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Drought Network News

Summer–Fall 2001 **A Newsletter of the International Drought Information Center and the National Drought Mitigation Center** Volume 13 Nos. 2–3

Creating a Network of Regional Drought Preparedness Networks: A Call for Action

Drought is a creeping, slow-onset natural hazard that is a normal part of climate for virtually all regions of the world; it results in serious economic, social, and environmental impacts. Its onset and end are often difficult to determine, as is its severity. Drought affects more people than any other natural hazard. Lessons from developed and developing countries demonstrate that drought results in significant impacts, regardless of level of development, although the character of these impacts will differ profoundly. At the Meeting on Opportunities for Sustainable Investment in Rainfed Areas of West Asia and North Africa (WANA), held in June 2001 in Rabat, Morocco, participants (including ministerial delegations of 13 countries of the WANA region) concluded that the primary keys to development of drylands in the region were reducing rural poverty, arresting natural resource degradation, accelerating economic growth, diversifying economic opportunities, and enhancing food security. The recurrence of persistent drought was identified as one of the obstacles to achieving these aims. The economic, social, and environmental challenges of drought in developed countries are also significant. Recent droughts in the United States, Canada, and Australia, for example, have resulted in serious impacts in the agriculture, transportation, and energy sectors and also serious water use conflicts and environmental impacts.

The impacts of drought, like those of other natural hazards, can be reduced through mitigation and preparedness. Drought preparedness should be an integral part of water resources management. Drought risk is a product of a region's or community's exposure to the natural hazard and its vulnerability to extended periods of water shortage. If nations, regions, and communities are to make progress in reducing the serious consequences of drought, they must improve their understanding of the hazard and the factors that influence vulnerability. The hazard or natural event is best characterized by the frequency of meteorological drought at different levels of intensity and duration, and this frequency is projected to increase for some regions in the future as a result of increasing concentra-

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tions of greenhouse gases in the atmosphere. It is critical for drought-prone regions to better understand the drought climatology of their region and establish comprehensive and integrated early warning systems that incorporate climate, soil, and water supply factors such as precipitation, temperature, soil moisture, snow pack, reservoir and lake levels, groundwater levels, and stream flow. An integrated early warning system can provide timely and reliable information to decision makers from farm to national level to aid in reducing the impacts of drought.

Increasing society's capacity to cope more effectively with the extremes of climate and water resources variability—i.e., floods and droughts—is a critical element of integrated water resources management. Historically, more emphasis has been given to flood management than drought management. With increasing pressure on water and other natural resources because of increasing and shifting populations, it is imperative for all nations to improve their capacity to manage water supplies during water-short years.

Vulnerability to drought is dynamic and influenced by a multitude of factors, including increasing and shifting population, technology, government policies, land use and other natural resource management practices, desertification processes, water use trends, and increasing environmental awareness. Therefore, the magnitude of drought impacts may increase in the future as a result of an increased frequency of occurrence of the natural event (i.e., meteorological drought), changes in the factors that affect vulnerability, or a combination of these elements. All drought-prone nations should develop national drought policies and preparedness plans that place emphasis on risk management rather than follow the traditional ad hoc approach of crisis management, where the emphasis is on reactive, emergency response. Crisis management decreases self-reliance and increases dependence on government and donors.

Global Drought Preparedness Network

Because of increasing concern over the escalating impacts of drought and society's inability to effectively respond to these events, developing and developed countries are now placing greater emphasis on the development of national policies and plans that emphasize the principles of risk management. In addition, global initiatives, such as the U.N. Convention to Combat Desertification (UNCCD), are emphasizing the importance of improving drought early warning systems and seasonal climate forecasts and developing drought preparedness plans. A "Global Drought Preparedness Network" (GDPN) can provide the opportunity for nations and regions to share experiences and lessons learned (successes and failures) through a virtual network of regional networks. This could include information on drought policies, emergency response measures, mitigation actions, planning

