REQUEST FOR PROPOSALS

FEASIBILITY STUDY FOR THE

TURKEY: FLOOD FORECASTING AND EARLY WARNING SYSTEM PROJECT

Submission Deadline: **4:00PM**

LOCAL TIME

November 12, 2010

Submission Place:

TURKISH STATE METEOROLOGICAL SERVICE
(DEVLET METEOROLOJI ISLERI GENEL MUDURLUGU)
KUTUKCU ALI BEY CADDESI NO: 4
06120 KALABA
ANKARA/TURKEY

PHONE: **+ 90 312 359 75 45**
FAX: **+ 90 312 359 34 30**

SEALED PROPOSALS SHALL BE CLEARLY MARKED AND RECEIVED PRIOR TO THE TIME AND DATE SPECIFIED ABOVE. PROPOSALS RECEIVED AFTER SAID TIME AND DATE WILL NOT BE ACCEPTED OR CONSIDERED.

REQUEST FOR PROPOSALS

Section 1: INTRODUCTION

The U.S. Trade and Development Agency (USTDA) has provided a grant in the amount of US$507,420 to the Turkish State Meteorological Service (TSMS) (the "Grantee") in accordance with a grant agreement dated September 3, 2010 (the "Grant Agreement"). The study will develop an implementation plan to assist TSMS in determining its national-level FFEWS needs, including hardware, software, Geographic Information Systems (GIS), Relational Database Management Systems (RDMS), sensors, weather and water monitoring equipment, communications equipment, and modeling systems. The Grant Agreement is attached at Annex 4 for reference. The Grantee is soliciting technical proposals from qualified U.S. firms to provide expert consulting services to perform the Feasibility Study.

1.1 BACKGROUND SUMMARY

Due to its geographic location, geology, and topography, flooding is a serious problem in Turkey. Floods are primarily due to heavy rainfall in the coastal areas of the country, or to sudden snow melts in the mountainous, southeastern part of the country. In recent years, heavy rainfall combined with rapid urbanization and deforestation has led to a dramatic increase in flooding.

Flooding in Turkey has caused many deaths and significant economic damage. As a result of recent flooding, especially the severe flooding that occurred in September of 2009, the Government of Turkey wants to improve the country's early warning and flood control capabilities. TSMS intends to deploy a comprehensive, nationwide Flood Forecasting and Early Warning System, and TSMS has requested USTDA support for a feasibility study that would define the parameters of that system. The system would take into account the national flood control master plan currently being revised by the State Hydraulic Works.

The overall objective of the proposed FS is to develop a comprehensive road map to be followed by TSMS in the systematic deployment of a fully operational Flood Forecasting and Early Warning System. The USTDA-funded study will develop an implementation plan to assist TSMS in determining its national-level Flood Forecasting and Early Warning System needs, including hardware, software, Geographic Information Systems (GISs), Relational Database Management Systems (RDMSs), sensors, weather and water monitoring equipment, communications equipment, and modeling systems.

The ability to carry out flood analysis quickly is of paramount importance in issuing useful forecasts that allow citizens and businesses the maximum time to prepare for a flood. Therefore, a major emphasis of the FS will be the development of real-time hydrologic modeling and forecasting capabilities in Turkey. The study will provide valuable support to TSMS in selecting and implementing suitable flood models; developing formats for automated data entry into models; generating useful outputs in the form of flood levels, inundation maps, and other information formats; and providing GIS images to disseminate information on the status of floods. The Flood Forecasting and Early Warning System Feasibility Study for TSMS will reduce economic losses, and risks to life, health and safety, due to flooding in Turkey.

TSMS is fully committed to the development and implementation of a modernized, national-level Flood Forecasting and Early Warning System based on the most advanced technology available. In this endeavor, TSMS has the full support of the Ministry of Environment and Forestry, the State Hydraulic Works, and the newly formed Prime Ministry Disaster and Emergency Management Authority. TSMS's General Director, Mr. Mehmet Çağlar, strongly supports the project, and has actively sought USTDA assistance. The recently constituted Flood Team within TSMS (a group of highly qualified meteorologists, software experts, and GIS specialists) will be responsible for management of the Flood Forecasting and Early Warning System Feasibility Study.

A background Definitional Mission Turkey: Flash Flood Control and Early Warning System is provided for reference in Annex 2.

1.2 OBJECTIVE

The objective of this study is to develop a comprehensive road map to be followed by TSMS in the systematic deployment of a fully operational Flood Forecasting and Early Warning System. The study will develop an implementation plan to assist TSMS in determining its national-level Flood Forecasting and Early Warning System needs, including hardware, software, Geographic Information Systems (GISs), Relational Database Management Systems (RDMSs), sensors, weather and water monitoring equipment, communications equipment, and modeling systems.

The Terms of Reference (TOR) for this Feasibility Study are attached as Annex 5.

1.3 PROPOSALS TO BE SUBMITTED

Technical proposals are solicited from interested and qualified U.S. firms. The administrative and technical requirements as detailed throughout the Request for Proposals (RFP) will apply. Specific proposal format and content requirements are detailed in Section 3.

The amount for the contract has been established by a USTDA grant of US$507,420 **The USTDA grant of US$507,420 is a fixed amount. Accordingly, COST will not be a factor in the evaluation and therefore, cost proposals should not be submitted**. Upon detailed evaluation of technical proposals, the Grantee shall select one firm for contract negotiations.

1.4 CONTRACT FUNDED BY USTDA

In accordance with the terms and conditions of the Grant Agreement, USTDA has provided a grant in the amount of US$507,420 to the Grantee. The funding provided under the Grant Agreement shall be used to fund the costs of the contract between the Grantee and the U.S. firm selected by the Grantee to perform the TOR. The contract must include certain USTDA Mandatory Contract Clauses relating to nationality, taxes, payment, reporting, and other matters. The USTDA nationality requirements and the USTDA Mandatory Contract Clauses are attached at Annexes 3 and 4, respectively, for reference.

Section 2: INSTRUCTIONS TO OFFERORS

2.1 PROJECT TITLE

The project is called Flood Forecasting and Early Warning System Project.

2.2 DEFINITIONS

Please note the following definitions of terms as used in this RFP.

The term "Request for Proposals" means this solicitation of a formal technical proposal, including qualifications statement.

The term "Offeror" means the U.S. firm, including any and all subcontractors, which responds to the RFP and submits a formal proposal and which may or may not be successful in being awarded this procurement.

2.3 DEFINITIONAL MISSION REPORT

USTDA sponsored a Definitional Mission Turkey: Flash Flood Control and Early Warning System to address technical, financial, environmental and other aspects of the proposed project. A copy of the report is attached at Annex 2 for background information only. Please note that the TOR referenced in the report are included in this RFP as Annex 5.

2.4 EXAMINATION OF DOCUMENTS

Offerors should carefully examine this RFP. It will be assumed that Offerors have done such inspection and that through examinations, inquiries and investigation they have become familiarized with local conditions and the nature of problems to be solved during the execution of the Feasibility Study.

Offerors shall address all items as specified in this RFP. Failure to adhere to this format may disqualify an Offeror from further consideration.

Submission of a proposal shall constitute evidence that the Offeror has made all the above mentioned examinations and investigations, and is free of any uncertainty with respect to conditions which would affect the execution and completion of the Feasibility Study.

2.5 PROJECT FUNDING SOURCE

The Feasibility Study will be funded under a grant from USTDA. The total amount of the grant is not to exceed US$507,420.

2.6 RESPONSIBILITY FOR COSTS

Offeror shall be fully responsible for all costs incurred in the development and submission of the proposal. Neither USTDA nor the Grantee assumes any obligation as a result of the issuance of this RFP, the preparation or submission of a proposal by an Offeror, the evaluation of proposals, final selection or negotiation of a contract.

2.7 TAXES

Offerors should submit proposals that note that in accordance with the USTDA Mandatory Contract Clauses, USTDA grant funds shall not be used to pay any taxes, tariffs, duties, fees or other levies imposed under laws in effect in the Host Country.

2.8 CONFIDENTIALITY

The Grantee will preserve the confidentiality of any business proprietary or confidential information submitted by the Offeror, which is clearly designated as such by the Offeror, to the extent permitted by the laws of the Host Country.

2.9 ECONOMY OF PROPOSALS

Proposal documents should be prepared simply and economically, providing a comprehensive yet concise description of the Offeror's capabilities to satisfy the requirements of the RFP. Emphasis should be placed on completeness and clarity of content.

2.10 OFFEROR CERTIFICATIONS

The Offeror shall certify (a) that its proposal is genuine and is not made in the interest of, or on behalf of, any undisclosed person, firm, or corporation, and is not submitted in conformity with, and agreement of, any undisclosed group, association, organization, or corporation; (b) that it has not directly or indirectly induced or solicited any other Offeror to put in a false proposal; (c) that it has not solicited or induced any other person, firm, or corporation to refrain from submitting a proposal; and (d) that it has not sought by collusion to obtain for itself any advantage over any other Offeror or over the Grantee or USTDA or any employee thereof.

2.11 CONDITIONS REQUIRED FOR PARTICIPATION

Only U.S. firms are eligible to participate in this tender. However, U.S. firms may utilize subcontractors from the Host Country for up to 20 percent of the amount of the USTDA grant for specific services from the TOR identified in the subcontract. USTDA's nationality requirements, including definitions, are detailed in Annex 3.

2.12 LANGUAGE OF PROPOSAL

All proposal documents shall be prepared and submitted in English, and only English.

2.13 PROPOSAL SUBMISSION REQUIREMENTS

The **Cover Letter** in the proposal must be addressed to:

Mr. Mehmet Çağlar
Director General
Turkish State Meteorological Service
(Devlet Meteoroloji Isleri Genel Mudurlugu)
06120 Kalaba – ANKARA/TURKEY
Phone: +90 312 359 75 45
Fax: +90 312 359 34 30

An Original and eight (8) copies of your proposal must be received at the above address no later than 4:00 PM, on November 12. Offerors must also include an electronic copy of the proposal on a CD along with the hard copies.

Proposals may be either sent by mail, overnight courier, or hand-delivered. Whether the proposal is sent by mail, courier or hand-delivered, the Offeror shall be responsible for actual delivery of the proposal to the above address before the deadline. Any proposal received after the deadline will be returned unopened. The Grantee will promptly notify any Offeror if its proposal was received late.

Upon timely receipt, all proposals become the property of the Grantee.

2.14 PACKAGING

The original and each copy of the proposal must be sealed to ensure confidentiality of the information. The proposals should be individually wrapped and sealed, and labeled for content including "original" or "copy number x"; the original and eight (8) copies as well as an electronic copy of the proposal on a CD should be collectively wrapped and sealed, and clearly labeled.

Neither USTDA nor the Grantee will be responsible for premature opening of proposals not properly wrapped, sealed and labeled.

The proposal must contain the signature of a duly authorized officer or agent of the Offeror empowered with the right to bind the Offeror.

2.16 EFFECTIVE PERIOD OF PROPOSAL

The proposal shall be binding upon the Offeror for FORTY FIVE (45) days after the proposal due date, and Offeror may withdraw or modify this proposal at any time prior to the due date upon written request, signed in the same manner and by the same person who signed the original proposal.

2.17 EXCEPTIONS

All Offerors agree by their response to this RFP announcement to abide by the procedures set forth herein. No exceptions shall be permitted.

2.18 OFFEROR QUALIFICATIONS

As provided in Section 3, Offerors shall submit evidence that they have relevant past experience and have previously delivered advisory, feasibility study and/or other services similar to those required in the TOR, as applicable.

2.19 RIGHT TO REJECT PROPOSALS

The Grantee reserves the right to reject any and all proposals.

2.20 PRIME CONTRACTOR RESPONSIBILITY

Offerors have the option of subcontracting parts of the services they propose. The Offeror's proposal must include a description of any anticipated subcontracting arrangements, including the name, address, and qualifications of any subcontractors. USTDA nationality provisions apply to the use of subcontractors and are set forth in detail in Annex 3. The successful Offeror shall cause appropriate provisions of its contract, including all of the applicable USTDA Mandatory Contract Clauses, to be inserted in any subcontract funded or partially funded by USTDA grant funds.

2.21 AWARD

The Grantee shall make an award resulting from this RFP to the best qualified Offeror, on the basis of the evaluation factors set forth herein. The Grantee reserves the right to reject any and all proposals received and, in all cases, the Grantee will be the judge as to whether a proposal has or has not satisfactorily met the requirements of this RFP.

2.22 COMPLETE SERVICES

The successful Offeror shall be required to (a) provide local transportation, office space and secretarial support required to perform the TOR if such support is not provided by the Grantee; (b) provide and perform all necessary labor, supervision and services; and (c) in accordance with best technical and business practice, and in accordance with the requirements, stipulations, provisions and conditions of this RFP and the resultant contract, execute and complete the TOR to the satisfaction of the Grantee and USTDA.

2.23 INVOICING AND PAYMENT

Deliverables under the contract shall be delivered on a schedule to be agreed upon in a contract with the Grantee. The Contractor may submit invoices to the designated Grantee Project Director in accordance with a schedule to be negotiated and included in the contract. After the Grantee's approval of each invoice, the Grantee will forward the invoice to USTDA. If all of the requirements of USTDA's Mandatory Contract Clauses are met, USTDA shall make its respective disbursement of the grant funds directly to the U.S. firm in the United States. All payments by USTDA under the Grant Agreement will be made in U.S. currency. Detailed provisions with respect to invoicing and disbursement of grant funds are set forth in the USTDA Mandatory Contract Clauses attached in Annex 4.

Section 3: PROPOSAL FORMAT AND CONTENT

To expedite proposal review and evaluation, and to assure that each proposal receives the same orderly review, all proposals must follow the format described in this section.

Proposal sections and pages shall be appropriately numbered and the proposal shall include a Table of Contents. Offerors are encouraged to submit concise and clear responses to the RFP. Proposals shall contain all elements of information requested without exception. Instructions regarding the required scope and content are given in this section. The Grantee reserves the right to include any part of the selected proposal in the final contract.

The proposal shall consist of a technical proposal only. A cost proposal is NOT required because the amount for the contract has been established by a USTDA grant of US$507,420 which is a fixed amount.

Offerors shall submit one (1) original and eight (8) copies of the proposal as well as an electronic copy of the proposal on a CD. Proposals received by fax cannot be accepted.

Each proposal must include the following:

Transmittal Letter,
Cover/Title Page,

Table of Contents,
Executive Summary,
Company Information,
Organizational Structure, Management Plan, and Key Personnel,
Technical Approach and Work Plan, and
Experience and Qualifications.

Detailed requirements and directions for the preparation of the proposal are presented below.

3.1 EXECUTIVE SUMMARY

An Executive Summary should be prepared describing the major elements of the proposal, including any conclusions, assumptions, and general recommendations the Offeror desires to make. Offerors are requested to make every effort to limit the length of the Executive Summary to no more than five (5) pages.

3.2 COMPANY INFORMATION

For convenience, the information required in this Section 3.2 may be submitted in the form attached in Annex 6 hereto.

3.2.1 Company Profile

Provide the information listed below relative to the Offeror's firm. If the Offeror is proposing to subcontract some of the proposed work to another firm(s), the information below must be provided for each subcontractor.

1. Name of firm and business address (street address only), including telephone and fax numbers.

2. Year established (include predecessor companies and year(s) established, if appropriate).

3. Type of ownership (e.g. public, private or closely held).

4. If private or closely held company, provide list of shareholders and the percentage of their ownership.

5. List of directors and principal officers (President, Chief Executive Officer, Vice-President(s), Secretary and Treasurer; provide full names including first, middle and last). Please place an asterisk (*) next to the names of those principal officers who will be involved in the Feasibility Study.

6. If Offeror is a subsidiary, indicate if Offeror is a wholly-owned or partially-owned subsidiary. Provide the information requested in items 1 through 5 above for the Offeror's parent(s).

7. Project Manager's name, address, telephone number, e-mail address and fax number .

3.2.2 Offeror's Authorized Negotiator

Provide name, title, address, telephone number, e-mail address and fax number of the Offeror's authorized negotiator. The person cited shall be empowered to make binding commitments for the Offeror and its subcontractors, if any.

3.2.3 Negotiation Prerequisites

1. Discuss any current or anticipated commitments which may impact the ability of the Offeror or its subcontractors to complete the Feasibility Study as proposed and reflect such impact within the project schedule.

