

Republic of Turkey
Prime Ministry
GAP Regional Development Administration

**WORKSHOP ON
AMERICAN EXPERIENCES IN
WATER BASED
DEVELOPMENT**

ANKARA, TURKEY
January, 2000

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Prime Ministry
GAP Regional Development Administration

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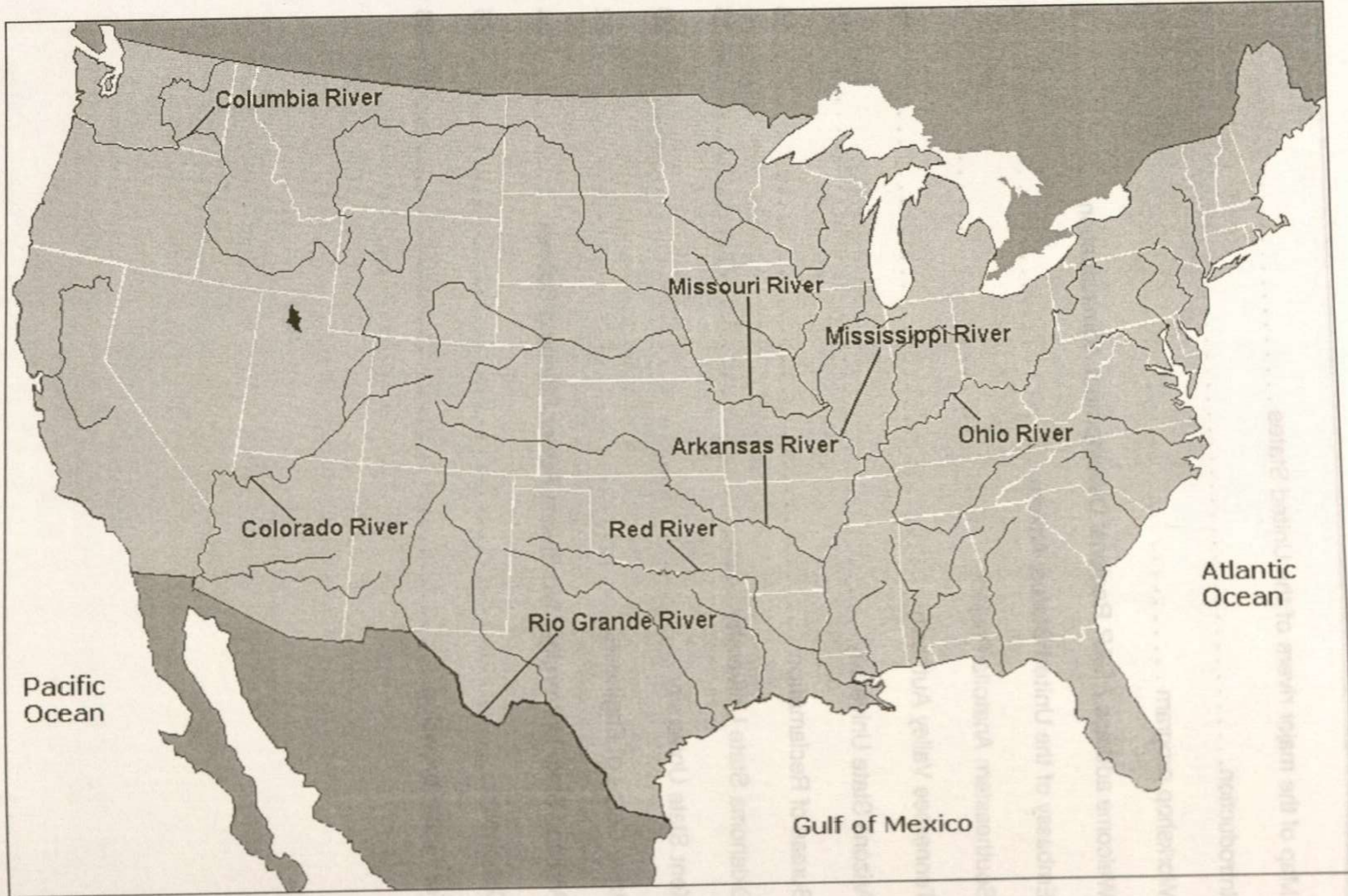
WORKSHOP ON AMERICAN EXPERIENCES IN WATER BASED DEVELOPMENT

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Major Rivers of the United States

The Southeastern Anatolia Project Regional Development Administration (GAP RDA) hosted a workshop entitled *American Experiences in Water Based Development* on January 11 – 13, 2000 at the Middle East Technical University in Ankara, Turkey. The purpose of the workshop was to provide a platform in Turkey for hearing the lessons learned from the implementation of water related development projects in the United States. Participants in the workshop included representatives from several federal government agencies of the United States, as well as representatives from various public universities who are involved in water related development projects.

American experiences in water based development are of particular interest to GAP for several reasons. First, the United States has been a world leader in developing water resource development technology and in transferring that technology to others. Second, the numerous projects that have been implemented in the United States over the last century present several case studies of the impact that natural resource development has on economic and social development. Third, water based development in the United States continues to adapt in response to changes in the natural, economic, and social environment. The lessons learned through these American experiences can be applied to water based development projects elsewhere.

Finally, the exchange of ideas and experiences – in both directions – is valuable for strengthening international linkages and for discovering the means for sustainable development. The Southeastern Anatolia Project is a pioneer in regional integrated and sustainable development, and the experience gained in the context of this region will be useful for multiple purpose regional development projects elsewhere in the world. The sharing of experiences from both the United States and Turkey presents a unique opportunity for mutual encouragement and learning.

The main events of the workshop were conducted over two days, with presentations by workshop participants, followed by questions from attendees. The presentations addressed issues such as:

- The relationship between water supply and economic development
- Environmental impacts of water based development
- The influence of water based development on urban and rural planning
- Natural resources management
- The institutionalization of water based development

In addition to the presentation of papers, the workshop was the venue for signing protocols of understanding between the GAP Regional Development Administration and three visiting institutions: Arizona State University, Tennessee Valley Authority, and Oklahoma State University. These protocols serve to formalize the developing cooperation between GAP RDA and these institutions as they explore opportunities for sharing expertise.

Following the presentation of papers, workshop participants travelled together to the GAP Region. This tour presented some of the historic sites of the region, as well as the Ataturk Dam and Reservoir, the Sanliurfa irrigation tunnels, irrigation facilities on the Harran Plain, Halfeti City and the Birecik Dam.

This publication has been designed as a permanent record of this workshop. It consists of brief summaries of each of the presentations in the order of the original workshop program, supplemented with additional information and references to relevant websites. Complete transcripts of any of the presentations are available upon request from GAP RDA.

Southeastern Anatolia Project Regional Development Administration

Prior to 1989, development in the Southeastern Anatolia Region of Turkey was implemented through individual projects administered by separate government entities. As the central government recognized the potential use of natural resources in the region to drive integrated regional development, plans were made for coordinating and accelerating this development.

In 1989, the GAP Master Plan was presented. This plan outlined the plans for integrated socio-economic development and called for a new entity responsible for the management, monitoring, evaluation and implementation of this development. This new entity was the GAP Regional Development Administration (GAP RDA).

The GAP Regional Development Administration is unique in its role as coordinator between central government agencies, local governments, private business, universities, non-governmental organizations, international agencies, and local citizens. As it fulfills this role, GAP RDA has conveyed a perspective that focuses on a human-centered, participatory approach to sustainable development.

By providing coordinating and advisory services to government activities in a variety of sectors - energy, infrastructure, economics, human services, environment - GAP RDA is able to draw from different expertises and perspectives to develop holistic, sustainable solutions to regional development issues.

Workshop program

Tuesday, January 11, 2000

6.00pm Reception, Best Hotel

Wednesday, January 12, 2000

- 9.00 Inauguration Speeches
- 9.15 Mr. J. Kunschthater
United States Embassy, Ankara
- 9.30 Protocol signing ceremony
Arizona State University
Tennessee Valley Authority
- 10.00 I. H. Olcay Unver, Ph.D.
Southeastern Anatolia Project
- 10.30 Break
- 11.00 Ronald Williams, Ph.D.
Tennessee Valley Authority
- 12.00 Break
- 2.00 Charles E. Backus, Ph.D.
Arizona State University
- 3.00 Break
- 3.15 Richard Ives, Ph.D.
US Bureau of Reclamation

Thursday, January 13, 2000

- 9.00 D. C. Coston, Ph.D.
Oklahoma State University
- 9.45 Charles Nieman, Ph.D.
Robert Heath, Ph.D.
Kent State University
- 10.30 Break
- 11.00 Jerome Delli Priscolli, Ph.D.
US Army Corps of Engineers
- 11.45 Peter Paquet, Ph.D.
Portland State University
- 12.30 Break
- 2.00 Concluding Remarks
I. H. Olcay Unver, Ph.D.

Southeastern Anatolia Project Regional Development Administration



I. H. Olcay Ünver, Ph.D.

Dr. Ünver has been President of GAP RDA for the last ten years. The following remarks are taken from his speech at the opening of the workshop.

I would like to welcome you all on behalf of the GAP Regional Development Administration. We are happy to host you in Turkey for the workshop on "American Experiences in Water Based Development".

We are providing this workshop in order to create a new platform where various approaches of different water based development projects from the United States of America could be shared and the experiences that have been gained through the implementation process of such projects could be disseminated.

Turkey is one of the largest countries in the Middle East and was the home of the world's earliest civilizations. The southeastern region of Turkey contains the northern end of the Mesopotamian Plain, the land between the Euphrates and Tigris rivers. The region, referred to as Southeastern Anatolia, contains 10% of Turkey's land and population, covering 75,000 square kilometers and with a population of over six million people.

Given the development challenges of Southeastern Anatolia, and the opportunities presented by the region's water and land resources, the Republic of Turkey initiated GAP as a water resources development package, including construction of dams, irrigation systems and hydroelectric plants. The project was later transformed in the early 1980's to a multi-sectoral, socioeconomic regional development program, and then into a sustainable human development project in the 1990's. The responsibility for coordination of development in several sectors was given to the GAP Administration.

Adapting sustainable development approaches to GAP and implementing a regional development project with global values has led our administration to develop relationships with foreign countries and international institutions more intensively.

The United States of America in particular has a tradition of know-how in water based development projects implemented by many institutions all over that country.