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methodologies, stakeholder involvement, early warning systems, automated meteorological networks, the use of climate indices for assessment and triggers for mitigation and response, impact assessment methodologies, demand reduction/water supply augmentation programs and technologies, and procedures for addressing environmental conflicts. The mission of the IDIC and NDMC is to lessen societal vulnerability to drought through the application of appropriate risk management techniques, including preparedness plans and mitigation actions and programs. I have been promoting the concept of regional networks for the past year, and the IDIC/NDMC is prepared to play a substantial role in the establishment of these networks. These networks can build on the existing network of scientists, policy makers, and others who receive the IDIC/NDMC's newsletter, *Drought Network News*, which has been published since 1989 with support from the International Affairs Office/NOAA and the World Meteorological Organization.

The IDIC/NDMC will work in partnership with key U.N. agencies, U.S. federal agencies, NGOs, and appropriate regional and national institutions to create a global drought preparedness network (GDPN) that will promote the concepts of drought preparedness and mitigation with the goal of building greater institutional capacity to cope with future episodes of drought. In essence, this global drought partnership will enhance current national and regional institutional capacities through expansion of the NDMC's drought information clearinghouse on the World Wide Web and by building regional drought networks. Working individually, many nations and regions will be unable to improve drought coping capacity. Collectively, working through global and regional partnerships, we can achieve the goal of reducing the magnitude of economic, environmental, and social impacts associated with drought in the 21st century.

The objectives of the GDPN for the 3-year period 2002–2004 are:

1. To initiate, within drought-prone areas, regional drought preparedness networks that will bring together people and institutions to share information on regionally and locally appropriate strategies to improve drought preparedness and mitigate the effects of drought.
2. To identify regional institutions to coordinate regional networks and potential funding sources for these networks.
3. To identify key global partners and potential funding sources for the GDPN.
4. To enhance the NDMC's drought information clearinghouse website to provide more information on drought monitoring, mitigation, and preparedness techniques and methodologies and linkages to the principal institutions in each region.
5. To assist regional networks in the development of comprehensive drought-related websites that link the principal national and regional institutions.
6. To organize and conduct, with the assistance of regional institutions, regional workshops and longer-term training opportunities at the regional and global levels on various aspects of drought preparedness.

The IDIC/NDMC is currently working to:

- identify key institutions for developing partnerships and providing base funding for the creation of the GDPN;
- serve as a catalyst in the development of regional networks in the Mediterranean, Sub-Saharan Africa, South America, North America, eastern/central Europe, western Europe, Asia, and Australia and the Pacific;
- identify, with the assistance of countries within each region, key institutions to provide leadership in the development of regional networks;
- assist regions in obtaining funding for the establishment of the network, including funding for organizing and conducting a launching workshop in each region.

Progress to Date

The concept of a regional network on drought preparedness has been discussed with regions in the Mediterranean, South America, North America, Asia, and eastern and central Europe.

For example, an advanced course, Management Strategies to Mitigate Drought in the Mediterranean: Monitoring, Risk Management, and Contingency Planning, was held in Rabat, Morocco, in late May 2001 with sponsorship of the Centro Internacional De Altos Estudios Agronomicos Mediterraneos' Instituto Agronomico Mediterraneo De Zaragoza, the European Commission, and the Kingdom of Morocco's Ministry of Agriculture. This course was used as a forum to discuss the establishment of a regional network for the Mediterranean region, institutional leadership and coordination, and financial requirements. The Rabat Declaration on Opportunities for Sustainable Investment in Rainfed Areas of West Asia and North Africa (ministerial meeting held June 25–26, 2001) has endorsed the development and implementation of a regional approach to drought preparedness through the development of appropriate policies and integrated drought management strategies. Creation of a regional drought preparedness network will be one of the first steps in this process.

In Brazil, the Institute of Agronomy at Campinas is seeking financial support to organize a regional launching workshop for a South American regional network. In organizing this workshop, the Institute will network with other Brazilian and South American institutions. Discussions have been held with the International Institute for Cooperation in Agriculture (IICA) regarding assistance in identifying the principal regional and national member institutions and funding opportunities.