2. Identify any specific information which is needed from the Grantee before commencing contract negotiations.

3.2.4 Offeror's Representations

If any of the following representations cannot be made, or if there are exceptions, the Offeror must provide an explanation.

1. Offeror is a corporation *[insert applicable type of entity if not a corporation]* duly organized, validly existing and in good standing under the laws of the State of _____. The Offeror has all the requisite corporate power and authority to conduct its business as presently conducted, to submit this proposal, and if selected, to execute and deliver a contract to the Grantee for the performance of the Feasibility Study. The Offeror is not debarred, suspended, or to the best of its knowledge or belief, proposed for debarment, or ineligible for the award of contracts by any federal or state governmental agency or authority. The Offeror has included, with this proposal, a certified copy of its Articles of Incorporation, and a certificate of good standing issued within one month of the date of its proposal by the State of _____.

2. Neither the Offeror nor any of its principal officers have, within the three-year period preceding this RFP, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a federal, state or local government contract or subcontract; violation of federal or state antitrust statutes relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, violating federal or state criminal tax laws, or receiving stolen property.

3. Neither the Offeror, nor any of its principal officers, is presently indicted for, or otherwise criminally or civilly charged with, commission of any of the offenses enumerated in paragraph 2 above.

4. There are no federal or state tax liens pending against the assets, property or business of the Offeror. The Offeror, has not, within the three-year period preceding this RFP, been notified of any delinquent federal or state taxes in an amount that exceeds $3,000 for which the liability remains unsatisfied. Taxes are considered delinquent if (a) the tax

liability has been fully determined, with no pending administrative or judicial appeals; and (b) a taxpayer has failed to pay the tax liability when full payment is due and required.

5. The Offeror has not commenced a voluntary case or other proceeding seeking liquidation, reorganization or other relief with respect to itself or its debts under any bankruptcy, insolvency or other similar law. The Offeror has not had filed against it an involuntary petition under any bankruptcy, insolvency or similar law.

The selected Offeror shall notify the Grantee and USTDA if any of the representations included in its proposal are no longer true and correct at the time of its entry into a contract with the Grantee. USTDA retains the right to request an updated certificate of good standing from the selected Offeror.

3.3 ORGANIZATIONAL STRUCTURE, MANAGEMENT, AND KEY PERSONNEL

Describe the Offeror's proposed project organizational structure. Discuss how the project will be managed including the principal and key staff assignments for this Feasibility Study. Identify the Project Manager who will be the individual responsible for this project. The Project Manager shall have the responsibility and authority to act on behalf of the Offeror in all matters related to the Feasibility Study.

Provide a listing of personnel (including subcontractors) to be engaged in the project, including both U.S. and local subcontractors, with the following information for key staff: position in the project; pertinent experience, curriculum vitae; other relevant information. If subcontractors are to be used, the Offeror shall describe the organizational relationship, if any, between the Offeror and the subcontractor.

A manpower schedule and the level of effort for the project period, by activities and tasks, as detailed under the Technical Approach and Work Plan shall be submitted. A statement confirming the availability of the proposed project manager and key staff over the duration of the project must be included in the proposal.

3.4 TECHNICAL APPROACH AND WORK PLAN

Describe in detail the proposed Technical Approach and Work Plan (the "Work Plan"). Discuss the Offeror's methodology for completing the project requirements. Include a brief narrative of the Offeror's methodology for completing the tasks within each activity series. Begin with the information gathering phase and continue through delivery and approval of all required reports.

Prepare a detailed schedule of performance that describes all activities and tasks within the Work Plan, including periodic reporting or review points, incremental delivery dates, and other project milestones.

Based on the Work Plan, and previous project experience, describe any support that the Offeror will require from the Grantee. Detail the amount of staff time required by the Grantee or other participating agencies and any work space or facilities needed to complete the Feasibility Study.

3.5 SECTION 5: EXPERIENCE AND QUALIFICATIONS

Provide a discussion of the Offeror's experience and qualifications that are relevant to the objectives and TOR for the Feasibility Study. If a subcontractor(s) is being used, similar information must be provided for the prime and each subcontractor firm proposed for the project. The Offeror shall provide information with respect to relevant experience and qualifications of key staff proposed. The Offeror shall include letters of commitment from the individuals proposed confirming their availability for contract performance.

As many as possible but not more than six (6) relevant and verifiable project references must be provided for the Offeror and any subcontractor, including the following information:

Project name,
Name and address of client (indicate if joint venture),
Client contact person (name/ position/ current phone and fax numbers),
Period of Contract,
Description of services provided,
Dollar amount of Contract, and
Status and comments.

Offerors are strongly encouraged to include in their experience summary primarily those projects that are similar to or larger in scope than the Feasibility Study as described in this RFP.

Section 4: AWARD CRITERIA

Individual proposals will be initially evaluated by a Procurement Selection Committee of representatives from the Grantee. The Committee will then conduct a final evaluation and completion of ranking of qualified Offerors. The Grantee will notify USTDA of the best qualified Offeror, and upon receipt of USTDA's no-objection letter, the Grantee shall promptly notify all Offerors of the award and negotiate a contract with the best qualified Offeror. If a satisfactory contract cannot be negotiated with the best qualified Offeror, negotiations will be formally terminated. Negotiations may then be undertaken with the second most qualified Offeror and so forth.

The selection of the Contractor will be based on the following criteria:

- Experience in weather forecasting, early warning, and water resources management, including structural and non-structural flood mitigation measures; planning and specifications development.
  [25 points]

- Experienced in flood evaluation, hydrologic and hydraulic modeling systems (HEC and others) including design and computer analysis; country planning; experience in meteorological instrumentation, covering a wide array of measurement needs.
  [25 points]

- Experience in systems integration, development of large-scale data centers and communications networks; experience with GIS and modeling systems; experience with Arc/Info, ArcView, MapInfo, MapObjects, TRANSCad, etc. as geographic analysis tools, as well as with cartographic and graphic design tools.
  [20 points]

- Experience in project management, implementation planning, and project financing specific to flooding analysis, early warning system and environmental protection projects.
  [15 points]

- Experience in conducting developmental impact, legal/regulatory, and environmental assessments [including Environmental Assessments (EA), Environmental Impact Statements (EIS)] of flood management projects; knowledge of environmental and water resources policy.
  [10 points]

- Experience in conducting similar flood forecasting and/or emergency (flood) management projects in the country and/or region:
  [5 points]

Proposals that do not include all requested information may be considered non-responsive.
Price will not be a factor in contractor selection.

ANNEX 1

Mr. Mehmet Çağlar, Director General Turkish State Meteorological Service (DEVLET METEOROLOJI ISLERI GENEL MUDURLUGU) KUTUKCU ALI BEY ADDESI NO: 4 06120 Kalaba- ANKARA/TURKEY

B - FLOOD FORECASTING AND EARLY WARNING SYSTEM PROJECT FEASIBILITY STUDY

POC: Nina Patel, USTDA, 1000 Wilson Boulevard, Suite 1600, Arlington, VA 22209-3901, Tel: (703) 875-4357, Fax: (703) 875-4009. FLOOD FORECASTING AND EARLY WARNING SYSTEM PROJECT FEASIBILITY STUDY. The Grantee invites submission of qualifications and proposal data (collectively referred to as the "Proposal") from interested U.S. firms that are qualified on the basis of experience and capability to develop a feasibility study for a Flood Forecasting and Early Warning System.

Flooding in Turkey has caused many deaths and significant economic damage. As a result of recent flooding, especially the severe flooding that occurred in September of 2009, the Government of Turkey wants to improve the country's early warning and flood control capabilities. TSMS intends to deploy a comprehensive, nationwide Flood Forecasting and Early Warning System, and TSMS has requested USTDA support for a feasibility study that would define the parameters of that system. The system would take into account the national flood control master plan currently being revised by the State Hydraulic Works.

The overall objective of the proposed FS is to develop a comprehensive road map to be followed by TSMS in the systematic deployment of a fully operational Flood Forecasting and Early Warning System. The USTDA-funded study will develop an implementation plan to assist TSMS in determining its national-level Flood Forecasting and Early Warning System needs, including hardware, software, Geographic Information Systems (GISs), Relational Database Management Systems (RDMSs), sensors, weather and water monitoring equipment, communications equipment, and modeling systems.

The ability to carry out flood analysis quickly is of paramount importance in issuing useful forecasts that allow citizens and businesses the maximum time to prepare for a flood. Therefore, a major emphasis of the FS will be the development of real-time hydrologic modeling and forecasting capabilities in Turkey. The study will provide valuable support to TSMS in selecting and implementing suitable flood models; developing formats for automated data entry into models; generating useful outputs in the form of flood levels, inundation maps, and other information formats; and providing GIS images to disseminate information on the status of floods. The Flood Forecasting and Early Warning System Feasibility Study for TSMS will reduce economic losses, and risks to life, health and safety, due to flooding in Turkey.

TSMS is fully committed to the development and implementation of a modernized, national-level Flood Forecasting and Early Warning System based on the most advanced technology available. In this endeavor, TSMS has the full support of the Ministry of Environment and

Forestry, the State Hydraulic Works, and the newly formed Prime Ministry Disaster and Emergency Management Authority. The recently constituted Flood Team within TSMS (a group of highly qualified meteorologists, software experts, and GIS specialists) will be responsible for management of the Flood Forecasting and Early Warning System Feasibility Study.

The U.S. firm selected will be paid in U.S. dollars from a $507,420 grant to the Grantee from the U.S. Trade and Development Agency (USTDA).

A detailed Request for Proposals (RFP), which includes requirements for the Proposal, the Terms of Reference, and a background definitional mission/desk study report are available from USTDA, at 1000 Wilson Boulevard, Suite 1600, Arlington, VA 22209-3901. To request the RFP in PDF format, please go to: https://www.ustda.gov/businessopps/rfpform.asp. Requests for a mailed hardcopy version of the RFP may also be faxed to the IRC, USTDA at 703-875-4009. In the fax, please include your firm's name, contact person, address, and telephone number. Some firms have found that RFP materials sent by U.S. mail do not reach them in time for preparation of an adequate response. Firms that want USTDA to use an overnight delivery service should include the name of the delivery service and your firm's account number in the request for the RFP. Firms that want to send a courier to USTDA to retrieve the RFP should allow one hour after faxing the request to USTDA before scheduling a pick-up. Please note that no telephone requests for the RFP will be honored. Please check your internal fax verification receipt. Because of the large number of RFP requests, USTDA cannot respond to requests for fax verification. Requests for RFPs received before 4:00 PM will be mailed the same day. Requests received after 4:00 PM will be mailed the following day. Please check with your courier and/or mail room before calling USTDA.

Only U.S. firms and individuals may bid on this USTDA financed activity. Interested firms, their subcontractors and employees of all participants must qualify under USTDA's nationality requirements as of the due date for submission of qualifications and proposals and, if selected to carry out the USTDA-financed activity, must continue to meet such requirements throughout the duration of the USTDA-financed activity. All goods and services to be provided by the selected firm shall have their nationality, source and origin in the U.S. or host country. The U.S. firm may use subcontractors from the host country for up to 20 percent of the USTDA grant amount. Details of USTDA's nationality requirements and mandatory contract clauses are also included in the RFP.

Interested U.S. firms should submit their Proposal in English directly to the Grantee by 4PM, November 10, 2010 at the above address. Evaluation criteria for the Proposal are included in the RFP. Price will not be a factor in contractor selection, and therefore, cost proposals should NOT be submitted. The Grantee reserves the right to reject any and/or all Proposals. The Grantee also reserves the right to contract with the selected firm for subsequent work related to the project. The Grantee is not bound to pay for any costs associated with the preparation and submission of Proposals.

ANNEX 2

DEFINITIONAL MISSION FINAL REPORT

Submitted to:
The U.S. Trade and Development Agency

For the:
Turkey – Flash Flood Control and Early Warning System Definitional Mission

Submitted by:

Pythia International Inc.
415 Mountain Road; Halifax, VA 24558 USA;
Phone: +1-202-412-0855; Fax: +1-347-710-1402

24 May 2010

This report was funded by the U.S. Trade and Development Agency (USTDA), an agency of the United States Government. The opinions, findings, conclusions or recommendations expressed in this document are those of the author(s) and do not necessarily represent the official position or policies of USTDA. USTDA makes no representation about, nor does it accept responsibility for, the accuracy or completeness of the information contained in this report

Mailing and Delivery Address: 1000 Wilson Boulevard, Suite 1600, Arlington, VA 22209-3901
Phone: 703–875–4357 • **Fax:** 703–875–4009 • **Web site:** www.tda.gov • **email:** info@tda.gov

The U.S. Trade and Development Agency

The U.S. Trade and Development Agency (USTDA) advances economic development and U.S. commercial interests in developing and middle income countries. The agency funds various forms of technical assistance, feasibility studies, training, orientation visits and business workshops that support the development of a modern infrastructure and a fair and open trading environment.

USTDA's strategic use of foreign assistance funds to support sound investment policy and decision-making in host countries creates an enabling environment for trade, investment and sustainable economic development. Operating at the nexus of foreign policy and commerce, USTDA is uniquely positioned to work with U.S. firms and host countries in achieving the agency's trade and development goals. In carrying out its mission, USTDA gives emphasis to economic sectors that may benefit from U.S. exports of goods and services.

Mailing and Delivery Address: 1000 Wilson Boulevard, Suite 1600, Arlington, VA 22209-3901
Phone: 703–875–4357 • **Fax:** 703–875–4009 • **Web site:** www.tda.gov • **email:** info@tda.gov

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ABBREVIATIONS

AFETACIL-	Prime Ministry Disaster and Emergency Management Organization
AWOS -	Automated Weather Observation System units
AKOM -	Istanbul Municipality Disaster Coordination Center
ALADIN -	Limited Area Numerical Weather Prediction Model (developed in international cooperation led by Météo France)
BSEC -	Black Sea Economic Cooperation
COTR -	Contracting Officer's Technical Representative
DM -	Definitional Mission
DSI -	Turkish State Hydraulic Works
ECMWF -	European Center for Medium-Range Weather Forecasts
EOCs -	Emergency Operations Centers
EMIS -	Emergency Management Information System
ESRI -	Environmental Systems Research Institute
EUMETSAT -	European Organization for the Exploitation of Meteorological Satellites
FAO -	United Nations Food and Agriculture Organization
FEMA -	Federal Emergency Management Agency
FFEWS -	Flood Forecasting and Early Warning System
GIS -	Geographic Information System
GTS -	Global Telecommunications System
HEC -	Hydraulic Engineering Center, U.S. Army Corps of Engineer (HEC series of weather, stream flow and flood forecasting models)
IFM -	Integrated Flood Management
INIDO -	United Nations Industrial Development Organization
IPCU -	Istanbul Provincial Governorship Project Coordination Unit
ITU CEDM -	Istanbul Technical University's Disaster Management Research and Implementation Center
ISMEP -	Istanbul Seismic Risk Mitigation and Emergency Preparedness project
IWRM -	Integrated Water Resources Management
MM5 -	Penn State Mesoscale Model (for creating weather forecasts & climate projections)
MARA -	Ministry of Agriculture and Rural Affairs
MENR -	Ministry of Energy and Natural Resources
MIKE-11 -	Suite of dynamic river modeling software tools developed by DHI
MIT -	Ministry of Industry and Trade
MOEF -	Ministry of Environment and Forestry
MOH -	Ministry of Health
MONE -	Ministry of National Education

NWS RFS -	U.S. National Weather Service, River Forecast System
OFDA -	U.S. Office for Foreign Disaster Assistance (within USAID)
OV -	Orientation Visit
RDMS -	Relational Database Management System
SPO -	State Planning Organization
TOPKAPI -	TOPographic Kinematic Approximation and Integration hydrologic model for real-time operational forecasting (developed by the University of Bologna)
TSMS -	Turkish State Meteorological Service
UNDP -	United Nations Development Program
UNEP -	United Nations Environment Program
USAID -	United States Agency for International Development
USTDA –	United States Trade and Development Agency
WMO -	World Meteorological Organization
WRF -	Weather Research & Forecasting model

I. EXECUTIVE SUMMARY

A. DEFINITIONAL MISSION OVERVIEW

On behalf of USTDA, Pythia International Inc., a Virginia based international consulting firm, represented by Holt Evans, conducted a Definitional Mission (DM) in Turkey to investigate and develop suitable projects in flood management and early warning systems. In addition, this report provides recommendations in areas USTDA might support that would assist Turkey with its emergency management improvements.