In the 1950s, the Bureau of Reclamation and the US Army Corps of Engineers were the models for Turkey's State Hydraulic Works, which carries the responsibility of constructing all dams and irrigation systems of GAP. The Tennessee Valley Authority, on the other hand, became the example for the regional development approach and institutional setting for GAP.

The experiences of GAP and other water based development projects should be shared. We have learned from the experiences of water based projects in the United States, but we believe that we also have learned some lessons and gained know-how that can be of benefit to our counterparts in the United States and in other countries.

GAP, with its human centered development philosophy, has a distinct place in the history of development efforts in the world. GAP is already contributing its experience to several similar water based development projects around the world. For example, last November in Sanliurfa, Turkey, we held a workshop on experiences in water based development, where we interacted with representatives of major development projects from India, China, Japan, France, Mexico, Egypt, and other countries.

The interchange between GAP and American institutions and universities should expand, with the mutual exchange of knowledge and experience, and initiate joint projects with American institutions, including many universities.

I am happy to see that American institutions also share our approach regarding this cooperation. Some of the relationships which were started long before this workshop have reached a new level with the signing of cooperation agreements. Arizona State University and Tennessee Valley Authority are two of these institutions. I am happy to declare that the memoranda of understanding with these two institutions will be signed before you in a few minutes.

It is a great pleasure to have the representatives of American institutions here in Turkey. Thank you for making this workshop possible.



Embassy of the United States Ankara, Turkey

John Kunstadter

Mr. Kunstadter is the Deputy Undersecretary of the United States Embassy in Ankara. Below are excerpts from his remarks at the opening of the workshop.

I would like to express appreciation on behalf of Ambassador Parris for having organized this very important workshop. I also bring greetings from Stu Jones, our Consul in Adana in Southeastern Turkey. I would urge the American guests here that when they are in the Region to stop in Adana. He is very open to discussing ideas with you and to cooperating and giving you further contacts.

We would like to underscore our support for the GAP Project. This is not only key to the whole Mesopotamian region, but integral to Turkey's development as well. It offers models for development that can be applied in many parts of the world. We hope that this workshop will strengthen the cooperation between Turkish authorities and the various US agencies and universities represented here.

The timing is very auspicious, because Turkey has just embarked on a major disinflationary program in conjunction with the IMF and the World Bank. In that context, the World Bank and the Turkish Ministry of Agriculture are working on a substantial reform of the agricultural system. In praising what GAP has done and in the vision that GAP represents, we also have some rather strong concerns which are shared by our Turkish friends. In fact, they are the ones who brought these issues to our attention.

I would like to touch on two points, salinization and erosion, which are two parts of water management which I know the GAP Administration is fully seized with. These are two very big challenges for the long-term success of the GAP Project.

An obstacle to progress in this area is the manner in which the farmers pay for water. Farmers in the Çukurova Plain and in the GAP Region pay for the water by the area they wish to irrigate, not the volume of water they use. This limits the incentive to use less water. The injudicious use of water contributes to soil erosion, salinization and increased loss of water through evaporation. Because of the way farmers pay for water, they do not have an

incentive to invest in spray irrigation equipment. We would like to see progress in the reduction of water consumption, which could have a positive effect not only on agriculture in the irrigated areas but also on other regional issues.

I would like to close by making three points. First, even though USAID left Turkey 25 years ago, there should be good sources of funding for cooperative projects among US foundations and the US corporate sector. As US investment increases in the GAP Region, there are more American companies becoming aware of the potential for GAP. I would encourage people to look to those sources. Getting funding from American foundations is a challenge at any time, but the money is there.

Second, during President Clinton's visit to Turkey in November, the governments of Turkey and the US signed an agreement, valued at \$600 million, designed to encourage US water engineering firms to build irrigation systems. Under this agreement, US firms are required to find their own financing. It will be tough for Turkish farmers to pay for such equipment given in part the lack of incentive to change the way they use water or pay for it. It is controversial to change the way farmers pay for water, so we would leave it to our Turkish friends to work out the best system for changing it. The debate on this in Turkey is very lively, and we are merely observers, but we would encourage such a change.

Third, the open canal system increases evaporation and is something American companies are interested in tackling. Owens Corning, with its Turkish partners, is building a \$15 million plant in Şanlıurfa to manufacture closed pipes for use in irrigation projects. We strongly support investment that introduces water conserving technology in the Region.

I wish to compliment Olcay Bey and the GAP Administration for the approach they have taken in the GAP Project which, for the United States, as a very close friend of Turkey, is key for Turkey's prosperity and success in the 21st century. Thank you very much.

The US Embassy hosts a website at www.usis-ankara.org.tr which includes a page devoted to GAP and opportunities for American business at: www.usconadana.org.tr/gap.html.

Southeastern Anatolia Project



I. H. Olcay Ünver, Ph.D.

Dr. Ünver presented a multimedia overview of GAP and the activities of the GAP Regional Development Administration. The following summary presents some of the history and major achievements of GAP over the last ten years.

The Southeastern Anatolia Project (GAP) is a regional development project aimed at the full fledged socio-economic development of Upper Mesopotamia, or the "Fertile Crescent," which has witnessed some of the earliest civilizations in the world.

GAP is the largest investment for regional development in the history of the Turkish Republic. As an integrated regional development project based upon the concept of sustainability, GAP covers investments in such fields as urban and rural infrastructure, agriculture, transportation, industry, education, health, housing and tourism, as well as dams, power plants and irrigation schemes on the Euphrates and Tigris rivers. This massive launch for development has special emphasis and priority for the economic, social and cultural advancement and well being of the whole country in general, and of the people of the region in particular.

The basic objectives of the GAP are: to remove interregional disparities in the country by raising the income levels and living standards in the region; to enhance productivity and employment opportunities in rural areas and; to improve the population absorbing capacity of larger cities.

The water resources development program of GAP includes 13 groups of irrigation and energy projects, seven of which are in the lower Euphrates sub-basin and six in the Tigris sub-basin. There are 22 dams, 19 hydropower plants, and irrigation networks to irrigate 1.7 million ha of land. The planned installed capacity is approximately 7,500 megawatts with an annual hydroelectric production of 27 billion kilowatt-hours. The aims and the main features of the integrated project are outlined in the GAP Master Plan. The Master Plan was prepared to determine the Region's potential, identify the bottlenecks for the development process, and to set the development objectives, goals and strategies.

When the Project is completed, the ratio of irrigated land to the total GAP area will increase from 2.9 % to 22.8%, while that for rain-fed agriculture will decrease from 34.3% to 10.7%. As a direct result of the introduction of irrigation, agricultural production and crop variety will increase substantially.

As of the end of 1999, progress has reached a global financial realization rate of 43.3%. Out of the total public investment requirement of \$32 billion, \$13.9 billion has been invested from domestic resources. In addition, the equivalent of \$2.1 billion in foreign currency has been allocated for different GAP-related projects. A \$1.5 billion equivalent hydropower project, the Birecik Dam, is under construction via a build-operate-transfer arrangement by a consortium of European and Turkish firms.

Limitations & Potential of the Region

The majority of the GAP Region lies in the Euphrates-Tigris basin. The total catchment area of the Euphrates in Turkey, upstream of the Syrian border, is 103 thousand km² of which 22% lies within the GAP Region. The upper Euphrates basin is separated from the GAP Region by the Southeastern Taurus mountains. The mean annual runoff near the Syrian border is estimated to be 31 billion m³.

The Tigris River, in the east of the GAP Region, drains a catchment of 38 thousand km² north of the Syrian border; 30,000 km² of this basin lies within the GAP Region. Mean annual discharge in Turkey is estimated to be around 17 billion m³.

The water quality of both rivers is good and suitable for irrigation with electrical conductivity values of below 0.6 mhos/cm and SAR of below 0.4.

When the GAP dams are built, the surface area of reservoirs will exceed 2,500 km². The Atatürk reservoir will have the largest surface area (817 km²), followed by the Keban (675 km²), Karakaya (298 km²), Ilisu (295 km²) and Silvan (181 km²) reservoirs.

The total population of the GAP Region in 1997 census was 6.1 million. The average annual growth rate of population for the Region was 2.5%, a figure significantly higher than the national average of 1.5 %. As a result of high birth rates, the Region has a very young population with half of the total under the age of 15, while those of working age (15-44) represent

40% of the population. Household sizes are large with 39% of households having between 5 and 7 members and 33% of families having 8 or more members.

The GAP Region has been characterized by net outward migration, typically to large cities elsewhere in Turkey. Also, substantial migration within the region occurs from rural areas to urban centers, from mountainous areas to the plains and from east to west. Seasonal migration for employment both within the region and to nearby provinces (especially Southern Turkey) is a common practice in rural areas.

Major environmental health problems are infectious and parasitic diseases aggravated by malnutrition. Malaria, trachoma and cutaneous leishmaniasis are vector borne diseases. Diarrhea and intestinal infections are associated with inadequate water supply, sanitation and personal hygiene. There is evidence of malnutrition especially in the eastern part of Region. However these problems are partly cultural as malnutrition is due to diet imbalance rather than a lack of food.

The 1981 Village Level Survey also found that 60% of households had no sanitation. Only 11% of households in the GAP Region had indoor facilities and 27% had outside facilities. There is no tradition of using pit latrines in the Region. There were 3500 rural settlements without drinking water supply, which account for 35% of total rural settlement. This ratio increased to 55%, if those with inadequate water supply were included. Twenty-two percent of the rural population in the region did not have access to clean drinking water, 29% of the villages had telephone services, 66.8% were electrified and 90% of the rural settlements were linked to the road networks

Urban centers, having better living standards and services, are attracting substantial rural migration. Urban infrastructure is therefore becoming rapidly inadequate.

A comparison of the gross regional product (GRP) in 1985 with the GDP of Turkey clearly indicates the level of its underdevelopment. In 1985, the Region accounted for 4% of GNP. Per capita income in the Region was only 47% of the national average. Agriculture is by far the dominant production sector, accounting for nearly 40% of GRP, and contributing over 9% of the agricultural value-added of Turkey. Rain-fed agriculture is predominant depending primarily on water availability constraints. Crop diversification is limited and productivity is low.

Nearly 70% of economically active population is engaged in agriculture, but it generates only 44% of the total value-added. Similarly, the animal stock is large but productivity is low. Traditional production methods still predominate, but agricultural modernization has started.