If your institution is interested in working with the IDIC/NDMC in establishing a regional drought preparedness network, please contact me by e-mail (dwilhite2@unl.edu). To learn more about the activities of the NDMC, see our website at **drought.unl.edu.**

Donald A. Wilhite

An Analysis of Recent Drought Conditions in Turkey in Relation to Circulation Patterns

Drought commonly is perceived to be a prolonged period with a significant reduction in precipitation. Namias (1985) argues that drought is associated with persistent or persistently recurring atmospheric circulation patterns. For example, the North Atlantic Oscillation (NAO) has a major role in controlling European climate and appears to exert a strong influence in modulating North Atlantic ecosystems. During the positive phases of NAO, the North Atlantic westerlies, which provide much of the atmospheric moisture to north Africa and Europe, shift northward. This, in turn, results in drier conditions over southern Europe, the Mediterranean Sea, and northern Africa (Hurrell, 1995; Hurrell and Van Loon, 1997).

Turkey is situated in the Mediterranean macroclimatic region of the subtropical zone. Because of its complex topographic features and its proximity to water, and because it is a transition zone for different pressure systems and air masses originating from polar and tropical zones, several climatic subregions appear to be dominant over the country. The amount and distribution of rainfall in the coastal areas is determined by troughs and frontal-type mid-latitude cyclones that are associated with the prevailing upper-level westerly flows. The Mediterranean Sea acts as a primary source for moist air masses that produce high rainfall over the windward slopes of the coastal mountain ranges. Frontal Mediterranean cyclones associated with the southwesterly air flows create favorable conditions for heavy rainfall and thunderstorms in the southern and western coastal parts of the country in late autumn and early winter. Annual average rainfall in Turkey is around 630 mm, with 67% of it occurring during the winter and spring, when the eastern Mediterranean basin and Balkans are influenced by eastward propagating mid-latitude cyclones and Mediterranean depressions (Türkes, 1996).

Drought has been a recurrent phenomenon in Turkey for the last several decades. A warming trend that began in the early 1990s has continued in recent years, despite some cooling, and annual mean

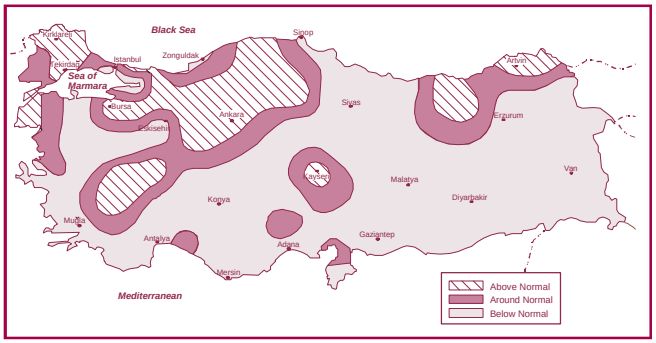

Figure 1. Precipitation conditions in 1999 with respect to climatic normals.

temperatures have remained above average for the last five years. A significant drought was observed during the winter and spring (normally the wettest seasons) of 1999 and 2000. Almost two-thirds of the country, mainly the southeastern and central Anatolia regions, experienced severe drought in 1999, and the drought continued in 2000 with slight differences in areal coverage (Figure 1). Although the central parts recovered slightly from the drought conditions, the effects were felt more dramatically in the eastern and western parts. Moreover, the drought shifted north, extending further into parts of the Black Sea region, normally the wettest in the country.

An analysis of the pressure systems in relation to prolonged dry periods indicates several main changes and shifts in the circulation patterns that affect precipitation conditions in Turkey (Figure 2). These changes can be summarized as (1) weakening of the Siberia anticyclone, especially after the 1980s (winter droughts); (2) penetration of the Azor anticyclone ridge into the eastern Mediterranean; (3) decrease in frequency of frontal systems in the Mediterranean; (4) penetration of the Basra low farther north (summer droughts); and (5) strengthening of Basra low (summer droughts).