The primary objective of the Definitional Mission was to assess, define, and develop Terms of Reference for a Flood Forecasting and Early Warning System (FFEWS) feasibility study on behalf of the Turkish State Meteorological Service (TSMS). Serious economic damage and numerous flood-related deaths have prompted the Government of Turkey to give top priority to improving the country's flood control and early warning systems. The TSMS has been working with ArcGIS, a geographical information system produced by Environmental Systems Research Institute (ESRI) on a flood control pilot project in the Black Sea region. Based on this pilot and various other inputs, the TSMS plans to deploy a nationwide early warning system and develop a comprehensive flood warning system that would be connected to the flood control master plan currently being revised by the State Hydraulic Works (DSI). Until recently, flood management in Turkey mainly consisted of structural protection measures such as multi-purpose reservoirs, dikes and levees, flood plains, and channel improvements. However, experience gained from floods in the last decade indicates that while structural measures have been somewhat effective in reducing the risk of flood damage, far more importance should be given to non-structural measures such as flood forecasting and early warning systems.

During the trip to Ankara and Istanbul from 20 March through 27 March, Pythia held detailed discussions with representatives from TSMS, including the recently constituted flood group, to define the parameters of the proposed FFEWS. Separate meetings were scheduled with the Disaster and Emergency Management Authority, the Istanbul Governorship, the Istanbul Metropolitan Municipality (AKOM), and other Turkish organizations to discuss possible emergency management projects. Related project initiatives and funding issues were discussed with representatives from the World Bank and UNDP. Before, during, and after the in-country visits, discussions were held with U.S. weather and water monitoring equipment vendors, IT providers, systems integrators, and GIS developers who could potentially support the FEWS implementation and other emergency management projects in Turkey. Pythia also advised and consulted with the U.S. Commercial Section personnel in Ankara and Istanbul.

B. DESCRIPTION OF PROJECTS REVIEWED

A brief description of the projects and initiatives reviewed by Pythia International in Turkey under the DM is provided below:

Flood Forecasting and Early Warning System Project

Pythia International evaluated a request from the Turkish State Meteorological Service (TSMS) for a feasibility study that would develop a comprehensive road map to be followed by the TSMS in the systematic deployment of a fully operational Flood Forecasting and Early Warning System (FFEWS). The USTDA-funded study would develop a high-level assessment and implementation plan to assist the TSMS in determining its national-level FFEWS needs, including hardware, software, GIS, RDMS, sensors, weather and water monitoring equipment, communications equipment, and modeling systems.

Under the feasibility study, technical assistance would be provided to the TSMS in a number of areas including: developing topographic and flooding maps and studies to determine the extent of flood risk for identified priority areas; reviewing existing hydrological models; collecting additional river basin and other data necessary to ensure successful modeling and simulation; preparing source data for ingestion into the GIS and digitally compiling the data into base layers; and developing the format for a GIS database of existing flood forecasting, control and mitigation facilities.

The Grantee, the TSMS, operating under the umbrella of the Ministry of Environment and Forestry, is the state body charged with the provision of meteorological information. It operates as a semi-autonomous unit within the Ministry, and receives a distinct annual budget allocation from within the Ministry's budget. Among the TSMS's core objectives are to make meteorological and related observations, to provide weather and flood forecasts, to develop climate data, archive data, and other related information, and to effectively communicate these to the public

Ultimately, the FFEWS feasibility study for the TSMS will reduce the damage, economic loss, and risk to life, health and safety due to flooding in risk areas located throughout Turkey. The model-based analysis to be carried out under the feasibility study will recommend effective approaches to enhancement and/or remediation of existing infrastructure, develop alternatives for flood risk mitigation, identify needed flood control infrastructure and flood warning systems, and propose procedures and best practices for specific situations in the basins for integrated water management, warnings, and facility operation and maintenance.

Other Emergency Management Projects and Initiatives

While no specific request for technical assistance had been received by USTDA prior to the DM, Pythia was mandated to identify possible projects and potential grantees for feasibility studies and/or pilots in the emergency management domain, as well as to provide recommendations on further activities that USTDA might support that would assist Turkey in emergency management, while also opening commercial opportunities for U.S. companies. In particular, USTDA is considering organizing an international emergency management conference or workshop in the near future and asked Pythia to gauge the interest among Turkish national and regional emergency management organizations in participating in such an event.

USTDA representatives had met previously with the Emergency Management Agency of Turkey and various forms of technical assistance had been discussed. However, in light of the recent disasters, the Government of Turkey has decided to entirely restructure its approach to emergency management. A new organization, the Prime Ministry Disaster and Emergency Management Authority (AFETACIL), was established on 17 December, 2009. This Directorate replaces, and effectively abolishes, three other organizations: the Emergency Management Agency of Turkey, the Ministry of Interior's Civil Defense General Directorate, and the Ministry of Public Works and Settlement's General Directorate of Disaster Affairs. The purpose is to have a central coordinating unit for disaster preparedness/risk mitigation/emergency and crisis management in Turkey. Its Director, Governor Mehmet Ersoy, was appointed in January 2010.

Consolidation of the overall emergency management process is in line with the Turkish Government's decision to considerably revamp the country's flood management processes and will support efforts to implement a fully integrated national flood management system [adapting an 'Integrated Flood Management' (IFM) approach to be carried out within the context of an 'Integrated Water Resources Management' (IWRM) program]. Lack of coordination and cooperation among the state organizations responsible for flood management has been a recurring problem in Turkey. In the past, unclear delineation of responsibility at the national level has hampered flood mitigation efforts, while local administrations have lacked the budgets and mandate to properly manage flood forecasting, data dissemination and response measures. The above institutional changes in the emergency management process represent an important step in addressing these issues.

In the discussions held with Mr. Ersoy during the DM, the main purpose was to gain an understanding of the main objectives and priorities of the organization and to familiarize AFTETACIL with USTDA's role and programs. Senior Commercial Specialist, Serdar Cetinkaya presented the Director with several past USTDA feasibility studies in the Emergency Management domain. In a follow-up meeting shortly after the DM, Mr. Cetinkaya met with several other EFETACIL managers who expressed interest in visiting Disaster and Emergency Management Centers in the U.S.

C. RECOMMENDATIONS AND KEY CONSIDERATIONS

Flood Forecasting and Early Warning System Project (FS)

The TSMS has demonstrated the capacity and commitment to develop an integrated national flood forecasting and early warning system (FFEWS). Implementation of the system is fully supported of the Ministry of Environment and Forestry, the DSI, and the newly formed Prime Ministry Disaster and Emergency Management Authority. Furthermore, the FFEWS will be a crucial component of the planned national flood management system, which is stated priority of the Prime Minister. The FFEWS will provide major development benefits for Turkey in the areas of public infrastructure, human capacity building, technology transfer and productivity enhancement, and transboundary relations. This upgraded approach to flood risk and damage mitigation will result in fewer deaths and injuries, reduced economic losses, and an improved business climate for the region

On the basis of the USTDA-supported feasibility study, financing for the majority of the FFEWS is likely to come from the national budget. Through the Ministry of Environment and Forestry, approximately $15 million has already been earmarked from the 2010 budget for upgrading of TSMS's flood monitoring, forecasting, and control infrastructure. Other likely funding sources for specific components of FFEWS implementation and planning include the World Bank and the UNDP.

The FFEWS will be a major generator of U.S. exports. The budget for implementation of the national system is expected to exceed $80 million. The FFEWS will require data management and communications systems, hydrologic forecasting modeling, and flood risk management tools. U.S. suppliers of weather radars and monitoring technology, GIS technology, meta-database and related networking equipment, digital maps, radar and satellite imaging, etc. could potentially provide the majority of the system components.

Pythia International recommends that USTDA fund a feasibility study for the TSMS that would provide a thorough technical review of TSMS's current hydro-meteorological network, processes, and organization and would assess external systems, models, hardware and software for possible adaptation by the TSMS. Based on the technical assessment, the feasibility study would develop an implementation and investment plan for the project that will implement the recommended flood forecasting, early warning and mitigation approach and network, with specific emphasis on high-risk regions. The study would also include an implementation schedule and detailed budget for roll-out of the FFEWS, a financial and economic analysis of the project, an assessment of possible funding sources, and an evaluation of the FFEWS's implementation costs and benefits. The proposed budget for the feasibility study is $507,420.

Emergency Management System Project (DS)

Due to the recent institutional changes discussed above, a USTDA-supported feasibility study or pilot project for the AFEETIL is premature. However, the newly appointed

director, Mr. Mehmet Ersoy is very open to USTDA assistance. Currently, the organization's is undergoing an internal needs assessment, which is expected to continue through June 2010, after which Mr. Ersoy has requested a follow-up meeting.

Based on the initial discussions during the DM, one potential project for the AFETACIL could be technical assistance to support AFETACIL in coordinating projects within emergency agencies at the provincial level, and in evaluating the telecommunications networks and environmental monitoring infrastructures needed to implement a national emergency management system. A key challenge facing the AFETACIL is developing the communications infrastructure capable of interconnecting the emergency management operations of each province into an integrated national emergency management network.

Key task areas that could be examined under a possible USTDA 'Turkey National Emergency Management System' feasibility study for the AFETACIL include the following:

Network Capabilities
This task area would entail an evaluation of Turkey's existing network capabilities, including the government-owned and private telecommunications backbone networks. Based on the evaluation, the consultants would develop recommendations for necessary upgrades to provide an IP-based emergency management platform with connectivity and capability to support data collection and dissemination, emergency communications for coordination and operations, notification systems and multimedia collaboration applications.

Monitoring and Analysis
This task would entail an evaluation of the data sources and communications for environmental and seismological monitoring, analysis, and validation of their usefulness for the AFETACIL and the provincial centers (e.g. AKOM, DED, etc.), primarily in regard to risk assessment and early warning systems.

Equipment and Decision Making Tools
This should include an evaluation of technologies under consideration for data presentation, decision making and use of the telecommunications network by the AFETACIL, provincial centers, the ministries and central public agencies who share emergency management responsibilities.

Program Planning and Management
The feasibility study could also include support for the AFETACIL in defining, managing, and integrating the its main priority projects including development of a dedicated national emergency communications network, interconnection of provincial Emergency Operations Centers (EOCs), development of a national Emergency Management Information System (EMIS), etc. Under this task area, the consultants could also assist the AFETACIL in identifying funding and program support under ongoing initiatives of the World Bank, European Commission, USAID/OFDA, and others.

Pythia would recommend that USTDA commission a desk study in approximately 6 to 9 months to explore this potential technical assistance project further.

Orientation Visit (OV)

During the DM, strong interest was expressed by the Istanbul Metropolitan Municipality (AKOM), the Prime Ministry Disaster and Emergency Management Authority (AFETACIL), the Istanbul Provincial Directorate of Disaster and Emergency (DED), and the Istanbul Provincial Governorship Project Coordination Unit (IPCU) in participating in a delegation to the U.S. to observe state-of-the-art Emergency Operations Centers (EOCs) and to see the application of U.S. technologies in these centers.

These authorities are currently in the process of expanding their Emergency Operations Centers, constructing new facilities, and interlinking them into an integrated national EOC network. Given that this process is already well underway, a USTDA feasibility study at this stage would have limited value. On the other hand, an Orientation Visit (OV) to the U.S. to visit selected EOCs in operation and to visit selected EOC technology providers would be very beneficial to the these Turkish organization in designing and specifying systems for their respective EOCs, as well as in determining optimal secure communications networking solutions for the proposed national EOC network. The OV would also open an important market opportunity for U.S. technology providers. A key advantage of the OV is that it would provide a forum where representatives of the Turkish emergency management organizations could meet directly with participating U.S. companies to discuss specific EOC solutions.

Pythia would recommend that USTDA fund a 'Turkish Emergency Management and Communications Orientation Visit' within the next six months. The OV could include a delegation of approximately 12 representatives from the AFETACIL, AKOM, IPCU, DED, and possibly other regional organizations. The OV could include a visit to the Federal Emergency Management Agency (FEMA), and its Mount Weather Emergency Operations Center, and to the New York City Office of Emergency Management to view the new EOC facility, containing advanced workstations, secure communications equipment, large video displays, and GIS technology. The OV could also include visits to other national or regional command and control centers, communications hubs, emergency alert systems, etc. U.S. companies, including Lockheed Martin, ESRI, Cisco, Oracle, and Raytheon, could also participate in the OV and arrange for visits to their respective facilities.

Project Review Summary

Project Description	Total Cost	U.S. Export Potential	Project Grantee/ Beneficiaries	Recommended Level of USTDA funding
Flood Forecasting and Early	$80 million	$48 million	Turkish State Meteorological	Immediate TA grant; Budget: $507,420

Warning System Feasibility Study			Service (TSMS)	
Desk Study supporting a National Emergency Management System Feasibility Study	TBD	TBD	Prime Ministry Disaster & Emergency Management Authority (AFETACIL)	Follow-on Desk Study in 6- 9 months
Turkish Emergency Management & Communications Orientation Visit	TBD	TBD	AFETACIL, AKOM, DED, IPCU, etc.	TBD

II. MISSION OVERVIEW AND OBJECTIVES

A. DEFINITIONAL MISSION BACKGROUND

Because of its geographical location, geology and topography, Turkey is frequently subjected to flash floods, landslides, and avalanches. Floods are primarily due to heavy rainfall in the Coastal/Black Sea areas of the country, or to sudden snow melts in the mountainous, southeastern part of Turkey. After earthquakes, flooding is the second biggest hazard in Turkey, causing huge economic loss. According to records based on annual flood inventory studies, economic loss related to flood disasters reaches approximately $100 million per year in Turkey. Over the past 15 years, about 500,000 hectares of urban and agricultural areas have been affected by floods. In recent years, heavy rainfall combined with rapid, uncontrolled urbanization and deforestation has led to increased flooding, exacerbated economic damage, and greater loss of life.

USTDA has recently been very active in Turkey, supporting a number of important projects and initiatives, which have considerably advanced Turkey's energy and environmental infrastructure. In 2009, Turkey received USTDA's Country of the Year award. The timing of the currently proposed project is especially significant in light of the severe flooding in Istanbul and northwestern Turkey last September, as well as major floods in Artvin (northeast Turkey) and Giresun (Black Sea region) in July - disasters which have led to the Turkish Government's decision to considerably revamp the country's flood management processes and, among other initiatives, to implement a fully integrated national flood management system [adapting an 'Integrated Flood Management' (IFM) approach to be carried out within the context of an 'Integrated Water Resources Management' (IWRM) program]. This approach is based on the clear recognition that specific measures for flood warning and control cannot be implemented or evaluated independently, owing to the complex nature of hazard mitigation.

During 2010, Turkey will also be required to undertake a number of measures under the EU Floods Directive, including an assessment of its water courses and coastlines, as well as of its existing structural and non-structural flood management infrastructure. The Turkish emergency management authorities now clearly understand that building a flood control structure is neither the best solution nor the only solution to the flooding problem. Structural flood protection projects may be considered as one of the basic strategies that can reduce flood damages, and in this context flood protection planning should consider the full range of hazard mitigation activities.

Among the measures that have been taken in response to recent flooding is a flood control pilot project in the Black Sea region, based on ESRI ArcGIS, which is being run by the Turkish State Meteorological Service (TSMS). Building on this pilot, TSMS intends to deploy a comprehensive, nation-wide flood warning system, which would be connected to the flood control master plan currently being revised by the State Hydraulic Works (DSI). TSMS has requested USTDA support for a feasibility study that would define the parameters of the system.

The new Integrated Flood Management approach in Turkey is primarily based on risk management to mitigate flood hazards. Consequently, development of an advanced, real-time flood forecasting and early warning system is now considered a national priority. The flood forecasting and early warning system currently run by the TSMS incorporates basin-level data collection and transmission via satellite, real-time monitoring of the meteorology and catchment status, and development of forecasts of the flood state of the catchment. However, the TSMS urgently needs to upgrade and expand this system.