Only 2% of country's total value-added from the manufacturing industry was produced in the GAP Region during the 1980-85 period. In 1985, 95% of the manufacturing industry employed less than five workers. Industrial employment comprises 5% of the regional labor force as compared to 16% for Turkey. The growth rate of employment reached its peak in 1985, at 19%, which was 4.7 times higher than the national average.

Paradigm Shift

The original idea of GAP dates back to the early years of the Republic. The founder of the Turkish Republic, Mustafa Kemal Atatürk, referred to developing the Euphrates as a "lake of humanity". Initial studies for its development started in the 1950s. The design of the projects to tap the waters of the Euphrates and the Tigris was initiated in the 1960s. In 1977, the water resources projects that were planned and designed for the lower Euphrates and Tigris were combined in one package entitled the Southeastern Anatolia Project.

GAP envisions sustained economic growth in the Region for the next 10 years, coupled with environmentally sound water and land development and urban management.

The Southeastern Anatolia Project, in its historical context, was formulated as a package of water and land resources development projects in 1970's, which was later transformed in the early 1980's to a multi-sectoral, socioeconomic regional development program, and then into a sustainable human development project in the 1990's.

Development Strategy of the GAP Master Plan

The GAP Master Plan set the fundamental development strategy on four components:

- develop and manage the Region's soil and water resources for irrigation, domestic and industrial purposes in an efficient manner
- improve land use by encouraging optimal cropping patterns and better agricultural practices
- promote private entrepreneurship with emphasis on the agro-industries and those based on indigenous resources
- improve social services, educational facilities and employment opportunities with a view to keep local population away from migrating to big cities as well as attracting qualified workforce to the Region.

The overall scenario for the Region's development has been described by the Master Plan as "the transformation of the region into an agro-related export base".

One of the outcomes of the GAP Master Plan Study was a set of principles for the management of this comprehensive program. The basic principles in the terms of reference for the entity that would manage the program were as follows:

- Regional perspective
- Integration within and between sectors
- Ability for multi-sectoral planning
- Flexibility in implementing and funding
- Hierarchical independence from existing ministries/bodies
- Authority to control land use to ensure operationalization of integration issues, including land-water resources integration,
- Ability to coordinate public entities,
- While still accountable to the government, flexibility to collaborate with the private sector, non governmental organizations, international organizations, professional societies and local governments.

As no existing organization would be able to undertake these, a new organization, the Southeastern Anatolia Project Regional Development Administration (GAP-RDA), was established under the auspices of the Prime Ministry in 1989.

GAP RDA envisions environmentally sustainable development that includes the participatory management of natural resources and their protection for future generations.

The establishment of GAP-RDA brought the much needed integral perspective and also led to the evolution of the sustainable development framework for the socioeconomic development program.

Sustainable Development and the Basic Strategies of GAP

Sustainable development was defined by the Brundtland Commission as one that "meets the needs of the present without compromising the ability of future generations to meet their own needs." Under this very broad definition, there are many issues which must be considered: social, economic, cultural, gender, educational, health, physical planning, agricultural, environmental, institutional, among others. At the hub of all these issues is people, either as object, or as the agent, or both. Hence, human development is at the core of sustainable development of the GAP Region.

In order to define the scope and composition of sustainability for GAP, a participatory approach was adapted. A seminar was jointly sponsored by United Nations Development Program (UNDP) and GAP RDA in March 1995 attended by a large number of different stakeholders of the development process.

Based upon the results of this Seminar and the objectives and targets of the GAP Master Plan, the following sustainability goals have been adapted for the development process:

1. Increasing investments to the optimal level which would accelerate the economic conditions
2. Enhancing health care and education services so that they reach national levels
3. Creating new employment opportunities
4. Improving the quality of life of the cities and improving urban and social infrastructure so as to create healthier urban environments

5. Completing the rural infrastructure for optimal irrigation development
6. Increasing inter- and intra-regional accessibility
7. Meeting the infrastructural needs of existing and new industry
8. Protecting water, soil and air and the associated ecosystems as a priority consideration
9. Enhancing community participation in decision-making and project implementation.

Examples of Implementation Projects:

- Regulation of water in irrigation canals and determination of water saving irrigation methods,
- Management, operation & maintenance of irrigation system
- Pilot implementation of modern irrigation technology
- Urban waste water recycling
- Reuse of irrigation return water
- Regional environmental studies
- Agricultural research and development project
- Farmers' training and extension activities
- Agricultural commodities marketing survey and planning of crop patterns
- Income generation projects for non-irrigated areas
- Consolidation of agricultural lands to improve efficiency
- Participatory urban zoning and planning
- Participatory resettlement and sustainable redevelopment as a result of reservoirs
- The Atatürk Dam Reservoir Sub-Regional Development Plan
- Multipurpose Community Centers
- Entrepreneur Support and Guidance Centers
- Eco-city and Eco-village planning and development in pilot areas
- GAP Geographic Information System feasibility study and pilot project implementation

The main components of sustainability for GAP are: social sustainability, physical and spatial sustainability, environmental sustainability, economic viability and sustainable agriculture & irrigation.

In accordance with the sustainable development approach and strategies of GAP,

special programs and projects have been initiated to emphasize the human dimension of development through project implementations concerned with basic social services (education, health, housing), gender equity, urban management, irrigation facilities, agricultural and environmental sustainability, institutional and community capacity-building, and public participation.

Water as the engine for sustainable development

Some of the larger project components are ready or near completion, such as the Karakaya and Atatürk Dams on the Euphrates River. These have produced a combined output of over 20 billion kilowatt-hours of hydroelectric energy in 1998 alone (47.5% of national hydro production) and a total of 155 billion kWh until now, equivalent to \$ 9.3 billion of coal-generated electricity or to the energy produced by 30 billion m³ natural gas.

The Lower Euphrates Project is one of the seven GAP schemes on the Euphrates River, with a reservoir capacity of 48.5 billion m³. This project consists of the Atatürk Dam and HEPP, the Şanlıurfa Tunnels, Şanlıurfa-Harran irrigation, Mardin-Ceylanpınar irrigation, Siverek-Hilvan pumped irrigation and Bozova pumped irrigation in 1990 with a reservoir capacity of 48.5 billion m³ in 1990. Water reaches the Şanlıurfa-Harran plains via the Şanlıurfa Tunnels system, which consists of two parallel tunnels each 26.4 km long and 7.62 m in diameter. One of the tunnels was opened in 1995 and irrigation was distributed to a 30,000 ha area in that year. The Şanlıurfa-

Harran plain has two main canal systems. The Şanlıurfa main irrigation canal will irrigate 43,000 hectares of land by gravity and 5,000 hectares by pumping. The Harran main irrigation canal will irrigate 98,500 hectares by gravity. By the end of June 1999, the initial 30,000 ha of irrigation in these plains reached 107,000 hectares.

The total production prior to irrigation amounted to \$31.5 million with a crop pattern of mainly wheat, barley and some vegetables. The value-added was \$60 per decar. With irrigation, cotton became the main crop with still some wheat and barley, and secondary crops were also introduced. The most striking change has been in the land used for cotton, increasing from 21% to 45%.

With irrigation, production values rose to \$121 million and the value-added per decar to approximately \$182, both showing significant improvement in only one year. Value-added per decar increased 3 times and the annual per capita income increased from \$1034 in 1994 to \$3963 in 1995. This area is closely monitored to assess the impact of irrigation on different facets of life and economy.

Water has begun to change the entire socio-cultural life of the people of the Region, in such activities as fishing, water sports and tourism.

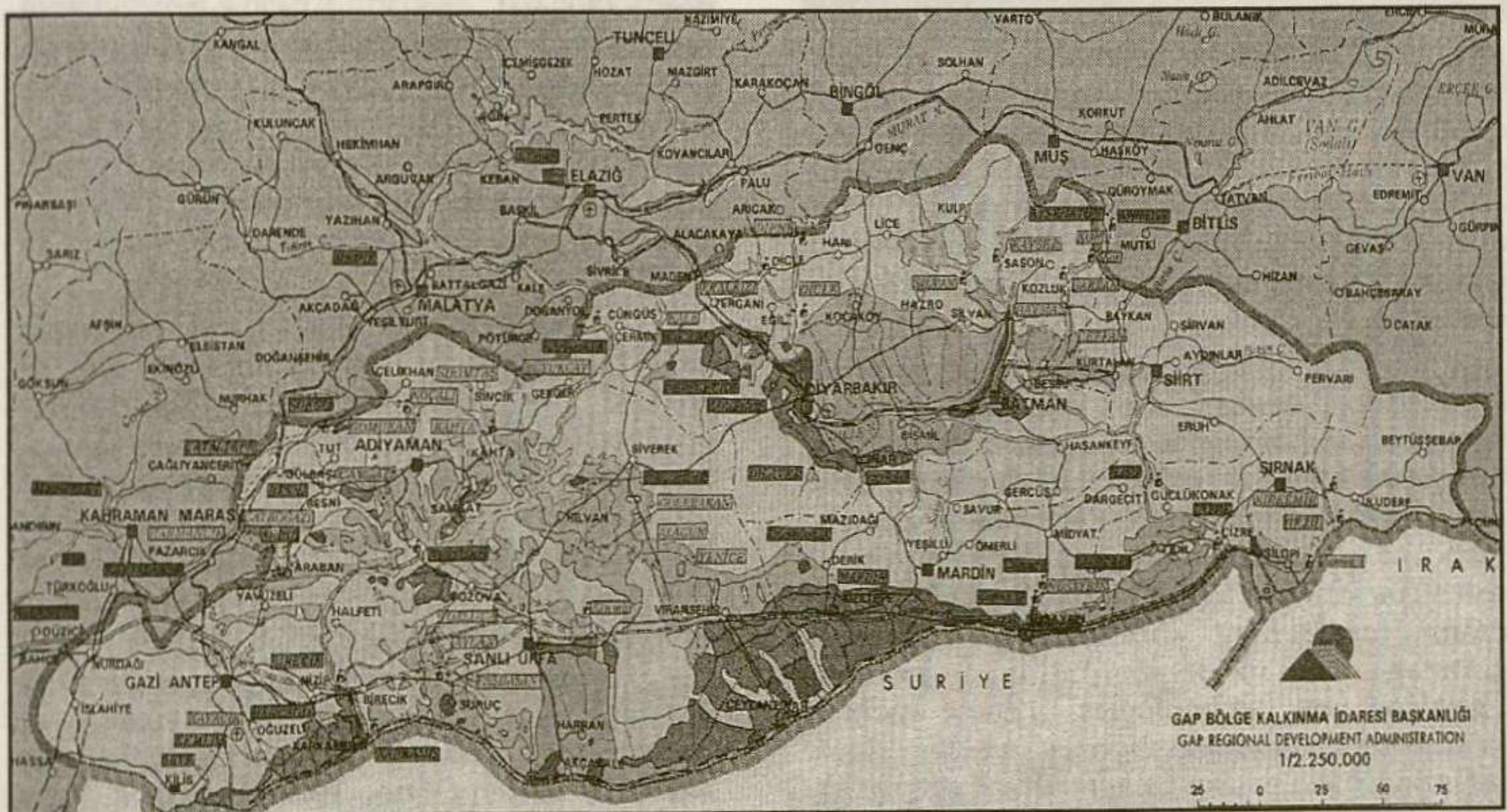
Conclusion

Turkey is implementing an integrated socio-economic development project based on

water resources in Upper Mesopotamia, which witnessed some of the earliest civilizations in the world. Sustainability is the philosophy underlying the Southeastern Anatolia Project, which has human wealth and well being as its focus. Having all its details scrupulously planned and implemented, GAP is one of the greatest projects of the of Republic of Turkey.