Changes in the NAO also affect rainfall variability in Turkey. During the positive phases of NAO, the North Atlantic westerlies, which provide much of the atmospheric moisture to north Africa and Europe, shift northward. This, in turn, results in drier conditions over southern Europe, the Medi-

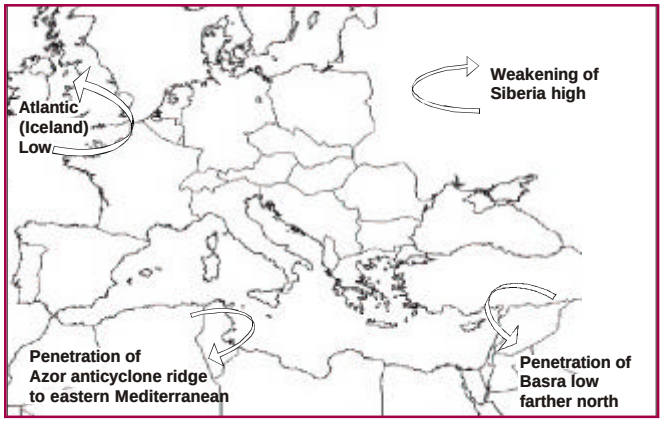

Figure 2. Changes in circulation patterns and pressure systems in relation to drought conditions in Turkey.

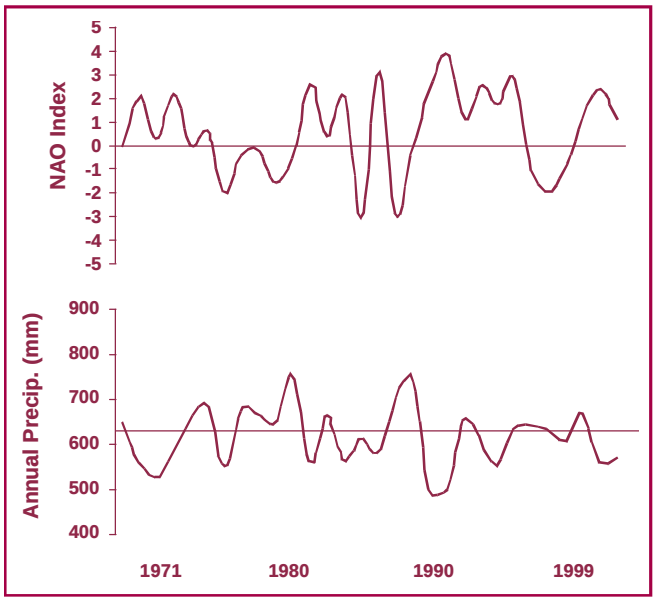

Figure 3. Relationship between NAO and annual rainfall changes in Turkey (1970–2000).

terranean Sea, and northern Africa (Hurrell, 1995). Jansa (1992) argues that the heaviest rainfall in the Mediterranean region is observed from the end of autumn to the beginning of spring, when significant cyclogenetic activity fundamentally determines the maximum rainfall. Since these winter cyclones are the dominant source of Middle Eastern rainfall and river runoff, NAO-related changes in Atlantic westerly heat/moisture transport and Atlantic/Mediterranean SSTs influence Middle Eastern climate.

It has been observed that during positive NAO years, Turkey becomes significantly cooler and drier (Cullen and deMenocal, 1999). Figure 3 shows a correlation between annual rainfall and NAO indices over the last three decades. It has been shown that the dry periods correspond well with the positive phases of the NAO, and, similarly, humid conditions prevail during the negative phases of the NAO. Considering that the country receives most of its rainfall in winter and spring, winter droughts in Turkey can be attributed to positive NAO anomalies. On the other hand, summer droughts experienced in eastern and southeastern parts of the country are usually associated with strengthening and penetration of the Basra low pressure farther north.