B. MISSION TASKS AND OBJECTIVES

To support its decision-making relative to the above requests for project funding, USTDA established the following tasks and objectives for Pythia International prior to travelling to Turkey:

- Hold discussions with appropriate in-country contacts to determine and gauge the interest of potential project financiers and potential U.S. suppliers.
- Assess whether the proposed projects are economically, financially, and technically viable.
- Analyze the potential procurement of U.S. goods and services for project implementation by categories and dollar values.
- Assess the priority of the projects, their political/social/organizational support, potential sources of financing, and the capability and experience of the Project Sponsor.
- Assess the social and economic development impacts of the proposed projects.
- Assess and justify whether or not USTDA should provide funding for the proposed studies, technical assistance projects, or other trade capacity building activities.
- Assess any alternative studies or activities which could be viable options for USTDA consideration;
- Develop detailed scopes of work and budgets for the feasibility study(s) proposed for USTDA funding consideration;
- Demonstrate meaningful discussions with current and previous host country Project Sponsors/Grantees to evaluate the status of implementation for USTDA projects that are sector-relevant to the Definitional Mission;
- Provide supporting analysis and recommendations on the above information and all the relevant issues.

Beyond the specifically defined tasks, USTDA communicated to the DM consultant the strategic importance of Turkey in USTDA's future development plans. Driven by the recent disasters, Turkey is currently in the process of totally restructuring its emergency management system. Given USTDA's strong presence in this sector, and its strong support of emergency management efforts in the region, there exists a significant opportunity for USTDA to support Turkey's development while creating export opportunities for U.S. technology providers. In light of Turkey's geographic position and growing regional influence and role, emergency management could become an area of strategic partnership between USTDA (possibly in coordination with other US agencies) and the Turkish Government.

C. OVERVIEW OF DM PLANNING AND EVENTS

An overview of the manner in which the definitional mission was carried out and a summary of the key meetings are provided below:

- Shortly after Pythia received notice of contract award, DM consultant Holt Evans made contact with COTR and Country Manager, Jamie Merriman. Ms. Merriman provided background materials, an update on the MAGD pilot program, as well as other relevant project details, meeting notes, and points of contact.

- After reviewing the materials, Mr. Evans contacted Serdar Cetinkaya, the U.S. Embassy's Senior Commercial Specialist in Ankara. Mr. Evans subsequently had several discussions and email exchanges with Commercial Specialists Ebru Olcay and Perim Akguner, based in Istanbul. All three provided assistance in locating key contacts and arranging the preliminary itinerary. One of the three specialists was present at all of the key meetings set-up under the DM.

- Mr. Evans also held initial discussions with Heyrettin Bacanli, Head of Research and Data Projects at the TSMS. Mr. Bacanli briefly outlined TSMS's desire for a feasibility study to focus on developing a comprehensive solution for flash flood forecasting and damage and risk reduction.

- Several discussions were held with Mr. Mehmet Tankut, Vice President of ESRI Turkey. In advance of the meeting that was scheduled for 22 March in Ankara, Mr. Tankut provided details to the DM consultant on ESRI's project work with the TSMS. Preliminary contacts were also made with Lockheed Martin (Jerry Jones) and with World Bank Environmental Specialist Alptekin Orhon.

- As summary of the in-country meeting itinerary during the week of 22 March is presented below:

  Monday, 22 March (Ankara)

- ESRI Turkey: meeting with President, Vice President
- Break-out session with ESRI engineers involved in the TSMS pilot
- Lockheed Martin: meeting with VP, Corporate International Business, Turkey

Tuesday, 23March (Ankara)
- TSMS: initial session with 3-member flood team (meteorologist, geomorphologist/GIS expert, systems & software expert)
- Briefing session with Serdar Cetinkaya, U.S. Commercial Service
- Follow-on discussion with meteorologist from TSMS to develop a draft terms of reference for the feasibility study.

Wednesday, 24 March (Ankara)
- World Bank: meeting with Country Sector Coordinator, Sustainable Development and with Disaster Management Specialist
- UNDP: meeting with Program Manager, Sustainable Development
- Break-out session with UNDP joint program team covering flood warning mechanisms

Thursday, 25 March (Ankara & Istanbul)
- Prime Ministry Disaster and Emergency Management Authority: meeting with Director and senior staff
- Istanbul Technical University, Disaster Management Research and Implementation Center: meeting with Director
- Briefing session with Ebru Olcay, U.S. Commercial Service

Friday, 26 March (Istanbul)
- Meeting with Prof. Metin Ilkisik, emergency management specialist and former director of AKOM Disaster Coordination Center
- Istanbul Governorship: meeting with Provincial Director of Disaster and Emergency Response
- Istanbul Project Coordination Unit (IPCU): meeting with Director, Deputy Director and telecoms/IT expert
- AKOM – Disaster Coordination Center: meeting with Director of Disaster Coordination Center and technical staff

Saturday, 27 March (Istanbul)
- Black Sea Economic Cooperation (BSEC): meeting with Director of Project Development Fund (PDF)

- Over the following four week period following the in-country visit, Pythia conducted additional research on the FFEWS project and held numerous telephone discussions with TSMS experts to develop and refine the terms of reference for the USTDA feasibility study. Discussions were also held with U.S. technology providers Oracle, BlueGrass GIS, and Riverside Technology, as well as with the USAID Office of Foreign Disaster Assistance (OFDA) regarding the Regional Flash Flood Guidance System initiative.

Strategy for Evaluating & Mitigating Project Risks

For flood forecasting and early warning system implementations to be successful, it is crucial that the flood forecast, flood information and flood defense modules be fully integrated into a holistic system. In many cases, these individual components are developed separately as discreet projects, which often leads to failure (as has been the case in past flood management projects in Turkey). For example, investment in the development of a flood forecasting system without regard to the efficient dissemination of warning and forecast data will certainly lead to failure.

The key system components and processes, which should be seamlessly interconnected in a chain from ***detection*** *to* ***reaction****, are outlined below:*

Detection *[automated & telemetric data collection/transmission; network of data collection stations, weather radars]*

↓

Forecasting [operational flood forecasting system with R-R-model & flood wave transformation model; efficient inter-agency communication system]

↓

Warning [clear responsibilities; 24 hour staffed offices; fast, efficient communication; long forecast lead time; targeted warnings & few false alarms; efficient inter-agency co-operation]

↓

Response *[high quality public information system with learning feedback]*

↓

Reaction [response to information/warnings; availability of assistance; awareness of the situation; prior flood experience]

These process-related issues were discussed in detail during the sessions with TSMS and it was agreed that, to the extent possible within the scope and terms of reference, the feasibility study should attempt to ensure that all links on the chain are either encompassed in the FFEWS project scope, or that the system is fully integrated with modules/components/processes that will be developed and/or managed by other institutions.

U.S. Company Interest and Involvement in the Projects

Based on the in-country DM meetings and follow-on discussions, the following U.S. companies have specifically expressed interest in the FFEWS implementation and other emergency management initiatives in Turkey:

ESRI

Following the floods in September 2009, the TSMS requested ESRI assistance in the development of a pilot application for the Black Sea region. For this purpose, TSMS acquired an ArcGIS server and desk top application. ESRI has also been working the TSMS in the development of a flood forecasting models based on HEC-HMC and HEC-RAS (U.S. Army Corps of Engineers). ESRI maintains a strong relationship with the TSMS and will be closely following the progress of the FFEWS feasibility study.

Lockheed Martin

Lockheed Martin's Vice President, Corporate International Business – Turkey, Mr. Jerry Jones has not personally been involved in LM emergency management projects. He is, however, now aware of LM's role in similar projects in Romania and elsewhere. He has briefed Scott Harris, LM's Regional Director in Brussels on USTDA's support of the FFEWS implementation and possibly other emergency management initiatives downstream. LM Turkey will now be tracking these opportunities going forward.

Oracle

Oracle Turkey's Sales Manager, Government Solutions, Cem Satana has been briefed on the USTDA-funded feasibility study for TSMS. Oracle is already in discussions with TSMS concerning the possible acquisition of the Oracle Enterprise Edition, including a spatial option, real application clusters, dataguard, and Oracle business intelligence options. Oracle views the FFEWS as a useful vehicle in developing this opportunity. Currently, TSMS has an Oracle 10G running Linux

Bluegrass GIS

Bluegrass GIS has been involved in a number of international technical assistance projects in the Black Sea Region. Bluegrass has considerable expertise in the assessment of flood forecasting models and in integrating these models as well as hardware, software, and networking components into an integrated GIS framework. Bluegrass would potentially be interested in the feasibility study as well as in the FFFEWS implementation.

Riverside Technology

The RiverTrack flood forecasting system developed by Riverside Technology is a large scale predictive application ideally suited to simulating gauged basins. Riverside has experience in developing and adapting its model to widely varying topographies and basin environments. It has many years of experience in international projects supported by USAID, USTDA, the World Bank, and other organizations. Riverside is interested in assisting TSMS directly in hydrologic analysis, streamflow forecasting and operations management, or in participating in the FFEWS implementation as part of a consortium.

Possible Support for the FFEWS and other Emergency Management Initiatives

As described in further detail in Section III below, support for the FFEWS implementation and future USTDA initiatives in emergency management, could potentially come from the World Bank, the UNDP, and USAID/OFDA.

It is quite likely that the World Bank Istanbul Seismic Risk Mitigation and Emergency Preparedness (ISMEP) project will be expanded to other areas of the country, with a broadened scope and budget. If this occurs as expected, the ISMEP vehicle could be used to finance part of the FFEWS implementation. Furthermore, creation of the Prime Ministry Disaster and Emergency Management Authority (AFETACIL) was largely the result of WB efforts. The World Bank team in Ankara would be open to collaborating with USTDA in possible technical assistance to the AFETACIL in the development of a national emergency management system.

Partial funding for the FFEWS implementation could be provided under UNDP's joint program for disaster risk needs assessment, which includes hydro-meteorological disasters and the set-up of early warning mechanisms. Funding would most likely be available to TSMS for training and institutional capacity building rather than physical network infrastructure. Beyond this, UNDP Turkey's Program Manager for Sustainable Development expressed an interest in developing a partnership with USTDA in the development of the country's climate change action plan.

In discussions with Ms. Sezin Tokar at the USAID Office for Foreign Disaster Assistance (OFDA) following the in-country visit, Pythia learned that the OFDA is putting a major effort into the Black Sea and Middle East Regional Flash Flood Guidance System. The training and support given to the TSMS and other organizations under this initiative will be of direct benefit to the FFEWS project. In addition, the OFDA is available for other forms of assistance to Turkey in the area of emergency management, and is open to the idea of collaborating with USTDA in the organization of conferences and workshops, both in the US and Turkey.

III. EMERGENCY MANAGEMENT AND FLOOD CONTROL MEASURES

In recent years, Turkey has taken a number of steps to improve emergency management planning, procedures and systems and to implement flood control and early warning systems. These initiatives and measures have been realized in coordination with multilateral organizations and specific technology providers. Several ongoing projects and initiatives could potentially support TSMS's planned flood forecasting and early warning system implementation and emergency management efforts generally. Among the more relevant past and currently ongoing initiatives are the following:

A. TURKEY EMERGENCY FLOOD AND EARTHQUAKE RECOVERY (TEFER) PROJECT

Project Overview

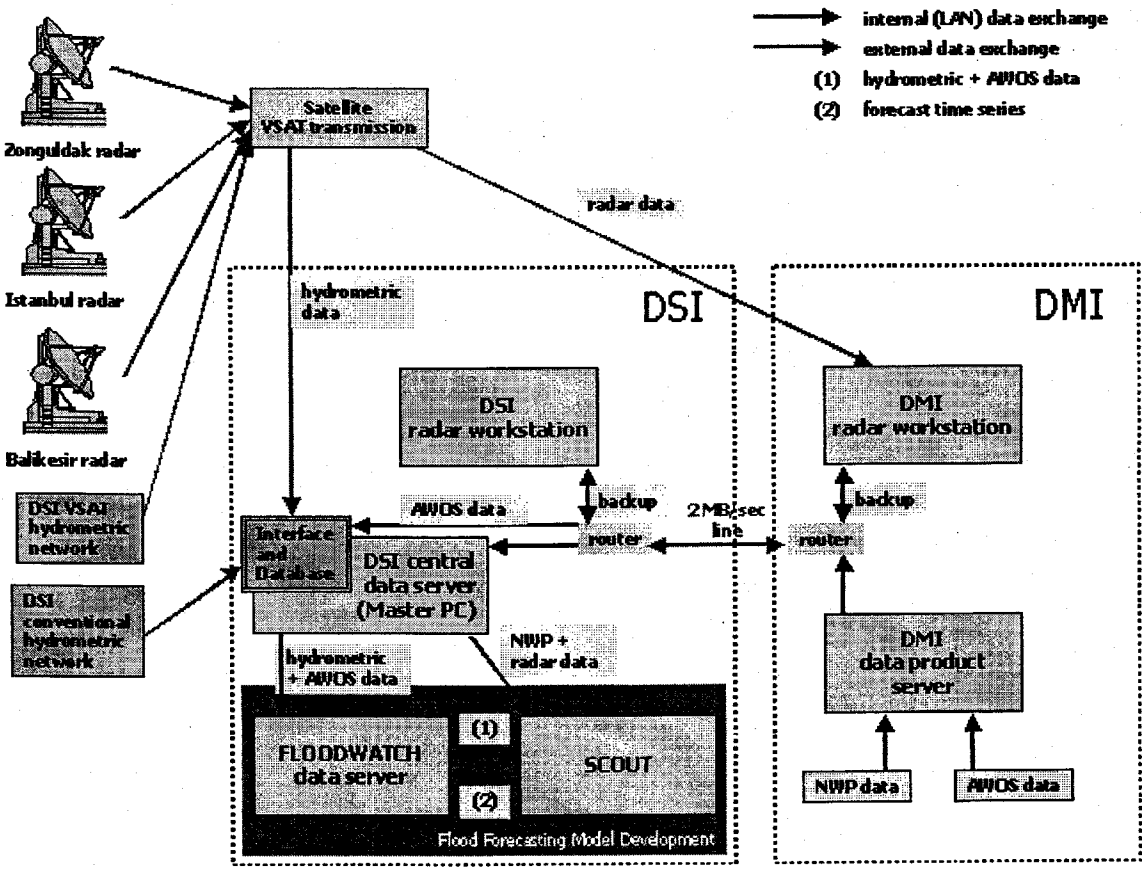
Under the World Bank-supported Turkey Emergency Flood and Earthquake Recovery (TEFER) project, completed in 2003, Turkey implemented a pilot meteorological and hydrological station network, modeling and data processing units, and a flood forecasting system.

In a nutshell, the system, which was implemented by DSI and TSMS (DMI), consisted of meteorological Doppler radars, automatic real-time meteorological stations, and real-time hydrological stations, which were installed in selected areas of the country on a pilot basis. Field data was transferred from the radar, meteorological and hydrological stations to the central server through VSAT using the TURKSAT 1C satellite.

The flood forecasting system put in place under the TEFER project took real-time monitoring data of the regional meteorology and catchment status, and produced forecasts of the flood state of the catchment. The forecasting system was based on MIKE FLOODWATCH (a GIS-based decision support system for flood management) and SCOUT (a rainfall forecasting model, which integrates real-time numerical weather prediction, radar and rain gauge data to produce rainfall forecasts).

While fully functional, the system implemented under the TEFER project had a number of problems, which are well known to DSI and TSMS. (For example, the rainfall forecasting system did not meet expectations, adaptation of the hydrological model proved to be difficult, and problems were encountered with data flow from the field to the forecasting center.) The improved flood forecasting and early warning system (FFEWS) to be implemented with USTDA support should specifically address these shortcomings. Specific components and sub-systems should be updated or replaced. New calibration processes would be required and the entire system implemented in the pilot areas would need to be revamped with new modeling and forecast technologies in order to be integrated into the overall FFEWS.

The core system components, interfaces, and data exchange channels are illustrated below:



Detailed Project Description

Within the scope of the TEFER Project, the General Directorate of State Hydraulic Works (DSI), the Turkish State Meteorological Service (TSMS), and the General Directorate of Electric Power Resources Survey and Administration (EIE) implemented a meteorological and hydrological station network, cooperated in the processing of the collected data, and developed meteorological and hydrological modeling and flood forecasting systems.

The contract for the TEFER, Flood Forecasting Model Development project was signed between the DSI and DHI Water and Environment, Denmark on 30th November 2001. Sub consultants to DHI for the project were einfalt & hydrotec GbR, Germany, and from Turkey Arti Proje Ltd and UBM United International Consultants.