The GAP Regional Development Administration is the first institution of Turkey entrusted with integrated regional development. In November 1999 it celebrated its 10th year of experience focusing on sustainable human development. GAP-RDA is eager to share its experience gained from implementing the GAP project. With this holistic project, planned to be completed by 2010, The rebirth of the Fertile Crescent, after thousands of years, will be possible along the banks of the Tigris and Euphrates.

More information about the GAP Regional Development Administration is available at their website, www.gap.gov.tr.





TENNESSEE VALLEY AUTHORITY

Ronald J. Williams, Ph.D.

Dr. Williams is the Vice President of TVA's Energy Research and Technology Application, in Muscle Shoals, Alabama

TVA was created in 1933, at the peak of the Great Depression, and was the first project to attempt the unified resource development of a river and its tributaries. Today, the TVA region is one of the fastest growing regions in the United States.

The TVA Region covers approximately 80,000 square miles (207,200 square km) in seven states. TVA has annual energy sales of \$6.7 billion; approximately \$700 million from hydroelectric operations. TVA operates 49 dams that work in a unified system to provide services to about 8 million people.

When TVA was created, the region was one of the poorest in the United States, with per capita income and literacy at half of the national average. Public health and sanitation were poor, and only 3% of farms had electricity. Soils had been depleted through subsistence agriculture, uncontrolled flooding, deforestation, and subsequent silting of the rivers.

TVA's motto is "Generating Prosperity in the Valley." To do that, TVA supplies low cost electricity, supports a thriving river system, and stimulates economic growth in an integrated, systematic approach, with multiple objectives that included conservation, flood control, and navigation, agricultural and economic development. TVA is a government owned corporation, but has the flexibility to act as a private enterprise, so it does not have to continually seek approval from Congress for its decisions.

TVA was created as a coordinating organization, working with and through other agencies and helping those agencies strengthen their own capacity rather than duplicate their projects. For example, TVA has worked closely with land grant universities and with agricultural extension services in the establishment of cover crops, researching soil fertility rates and cultivars, and in demonstration projects to introduce new technologies. These include enterprise demonstrations, which look holistically at a particular agricultural enterprise.

This has progressed into whole farm services, assisting in several aspects of the farming system, such as financial planning. TVA also has worked closely with the extension service also in the establishment of farmers' associations and farmers' cooperatives, and worked with these organizations to disseminate information more effectively.

Also, TVA for many years had a fertilizer research and development program, working in conjunction with land grant universities. This program produced over 300 patents. As the fertilizer industry matured, however, Congress discontinued funding for this program.

When TVA was created, its priorities were for navigation, flood control, rural electrification, and improved quality of Valley life. As the Region has developed and basic needs have been met, citizens' priorities have changed. Today, residents in the region express their concern for water quality and the improvement of recreational benefits from water resources. Increased public involvement in establishing priorities has sometimes created conflicts between different interest groups.

To address the conflicts between competing uses of water resources, and to respond to the growing public interest in water resource issues, TVA conducted a review of its operating policies and created the Lake Improvement Plan. Conventional wisdom held that additional water quality and recreation benefits could only be provided at great sacrifice to navigation, flood control, and hydroelectric power production. However, by taking a broad view and by vigorously incorporating public input in the entire planning process, TVA was able to respond effectively to a wide variety of stakeholders.

TVA's efforts during this three-year project to keep the public informed and to provide opportunities for stakeholder involvement resulted in better decision making, since the decision making base was larger and of better quality. Also, the final decisions had better public support since, even though not everyone got what they wanted, people were satisfied that all requests were fairly considered.

One way of increasing accountability and stakeholder involvement is the creation of an advisory council of stakeholders that represent conservation, recreation, and local

government interests. This council provides an opportunity for various stakeholder groups to provide input into TVA decision making. Issues addressed at this council include establishing priorities for conservation, the development of public land and water resources and other TVA stewardship programs.

Initially, all of TVA's projects were funded by money from Congress, principally because the primary benefits of the project – navigation and flood control – were considered public goods. When hydroelectric power plants and the potential for income generation were added to the project, the financing structure changed. In 1959, in response to objections from private utility companies concerning unfair competition from TVA, Congress required TVA's power system to be self financing. However, projects which directly reflected the stewardship responsibility of the federal government – navigation and water supply, for example – were funded 100% by Congress.

Today TVA receives no tax money to support its water resource infrastructure. All funding is provided through power proceeds, as well as through the sale internationally of innovative bond issues. These revenues also pay for the original capital investment in TVA's power program that was made by the federal government from 1933 to 1959.

Federal agencies, including TVA, do not pay property or sales taxes. This means that the land owned by TVA in the region does not generate tax revenue for the state and municipal governments where it operates. To compensate for this, TVA makes payments in lieu of taxes to each state where it owns land. These payments are then allocated by the individual states to their local municipalities for public programs such as schools, hospitals, fire, emergency and other services.

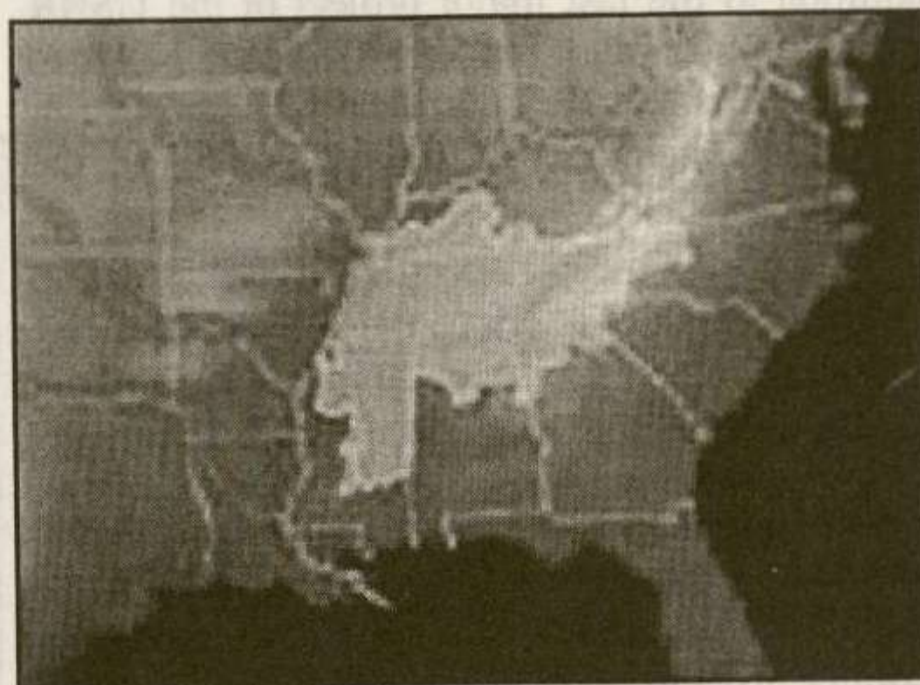
Recognizing that competing objectives – including issues concerning land use, recreation, flood control, and power production – are pervasive, TVA has learned that a strong system of checks and balances, plus strong determined leadership, are critical for dealing with competing objectives, sharing power with other stakeholders, and maintaining a balance in the administration of diverse engineering, environmental and economic programs.

The TVA experience demonstrates the need for a shared vision, a strong public policy framework, and congressional support. A unique strength of TVA is that it is headquartered in the region that it serves.

Rather than basing their operations in Washington, TVA was close at hand to its stakeholders. This helped to build trust and participation on the part of citizens in the region, and also resulted in increased cooperation from businesses, local and state agencies, and non-governmental organizations.

TVA is aware of the need to educate across generations and to train new administrators in the institutional basis in which TVA was formed. Because of the importance of institutional memory and a shared understanding of the philosophical basis of TVA, it is necessary to remind people what TVA means and the importance of preserving it.

For more information about TVA's history and programs, please see their website at: www.tva.gov.



- TVA is the nation's largest producer of electricity, with 28,498 megawatts of dependable generating capacity.
- TVA's power facilities include 11 fossil fuel plants, 29 hydroelectric dams, three nuclear plants, four combustion-turbine plants, a pumped-storage facility, and 17,000 miles of transmission lines.
- Through its 159 locally owned distributors, TVA provides power to nearly eight million residents in the 170 counties of the Tennessee Valley region.
- About 34,000 barges travel the Tennessee River each year – the equivalent of two million trucks travelling the roads.

Source: www.tva.gov/abouttva/index.htm



ARIZONA STATE
UNIVERSITY EAST

Charles E. Backus, Ph.D.

Dr. Backus is the founding Provost of Arizona State University East.

Development in the Phoenix area began with the Salt River Project, the first project of the US Bureau of Reclamation. Land owners borrowed money through the USBR to build dams which are still owned and operated by farmers who own the irrigated land. The Salt River Project also has a publicly run power utility. The project comprises six dams on the Salt River, and includes Roosevelt Lake, a major recreational area. This project, in addition to the last major project of the USBR which brings water from the Colorado River to central Arizona, provides the water needed for the development and economic growth of the region.

Certain key factors have contributed to growth in the region since the 1950s. First, the introduction of air conditioning, which made Arizona livable in the summer. Second, the large agricultural base and the availability of water and electricity, thanks to the Salt River Project. Third, the creation of Arizona State University in Phoenix from a state teachers' college in 1958. All these factors, plus the level terrain and opportunities for recreation, combined to attract industry and new workers to the region.

