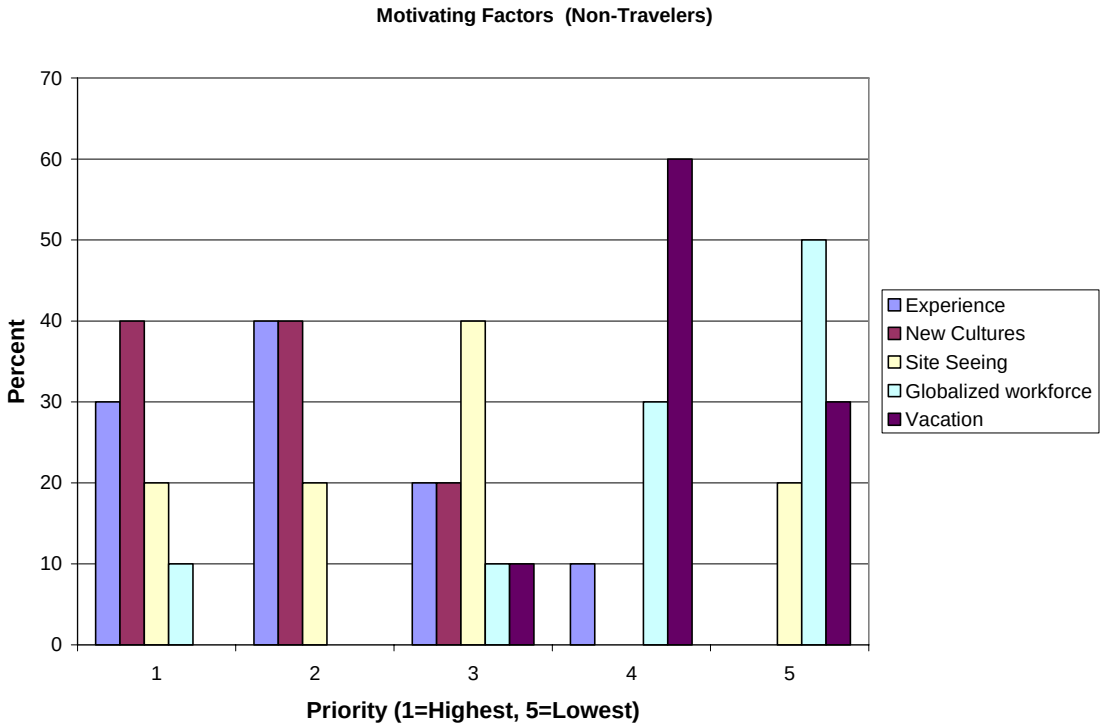


Figure 8



Overall, the desires and discerning factors of both parties seem to be similar. Both, the placebo group and the class participants would like to travel abroad to learn about the different cultures and gain experience that would otherwise be impossible to receive in their home country. Neither group mentioned safety as an important reason to avoid traveling.

In the placebo, or test group, there were those who expressed an interest in living within the society for six months instead of visiting for three to five weeks. This trend seemed to depend partially on the commitments of the students (married, job) not just the desire to experience another culture. However, there were also a few outliers who didn't comprehend a reason or show any desire to travel abroad. They expressed beliefs that you could learn the same amount in your home country. The small set of students that fit the profile of Hydraulics students I think in the end made it hard to draw strong comparisons between the test group and course participants. The deciding factor between the two groups could possibly be something like motivation which is hard to quantify. If this study was continued for multiple IPWRM trips more robust conclusions could be drawn.

Course Feedback

The main objective of the IPWRM survey was to look into American students motivations and factors in traveling abroad, this portion was discussed in the previous section. Along with questions pertaining to that topic the participants were asked for feedback about their trip and for consideration that event organizers should take into account during future trips. The section show the question asked followed by a summary of the answers.

What was your favorite experience from the trip?

Most of the responses to this question had responses relating to the social aspect (Liverpool fans/night before UEFA final game,, free time at the bazaars and markets, the Uzuners dinner), water resources (old water system/aqueducts, Cistern) and Site Seeing(Castles, Mt. Nemrut, Bosphorous).

Would you recommend the IPWRM course?

All of the participants recommended the trip some rather enthusiastically. Some of the answers that included comments are given below.

I think the course is great. The chances to see the engineering feats of the world come only once in a life and much is gained from seeing the various applications and aspects. I would, especially as an introduction to traveling abroad for students who haven't done much international travel in the past. It helped me gain a better understanding of the water resources practices in a region I knew little about before the trip process

Yes, for Hydraulic and non-Hydraulic students alike.

Without hesitation. The program was well planned to give the right amount of touristy things and the right amount of educational things. It would be very difficult and expensive to do all the things we did on the course as an individual on vacation.

Do you have any suggestions for further IPWRM trips? Please elaborate.