The complete system that was established through this project consisted of 3 Meteorological Doppler Radars and 206 automatic meteorological stations (AWOS) for the TSMS and 129 hydrometric stations for DSI. The radars were installed in the provinces of Balikesir, Istanbul, and Zonguldak. The meteorological stations were installed in the western region of Turkey. The Hydrometric stations were installed in West Black Sea, Susurluk, Gediz, and Buyuk Menderes catchments with catchment areas ranging from 18,000 to 30,000 km^2

Data transfer from the RADAR, Meteorological and Hydrological stations to DSI and TSMS was achieved by means of VSAT (Very Small Aperture Terminal) satellite communication technology using TURKSAT 1C Satellite.

The flood forecasting system took real time monitoring hydrological and meteorological data of the catchment, and produced 48 hour forecasts of the flood state of the catchment. The forecasting system was based on MIKE FLOODWATCH and SCOUT. MIKE FLOODWATCH with MIKE 11 at its core is a GIS based decision support system for flood management. SCOUT combines real time raingauge data, radar and numerical weather prediction to produce rainfall forecasts. The system combines the compilation of real time data with rainfall and flood forecasting and presentations of the information and results. It was one of the first applications worldwide, which utilized a combination of NWP data, radar data, raingauge data and a hydrological-hydrodynamic model for real-time operations. The forecasting process was automated, and adjusted to be run every hour with the possibility of manual check and control.

The system consisted of a rainfall forecasting model, runoff forecasting model and a control program that controls the data flow between two models and disseminates the forecasts to the internet. The detailed specifications of the system are described below:

1- Data flow:
The overall data communication between the stations and center is as follows;

- measured hydrometric stations data are delivered via VSAT to DSI.
- AWOS data and NWP data and Radar Data are provided by DMI via a dedicated 2MB data line to DSI.
- the arriving hydrometric and AWOS data are transformed from their original formats to the format specified for the Flood Forecasting Model.

All of the collected data is stored in a Database program DEMAS DB by SEBA Hydrometry from Germany, which runs on Oracle. The Forecasting center was designed to use all the available information in real time from the field. Requests for data from the data loggers in the field are made from the flood forecasting center. The hydrometry stations are checked one by one and the total time for requesting the whole data is about 100-110 minutes.

2-Rainfall Forecasting Model (SCOUT)
SCOUT generates rainfall forecasts up to 48 hours in real time by the combination of radar, NWP, and raingauge data. All incoming data is quality controlled: raingauge data is

checked for extreme values and hidden or missing data before being used. Radar data is checked and corrected for bright band, ground clutter, anaprop, vertical profile and adjusted to raingauges. A part of this work is done on the radar workstation at TSMS by SIGMET IRIS software, the other part is performed by SCOUT.

SCOUT is a feature tracking approach to determine echo motion and was first implemented in a suburban county near Paris to control the sewer network. SCOUT is based on the mass centroid method, getting the displacement vector between consecutive radar scans from the distance of the mass centers of two corresponding radar echoes. A comparison between the previous forecasts and the actual measurements provides a means for a quality estimation of the current forecast. As a result, SCOUT provides forecast images and catchment specific time series for the individual sub-catchments up to 48 hours.

The radar provides a spatial view of the rainfall over the catchment and is used for nowcasting purposes up to one hour. The raingauge network describes the actual state in the catchment and can be used for nowcasting purposes up to one hour, if no radar forecast is available. After approximately one hour, the reliability of radar or raingauge based forecasts tends to be more uncertain, and the numerical model results, provided by the ECMWF model used by TSMS, are included for the following time period. In this way, rainfall measurements during the current NWP forecast period can be taken into account for the 72-hour forecast. The resolution of the NWP data forecast is about 25 km. One pixel in the NWP data represents an area of 525 km^2 which is a coarse resolution for small sub-basins.

3- Flood Forecasting Model

Under the TEFER project, FLOODWATCH was, for the first time, operationally applied to input from raingauge data, from SCOUT rainfall forecasts and from numerical weather prediction results for flood forecasting studies. The flood forecasting system was set up within MIKE FLOODWATCH and normally runs for every hour, with manual control over the system also being possible. The forecasting time is 48 hours.

The flood forecasting system uses the MIKE FLOODWATCH as a control unit and uses different modules. These are;

- Hydrologic-Hydrodynamic module which explains the rainfall-runoff process, and the spreading of flood waves through the river network;
- Flood Forecasting module which incorporates an updating procedure to ensure maximum and most effective use is made of the available real time information on the catchment;
- Flood Mapping module, providing real time flood maps of selected flood prone areas, showing the area and depth of the actual and historical flooding (high resolution maps are needed);
- Dissemination of forecasts in a variety of formats (graphs, bulletins, warning maps) to the internet.

3.1- Hydrologic Module

The hydrologic module of the forecasting system takes forecast rainfall as its primary input, and simulates the land phase of the hydrologic cycle to forecast the runoff to the main rivers. The module is based on the NAM (a lumped, conceptual rainfall-runoff model) component of the MIKE 11 modeling system. NAM operates by continuously accounting the moisture content in four interrelated storages representing the physical elements of the catchment:

– Snow layer (distributed by altitude)
– Surface zone (vegetation, small channels and lakes)
– Root zone (the depth from which plants draw water)
– Ground water

The forecast rainfall over each subcatchment (ranging between 80-1500 km^2) is received in real time from SCOUT. With real time evaporation and temperature (for snowmelt), the module forecasts the total catchment runoff and effective precipitation to the hydrodynamic module. The module has been calibrated with available historical discharges from 1995 to 2000.

3.2- Hydrodynamic Module

The Hydrodynamic Module has been set up to use the resulting data from NAM rainfall-runoff module to receive the runoff from the dry areas of the sub-catchments and the direct effective precipitation on lakes and flooded areas. The module uses an implicit finite difference scheme for the computation of steady and unsteady flows in open channels. The module describes critical and subcritical flows through a numerical scheme which adapts to local temporally and spatially varying flow conditions.

3.3- Flood Forecasting Module

The flood forecasting module implements flood forecasting techniques to predict local flood levels and river discharges, as well as an updating routine to improve forecast accuracy. The measured and simulated water levels and discharges are compared and analyzed in the hindcast period. Based on this information, the simulations are corrected to minimize the errors and differences between the observations and the model simulations. Due to the high number of calibration processes, there are differences between the observed and simulated flow; therefore, the corrected simulations make the system considerably more effective and accurate.

3.4- Flood Mapping Module

The MIIKE 11 GIS flood mapping module is well suited as a spatial decision support tool for river and flood plain management by merging the numerical river modeling and GIS. If the system is supported with enough resolution maps, it gives good results. The flood mapping module runs manually in case of big floods.

3.5- Flood Warning Module

Flood Warning Module disseminates the warnings, maps, bulletins and graphs to the internet. The module can be effective if the local knowledge of the catchments can be implemented. The produced maps for warning are in JPEG format and 3 maps (for time of flood, for the next 24 hours and next 48 hours) are produced.

Implementation Problems Encountered

As indicated above, the pilot flood forecasting and warning system implemented under TEFER experienced a number of problems. Many of these problems boiled down to lack of sufficient training and post-implementation support.

At the beginning of the installation of the system, just one basin was proposed for flood forecasting and warning. But because additional funds became available, the system was extended to four basins. While this appeared to be a positive development initially, it proved to be problematic due to the complexity of the system and the limited implementation time. The system is comprised of hydrometry stations and operation, database management, meteorological modeling, hydrological modeling, GIS and remote sensing components, each requiring separate engineering and technical expertise, which, at the time of implementation, was lacking at DSI and TSMS. While some training was provided on the various system components, it was insufficient. The consultants implementing the TEFER system had initially proposed an installation time of 6 years, but the World Bank contract was limited to 3 years, which was wholly inadequate for the local engineers to absorb the required know-how.

As the Turkish support team had little information about the models, outside consultants were frequently called in, leading to high operational costs for the system. The view of TSMS experts was that the support time and interval stated in the tender for the system should have been at least 5 years so that the local forecasting team would have the time to develop a thorough understanding of the system. Due to rapid developments in the technology, the system required substantial upgrades shortly after the World Bank contract expired. A budget for these upgrades was not provided for and, therefore, the system never became fully functional.

The TEFER implementation was the first time that a rainfall forecasting system, SCOUT, NWP data and a hydrological modeling were coupled together in a flood forecasting system. Several parameters were needed for the calibration of the rainfall forecasting system, which, at the time of installation, TSMS was unable to produce. Difficulties were also encountered with the calibration of the meteorological radars. Due to the lacking parameters and insufficient calibration, the rainfall forecasting system was never what it could have been. At the same time, the Mike 11 hydrological model was never properly adapted to Turkey's unique geo-morphological characteristics. Important meteorological and hydrological data from the basins was not available and insufficient time was allotted for calibration of the model, leading to poor results.

A specific, practical problem of the system was data flow from the field to the flood forecasting center. As most of the hydrometric stations in the field could not access the

electricity grid, solar panels had to be used. Under the tender, the solar panels and their batteries were required to supply power for at least 6 days under low sun conditions, but in poor weather conditions the batteries only supplied energy for 1 to 2 days. The data loggers also presented a problem. Roughly 10% of the installed data loggers were reserved as spare parts, which was not nearly enough. When malfunctioning data loggers were replaced with the spares, the faulty loggers had to be sent to Germany for repair, which took 30 to 40 days. Consequently, to insure uninterrupted data collection, TSMS had to install outdated loggers. This was particularly cumbersome as the older data loggers required different algorithms for data transformation.

Considerations for the FFEWS

While many of the problems of the TEFER flood forecasting and early warning system project were eventually resolved by various measures, Turkey lost a considerable amount of time and money due to technical problems associated with the installation, as well as problems with the terms and conditions of the tender. In developing the specifications and implementation plan for the FFFEWS on behalf of TSMS, the US engineering firm conducting the USTDA feasibility study should attempt to draw on the lessons learned from the TEFER implementation and assist TSMS in avoiding some of the pitfalls.

Specifically, as the TEFER experience demonstrates, an absolutely critical success factor is training. Flood forecasting and early warning systems are extremely complex, containing hydrometry stations, database management, meteorological and hydrological modeling, and GIS and remote sensing components. Successful operation of the system requires highly skilled local managers and technicians. As a general rule, the system is only as good as the know-how, experience, and education of those responsible for its operation. Therefore, the selected consultancy should assure that adequate technical support and longer-term, post-implementation training is provided for in the RFP and/or tender documents to be developed under the FFEWS feasibility study.

B. ONGOING MULTILATERAL PROJECTS

UNDP Capacity Enhancement Program

Within the overall scope of the ongoing UNDP Capacity Enhancement Program, the UNDP is providing technical assistance in the development of early warning mechanisms for floods, focusing primarily on the Seyhan river basin in the southeastern part of Turkey.

The main objective of the United Nations Joint Program - MDG-F 1680 Enhancing the Capacity of Turkey to Adapt to Climate Change (June 2008 – June 2011) is to develop capacity for managing climate change risks to rural and coastal development in Turkey. This is being achieved by mainstreaming climate change adaptation into the national development framework, building capacity in national and regional institutions, piloting community-based adaptation projects in the Seyhan River Basin, and integrating climate change adaptation into all UN agencies in Turkey.

UNDP is the main implementing organization of the project that has been structured as a joint program. The key requirements for climate change adaptation in Turkey are stipulated in Turkey's Ninth Development Plan 2007-2013 (paragraph 461) and in rural development strategies such as The Regional Development Plan for the Eastern Black Sea Region (2002). These requirements are being addressed through the development of a National Climate Change Adaptation Strategy which complements the existing development plans and procedures. In addition, legislative changes are being proposed to mainstream climate change risks into development and regional planning.

Under the program, the capacity of national and regional institutions to respond to disasters induced by climate change is being enhanced. In particular, capacity development programs are underway at the Ministry of Environment and Forestry (MOEF), State Planning Organization (SPO), Ministry of Agriculture and Rural Affairs (MARA), Ministry of Industry and Trade (MIT), Ministry of Energy and Natural Resources (MENR), Ministry of Health (MOH), Ministry of National Education (MONE), NGOs and Universities to ensure that appropriate climatic data are systematically collected and disseminated to relevant end-users via early warning systems.

Regarding flood management in particular, the Turkish State Meteorological Service (TSMS) is currently benefiting from a needs assessment survey which is being led by Prof. Mikdat Kadioglu of Istanbul Technical University's Disaster Management Research and Implementation Center (ITU – CEDM). Working with experts from the TSMS, the UNDP-supported team is defining guidelines, as well as equipment and network requirements, for an early warning system focused on hydro-meteorological disasters. As indicated in the terms of reference for the USTDA-supported Flood Forecasting and Early Warning Systems (FFEWS) feasibility study, the outcome of this needs assessment,

which will be completed by end-June 2010, should be taken into account in developing the technical requirements of the FFEWS.

Present initiatives in the Seyhan River Basin to increase the resilience of communities to climate change and climate variability will also be further developed under the program. The approach will be multi-faceted and will aim to e.g. maintain agricultural productivity, ecosystem goods and services, and the natural resource base in the context of a changing climate. It will also focus on improving preparedness for an increase in the frequency of droughts and floods. Measures will include the installation of weather and water monitoring equipment in appropriate locations in the basin. Possible public-private partnerships will also be examined within this initiative.

The United Nations Development Assistance Framework (UNDAF) will be revised and used for mainstreaming climate change adaptation within MDG-based UN programming in Turkey. UN resources for responding climate change risks will be mobilized. The focus will be on areas where the UN has a comparative advantage and can develop long-lasting in-country capacities at individual, institutional and societal levels. Adaptation to climate change will be integrated into all multi-agency projects targeted at achieving the MDGs.

World Bank – Istanbul Seismic Risk Mitigation and Emergency Preparedness Project (ISMEP)

The overall goal of the World Bank Istanbul Seismic Risk Mitigation and Emergency Preparedness (ISMEP) project is to transform Istanbul into a city that is resilient to major earthquakes and other natural risks. A specific component of the ongoing $400 million ISMEP project, to be completed in December 2011, provides assistance to municipal authorities in preparing for, and responding to, significant emergencies, including earthquakes and floods.

Project Background

Turkey is highly vulnerable to natural disasters, particularly earthquakes. In the 1999 Marmara earthquakes, the death toll reached over 17,000 with a direct economic impact estimated at about US$5 billion, or around 2.5 percent of GNP. Within the nation's high-risk context, Istanbul is most vulnerable because of its seismic-prone location on the North Anatolian Fault, and its high population and commercial/industrial densities. According to recent assessments, the probability of a major earthquake affecting Istanbul in the next 30 years is 62% ± 12%, while the likelihood of such devastation in the next decade is 32% ± 12%. If a seismic event of the same magnitude as that in 1999 were to occur near Istanbul, the human suffering as well as the social, economic, and environmental impacts would be dramatically higher than in the Marmara region, as Istanbul is not only the financial, cultural and industrial center of the country, but is also a nexus of inter-continental importance and home of about 15 million people. An

interruption of Istanbul's social, economic and financial life would be felt for many years to come.

Project Objectives

The proposed project will initiate a process that aims at transforming Istanbul in the next 10-20 years into a city resilient to major earthquakes and other natural disasters. ISMEP is designed to save lives and reduce the social, economic and financial impacts in the event of future earthquakes. Specific components and activities of the project are aimed at improving the city of Istanbul's preparedness for a potential earthquake, or other natural disaster, through enhancing the institutional and technical capacity for disaster management and emergency response, strengthening critical public facilities for earthquake resistance, and supporting measures for better enforcement of building codes and land use plans.

Project Description

The project consists of the following components and activities:

Component A: Enhancing Emergency Preparedness. The objective of this component is to enhance the effectiveness and capacity of the provincial and municipal public safety organizations in Istanbul to prepare for, respond to and recover from significant emergencies, especially those arising from earthquakes. Specifically, the component will support: improvement of emergency communications systems; establishment of an emergency management information system; strengthening of institutional capacity of AYM – Istanbul Governorship Disaster Management Center; upgrading of emergency response capacity in Istanbul; and public awareness and training.

Within this component, assistance has been provided to the Istanbul Municipal Meteorology Department in enhancing its hydro-meteorological data collection network, in developing flood control and early warning systems, and in formulating emergency response procedures.

Component B: Seismic Risk Mitigation for Public Facilities. The objective of this component is to reduce the risk of future earthquake damage to critical facilities and lifelines in order to save lives and ensure their continued functioning in the event of an earthquake. The component will consist of the following key activities: retrofitting/reconstruction of priority public facilities such as hospitals, clinics, schools, administrative buildings and infrastructure, etc.; risk assessment of lifelines and vital infrastructure; and risk assessment of cultural heritage buildings.