In conclusion, drought conditions that prevailed over the last 2–3 decades in Turkey are related to changes in the weather patterns in the Atlantic region, specifically variations in North Atlantic Oscillation. Furthermore, penetration of the Basra low farther north and weakening of the Siberia anticyclone contributed to the summer and winter droughts to a great extent.

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Poor Water Resources and Drought in the Gujarat/Saurashtra Regions of India

Inadequate water resources pose a big threat to the economy, human activities, and livelihood in the Gujarat/Saurashtra regions of India. Scanty rainfall with wide aberrations in its distribution has made the situation worse, leading to chronic drought in the state in 2001. With the exception of the Narmada and Tapi rivers, there are hardly any water resources to sustain agricultural production in the region. The gradual disappearance of forest cover in the state has further aggravated the drought situation. This has led to large-scale erosion of the topsoil, particularly near the riverside. There is apprehension that the region will soon become an "environmental refugee" zone.

In addition, groundwater resources are overexploited in the state, with the water table going down nearly 4 m per year, particularly in the premonsoon season. The state was once a lush green carpet of groundnut and cotton crops, but mismanagement of water resources at all levels has led to the current drought problem in the Gujarat, Saurashtra, and Kutch regions. Figure 1 depicts the current drought-affected regions of the state.

India has a record of 12 successive good monsoons, with the 13th in the offing this year. But the drought in the Gujarat and Saurashtra regions may be due to the poor monsoon and winter rainfall last year. The crisis was aggravated by overexploitation and reckless use of groundwater. Out of 100 million people affected by drought in India, 25 million are from this region, spread over 17 districts of the state, and 7 million cattle are also affected. There is a 30% deficit of food grains in this region.

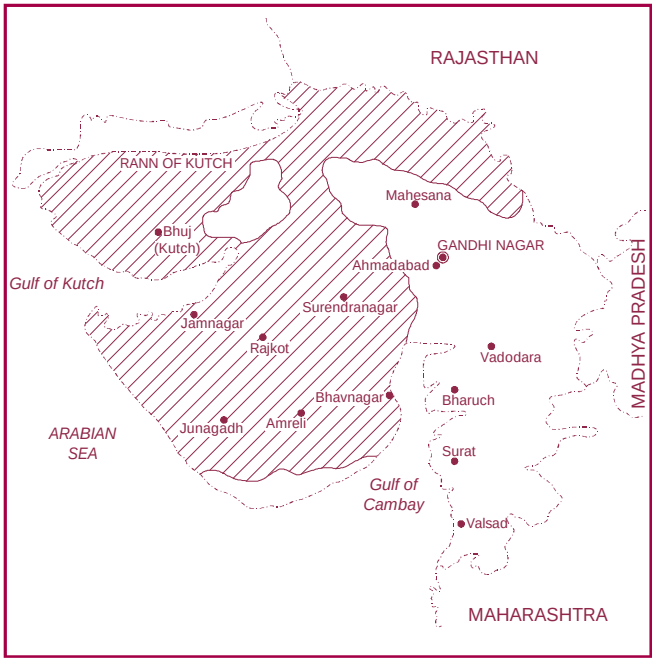

Figure 1. Drought-affected regions of Gujarat state of India.

Current Scenario

The Kutch region, once covered with 6-foot tall green grasses, has now been reduced to dusty plains. Most of the cattle grazers are battling the drought for their livelihood. Fodder supplied by the government hardly meets their needs, and milk yields from buffaloes are therefore poor. As one alternative source of income, some producers have been able to sell the glue produced by scrub trees such as *Prosopis juliflora*.

Habitation is very much affected by water quality problems due to high levels of fluoride and salinity in the drought-affected region. In Gujarat, 12.4% of the total area is affected by salinity, with EC>4,000 micro-mhos. Gujarat has replenishable groundwater resources of about 20.4 billion cubic meters (BCM). Groundwater resources in alluvium/unconsolidated rocks amount to about 92 BCM; groundwater resources in hard rocks, about 12 BCM. Overdraft of groundwater has led to the problem of seawater ingress, particularly along the Saurashtra coast. Water logging affects 172,590 km^2 and salinity affects 911,000 km^2 in Gujarat; soil alkalinity is not a problem in the region.