This question drew the lengthiest comments from the participants. The subjects that were brought up multiple times included a need for more rest, more free time, and shorter lunches. Some other suggestions that were only broached once include spending less on accommodations, having only one group leader, and including participants in the planning process.

Do you think the arrangement of the cultural activities, sight seeing and water resources aspects had the correct balance or do you think the course should have been emphasized towards a certain aspect?

Overall as a group the consensus was that the correct balance was achieved. The only comments that were given were one person wanted more water resources aspects but wouldn't cut out the other parts while another person wanted less tourist activities.

Do you think 2 weeks are enough?

The majority of the participants agreed that 2 weeks was an adequate amount of time while a couple people wanted closer to 3 weeks and one said you can't spend enough time in Turkey. Another useful suggestion was to encourage students to plan an extension of the trip on their own

Were there any negatives you experienced about the trip to Turkey (besides the sickness)?
The main negative aspects mentioned were the tour guides and slit toilets which were both accepted to be hard things to control.

Modernity Through Old Technologies
Turkey's road to the European Union

University of Iowa
Institute for Hydraulic Research
International Perspectives in Water Resource Management 2005: Turkey

Yudai Tadaki
July 14th, 2005

Introduction:

The Republic of Turkey is facing a significant identity crisis as the world advances further into the twenty-first century. Located at the crossroads of the world's oldest civilizations, two continents, and countless ancient and modern cultures, it is faced with the challenge of preserving its cultural heritages while prospering in the new millennium.

Mustafa Kemal Ataturk, the "Father of (Modern) Turkey," is credited and celebrated for providing the first of this service in the 1920s. Following the War of Independence, he reformed the Ottoman Empire in to the modern republic that it is today. This transformation brought, amongst other things, a secular form of government, the western alphabet, rail roads, electricity and other "modern" amenities across Turkey, although development of education and employment may have lagged (Clow, 2004, pp. 172). Efforts to further accelerate the development of Turkey were undertaken in 1976 as a large-scale water resource development project known as the Southeastern Anatolian Project (GAP) was initiated in Turkey (DSİ, 2003) and is still under development today.

The project involves the installation of 22 hydroelectric dams for the primary purposes of irrigation and power production. In the summer of 2005, the project was nearing its end and a group of U of I students visited the country to investigate the various technical, political, environmental and social aspects of the nearly completed project. The following is an analysis of the GAP project's goals, implementation, and its social and environmental implications.

Economic Development

River Damming advocates and critics alike can agree that dam building has, in certain situations, its advantages. The original purpose of dams was to improve the living standards of populations by providing drinking water and supporting economic development by providing water for agriculture, power, navigation and flood control (Black, 2001, Altinbilek, 2001).

The goal of Turkey's ambitious GAP project, as with arguably *all* dam building projects, is quite obvious: economic development. What is unique about Turkey's situation is that economic development is not the ultimate goal. The ultimate goal (as learned from talking with Turkish students) is the accession into the European Union (EU). Economic development of the country achieved through this extensive project is necessary if Turkey is to enter into the EU.

The "Copenhagen Criteria" for membership into to the EU require applicant countries to meet certain membership criteria. These criteria can be divided into four general groups: political, economical, integrative and structural (n.a.). The development of the GAP region through the building of dams addresses only (and not fully) the economic criterion which requires "the existence of a functioning market economy as well as the capacity to cope with competitive pressure and market forces within the Union."

Turkey is currently very seriously and aggressively going through the process of accession into the European Union. For this to be realized, development of Turkey and its people are needed in a rather short period of time (Okumus, 2003). This development

is to be achieved by economic development of rural Turkey through increased agricultural production by means of increased irrigation of the GAP region.

The Turkish state is counting on the services the GAP dams will provide to fulfill its accession requirements, thus allowing it to enter into a very powerful and prosperous European community that will allow it to prosper globally in the new millennium.

Turkey's Dams:

To fulfill the economic development requirement of accession into the EU, Turkey is constructing a network of 22 large dams and 19 hydroelectric power stations in the Southeastern Anatolian Region, namely, the Tigris and Euphrates Rivers (DSİ, 2003). The dams store water at night by completely restricting the flow of water through the dams (Bilicek guy). This stored water is released only during the day through the hydro-electric generators, when electrical demands of the region are highest. The hydro-electric dams are projected to produce 27 billion kWh of energy annually (Tirgrek, Altinbilek). Roughly 75 percent of this electrical production capacity has so far been realized.

The stored water will also be used to irrigate some 1.7 million hectares [Roughly the size of the state of Connecticut (50states.com)] of the region (Tigrek, Altinbilek). Pricing for the water is based on the users' crop and crop size, and their "ability to pay" with the state paying for any shortcomings (Tigrek, 2005). This allows all farmers to have access to the water from a financial standpoint. The Farmers' Union is responsible for the actual operation, maintenance and distribution of the irrigation systems and its waters (Darama, 2005).