Component C: Enforcement of Building Codes. The objective of this component is to support innovative approaches to better enforcement of building codes and compliance with land use plans. The component will support: public awareness campaigns; further development of regulatory framework for enforcement of building codes enforcement

land use plans; volunteer accreditation/training of engineers; and streamlining of building permits issuance procedures and promoting transparency and accountability in selected district municipalities.

Implementing and Monitoring

Responsibility for project implementation and monitoring is vested in the Istanbul Project Coordination Unit (IPCU) established under the Istanbul Special Provincial Administration (ISPA). The IPCU will work closely with Istanbul Governor's Office and various government agencies involved in the implementation of the respective components. The IPCU will monitor implementation process and prepare relevant progress reports. Particular attention will be given to the financial and procurement aspects of implementation and the environmental and social monitoring.

Benefits

The project will benefit, in particular, the 15 million inhabitants of Istanbul by mitigating the risk of an earthquake and preparing the city and its population for a potential disaster. More broadly, decreased vulnerability of Istanbul will benefit the country in economic, financial and social sense, since major losses to the metropolis of this importance would dramatically affect Turkey as a whole.

Preliminary Results

The seismic retrofitting of 9 schools is ongoing and retrofitting designs for 118 facilities (out of 257) were completed. The contracts for the strengthening of 2 hospitals and 100 schools, and the reconstruction of 14 schools are about to be signed. The hardware and furnishing for the newly constructed Istanbul Governorship back-up Disaster Management Center was procured, and several packages of medical equipment and search and rescue vehicles were delivered for the emergency response services of Istanbul. Also, two studies on municipal information system and public land management were completed and will guide implementation of measures for better enforcement of building codes in two pilot municipalities.

Future Project Expansion

As discussed in Section II above, there is a strong possibility that the ISMEP project will be expanded to cover other parts of the country and that its financing will be increased. In this case, support could possibly be provided for certain aspects of the Turkish State Meteorological Service's Flood Forecasting and Early Warning System implementation. The USTDA feasibility study will assess potential implementation financing from the expanded ISMEP and possibly other World Bank programs.

WMO – Hydrology and Water Resources Program (HWRM)

The World Meteorological Organization (WMO), a specialized agency of the United Nations, promotes cooperation in the establishment of networks for making meteorological, climatological, hydrological and geophysical observations, as well as the exchange, processing and standardization of related data, and assists technology transfer, training and research. It also fosters collaboration between the National Meteorological and Hydrological Services (NMHS) of its Members and furthers the application of meteorology to public weather services, agriculture, aviation, shipping, the environment, water issues and the mitigation of the impacts of natural disasters.

For over 70 years, the World Meteorological Organization (WMO) and its predecessor, the International Meteorological Organization, have supported National Hydrological Services, River Basin Authorities and other institutions responsible for water management in a wide range of activities. The Turkish State Meteorological Service (TSMS) is an active member of the WMO and its efforts in the areas of hydrological data development, flood forecasting, and water resources management have been largely guided in recent years by its participation in the WMO Hydrology and Water Resources Program (HWRP).

The HWRP is concerned with the assessment of the quantity and quality of water resources, both surface and groundwater, in order to meet the needs of society, to permit mitigation of water-related hazards, and to maintain or enhance the condition of the global environment. It includes standardization of various aspects of hydrological observations and the organized transfer of technologies for enabling Hydrological Services to provide the hydrological data and information required for the sustainable development of their countries. It provides advice to Members on flood management policy and assists them in their effort to adopt Integrated Water Resources Management (IWRM) with an emphasis on practical applications.

Several sub-programs are being implemented within the context of the overall HWRM. These are the following:

Program on Basic Systems in Hydrology (BSH)

The objective of the Program on Basic Systems in Hydrology (BSH) is to assist national hydrological and meteorological services in the development and maintenance of their activities for the provision of data and products with an emphasis on quality assurance, thereby promoting the effective use of hydrological data and information in support of sustainable socio-economic development. It covers the collection, transmission and storage of hydrologic data and their analysis. It is designed to facilitate assessment and appreciation of the socio-economic benefits of hydrological data and information, provision of water-related services and the delivery of warnings. In Turkey, this program has helped the DMI and the TSMS in enhancing their capabilities and in more effectively assessing the quantity and quality of a Turkey's water resources, thereby facilitating rationalization of water management and the achievement of sustainable development.

The program also promotes the sharing of information on water resources among countries.

One of the major activities under BSH is the implementation of the World Hydrological Cycle Observation System (WHYCOS). WHYCOS, through the implementation of a series of regional projects components known as Hydrological Cycle Observing Systems (HYCOSs), each of them designed to meet regional needs and priorities within the framework of common guidelines and standards, supports the objective-driven collection, storage and dissemination of water-related data and information through international cooperation in technology transfer and capacity-building. It also supports IWRM activities in the member countries for the sustainable development of water resources, enhancing cooperation in the management of water resources in shared basins and contributing towards the implementation of global research programs.

In the period 2010–2011 BSH activities will be especially focusing on the development of a quality management framework in hydrology through the preparation of further guidance and training material (also in collaboration with the International Organization for Standardization (ISO) and other similar organizations), support implementation of such methodologies in developing countries and encourage members to adopt standard practices in hydrological data observation, collection, analysis and management. Product delivery and public awareness in hydrology and water resources form an important part of the Program, thereby improving the ability of national organizations to provide products required by the community.

Program on Hydrological Forecasting for Water Resources Management (HFW)

The objective of the Program on Hydrological Forecasting for Water Resources Management (HFW) is to promote the application of hydrological modeling and forecasting techniques, and of risk assessment and management approaches to the risk reduction and prevention of water-related disasters. It advocates and supports the adoption of Integrated Flood Management approaches; to promote better understanding of the implications of climate variability and change on water resources management. The Program undertakes a review of operational requirements for forecasts and warnings and support the development and improvement of various techniques to predict extreme hydrological events, in particular floods and droughts. Emphasis is also placed on water supply prediction and lean season flow forecasting, with particular reference to hydrological drought prediction. Support is provided for developing periodic outlooks of water availability, which, together with flood forecasts, might be issued through the media in conjunction with weather forecasts and seasonal outlooks. To achieve the above, increased coordination is provided between hydrological, meteorological and climatological services.

One focus of the activities under the HFW Program in Turkey is on the coupling of advanced Numerical Weather Predictions (NWP) models with hydrological models to improve short-term forecasting. The use of remote sensing and global sources of data is currently being assessed and information on techniques and data sources has been

provided to the TSMS. Ongoing activities will build the TSMS's capacities to provide improved short-, medium- and long-term meteorological and hydrological forecasts, mainly through the development and implementation of national pilot projects under the WMO Flood Forecasting Initiative (FFI), aimed at improving the capacity of meteorological and hydrological services to jointly deliver timely and more accurate products and services required in flood forecasting and warning and in collaborating with disaster managers, active in flood emergency preparedness and response.

During the 2008–2011 period, a particular focus will be on the development of guidance material for the application of risk management strategies, assessment of water hazard risks, and their management, and risk reduction within a multi-hazard framework. Guidance on Flood Hazard Mapping will be developed to help build capacities in Flood Risk Assessment. Advisory services in flood management policy and strategy formulation, with an emphasis on integrated approaches and support in establishing an enabling environment for flood management with attention to economic, social, environmental and legal aspects of flood management is carried out also through the Associated Program on Flood Management (APFM), new approach to flood management, in which consideration is given to the positive as well as the negative aspects of flood waters and to the valuable resource that is represented by the flood plains that these waters occupy on occasions. The APFM integrates land and water resources development in a river basin, within the context of Integrated Water Resources Management (IWRM), with a view to maximizing the net benefit from floodplains and minimizing loss to life due to extreme hydrologic events.

In its implementation HFW is closely linked with the World Climate Program, Disaster Risk Reduction Program and Technical Cooperation Program.

Program on Capacity Building in Hydrology and Water Resources Management (CBH)

The main objective of the Program on Capacity Building in Hydrology and Water Resources Management (CBH) is to facilitate the development and operation of national hydrological and meteorological services, including staff education and training, increased public awareness of the importance of hydrological activities, and provision of support through technical cooperation activities. CBH, whose implementation cross-cuts with that of BSH and HFW programs, aims to provide guidance material to assist the national organizations in implementing institutional improvements, to build their capacity to assess the economic and social benefits of the services they provide and to plan, organize and operate of their activities. The implementation of training events by the various regional WHYCOS components is also used to enhance the staff skills of the National Hydrological Services (NHSs) and to strengthen cooperation among countries in the field of operational hydrology.

CBH facilitates the development, testing and exchange of hydrological technology (computer software, instrumentation, and technical and general manuals). This activity includes the development and deployment of new technology, and promotes the development and strengthening of the network of HOMS National Reference Centers

(HNRCs) particularly in developing countries, as well as the use of state-of-the-art technologies through HOMS.

In close coordination with ETRP, and in accordance with the WMO Strategy on Education and Training in Hydrology and Water Resources, the systematic review of staff and training needs within NHSs is addressed, the gaps detected and filled either directly or through resource mobilization activities, and advice and support provided for the development of suitable curricula and courses. Advice and support is provided to Members organizing national, regional or international courses, in line with the need for enhanced training in hydrology, through WMO Regional Training Centers.

Program on Cooperation in Water-related Issues (CWI)

The objective of the Program on Cooperation in Water-related Issues (CWI) is to increase the effectiveness and visibility of the activities of national hydrological and meteorological services through inter-organizational collaboration in the field of water. It also strives to enhance the role of hydrological data and information in tackling various environment issues.

The Program supports and assists international river basin authorities and non-governmental and international organizations in their work in hydrology and water resources management through close collaboration with NHSs. In addition, it promotes joint activities and collaboration with scientific and technical nongovernmental organizations.

Through active participation in UN-Water activities it ensures appropriate cooperation between WMO and the other United Nations organizations that have water-related programs. In particular, through close links with UNESCO, as well as co-sponsorship of activities organized by NGOs and IGOs, participation of NHSs in activities of relevant technical associations, regional bodies, and basin organizations is promoted under this Program.

C. REGIONAL FLASH FLOOD GUIDANCE SYSTEM

The USAID Office of Foreign Disaster Assistance (OFDA), along with several other organizations, is supporting a global initiative to promote the use of a Flash Flood Guidance System as a diagnostic tool by national meteorological and hydrologic services (NMHS) and disaster management agencies worldwide to develop warnings for flash floods. The guidance system is designed to be incorporated into NMHS operations and used along with other available data, systems, tools, and local knowledge to aid in determining the near-term risk of a flash flood in small streams and basins.

Background

Flash floods are the leading cause of weather-related deaths in many countries due to their rapid- onset characteristics, limited warning procedures and emergency actions, the high velocity of water flows, and the associated debris flows. The speed and power of flash floods can roll boulders, tear out trees, destroy buildings and bridges, scour out new channels, and trigger catastrophic landslides. Flash floods kill an average of 5,000 people per year around the world, more than any other natural disaster while impeding economic development. The Chief of Natural Disaster Prevention and Mitigation of the World Meteorological Organization (WMO) has noted that of the 139 countries responding to a WMO country-level disaster prevention and mitigation survey, 105 indicated that Flash Floods were among the top two most important hazards around the world and require special attention.

Introduction

Flash floods rise and fall quite rapidly with little or no advance warning, usually as the result of intense rainfall over relatively small areas. The response time is usually less than six hours. These events are, for the most part, very localized hydro-meteorological phenomena. Most National Meteorological and Hydrologic Services (NMHSs) and National Disaster Management agencies do not have the tools to identify, evaluate and predict flash flooding, then issue timely and accurate flood warnings in order to be prepared or provide effective disaster response. Very few local systems are available to provide early warning against these devastating events that are regional in nature and such systems provide no significant early warning for these disasters. Local monitoring uses on site sensors that are expensive to implement, require frequent maintenance, do not fully cover the areas that are flash flood prone and may have imposed data restrictions for regional use.

There is an urgent need for an approach to improving capacities for warnings of flash floods to reduce vulnerability to these extreme events. The World Meteorological Organization and USAID/OFDA have been cooperating for many years in raising awareness and building capacity on flash flood early warnings. After Hurricane Mitch devastated Central America, USAID/OFDA supported development of the Central America Flash Flood Guidance System (CAFFG) in 1998. The system is operationally used to provide warning for flash flood today. In 2005, USAID/OFDA conducted an introductory workshop on flash floods in cooperation with the Mekong River Commission (MRC) for the lower Mekong River. USAID/OFDA, WMO and MRC are currently working an implementation of a CAFFG-type system in Southeast Asia for the countries of Cambodia, Laos, Thailand and Vietnam. In cooperation with the International Center for Mountain Development (ICIMOD), WMO, the Government of Norway, and the National Oceanic and Atmospheric Administration (NOAA), the Chinese Meteorological Department organized a workshop on Flash Flood Management and Sustainable Development in the Himalayas. A Regional Flash Flood Workshop was held in Tsukuba, Japan. In 2006, WMO, USAID/OFDA, Canada and the Costa Rica Meteorological Department hosted the first International Workshop on FFG. A Southern Africa FFG workshop was held in Pretoria in 2008.

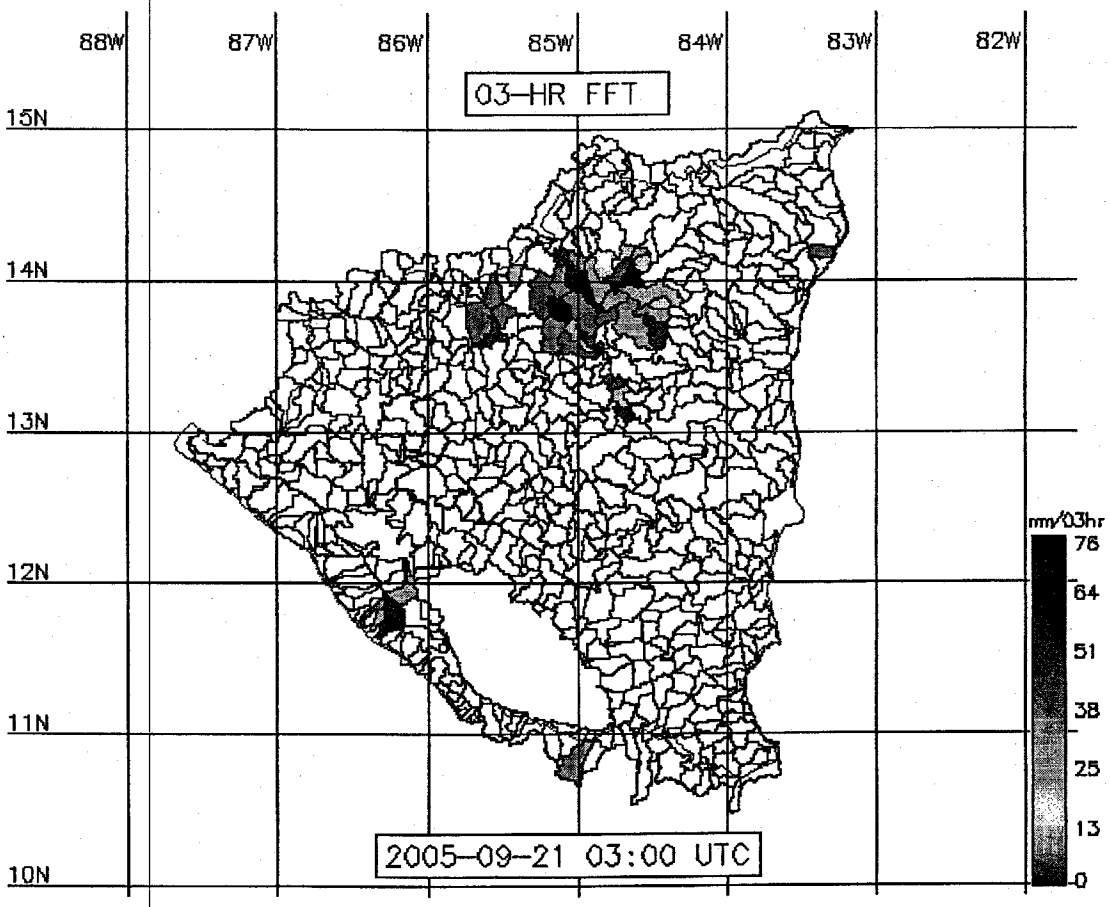
Global Flash Flood Guidance Project

In 2008, WMO and USAID/OFDA signed an agreement to develop an infrastructure first on a global scale and then support the development of regional implementations of technology, training, protocols and procedures to address the issues of mitigating the impacts of flash floods.