Table 1 shows the status of the monsoon in the region. The significant drought years are 1982, 1985, 1986, 1987, and 1988; 1982 was a moderate drought year in the Saurashtra and Kutch regions, with more

Year	Gujarat	Saurashtra/Kutch
1991	N	D
1992	N	N
1993	N	D
1994	E	E
1995	D	D
1996	D	N
1997	E	E
1998	D	N
1999	E	D

D = Deficit (-20% to -59%)
N = Normal (+91% to -19%)
E = Excess (+20% or more)
Note: 1984, 1985, 1986, and 1987 are successive rainfall deficit years

Table 1. Status of monsoon in Gujarat, Saurashtra, and Kutch regions.

than 3,000 villages facing acute drinking water shortages. From 1984 to 1987, the Gujarat and Saurashtra regions faced continuous rainfall deficiency, with 1987 being the worst drought year (rainfall deficits of -42% for Gujarat and -74% for Saurashtra/Kutch).

In 1985, a dry spell of 12–14 weeks affected more than 75% of the crops. During 1986 and 1987, India as a whole suffered from drought, but it was a chronic drought for Gujarat and the Saurashtra/Kutch regions. Against a target of 2 million tons, rabi production fell by 9 lakh[1] tons, a loss of Rs. 976 crores. There was complete absence of surface water, with 40 dams completely dried up and 20 dams partially dried up. In Saurashtra alone, 5,000 cattle died.

Climatic Resources

Gujarat and the Saurashtra/Kutch regions have arid climates. The mean annual rainfall varies from 300 m to 600 mm with 40–60% coefficient of variation (CV). The southwest monsoon sets in during mid-June and withdraws by mid-September from these states. Monsoon rain is also scanty during June–September, with 300–500 mm of rain, having a CV of 50–60%. The number of rainy days during this period is 10–30. Winter rains are also poor, with about 20 mm of rain from October to December. Nearly 90% of the annual rainfall occurs during June–September. During April–June, more than 10 hours of bright sunshine, with nearly 500–600 cals./day of solar energy, prevails in the region. This increases the evaporation rate to an average of 12–14 mm per day for April–June. Annual mean evaporation is 3,500 mm in Gujarat and Saurashtra states. Thus we have a large deficit of moisture with atmospheric subsidence in the region.

Table 2 shows the rainfall and evapotranspiration of these states. The moist weeks for the region during the monsoon are meteorological weeks 26–39. However, the moisture deficit week occurs either before the monsoon or during the winter months (week 40 onward). The water availability period for crop planning for Gujarat is shown in Table 3. The annual deficit varies between 750 mm in Surat to 1,650 mm in Bhuj region. Therefore, the poor water resources and moisture deficit together with unfavorable climate conditions have made the region drought prone.

Participatory Approach for a Better Future

In response to the current drought conditions in this region, the people of the villages (including tribal) have developed strategies to combat drought. In this process, some of the old check dams were repaired through financial support from nongovernmental organizations (NGOs). A few farmers contributed money for plastic lining for farm ponds to conserve water. Other farmers participated in land shaping work. Strict orders were issued to prevent people from pumping water out of the check dams. People from tribal regions of Gujarat built 15 check dams on 200 ha of land. These check

Stations	PET (mm)	Rain (mm)	Moist weeks	Water deficit weeks
Gujarat:				
Ahmadabad	680	758	26–37	23–25
Baroda	642	934	26–39	23–25
Broach	674	971	26–37	40–43
Saurashtra and Kutch:				
Veraval	644	572	26–31	33–43

Table 2. Seasonal rainfall and PET.