As the city has grown, the demands on water resources have shifted away from agriculture and irrigation to urban and industrial uses. However, as the urban population uses less water per acre than agriculture, the demand for water has so far gone down as urbanization has continued.

ASU East currently has 15,000 students and offers a wide variety of programs. ASU East is part of Arizona State University, but has its own academic programs apart from the main campus. These distinct programs include Agribusiness and the College of Technology and Applied Science, with one of the top five engineering technology programs in the United States.

As an example of the university's advances in engineering technology, Dr. Backus mentioned that Intel Corporation is closing down a manufacturing plant in Phoenix and moving all of their production equipment for micro

The Morrison School of Agribusiness and Resource Management at ASU East offers a master's degree in Agribusiness to prepare individuals for managerial and administrative careers in agribusiness and government.

electronic manufacturing into a facility on the campus of ASU East. This facility will become a micro electronic teaching factory capable of making products. Motorola has committed for managers and technicians to run their facility. Even though it will make products for industry, the primary reason for this project is education and training.

University growth is tied to the growth of Phoenix. As the city has experienced rapid growth, so has the university. Many high-tech industries are based in Phoenix, such as aerospace electronics, micro-electronics, and other electronic manufacturing in general. The Phoenix area has the second largest production facilities for this industry in the United States.

ASU has appreciated its relationship with GAP and is interested assisting with its experience in similar climate, problems, and opportunities. ASU Main has programs that can be beneficial for GAP, including Architecture and Environmental Design, recreation and tourism, geography. Other special projects related to water resource development include studies on the replenishment of ground water from surface water, waste water treatment and recycling, and GIS applications in precipitation forecasting, and river flow measurement and forecasting.

The most important benefit that ASU can offer GAP is education in the form of university degrees. Education and expertise are the best long-term investment one can make to

ensure sustainability. ASU has high quality degree programs, along with opportunities for practical application in Phoenix or at the Salt River Project. Because of the many similarities between this project and GAP, this presents a unique opportunity for cooperation.

The College of Technology and Applied Sciences includes programs in

- Aeronautical Management Technology
- Electronics and Computer Engineering Technology
- Information and Management Technology
- Manufacturing and Aeronautical Engineering Technology

ASU also offers customized training programs. For example, during this conference, a professor from ASU is presenting a seminar in Sanli Urfa on environmental management. Various courses could be presented either in Arizona or in Turkey. ASU can also bring expertise from other universities to present training events.

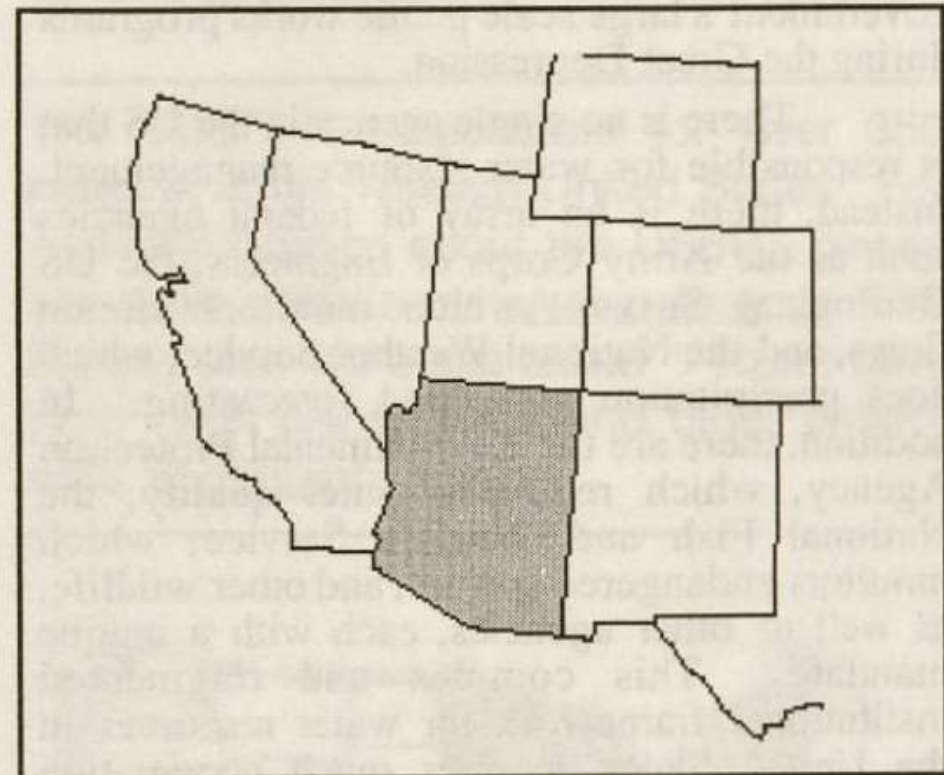
ASU can help GAP seek support from US or international agencies for funding the GAP/ASU partnership. ASU wants to take the lead in approaching US agencies for funding for work, investigations, research for sponsored projects in the GAP region.

In response to questions about financial assistance for students from Turkey to study at ASU, Dr. Backus clarified that, as a state institution, the university could not allocate state tax money to the education of non-residents of Arizona. However, occasionally scholarships are available through sponsored projects, created by consortia of universities across the United States, or international students can be employed by special projects and then be eligible for in-state tuition.

Dr. Ünver of GAP congratulated Dr. Backus on his presentation, and remarked on the high level of interest in GAP demonstrated by the attendance of several high ranking officials from ASU East. He commented on the positive nature of his visit to the university and assured the ASU delegation that GAP would seriously consider all the suggestions for collaboration.

For more information about ASU East, please see their website at: www.east.asu.edu

For more information on the Salt River Project, see: dataweb.usbr.gov/html/saltriver.html





UNITED STATES BUREAU OF RECLAMATION

Richard Ives, Ph.D.

Dr. Ives is Chief of International Affairs at the Bureau of Reclamation.

The US Bureau of Reclamation was created in response to the expansion in the American West during the late 1800s. The government encouraged settlement of the region, but there was insufficient rainfall to farm without irrigation. Largely private irrigation works by early settlers to capture the spring runoff were unsuccessful.

The Bureau of Reclamation was created in 1902 with the mission of reclaiming arid land in 17 western states for farming and habitation. The Bureau's most well known projects, such as the Grand Coulee Dam and Hoover Dam, were built in the 1930s as part of the federal government's large scale public works programs during the Great Depression.

There is no single agency in the US that is responsible for water resource management. Instead, there is an array of federal agencies such as the Army Corps of Engineers, the US Geological Survey, which monitors stream flows, and the National Weather Service, which does precipitation and flood forecasting. In addition, there are the Environmental Protection Agency, which regulates water quality, the National Fish and Wildlife Service, which monitors endangered species, and other wildlife, as well as other agencies, each with a unique mandate. This complex and fragmented institutional framework for water resources in the United States requires much cooperation between agencies.

During the late 1800s and early 1900s, dams and irrigation were the single focus of the development of the American West. However, irrigation did not generate the revenues needed to pay for the cost of structures and to maintain canals and other facilities. With the introduction of hydroelectric power, energy production, with its ability to subsidize irrigation, has become a major subset of the Bureau's program. The USBR is now the second largest producer of hydroelectric power in the Western US, with approximately 20,000 mW of installed capacity and serving 6 million homes.

As concern has grown over the impact that dams have on the complex environments of western rivers, the Bureau's role has changed.

Since few good sites remain for dam construction, and because of current environmental and financial issues, no new dam projects are planned.

Instead, the Bureau has assumed the role of an innovative water management agency devoted to developing and protecting water resources, placing increasing emphasis on conservation of water, environmental protection and restoration, and devising strategies to meet the West's growing water demands. Because of the heavy demands on the water supply by population growth, economic expansion, and farming, water conservation is at the center of the Bureau's mission.

The Bureau also focuses on environmental restoration, studying the effects of dams on river habitats, and conducting experimental flooding that imitates natural spring flooding before dam construction. Experimental flooding recreated natural sand beaches along the river, rejuvenated endangered fish spawning habitat and reduced non-native invasive plant growth. Since the recognition of wetlands as vital habitats for wildlife and for their natural filtering capacity to maintain water quality and sustain entire ecosystems, Reclamation supports the responsibility of the federal government to protect wetlands, including the trust assets of Native Americans.

A major environmental project of the Bureau is for the protection of salmon species in the rivers of Washington, Oregon, Idaho and California. Salmon runs have been depleted due to overfishing, dams, increased populations of hatchery fish, and increased human activity on the rivers. The Bureau of Reclamation supports water conservation programs to increase in stream flows throughout the Pacific Northwest, and is buying uncontracted reservoir storage to augment river water flows, investing new storage potential on the Snake River in Idaho, and employing fish screens and ladders to prevent the loss of fish through dam turbines.

As the population of the American West has grown, and as social values have changed, the Bureau of Reclamation has faced new demands. Originally, much of the Bureau's system was designed for a population of about 8 million people. The region now has 85 million, and some of the fastest growing states in the US. In lands originally devoted to agriculture in California, the population has grown between 30% and 50% in the last decade. Irrigation was the water source for these farm lands before, and in spite of the increased population, there are no new sources of water.

A landmark in the Bureau's history was the passage of the National Environmental Policy Act in the early 1970s. This act opened up Bureau projects for comment and critique by any stakeholder. When the USBR solicited public comments on the operation of the Glen Canyon Dam, they received 40,000 comments. The Bureau reviewed those comments, and determined the principal themes concerning conflicting uses of the dam. To optimize hydroelectric production, water was released from the dam to match the hours of peak demand for electricity in the morning and evening. This resulted in frequent drastic changes in water levels in the river, which interfered with recreational activities. To meet the demands of citizens for these recreational uses, the Bureau changed its operation of the dam to make flows more regular, foregoing the potential revenues from power sales in order to optimize the goals of the customers.

USBR's transition from "dam builder" to "environmental organization" was difficult, but the reality was that the vision of the early 1900s for irrigation and "making the desert bloom", did not allow for the population growth and the environmental and recreational needs that emerged later in this century. Consequently, many older structures were not designed with these needs in mind.

Now the Bureau is retrofitting these projects to better meet environmental and recreational needs and to satisfy a large number of users at different levels. Nevertheless, there is still strong support for the irrigation component, since the Bureau's projects serve 140,000 farmers. These projects provide water to water users' associations, known as irrigation districts, based on contracts for specific quantities of water to be delivered according to a specified schedule.