The main objectives of the initiative are:

- to provide rapid assessments of the potential of flash floods with minimum technical and data requirements, allowing improvement of early warnings of flash floods and therefore allowing for the more rapid mobilization of response activities through nationally mandated agencies,
- to strengthen the capacity of NMHSs including cross-training of hydrologists and meteorologists from different countries within each region,
- to encourage regional (cross-border) cooperation in preparing public awareness campaigns and response strategies,
- to implement a regional infrastructure in selected locations allowing for the generation and dissemination of real time data and products, and
- to provide opportunities to enhance regional collaboration of disaster mitigation and response agencies, and to improve community awareness of flash flood disasters.

Example: FFGS Identification of High Risk Areas



Regional Flash Flood Guidance System

Complete implementations will occur in a maximum of two regions, selected based on USAID/OFDA priorities. It is highly likely that one of the two regions will be the Black Sea and Middle East Region, with Turkey playing a central coordinating role in implementing the project.

In late March, an initial workshop for the proposed Regional Flash Flood Guidance System - Black Sea and Middle East Regions was held in Istanbul to orient and set the groundwork for the project. The workshop was attended by representatives from USAID/OFDA, the WMO, the U.S. National Weather Service (NWS), and the Hydrologic Research Center (HRC), a non-profit public benefit corporation located in San Diego, California. Along with their counterparts from Armenia, Azerbaijan, Georgia, Iraq, Lebanon, and Syria, representatives from the Turkish State Meteorological Service (TSMS) participated in the workshop and presented the current Turkish hydro-meteorological monitoring network and the flood control and early warning systems currently in place.

If implemented in the Black Sea and Middle East Region as planned, the Regional Flash Flood Guidance System initiative will be of great benefit to the TSMS. The flash flood guidance system will be a very useful tool within TSMS's overall Flood Forecasting and Early Warning System. It will improve TSMS's ability to predict the occurrence of flash floods in small streams and basins, especially in remote areas where it is difficult to maintain weather and water monitoring equipment. Participation in this regional initiative will also advance Turkey's efforts to improve transboundary flood management efforts. In developing and implementing the system regionally, the TSMS will play a leading role. Improved communication and regular contacts with NMHS's from the other participating countries will result. Furthermore, the active participation of USAID and NWS in this initiative will open the door for their possible support of other aspects of TSMS's flood forecasting and early warning system implementation.

D. OTHER DEVELOPMENTS

The USTDA feasibility study to support implementation of the improved flood forecasting and early warning system, should also take into account several other recent flood and emergency management developments in Turkey, including the following:

Standards Development

In collaboration with the Ministry of Interior, the Istanbul Technical University has recently developed a series of national standards to be adapted in all of the county's emergency planning and development measures. These standards - governing Remote Sensing Systems (RSS), Global Positioning Systems (GPS), Geographic Information Systems (GIS), and data acquisition techniques – will be encompassed into a Turkey Disaster Information System (TABIS). While these standards are based on internationally accepted norms, the system design elements and specifications to be developed under the USTDA feasibility study for TSMS should be cross checked for conformity to TABIS.

Types of Standards in TABIS

The concept of 'standards', as defined and used in the GIS-based TABIS, refers to the following:

- The standards regarding the spatial reference or the standards related to the modeling of the spatial. The concept 'spatial' contains urban and rural zones.
- Similarly, modeling of data with spatial & non-spatial reference related to the multi-directional management of earthquakes.
- Principles related to the institutional modeling for maintenance of the system.

- Examining of existing data for integrating into the system on the basis of their location, unit, concept, format and entry date.
- Software standards which will be used during and after the establishment of the system.
- Hardware which will be used during and after the establishment of the system.
- Gaining standards of meta-data with different characteristics (geometric, attribute and meta) for different scales
- Rules determining the integration of data obtained from different sources.
- Data exchange standards
- Standards related to the cartographic products (maps) which will be produced by geometric data infrastructure with medium and large scales.
- Standards related to data presentation (e.g. cartographic or other documents)
- Standards related to obtaining and marketing of the data
- Meta-data standards.

TABIS Object Catalogue (TABIS-OK)

The core of the Turkey Disaster Information System is the Basic Spatial Database. The reference model of the TABIS system comes into existence from two vectoral components. These components are:

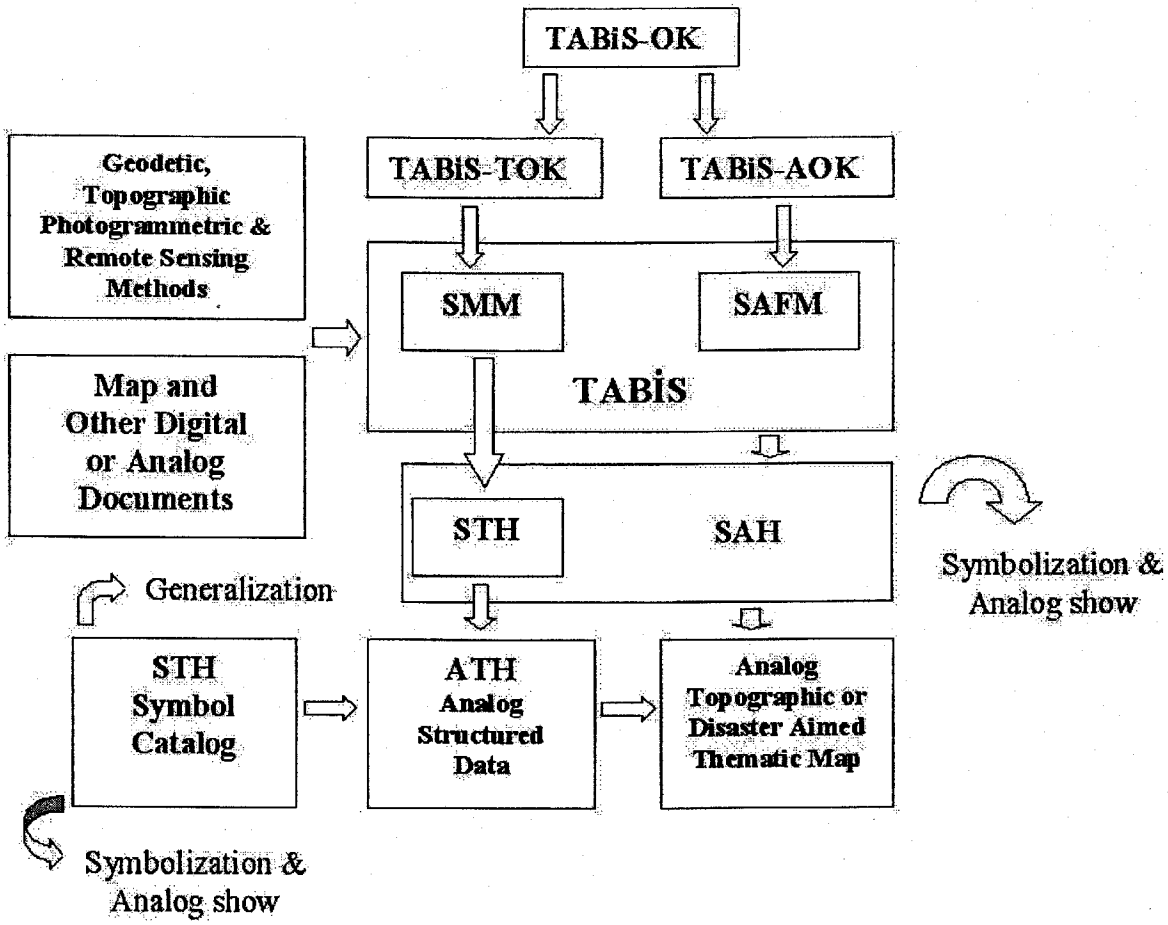
- Digital Spatial Model (SMM) and
- Digital Disaster Model (SAFM)

Both digital models can be separated into their core components based on an object oriented process. This process is referred to as 'atomizing the space' in database modeling. The atomized data of both digital models is developed into object catalogs. These catalogs are:

- TABIS-Basic Topographic-Spatial Object Domains Catalog (TABIS-TOK)
- TABIS-Disaster Management Object Domains Catalogue (TABIS-AOK)

The aim of the TABIS-TOK is the modeling of the concrete objects which are the characteristic parts of the topography of the region where the system will be constructed. Parallel to this aim, the components of the TABIS-TOK are referred to as "Basic Topographic-Spatial Object Domains". TABIS-TOK also has the quality of being a data standard for the country-wide public and private institutions who want to set up a detailed spatial information system for their own purposes. Utilizing the object modeling, object definitions, and attribute definitions defined in the TABIS-TOK model, data types for the attributes and attribute values can be matched with analog topographic map contents to constitute a disaster management-based GIS that is interoperable with the other GISs of the same region, even if the aims of the systems are different. The modeling approach of the TABIS-OK is illustrated below:

TABIS Reference Model


TABiS-OK
TABiS-TOK
TABiS-AOK
Geodetic, Topographic Photogrammetric & Remote Sensing Methods
SMM
SAFM
TABİS
Map and Other Digital or Analog Documents
STH
SAH
Symbolization & Analog show
Generalization
STH Symbol Catalog
ATH Analog Structured Data
Analog Topographic or Disaster Aimed Thematic Map
Symbolization & Analog show

Transboundary Cooperation Efforts

During 2009, Turkey become increasingly more involved in trans-boundary cooperation in the area of flood management, and is now actively participating in the United Nations Economic Commission for Europe (UNECE) Water Convention framework. Turkey's participation in international data exchange and flood forecasting systems harmonization will be further enhanced by its planned adaptation of the EU Flood Directive, which will be carried out in coordination with the Water Framework Directive. Turkey has also indicated an interest in accessing EU flood management support tools such as the European exchange circle on flood forecasting (EXCIFF), the European exchange circle on flood mapping (EXCIMAP), and the European Flood Alert System (EFAS), which would entail adaptation of existing local systems.

Of particular concern to Turkey in terms of trans-boundary flood management coordination is the Meriç River (Maritsa/Evros), which flows through Bulgaria, Turkey and Greece. It is the second largest river basin in the Balkans with a total length of 550 km and a catchment area of 39,000 km^2. The river originates in Bulgaria and flows through Turkey where it forms a 203 km boundary with Greece before flowing into the Aegean Sea. In recent years both the frequency and magnitude of floods have increased, especially in the lower Meriç River regions on Turkish, Bulgarian, and Greece territory.

Diminishing the hazardous effects of flooding and improving flood prevention measures, can only be achieved through co-operation and use of common information sources. In response, Turkey and Bulgaria have started transboundary cooperation on data and information transfer and flood forecasting and early warning. So far, four telemetric hydrometry stations have been established in the Bulgarian part of the Meriç catchments. These stations are recording continuously and supply real-time river data using satellite and GSM communication systems to both countries.

To date, Turkey and Bulgaria have developed three joint projects through the European Commission Cross Border Cooperation program, one for exchange of information and real time data, and two on flood forecasting and warning. These joint projects are the first common projects that have been applied in the region on forecasting. The information is shared on a common website, with real-time information from two hydrometric stations. The transboundary forecasting and early warning system will be used as input for local and regional preparedness and emergency response plans.

Despite recent progress, it is generally agreed that cooperation between all three States (Bulgaria, Turkey, Greece) needs to be significantly enhanced, for example, by developing a common hydrological model and a joint flood forecasting system among other measures. However, cooperation at the technical side can only flourish is there is political support.

Recent EU flood management efforts have focused on improving the compatibility of systems among member and candidate countries. Different levels of data availability, and

a resulting lack of meteorological, hydrological and geo-morphological data, is seen as a major obstacle for integrated flood risk management. The aim is to achieve general transboundary agreement on model compatibility and data transfer in order to form a common basis for assessing flood risk situations. The challenge of data exchange and information systems is to achieve an undisrupted data and information flow on flood risks in river basins. In addition, compatibility of calculation models guarantees that potential strategies and options can be discussed for their merits, avoiding potential disagreements on their potential effects due to the diverging models used.

The EU position, which is shared by both DSI and the TSMS in Turkey, is that transboundary flood risk management needs to be considered as a part of Integrated Water Resources Management (IWRM) and, therefore, issues of transboundary flood management should be dealt with in the framework of IWRM. In almost all transboundary river basins, IWRM involves international cooperation with at least the border countries, and possibly all countries involved in the international river basin. Bilateral cooperation is essential, but sometimes not sufficient. Trilateral and multilateral cooperation agreements are more difficult, but required in the case of more than two riparian countries.

In developing the parameters of the FFEWS for TSMS the consulting firm carrying out the USTDA feasibility study should take these trans-boundary flood risk management issues into account, with a particular emphasis on integration and interoperability with systems in place in neighboring countries.

IV. FLOOD FORECASTING AND EARLY WARNING SYSTEM PROJECT

A. PROJECT DESCRIPTION AND BACKGROUND

Due to its geographical location, geology, and topography, flooding is Turkey's second most destructive natural hazard after earthquakes. Floods are primarily due to heavy rainfall in the coastal areas of the country, or to sudden snow melts in the mountainous, southeastern part of Turkey. In recent years, heavy rainfall combined with rapid, uncontrolled urbanization and deforestation has led to a dramatic increase in flooding incidents.

Serious economic damage and numerous flood-related deaths, and, in particular, the severe flooding that occurred in September 2009, have prompted the Government of Turkey to improve the country's flood control and early warning systems. The Turkish State Meteorological Service (TSMS) intends to deploy a comprehensive, nation-wide flood forecasting and early warning system, which would be connected to the flood control master plan currently being revised by the State Hydraulic Works (DSI). TSMS has requested USTDA support for a feasibility study that would define the parameters of the system.

Among the areas that TSMS is currently examining, and for which technical assistance has been requested under the proposed feasibility study, are the following:

- Developing topographic and flooding maps and studies to determine the extent of flood risk for identified priority areas;
- Reviewing existing hydrological models;
- Collecting additional river basin and other data necessary to ensure successful modeling and simulation;
- Preparing source data for ingestion into the GIS and digitally compiling the data into base layers;
- Developing the format for a GIS database of existing flood forecasting, control and mitigation facilities.

Inputs from the recently completed flood control pilot project in the Black Sea region, based on ESRI ArcGIS, could also be useful in developing the enhanced FFEWS.

The overall objective of the proposed feasibility study is to develop a comprehensive road map to be followed by the TSMS in the systematic deployment of a fully operational Flood Forecasting and Early Warning System (FFEWS). The USTDA-funded study will develop a high-level assessment and implementation plan to assist the TSMS in determining its national-level FFEWS needs, including hardware, software, GIS, RDMS, sensors, weather and water monitoring equipment, communications equipment, and modeling systems.

Ultimately, the FFEWS feasibility study for the TSMS will reduce the damage, economic loss, and risk to life, health and safety due to flooding in risk areas located throughout

Turkey. The Contractor shall use a model-based analysis to recommend effective approaches to enhancement and/or remediation of existing infrastructure, develop alternatives for flood risk mitigation, identify needed flood control infrastructure and flood warning systems, and propose procedures and best practices for specific situations in the basins for integrated water management, warnings, and facility operation and maintenance.

The capability to carry out flooding analysis quickly is of paramount importance in issuing useful forecasts that allow citizens and businesses the maximum time to prepare for a flood. Therefore, a major emphasis of the feasibility study will be in developing real-time hydrologic modeling and forecasting capabilities in Turkey. The study will provide valuable support to the TSMS in: selecting and implementing suitable flood models; developing formats for automated data entry into models; generating useful outputs in the form of flood levels, inundation maps, and other information formats; and providing GIS images to disseminate information on the status of floods.