[1] 1 lakh = 100,000

Stations	Water availability duration (days)	Annual deficit (mm)	Mean annual rain (mm)
Bhuj	80	1,650	350
Jamnagar	110	1,220	490
Rajkot	120	1,470	670
Bhavnagar	115	1,210	600
Veraval	135	990	700
Ahmadabad	125	970	820
Baroda	140	880	930
Surat	150	750	1,200
Broach	155	810	1,000

Table 3. Water availability period for Gujarat and Saurashtra regions.

dams provided water for irrigation and also for groundwater recharge.

During the current drought, about 10,000 check dams were constructed in the chronic drought regions of Saurashtra and Kutch. Here the farming community contributed 40% of the cost; NGOs also provided support. Water harvesting and a participatory approach in watershed management by the village community, along with the empowerment of women, could bring about a substantial increase in efficiency in the water cycle in Gujarat, Saurashtra, and Kutch states. However, water is no longer a plentiful resource. It needs to be used judiciously.

Social Mobilization for Drought Proofing

Gujarat, Saurashtra, and Kutch are not the only states affected by drought. Other regions of India will also be affected if we do not care enough to take the necessary steps to conserve and regenerate water resources. It has been suggested that future wars will be fought over water. Water is now not only a state or national subject but also an international topic.

Exploitation of groundwater through tube wells has led to an alarming fall in the water table, resulting in poor, brackish water. India receives major rainfall in about 100+ hours out of 8,760 hours in a year. If proper rainwater harvesting were to be done in the cities of India, there might not be any water problem in the next few years. Just 1% of our rainfall, if harvested properly, would be enough to serve the country's needs. About 100 mm of rain received in a hectare plot may yield 1 million liters of water. The solution lies in harvesting rainwater through capturing it, storing and recharging it, and then later using it effectively during prolonged drought periods or dry spells. This must be implemented on a large scale through social mobilization by NGOs, if not by government bodies.

Some of the practical methods of rainfall harvesting, such as rooftop harvesting and conservation of small check dams, require the people's participation. In the future, the quest for water will involve community-based rainwater harvesting in both urban and rural areas of India, which may help us achieve food sustainability and security.

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Announcements

Allocating and Managing Water for a Sustainable Future: Lessons from Around the World

The Natural Resources Law Center (NRLC) and the University of Colorado Law School will host a conference, Allocating and Managing Water for a Sustainable Future: Lessons from Around the World, June 11–14, 2002, in Boulder, Colorado. The conference will focus on problems of sustainable water management in the western United States, and sessions will be organized around three themes: the role of markets and policy; integrating environmental, cultural, and other values; and transboundary water conflicts and cooperation. For more information, contact NRLC at 401 UCB, University of Colorado Law School, Boulder, Colorado, 80309–0401; phone (303) 492–1272; fax (303) 492–1297; e-mail nrlc@spot.colorado.edu; or visit their website at www.colorado.edu/law/NRLC/2002Conference.html.

Defending the Integrity of Ground Water: Understanding the Impacts of Natural and Manmade Disasters

An international conference on water security, Defending the Integrity of Ground Water: Understanding the Impacts of Natural and Manmade Disasters, will be held July 10–12, 2002, in Washington, D.C. The National Ground Water Association (NGWA) is sponsoring the meeting. The conference will address the impacts of natural and manmade disasters on groundwater resources, the actions needed to minimize damage and restore resource quality in a timely manner, and contingency planning to ensure the availability of groundwater to meet emergency needs. Topics to be addressed include case studies of groundwater quantity and quality changes resulting from natural disasters; global climate change effects on groundwater resources and availability; earthquakes and groundwater; case studies of groundwater contamination by toxic compounds; chemical and biological war agents in soil, groundwater, and surface water; hydrogeologic methods to delineate groundwater recharge areas and source water and wellhead protection areas; drinking water protection technologies; disaster contingency planning; and emergency water supply from wells. For more information, visit the NGWA's website at http://www.ngwa.org/education/disaster.html or contact the NGWA at 1–800–551–7379.