With the increase in population from 8 million to 85 million, and with no new sources of water, the challenge is to maintain the viability of the irrigation systems and also respect the contractual obligations. The Bureau cannot dictate to farmers how to use irrigation, or terminate their supply of water. To increase the supply of water for other uses, the Bureau negotiates with farmers to develop water conservation plans and provides technical assistance.

The Bureau's focus now is more on resource management, and is involved in programs for flood management, flood forecasting and management, and dam safety. The Bureau develops computer models of water systems to better assess the trade offs between competing uses. This is often a difficult process

in multi-purpose projects in river basin systems with more than one facility, where numerous economic, social and environmental variables require complex modelling and forecasting techniques.

In retrospect, Ives recommends that project planning look carefully at the long term, not just the first few years of a project. The American West had been growing for many years before the USBR took note of the impact that population growth and economic trends would have on their activities. If that had been the case, the USBR might have been more open to processing information and reflecting on what they should do, and so be ahead of the curve a little.

For example, the USBR established long term contracts with users, but without clauses that allowed for adjustments in costs or in the level of demand. Consequently, rates did not go up with inflation, and farmers paid very little for water for many years. But as an agency makes allowances for these changes, they must also think through the impact their policies will have on agriculture and on the overall economy.

The USBR is responsible for over 350 projects in the Western United States. For more information about the USBR, please see their website at: www.usbr.gov. The Bureau also has a site called "Project Data Web" with plans, maps and other project data, at dataweb.usbr.gov.



The 48 coterminous United States (Alaska and Hawaii are excluded). The 17 states served by the USBR are in white.



OKLAHOMA STATE UNIVERSITY

D.C. Coston, Ph.D.

Dr. Coston is Associate Director of the Oklahoma Agricultural Experiment Station and Interim Associate Director of the Oklahoma Cooperative Extension Service, both at Oklahoma State University in Stillwater, Oklahoma.

OSU was founded in 1890 as one of many state land grant universities across the United States. The US government passed the Land Grant Act that provided for the creation of a technical university in each state, supported by the sale of particular tracts of land. These universities were to specialize in agricultural and mechanical sciences to support economic development and diversification.

As some of these land grant colleges and universities gave increased emphasis to research, Congress passed another law that established the agricultural experimental station system. These programs supported research that addressed the particular issues of each state. Faculty at these universities then saw the need to communicate research findings not only to their students, but also to farmers and the general public. Consequently, Congress passed a third act to set up the cooperative extension service.

Oklahoma State University has approximately 1100 full-time faculty, and offers over 200 degree programs at the bachelor's, master's and doctorate level. Approximately 26,000 students are enrolled, with 1,800 from 118 other countries. OSU has prestigious programs in distance education and a renowned research center for agricultural and renewable resources. The university is involved in programs in other countries, including several projects in the GAP Region of Turkey.

The Agricultural Experiment Station has about 150 faculty members from the College of Agricultural and Natural Resources, as well as from other disciplines such as environmental sciences, nutrition and veterinary medicine. In addition to the facilities at OSU-Stillwater, there are 16 branch research stations throughout the state, each established to address agricultural and other issues of each region.

The Cooperative Extension Service has about 80 faculty, mostly in Stillwater, and 200

educators across the state, with offices in every county. The extension service works directly with farmers, both through individual consultations and through presentations and published materials. Funding for extension services comes from the federal government, the state government, and from each county in Oklahoma, in addition to special funding for specific projects. The extension service often works in collaboration with agencies of the state and national governments on issues such as environmental quality and natural resource conservation, as well as with consultants that are hired by private farmers' cooperatives.

To ensure the effectiveness of this program, improvements have been made in the linkages between knowledge development and knowledge transfer. This includes better communication with constituents to understand clearly the issues that local farmers are facing, and better communication between field staff and researchers. This enables field staff to stay technically competent, and researchers to learn more quickly the issues that require applied research.

Oklahoma is situated in the mid-United States, where there is a transition from the climate, vegetation and land use patterns typical of the eastern US to those of the western US. Eastern Oklahoma has more forest and tall grasses, and receives an average of 1200 mm of precipitation per year. Farms in the eastern part of the state are smaller, with more fruit and vegetable crops. Surface water is from reservoirs built by the Army Corps of Engineers primarily for flood control.

Western Oklahoma is drier, with about 300 to 400 mm of precipitation per year, and the natural vegetation includes more short grasses. Farms in this region are larger and are devoted more to cattle and cotton. Water comes from irrigation projects with dams and canals, and in the Panhandle water typically comes from underground aquifers. These aquifers cross into other states in the same region of low precipitation, so the various states that share these water sources are constantly in negotiations about water use.

As younger people get more education, they move from rural areas into urban areas around Tulsa and Oklahoma City, or even to other states. Presently, 60% of the state's population lives in either the Oklahoma City or

Tulsa areas. OSU is looking at dealing with issues such as rural population decline, and is seeking the integrated development of a vibrant and diverse economy, with a strong commitment to human capital development and particularly leadership development at the local level. This includes working with the agriculturalists of the state to look at new crops, innovations, how to make them more efficient and effective, with a very strong emphasis on developing export markets.

Part of the strategy for economic development during the agricultural crisis of the 1980s was to stimulate a shift from producing primarily raw products for export to other states, to increasing processing and other value added activities within the state. OSU built a facility for research and development which in the last three years has helped over 250 new and established companies in the state to work more efficiently and to be able to expand their value adding activities. OSU engineers are working with small manufacturing companies and micro-businesses as well. Oklahoma has up to 90,000 micro- and home-based businesses, ranging from home child care to sewing, accounting and even software development. OSU has a program that reaches over 20,000 people in these types of businesses to help them become more efficient.

OSU also works with communities in planning infrastructure projects such as roads, water systems, waste management, and even helping plan health care and information technology, so that rural areas can attract professionals and skilled workers.

Work force development is an important aspect of rural development, helping local people improve their skills. OSU works closely with public schools and with a system of vocational and technical education in the state, as well as a number of the programs that OSU itself implements to help people gain new skills.

OSU has a number of leadership development programs, targeting constituents that range from local government officials to emerging youth leaders. A significant part of this effort is not to just give them the skills, but have the participants make a commitment to each other that they will identify issues of importance in their community. In the program they must then actually do something about some of the issues they have identified.

For more information about OSU's Cooperative Extension Service, please see:

www.dasnr.okstate.edu/oces/

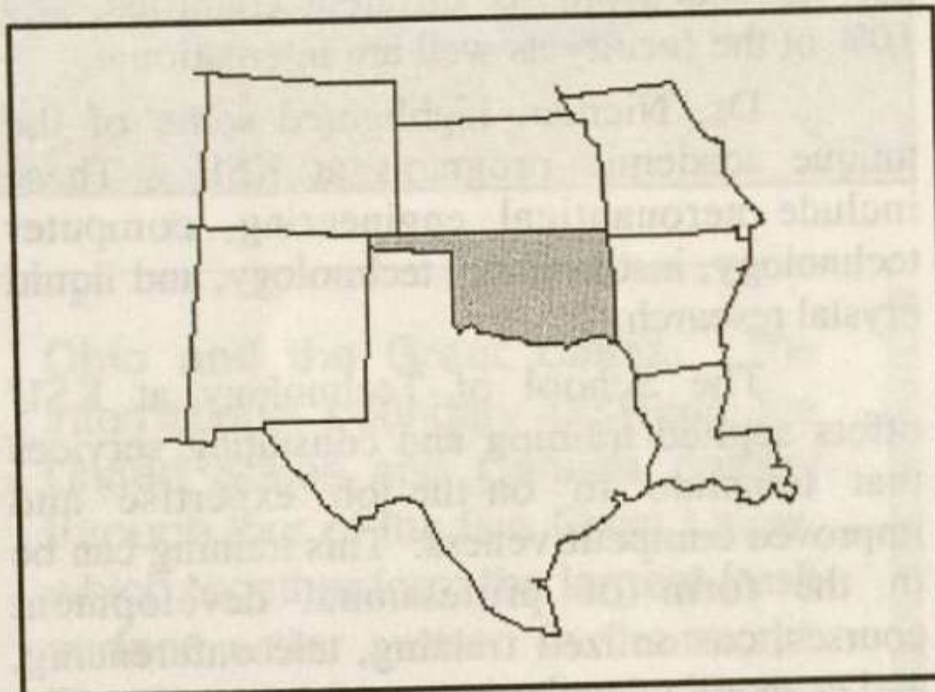
Information on OSU's Agricultural Experiment Station is available at:

www.dasnr.okstate.edu/oaes/

For more information on the State of Oklahoma, please see:

Oklahoma State Information

www.state.ok.us/osfdocs/stinfo2.html





Charles Nieman, Ph.D.

Note: At the workshop on American Experiences in Water Based Development, Dr. Nieman gave a multi-media presentation on the variety of programs available at KSU. He was followed by a presentation by Dr. Robert Heath, who covered more specifically the activities of the Water Resources Research Institute at KSU.

Dr. Charles Nieman is Director of International Student and Scholar Services at KSU.

Kent State was founded in 1910 originally as a teachers college, but today is one of the largest state supported schools in Ohio. In addition to students from Ohio, Kent has students from 83 different countries, and 10% of the faculty as well are international.

Dr. Nieman highlighted some of the unique academic programs at KSU. These include aeronautical engineering, computer technology, instructional technology, and liquid crystal research.

The School of Technology at KSU offers applied training and consulting services that translate to on-the-job expertise and improved competitiveness. This training can be in the form of professional development courses, customized training, teleconferencing, and economic development programs.

KSU also houses the Small Business Development Center to provide expertise to young businesses, and provides business incubator facilities that are designed to offer from one to three years of carefully monitored growth for new businesses. This is a means for helping entrepreneurs with good business ideas, training them to develop successful business plans.

Robert Heath, Ph.D.

Dr. Heath is the Director of the Water Resources Research Institute at Kent State University in Kent, Ohio.

The Water Resources Research Institute is a consortium of faculty from among the departments of biological sciences, chemistry, geology and geography at KSU, who focus on collaborative research. The study of water issues requires more than just a biological approach or just a geological approach or just a chemical approach but rather it requires a multi-disciplinary integrated approach.