Yet, with less than 20% of the irrigation project realized, problems are already arising. The first and most disturbing seems to the lack of a fair and reliable distribution system. A system to meter and account for water usage was initially not installed in the system. This resulted inevitably in excessive water usage by many farmers, resulting in poor water-usage efficiency and distribution. Although farmers do not have financial obstacles in accessing water as described above, some do not have physical access to water due to its overuse and wasting by others. Attempts to curb this water wasting by installation of water meters were met with vandalism of the meters and other hostile acts.

A second sign of trouble is the selection of crops grown by the water users. It was first predicted that roughly 30 percent of farmers would grow cotton while the remaining 70 percent would grow wheat. The exact opposite is found to be true in the newly irrigate regions (Demirel, 2005). Seventy percent of farmers are growing water intensive cotton, which results in further demand for water and will result in increased soil nutrient depletion (Fennely, 2005).

Society and Environment:

The GAP project, initially conceived as an irrigation project, is said to have been converted into a sustainable human development project, "placing human being at the focal point of the development" (Tirgrek, Altinbilek). Out of these efforts have come several progressive programs such as the multi-purpose community centers, youth-to-youth development and cultural heritage programs.

And yet, the priority the project places on economic development seems overwhelming. Of the roughly 20 laws passed by the EU in 1999 known as Agenda 2000,

one calls for the "continuation of agricultural reforms to strengthen the European competitiveness, improve the importance of environmental protection…"(n.a.). The goals of the GAP project defy both of these objectives by encouraging state subsidized agriculture, by building large dams which have irreversible negative effects on the local environment, by irrigating large tracts of land which is destructive to the soil and inundating whole cities and cultural heritage sites.

All of these negative effects have been overlooked for the anticipated economic benefits of the project.

Conclusions:

The decision to build a series of large dams in order to enter into the EU seems to be a shortsighted means to an end. The completion of the project will undoubtedly bring a certain amount of economic and social development to the region, but Tigrek and Altinbilek's claim that "the GAP will put an end to the unemployment in the region and there will be migration into the Southeastern Anatolia" (Tigrek, Altinbilek) seems highly unrealistic.

Dams were built, irrigation channels were dug and irreversible environmental damage has been done, but no water metering systems were installed. State farming plans were not followed by the farmers as expected (Demirel, 2005). Over 100,000 people were displaced (Tigrek). The issue of salinization has been (dis)regarded as a future problem to be handled in the future. The archeological site of Zeugma, located on the Euphrates, was inundated by the Bilicek dam. Archeologists from around the world assembled to excavate and salvage what they could from the site. The effort has been

celebrated as a successful cultural heritage rescue effort, even though over half of the site remains unexcavated and is now submerged underwater.

Turkey is not the only country in the world to have tackled such extensive water development projects. Erik Swyngedouw describes a national "waterscape" production project of Spain in the late 1800s to produce a "hydraulic utopia of abundant waters for all" to promote social harmony by eliminating conflicts caused by inequalities associated with access to water (2003).

Swyngedouw maintains that modernization is as much of a social process as it is a physical process. In fact, we see that social conflict related to access to water (and therefore money) was an important factor that initiated the hydrologic projects in the first place. The effects of the projects are interesting. The Water Act of 1879 established that all surface water was common property to be managed by the state. Spain was divided into ten administrative zones. The zones were established according to major river basins and more or less did not consider provincial boundaries or native use patterns. This contributed to some socio-political conflicts which delayed the realization of a water resource management system as stipulated by the Water Act of 1879 until 1961, almost 100 years later (Swyngedouw, 2003).

Today Spain still faces major water shortage problems. Despite unsustainable pumping of water, droughts still plague the Spanish society and economy. In short, Spain's massive irrigation project failed to give increased access to water or to quell water related social conflicts in the short and the long terms.

The 1950s in the United States saw a similar occurrence. Many dams were built to help support urban development across America. The National Inventory of Dams lists

over 79,000 dams in the US (NID, 2005), including 7,700 major dams (NationalAtlas, 2005). Many of these were built in the 1940s – 1950s with little regard to their environmental or social implications. Now, over fifty years later, many in the environmental science/engineering field concede the negative economic and environmental impacts of these outdated dams.

Even well planned and implemented damming projects are wrought with environmental and social negatives that are very difficult to deal with. The installation of dams across Turkey, as a means for accession to the EU, with its apparent lack of sufficient planning and foresight may have short-term benefits, but has long-term consequences as well, all of which countries that built dams 50 and 100 years ago are dealing with now, and Turkey will inevitably have to deal with in the future.

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Turkey — International Perspectives in Water Resources Management

May 21 - June 4, 2005

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Turkey International Perspectives in Water Resources Management

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