Conference on Energy Climate, Environment and Water—Issues and Opportunities for Irrigation and Drainage

The Conference on Energy Climate, Environment and Water—Issues and Opportunities for Irrigation and Drainage will be held July 10–13, 2002, in San Luis Obispo, California. The conference, sponsored by the United States Committee on Irrigation and Drainage (USCID) and the Environmental and Water Resources Institute of the American Society of Civil Engineers, will provide participants an opportunity to discuss challenges facing irrigators, including increasing competition for water supplies, rising energy costs, environmental considerations, and the effect of climate changes. Participants are expected to include

engineers, environmental and social scientists, managers, attorneys, and economists from academia, consulting firms, water districts, and government agencies. For more information, visit the USCID website: www.uscid.org/~uscid/i_sloprg.html.

Third International Conference on Water Resources and Environment Research (ICWRER)

The aim of the Third International Conference on Water Resources and Environment Research (ICWRER): Water Quantity & Quality Aspects in Modelling and Management of Ecosystems is to encourage and facilitate interdisciplinary communication among scientists, engineers, and professionals in the fields of ecological systems, sustainable management, development of water resources, and conservation of natural systems. ICWRER will be held in Dresden, Germany, July 22–25, 2002. Conference topics include Modelling Water Resources Phenomena, Water Resources Management, Matter and Particle Transport in Surface and Subsurface Flow, and Ecosystem Research. For more information, contact the conference secretariat, Cathleen Schimmek and Gisela Schöler, Institute of Hydrology and Meteorology, Dresden University of Technology, Wuerzburger Str. 46, D–01187 Dresden, Germany; telephone +49–351–463 33931; fax +49–351–463 37162; e-mail icwrer2002@mailbox.tu-dresden.de. ICWRER's website is www.tu-dresden.de/fghhihm/normal/2nd-Announc-2.htm.

Johannesburg Summit 2002: World Summit on Sustainable Development

Johannesburg Summit 2002, the World Summit on Sustainable Development, will bring together heads of state and government, national delegates, leaders from businesses and nongovernmental organizations, and other major stakeholders September 2–11, 2002. The meeting is being organized by the United Nations and will be held in Johannesburg, South Africa. The Johannesburg Summit builds on the 1992 Earth Summit in Rio—in particular, Agenda 21, adopted during the 1992 meeting. Agenda 21 is a global plan of action for sustainable development, incorporating environmental, economic, and social concerns into its framework. The Johannesburg Summit will evaluate progress made on Agenda 21 and provide a forum for participants to determine concrete steps to achieve sustainable development. In preparation for the 2002 Summit, meetings of intergovernmental subregional and regional preparatory committees (PrepComs) were planned for late 2001 and early 2002; the final agenda and issues to be debated will be determined from these meetings. For more information, visit the Summit website (www.johannesburgsummit.org) or send e-mail to the following: 2002participation@un.org (general questions) or summitregister@un.org (registration questions).

Drought Network News is published three times a year by the International Drought Information Center (IDIC) and National Drought Mitigation Center (NDMC). The IDIC and NDMC are part of the School of Natural Resource Sciences at the University of Nebraska–Lincoln. Funding for the newsletter is provided by the International Activities Division, National Weather Service/NOAA, through their cooperative program with the World Meteorological Organization, and Cooperative State Research, Extension, and Education Service, U.S. Department of Agriculture.

Drought Network News encourages readers to submit information on current episodes of drought and its impacts; timely reports of response, mitigation, and planning actions of governments and international organizations (successes *and* failures); recent research results and new technologies that may advance the science of drought planning and management; recent publications; conference reports and news of forthcoming meetings; and editorials. If references accompany articles, please provide *full bibliographic citations*. All artwork *must* be *camera-ready*—please provide clear, sharp copies (in black/gray and white only—we are unable to reproduce color artwork) that can be photocopied/reduced without losing any detail. Correspondence should be addressed to

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