Kent State faculty are engaged in a broad range of water research activities. Much of this research focuses on the Great Lakes, but faculty also participate in research on water systems in other parts of the United States in collaboration with other universities. Research is most frequently at the level of the watershed and is based on an ecosystem level, integrated approach that investigates relationships between water and land. Some of the topics investigated by researchers at the institute are:

- Erosion processes and ways of stabilizing soils to withstand erosion
- Bio-geochemical studies in how materials dissolve and are utilized by organisms in water
- The role of organic matter in ameliorating and changing the availability of nutrients in water
- Disaster geography, studying the effects of catastrophic events like floods and windstorms on water quality
- Climate modeling, reconstructing climate changes through time and projecting possible future climates in relation to natural resource management
- Ground and surface water hydrology, studying how water moves in different environments
- The relationship between water flows and international law

One of the impacts of global warming is the change in wind patterns. This then affects precipitation patterns and consequently the future availability and quality of water. Reliable

models are needed to project future resources and then select the best plans for sustainable water management.

Dr. Heath presented some of the research conducted by a member of KSU's geology faculty. This research is conducted in collaboration with other US universities, and involves mathematical modeling of water flows of series of reservoirs that are used for hydroelectric power and for agriculture. The researcher focuses on not only water quantity *per se* but the way in which that influences vegetational patterns.

This research involves the development of local climate models, and combines that with information about terrain, elevation, wind direction and average wind velocity, and the availability of carbon dioxide (both C13 and C12) and sunlight. This data is then compared with vegetation patterns.

Many water resource projects in the western US depend on snowmelt as the primary source of water, so it is necessary to predict as far as 30 to 50 years into the future the amount of snow available and how snow patterns will change, especially in carbon dioxide content.

This research also includes studies on the relationship between certain plants and climate conditions. For example, a particular type of cactus in the western US can survive up to five drought years in succession. By studying the distribution of this plant researchers can determine the probability of multi-year droughts in the study area. This knowledge can be applied to planning which species to use in agriculture and forestation projects.

The Water Resources Research Institute at KSU is involved with environmental studies of the Great Lakes in various capacities. Dr. Heath works with the International Joint Commission, which advises the governments of Canada and the United States on the management of the Great Lakes. The WRII collaborates with the Great Lakes Environmental Research Laboratory in Ann Arbor, Michigan, with private industries such as utility companies, and with private foundations such as the Great Lakes Protection Fund.

For more information about academic programs at Kent State University, please see www.kent.edu.

Information about the Water Resources Research Institute at KSU is available at www.kent.edu/wrri.



Ohio and the Great Lakes. The international boundary between the United States and Canada passes through four of the five Great Lakes, which together form the largest fresh surface water system in the world. The State of Ohio is bounded on the north by Lake Erie, which provides access to the Atlantic Ocean, and on the south by the Ohio River, which provides access to the Mississippi River and the Gulf of Mexico.

For more information on this region, please see the web site for the Great Lakes Information Network at www.great-lakes.net, with a wide selection of links to other sites related to the Great Lakes.



UNITED STATES ARMY CORPS OF ENGINEERS

Jerome Delli Priscolli, Ph.D.

Dr. Priscolli is Senior Advisor at the Corps' Institute of Water Resources in Washington, D.C., and is editor in chief of the journal Water Policy.

The US Army Corps of Engineers was founded over 200 years ago, during a period when the only engineers in the United States were army engineers. As the United States grew, Congress called on the US Corps of Engineers to perform civil functions in navigation and in the maintenance of ports and harbors. The USACE helped map out the expansion and development into the western US and assumed responsibility for flood management, hydroelectric development and eventually multi-purpose water management.

The priority missions for the Corps today are flood damage reduction, navigation and environmental engineering and protection. The Corps provides planning, designing and funding for construction, management of construction locks, reservoirs and other facilities to deliver services to final users. The Corps is the major operator on the major river systems of the United States as well as the *intra-coastal waterways*, and facilitates the flow of over 2/3 of the agricultural exports in the United States. The Corps also regulates the nation's wetlands and the waterway systems, including the issuance of permits for enterprises related to those waterway systems.

The United States has a great deal of water infrastructure, but much of it is aging at a time when the demands on it are growing, and when a national consensus on the goals of public infrastructure investment and the economic development have dissipated. This is because we have begun to identify the ecological costs, and the competition for capital has increased.

In these last few decades we have had much debate over environmental and other concerns related to water resource management. This debate has led us to ask, What is water resource management? What are the private and public roles? and what are the lessons learned? What follows are some of those lessons.

Lesson 1. Water management, especially large scale water management, requires a balance of private and public infrastructure investment. As Adam Smith said years ago in *The Wealth of Nations*: in order to have private markets work, we need public infrastructure.

Lesson 2. Ecology is not static. Rather, we are co-designing our ecology in partnership with nature. This is contrary to the notion of preserving nature or fixing some static place in nature, which are akin to the old idea of controlling nature. For example, we have endangered species in the Colorado River with the systems we've put in, but they're completely different from the ones that were there before. We need to ask how we're affecting the change of varied species and at what rate.

The United States has developed a basic policy that says "no net loss of wetlands." But there is disagreement about the definition of a wetland, whether an artificially created wetland is really a wetland, and whether no net loss implies the acceptability of removing one here and creating one there.

Lesson 3. The dialogue about intervention in ecology has required, and has created a whole new language of water resource performance indices that move us far beyond the traditional categories. As an example, we know the wetlands are very important for water systems, but this requires the ability to define them. We also have to define the values and functions of why we think they are important, and then engage in trade off analysis about these things.

Lesson 4. Main stream ecological ends cannot be achieved without engineering means, nor can you do public engineering in the absence of clearly defined ecological goals.

Lesson 5. Comprehensive water management requires a balance of non-structural and structural engineering. We are transforming the way we look at risks and uncertainty. We no longer have enough money to say we protect everybody from everything that could possibly be conceived of.

Populations and stakeholders who are impacted by water resource projects must actively choose the level of risk they are willing to assume, rather than passively accept a level of risk defined by engineers. The question then is,

How do we reform this process by which our stake holders actively choose levels of risk?

As a result of demographic and social changes, diverse new demands have grown and older patterns for allocations for water projects have proven to be too inflexible. The existing rules don't fit the current demographic realities and values, and they are not conducive to taking advantage of the variability in the hydraulic cycle.

Lesson 6. Successful programs now tend to start small, and then evolve into larger institutions, rather than starting with a "grand design" like the TVA.

The public role in water management grew during the last century in a succession of single purposes, and these single purposes became institutionalized in federal agencies. Since these institutions are driven by different purposes, there has been a lack of cooperation, and sometimes competition, among them.

Programs like those for the Susquehanna and Delaware river basins started small, built trust, they developed joint diagnosing of problems and built a joint vision, patiently building a revenue base, working on issues which are salient to the riparians themselves.

Lesson 7. We need to find ways to engage environmental values early in the process. Traditional public agencies have hurt themselves and their constituencies by resisting environmental thrusts early on and imposing restrictive definitions and purposes for themselves.

Lesson 8. Water is a common and public good and there will always be a role for public agencies. The current thrust to privatize the vendable aspects of water resources can actually push counter to the goals of integration. As services are segmented, they are moved further apart, and the job of integration becomes more difficult. Nor does this resolve the problem of providing necessary services that don't generate a lot of revenue.

We should have been bringing in what we knew from academics and theory about risks much, much earlier into this whole process. Public engineers have for a long time designed projects for an unrealistically high tolerance of risk, so people have not been well prepared to assume lower levels of risk, even though financial limitations are making this necessary. The debate over the level of risk a community

should assume has now become central to the democratic process. We as citizens must be engaged in issues that affect their lives, but also accept responsibility.

Lesson 9. A key to successful integrated management, which really amounts to managing these conflicts, finding win-win solutions, is to negotiate around benefits, economic, environmental and others rather than solely on the flow of water. The focus on rights to the exclusion of the creation of benefit streams reduces the likelihood of agreement. Also, the structure of these rights, mostly concerning access to water, have become outdated and often don't fit today's realities.

Lesson 10. The political and the technical experts within interest groups, among stakeholders, and across interest groups must become partners, working with each other and not against each other. This requires a new synthesis of what is technical and what is political. Technical experts must be open to alternative solutions, and political experts need to have more technical understanding.

Various constituencies need the expertise of water managers and engineers. However, that expertise can be shared only by building a new relationship with those they serve that is built on participatory notions and on the idea of an ethic of informed consent rather than well-intentioned paternalism.

The main issue is to transform the thinking of the managers. So the Corps created small units in various parts of the Corps with a program that looked at research and case studies, and developed training to give people the ability to think differently.

As the US enters the next century, it is clear that there is a need for new modes of cooperation between states, for more participation, conflict management and consensus building.

For more information about the Institute of Water Resources at the US Army Corps of Engineers, please see their website at: www.wrsc.usace.army.mil/iwr/index.htm



**Portland State
University**



**Northwest
Power Planning
Council**

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The Columbia River Basin is the third largest river basin in the US, with a little more than one million hectares. The two main river systems in the region are both transboundary rivers, crossing the border between the United States and Canada several times before entering the Pacific Ocean.

Historically, the central portion of the basin was dry plain, shrub steppe. Precipitation in this portion of the basin is generally less than ten inches in a year. The Cascade Mountains rise up to 14,000 feet, and block the rain. The coastal region, however, has heavy precipitation, with 200 inches of rain in a year. These differences result in very different vegetation and habitat types. So very dramatic differences in the climate have resulted in variation in habitat types and vegetation types.

The system has over 400 dams, including projects by the US Army Corps of Engineers and the Bureau of Reclamation. One of Reclamation's largest projects, the Grand Coulee Dam, is in this system. The hydro power system is jointly operated as a single system in the US and Canada through cooperative agreements and international treaty.

The major emphasis when the system was designed was for power production, irrigation, navigation and flood control. The system was well planned with a master plan that was developed in the 1920s and 1930s. With irrigation, the region has become a major agricultural area, leading in world wheat and potato production.

Since the construction of most of the infrastructure projects in the system, ideas about natural resources and conservation have changed, as well as ideas about civic participation and stakeholder involvement. The ecosystem is no longer sustainable, and is not functioning correctly.

For example, the region used to lead in the production of salmon, but now, because dams obstruct the migration of these fish to breeding sites, all of the salmon stocks in the river are now listed under the Federal Endangered Species Act. They are now carried in barges from the upper river to down below the dams. The system is no longer sustainable, and has to be changed to regain that sustainability.

The US Congress created the Northwest Power Planning Council in 1980 as a multi-state agency responsible for planning the power needs of the Columbia River basin and for developing environmental plans for the Columbia river in general. The agency works with several federal agencies who are charged with implementing the plans of the council, including the Bonneville Power Administration, the Bureau of Reclamation, the US Army Corps of Engineers, and the Federal Energy Regulatory Commission. State, tribal and local governments often work closely with the Council as it develops its power and fish and wildlife plans, and these entities also implement measures in those plans. The thirteen Native American tribes in the region are an important stakeholder group in that they are sovereign nations who have treaties with the US government, and who own and manage about 10 million acres within the Columbia River basin.

With previous resource development plans, the scientific foundation was not established at the beginning, so people were thinking at different levels and then making inconsistent proposals for action. The NWPPC learned that they need to make explicit what the scientific foundation is, and what are the principles they will operate under. They also learned that they must have policy development on a continuing basis, and that it must be done while interacting with scientists, sharing information back and forth, rather than treating science and policy separately.

The NWPPC is utilizing a process called the "multi-species framework process". This involves looking at alternative futures that are possible in the Columbia basin. Assuming that there are certain functions within the entire basin-wide ecosystem that are necessary for that ecosystem to function properly, the NWPPC is attempting to identify what those functions are for within that system, and to try to meet the needs of those various functions.

To develop alternative futures in a participatory manner that allowed for feedback and stakeholder involvement, NWPPC brought together the stakeholders in the region: the power interests, the utilities, the agricultural interests, the Indian tribes, local governments. They conducted a 4-day conference where they asked the stakeholders to express their own visions, and to identify goals and objectives to reach those visions.

The resulting visions from all the participants were sorted into 27 different issues. These issues were then combined into seven initial alternatives which went through a qualitative review by a group of independent scientists from universities, research institutes the Corps of Engineers, and other institutions. The review produced critiques of the seven major alternatives, which then went back to the stakeholders for more feedback. This is an iterative process, and although it takes more time, it creates consensus.

The NWPPC is taking a watershed based approach, that examines water and land systems together in zones marked by the upper limits of each water shed. This includes human impacts as well, and looking at social, cultural and economic aspects of the watershed also. As they develop these alternative futures, they analyze their impact across ten ecological provinces in the region. They look at what the historical potential for the region might have been, and then assess how closely each alternative moves the region toward that historical potential.

This allows them to work at a scale where they can begin to see patterns and where they can set priorities for their limited funding. But action is taken at a much smaller scale, usually at the level of the watershed. So the findings from research, monitoring, evaluation and analysis at the watershed level are taken back up to higher levels of analysis and looped back into the planning process.

The NWPPC believes that a sustainable system – sustainable economy, sustainable agriculture, whatever — depends on having healthy fish and wildlife populations or at least the functions that are provided by those species. They define a healthy environment as one that results in productive and sustainable populations of the target species, and achieves the social ends described in the vision.

The Northwest Power Planning Council has a website at www.nwppc.org, where you can download reports on current fish and wildlife programs and power plans, as well as find links to other sites in the Pacific Northwest.

PowerPoint®, presentations, color maps with GIS data, and downloadable documents on the Columbia River Basin Multi-Species Framework are available at: www.nwframework.org.



Portland State University offers Ph.D. programs in environmental sciences and natural resources, a Ph.D. in urban planning, and several professional certification programs, including certification in watershed management.

PSU is also home to a new Contemporary Turkish Studies program, with a chair endowed by the government of Turkey. For more information on PSU's academic programs, please see www.pdx.edu.



The states represented on the NWPPC are Washington, Oregon, Idaho and Montana, shown here in gray.

Conclusion

The presentations at the workshop related the experiences of different agencies in different regions of the United States, but certain issues were common to all. These issues have been compiled in the following summary under four general themes: water resources development as a catalyst for change, managing change, stakeholder participation, and communication across traditional barriers between professions, institutions, and sectors.

Water based development as a catalyst for change

Agencies like the Bureau of Reclamation and TVA were created expressly for using water resources development to stimulate economic growth. By and large the projects highlighted in the workshop have succeeded in boosting agricultural production and delivering electricity to areas that previously contributed little to national growth. Case studies from Oklahoma and Tennessee demonstrated how these regions today are vastly different from 75 years ago in economic and human development terms. The Bureau of Reclamation's original vision of "making the desert bloom" has resulted in California becoming a world leader in agricultural production. All of these projects represented enormous public investments and required years of planning and decades of implementation to realize the benefits that today are almost taken for granted.

Managing change

Most of the projects described in this workshop were constructed prior to World War II as part of the economic revitalization plan instituted by the federal government during the Great Depression, and represent the economic and environmental thinking of that era.

Many changes in American society stem from the "Baby Boom" during the 1950s and 1960s, and the expansion of the population of the American West. In the early 1960s, books like Rachel Carson's *Silent Spring* appeared, which addressed the impact that economic and social change have on the environment. Growing concern about the environment led to the celebration of the first Earth Day in 1970. With over 20 million participants, this was seen

as the coming of age of the environmental movement in the United States. During this same period, education levels and civic participation concerning the environment increased.

Federal agencies had to respond to growing public pressure to reduce the negative impact their projects had on the environment. New institutions, like the Environmental Protection Agency in 1970, were created in response to the demand for stricter regulation of pollution.

The American public also has demanded better protection of natural resources for recreational purposes. For example, TVA was designed for economic development of the Tennessee Valley region, but today the region's residents demand that resource management goals include the maintenance of the recreational uses of the water. The demand for recreation has impacted Bureau of Reclamation projects as well, requiring a rethinking of priorities and adding to the complexity of planning for multipurpose water resource projects.

As more attention was given to the impact that water projects had on the environment, these large projects and the agencies that maintain them were seen in a negative light. To remain viable, they have had to modify their policies, become more open to stakeholder input, and incorporate changing social priorities and current scientific knowledge about the environment into their projects. Examples cited by presenters included experimental flooding by the Bureau of Reclamation to imitate pre-dam patterns, and continual professional development of personnel at TVA and the Oklahoma Cooperative Extension Service in order to better anticipate and respond to change. A project at Kent State University to improve long range climate forecasting is another example of efforts to improve the monitoring of change.

Stakeholder participation

Workshop presenters agreed that greater stakeholder participation has improved the quality of their projects, but that this participation requires time and considerable effort.

Presenters described different issues that required stakeholder input and different methods for soliciting and applying that input. From the example of USBR receiving 40,000 comments about the management of the Glenn Canyon Dam to the iterative participatory visioning and review system of the Northwest Power Planning Council, it is evident that citizens now expect to have more input into these projects. TVA and other organizations now have advisory councils that include a broad range of stakeholder representatives. This participation results in greater transparency, more relevance for the projects that are designed, and more local support.

Presenters added that greater involvement by stakeholders requires the establishment of new channels for communication, since participation depends on the effective flow of information in multiple directions. They also remarked that this process takes more time and more energy, and requires effective public education about the issues.

The Oklahoma Cooperative Extension Service uses both top-down and bottom-up learning as it communicates agricultural research findings to local farmers and consumers, and also communicates the needs and issues of farmers to researchers, to improve the relevance and responsiveness of applied research. This process requires ongoing training and review at many points along the information stream, including training in communication skills for extension agents working at the interface between researchers and consumers.

Communicating across traditional barriers

All of the case studies cited experiences where groups that formerly opposed each other now are learning to work together for common goals. These experiences have ranged from differences between disciplines, between interest groups, between state and federal interests, and even at the international level, as in the Great Lakes and the Columbia River.

Several of the presenters described the previously adversarial relationship between scientists and policy makers. Scientific information was packaged and then delivered to politicians, who may or may not have understood that information. Organizations have learned to keep different factions in

communication, and to identify and remedy information gaps. Presenters emphasized the need for scientists and politicians to work together.

Presenters from government agencies remarked on the broad variety of agencies at the federal and state level responsible for various aspects of natural resource management and development. The diversity of organizations has created problems in coordination of projects, information sharing and issues of jurisdiction. Examples include Arizona's demand for water from the Colorado River, which must be coordinated with demands from three other states. Other cases cited coordination at the international level, such as with the International Joint Commission that advises the governments of the United States and Canada on issues related to the Great Lakes.

Barriers have also existed between factions such as environmental organizations and business. One means of bringing different factions to the table has been the creation of coordinating boards, such as the general council for the TVA and the advisory committees for the Oklahoma Cooperative Extension Service. These entities assist in identifying needs, obtaining stakeholder input, and developing plans.

Participants with experience in this type of coordination remarked that, even though no single faction gets everything it wants, stakeholders are overall more satisfied when the process is fair, and accept the outcome. In game theory terminology, this presents a change from win-lose outcomes to create the possibility for win-win outcomes.

For further browsing

The following websites are suggested for those who wish to learn more about water based development in the United States or elsewhere in the world. This list includes some of the organizations mentioned in workshop presentations.

Disclaimer: Reference to any of the websites listed in this publication does not imply an endorsement of their contents by GAP or by any of the participants in this workshop.

Selected US government agencies

Bureau of Land Management
www.blm.gov

Fish & Wildlife Service
www.fws.gov

National Weather Service
www.nws.noaa.gov

Natural Resources Conservation Service
www.nhq.nrcs.usda.gov

Environmental Protection Agency (EPA)
www.epa.gov

US Department of Agriculture
www.usda.gov

US Geological Survey
www.usgs.gov

Major environmental legislation:

National Environmental Policy Act
www.epa.gov/region5/defs/html/nepa.htm

Endangered Species Act
www.epa.gov/reg5oopa/defs/html/esa.htm

Natural resource maps of the US

Perry-Castaneda Library Map Collection,
University of Texas
www.lib.utexas.edu/Libs/PCL/
Map_collection/united_states.html

Interactive maps from the US Census
Bureau:
tiger.census.gov

Major US environmental NGOs

Sierra Club
www.sierraclub.com

World Wildlife Fund
www.worldwildlife.org

National Wildlife Federation
www.nwf.org

International Water Organizations

International Water Resources Association
www.iwra.siu.edu

Universities Water Information Network
www.uwin.siu.edu

The Water Web Ring
A cycle of international water websites
www.waterweb.org

World Water Council
www.worldwatercouncil.org

Southeastern Anatolia Project (GAP)
www.gap.gov.tr



SOUTHEASTERN ANATOLIA PROJECT
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