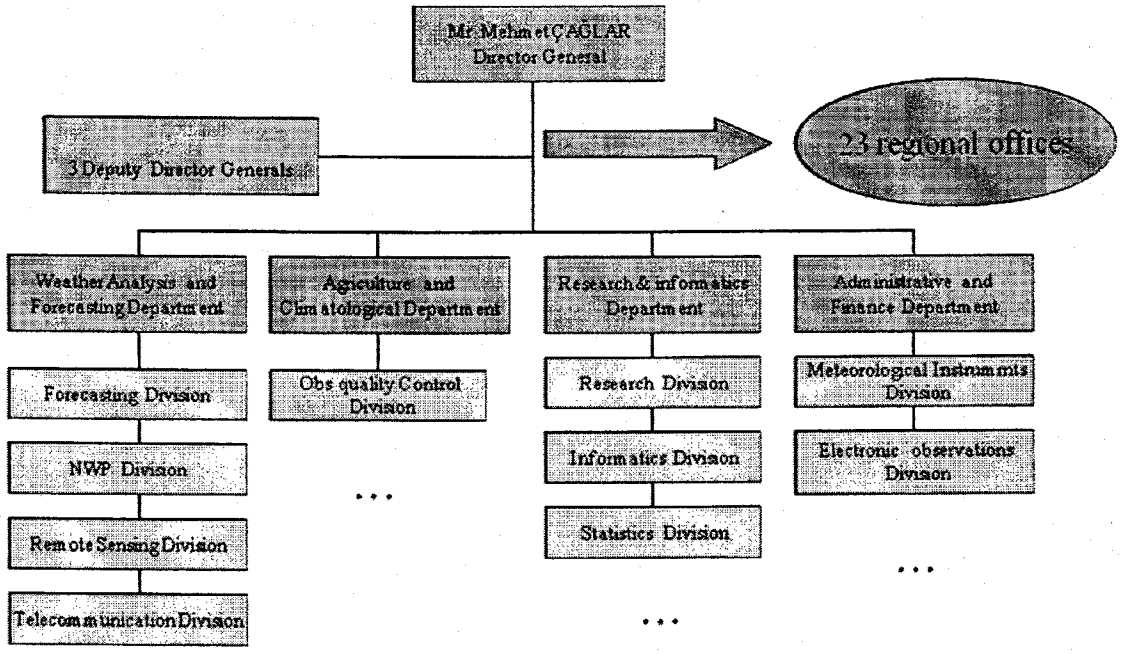
The FFEWS project will be focused primarily on non-structural (i.e. non-physical) flood control measures, which are under the purview of the TSMS. Non-structural measures are generally favored in any case because of lower costs, lower environmental impacts, less disturbance, and less taking of land. However, a number of Turkish cities are located along major rivers or in basin areas subject to frequent flash floods. These cities suffer unacceptable levels of risk and damage even if flood warnings are prompt and evacuation effective. In some of these urban areas, extensive levee systems have been constructed and offer protection during moderate flooding. However, many of these are not hydraulically or structurally adequate, some areas needing protection are beyond the levees, and more sophisticated ancillary systems such as pump stations and floodwall gates may be warranted. Therefore, the Contractor shall advise on the use of structural methods in specific situations to counter the often disastrous effects of floods in the Istanbul area, the Black Sea region, and other areas of the country.

B. PROJECT SPONSORS CAPABILITIES AND COMMITMENT

The Grantee, the **Turkish State Meteorological Service** (TSMS) was initially established in 1937. Operating under the umbrella of the Ministry of Environment and Forestry, the TSMS is currently the only legally mandated organization in Turkey for the provision of meteorological information. TSMS operates as a semi-autonomous unit within the Ministry, and receives a distinct annual budget allocation from within the Ministry's budget.

The main objectives of the TSMS are: to make meteorological and related observations; to provide forecasts; to provide climate data, archive data, and other related information; to communicate these to the public; to provide for the meteorological needs of the army and civil aviation authority; and to participate in meteorological and climate research activities.

The organizational structure of the TSMS is as follows:



The TSMS employs more than three thousand total staff including meteorologists, hydrologists, engineers, field observers, and technicians. Approximately 1,000 staff members are located at TSMS's headquarters in Ankara, with the remainder being based at regional offices across the country.

Operational forecasts conducted by the TSMS include:

- Long Range: 3 and 7 days
- Short Range: 12 and 24 hours
- Nowcasting: 3 to 6 hours
- Airports: TAF (Terminal Aerodrome Forecast) and SPECI (Aviation Weather Report)
- Ocean: daily and 3-day forecasts
- Daily Warnings (broadcasted via FM radio)

Through its national observation network consisting of approximately 450 automated weather stations (AWOS), 6 hydro-meteorological stations, 4 meteorological Doppler radar systems, remote sensing and satellite links (EUMETSAT), the TSMS constantly monitors changes in the national weather. The TSMS also maintains detailed historical measures of meteorological induced hazards and the geographic distribution of floods. The TSMS currently operates the MM5, ALADIN, and WRF weather forecasting systems and has also worked extensively with HEC flood forecasting models (U.S. Army Corps of Engineers). TSMS's GIS system is based on ArcGIS from ESRI.

The TSMS is an active member in the following international organizations:

- WMO (the World Meteorological Organization), a specialized agency of the United Nations which organizes the work and collaboration of all the national meteorological services
- ECMWF, a European intergovernmental organization providing global meteorological and oceanographic forecasts
- EUMETSAT, the European meteorological satellite organization for the establishment, maintenance and exploitation of operational meteorological satellite systems
- ECOMET, a European organization dealing with commercial activities within the meteorological community.
- ICAO, a UN specialized agency which provides Standards and Recommended Practices (SARP) for the safe, regular and economic performance of international civil aviation.

The TSMS is fully committed to the development and implementation of a modernized, national-level flood forecasting and early warning system based on the most advanced technology available. In this endeavor, TSMS has the full support of the Ministry of Environment and Forestry, the DSI, and the newly formed Prime Ministry Disaster and Emergency Management Authority. TSMS's General Director, Mr. Mehmet Caglar, is fully behind the project and has actively sought USTDA technical assistance. The recently constituted Flood Team within TSMS (a group of highly qualified, western-trained meteorologists, software experts, and GIS specialists) will be responsible for management of the FFEWS feasibility study.

C. *IMPLEMENTATION FINANCING*

The overall budget for implementation of the proposed national flood forecasting and early warning system project is expected to reach approximately $80 million over the next five to seven years. The majority of the funding for the FFEWS implementation will come from the national budget. Through the Ministry of Environment and Forestry, approximately $15 million has already been earmarked from the 2010 budget for upgrading of TSMS's flood monitoring, forecasting, and control infrastructure. To access these funds, TSMS must prepare and present a feasibility study to the Turkish State Planning Organization (SPO), which in turn requests final Treasury approval for the project. For this reason, it is very important that the USTDA-supported feasibility study, or key sections of it, be completed by year-end 2010.

Additional funding for the FFEWS implementation is likely to come from a variety of sources including multilateral organizations, U.S. agencies, and the E.C. Given the recent natural disasters (floods, earthquakes, landslides), continued problems related to rapid

urbanization, and Turkey's EU convergence requirements, emergency management and early warning systems projects are receiving high priority.

The World Bank /International Bank for Reconstruction and Development continues to fund major emergency & flood management projects in Turkey. For the period 2008 though 2011, Environmental Management and Disaster Prevention is one of the World Bank's core country assistance strategy (CAS) development themes for Turkey. Funding of approximately $800 million will be made available for disaster prevention, the improvement of existing management systems, and for programs to support convergence with EU environmental standards. Details on two recent initiatives are provided below:

- Overall funding for the Turkey Emergency Flood and Earthquake Recovery Project (TEFER), discussed above, was $685 million. (Development of flood management infrastructure in the Western Black Sea flood area was a sub-component of the TEFER project.)
- A specific component of the ongoing $400 million Istanbul Seismic Risk Mitigation and Emergency Preparedness Project (ISMEP), to be completed in September 2010, provides assistance to municipal authorities in preparing for, and responding to, significant emergencies, including earthquakes and floods.

Based on discussions with World Bank representatives in Ankara during the DM, the ISMEP is likely to be expanded to other parts of the country. It is therefore quite possible that this project vehicle could be used to fund aspects of the FFEWS implementation.

In addition, financing from UNDP Turkey is accessible for disaster management and response projects with a primary emphasis on human and institutional capacity building. Under UNDP's strategy for 2006 – 2010, formulated with and agreed by the Turkish Government, environment and sustainable development is one of the three core focus areas. Under a joint program with the UNEP, FAO, and INIDO, UNDP is currently developing a disaster risk needs assessment on behalf of the TSMS, the DSI and several other organizations, which includes hydro-meteorological disasters and the set-up of early warning mechanisms.

U.S. Ex-Im Bank is fully operational in Turkey, offering a variety of credit facilities to U.S. firms exporting to Turkey, including vendor financing programs, and financing vehicles for U.S. investments. Ex-Im Bank does not have a ceiling for Turkey as long as a Treasury guarantee is provided (for public sector-funded projects). OPIC is another source for project financing for U.S. companies active in Turkey, providing loan guarantees, direct loans, and political risk insurance programs.

EU pre-accession funding is increasingly available for environmental and emergency management projects in Turkey. Most EU financing is channeled through the Instrument for Pre-Accession Assistance (IPA) that can be accessed by Turkish Government bodies, agencies, and NGOs for specific, qualifying projects. For the first four years of IPA (2007 – 2010), the European Commission has earmarked Euro 2 billion for Turkey. A recent project example is the Euro 2.2 million Technical Assistance to Mitigating Flood Risk in Flooded areas in the GAP (South Eastern Anatolia) Region project, which was initiated in 2008 and will be completed in 2010. Several trans-border flood management projects are

currently in the development phase, including a joint initiative with Bulgaria for the Western Black Sea region and Maritsa River.

> (Note: While eligibility to receive funding for pre-accession projects is theoretically restricted to European-based firms, there are no prohibitions against the participation of European-based companies of U.S. parentage, either as developers of or suppliers to projects supported by EU funds, or as bidders on subsequent public tenders related to such projects.)

Since 2005, the European Investment Bank (EIB) provides funding for projects in Turkey though the Pre-Accession Facility and the Mediterranean Partnership Facility. The targeted lending through these two facilities is at least Euro 2 billion per year. Among the specifically identified priorities are environment and disaster risk mitigation projects.

D. U.S. EXPORT POTENTIAL

The Flood Forecasting and Early Warning System project will be a major generator of U.S. exports. The overall FFEWS budget, if implemented by the TSMS/DSI on a national scale, could quite conceivably surpass $80 million. About 60% of this budget, or $48 million, could potentially come from U.S. suppliers.

The core of the FFEWS would require the acquisition of hydro-meteorological equipment, computers, software, training, and the involvement of providers of related technology, including: data management and communications systems, hydrologic forecasting modeling, and flood risk management tools. U.S. suppliers of weather radars and monitoring technology, GIS technology, meta-database and related networking equipment, digital maps, radar and satellite imaging, etc. could potentially provide the majority of the system components.

The main categories of potential U.S. exports in the FFEWS implementation are estimated as follows:

Category	Amount
-Weather & water monitoring equipment	$12.4 million
-Meteorological radars & sensors	$11.7 million
-Flood modeling systems	$10.5 million
-Communications networking & central computing facilities	$ 8.6 million
-Training, implementation & support services	$ 4.8 million
TOTAL	$48 million

Among the many U.S. companies that could potentially supply equipment, technology, and services for the FFEWS project are the following:

U.S. Export Category	Potential U.S. Suppliers
RF Communications Equipment	Harris Interactive, Motorola, Microwave Data Systems, Free Wave.
Applications Software	ESRI, David Ford Associates, Riverside, Vieux Associates
Hydraulic Gates, Flow Controllers	Rodney Hunt Co., Henry Pratt Co, Steel Fab, Inc.
Flood Control Systems	Caterpillar, CH2MHILL, GM, ERM, John Deere, URS
Meteorological Sensors	Global Water, Vexcel, Hydrolab, Hach
Electrical and Mechanical Systems	GE, Trane, Westinghouse
System Integrators	Lockheed Martin, Washington Group, Froehling and Robertson, CHF Int'l
Weather Monitoring	Raytheon, Campbell Scientific, Inc. , Applied Technologies, Inc, Lockheed Martin, Barons Services, EEC, Rockwell-Collins, Hydrolab
Flood Forecasting	Montgomery Watson Harza, Moffet and Nichols, URS, CH2MHILL, BOSS International, HAESTED, Vieux, Riverside Technologies (RTI)
Water Monitoring Equipment Including Telemetry Systems	Campbell Scientific, YSI, Vaisala Boulder, Motorola, Raytheon, HAESTED, ISCO, RD Instruments
Land Use Assessment	BOSS, ESRI, Space Imaging, Riverside
Hyrdological Software and Models	ERM, URS, Montgomery Watson Harza, ESRI, Intergraph
Technical Training	Motorola, ERM, Montgomery Watson Harza, Raytheon, Riverside, URS
Operation and Maintenance	Montgomery Watson Harza, BOSS, URS
Hardware	HP, Dell
System Software	HP, Oracle, Sybase, Microsoft
Communications and networking	Cisco, Lucent

Technical consultants such as Burgess & Niple, Booz-Allen, Black & Veatch, F&R Worldwide, and others would be well placed to conduct the feasibility study as well as to participate in project implementation.

E. FOREIGN COMPETITION AND MARKET ENTRY ISSUES

Given the magnitude of the projected capital investment and the traditionally strong competitive commercial efforts of the European community, there would definitely be foreign companies interested in participating in the FFEWS and other Turkish emergency management projects. Therefore, the competitive nature of the project should be considered high. Companies from Germany, Holland, Japan, China, and Taiwan have expressed interest in flood forecasting and warning systems projects in Turkey. In addition, the Danish Hydraulic Institute (DHI) has been involved in the World Bank-funded TEFER project and in an EU-funded flood risk assessment.

Foreign competition will be particularly high in design, sensors, communication, computers, and water control equipment. Some international firms that offer equipment, supplies and services, which will be required in the FFEWS project are the following:

Export Category	Foreign Supplier
Water-Control Consulting Services	SNC-Lavalin (Canada), Lyonnaise des Eaux (France), SA Water (Australia), Vivendi (France)
Weather Monitoring	NEC (Japan), Fujitsu (Japan), JSI (Japan), Meteorological Engineering Limited (UK)
Flood Forecasting	ACRES (Canada), SNC-Lavalin (Canada), DHI (Denmark), Delft Hydraulics (Netherlands), EDF (France)
Water Monitoring Equipment Including Telemetry Systems	Bouygues Telecom (France), FTS (Canada), Hydro Quebec International (Canada), BC Hydro (Canada), Rescan (Canada)
Non Off-The-Shelf Software Development	DHI, Delft, ACRES
Technical Training	DHI, Delft, ACRES, Hydro Quebec International, BC Hydro
Operation and Maintenance	Hydro Quebec International, BC Hydro, EDF, DHI, DELFT
Flood Control Works	Bouygues, SNC-Lavalin
Hardware	Sony, Japan, Sidemen's, Germany
Software	SAP, Germany
Communications and networking	Lacteal, Belgium, Sidemen's, Germany
Peripherals	Epson, Japan, Canon, Japan
Services	Wallingford Software, Thames International Water, Co. UK, Delft, Sarah Group, France

While U.S. technology enjoys a very positive image in Turkey, USTDA support of the proposed Flood Forecasting and Early Warning System project will develop a clear business opportunity, and will provide a level competitive playing field for U.S. manufacturers, engineers, and consultants. Experience gained through the FFEWS will place these companies in a strong position to compete for a wide range of environmental and emergency management projects planned by the Turkish Government over the coming years.

F. DEVELOPMENTAL IMPACT

The proposed flood forecasting and early warning system project for the TSMS - and the downstream structural measures that it will lead to - will provide substantial development benefits for Turkey in the areas of public infrastructure, human capacity building, technology transfer and productivity enhancement, and transboundary relations. The improved approach to flood risk and damage mitigation will result in fewer deaths and injuries, reduced economic losses, and an improved business climate for the region.

Infrastructure

The FFEWS project will contribute directly to development of an advanced, nation-wide hydro-meteorological network linked to a state-of the central computing facility. Downstream, the FFEWS will lead to implementation of structural flood management measures and infrastructure such as upgraded levees, floodwalls, sensors and ancillary

items. These measures will in turn protect existing infrastructure such as highways, water and wastewater facilities, power plants, and private industrial facilities.

Human Capacity Building

Once implemented, the FFEWS project, combined with ongoing efforts to develop an integrated water management system, will lead to new jobs, both at the TSMS and at the level of the regional authorities. Deployment, operation and management of the FFEWS will also require extensive training of both technical and general administrative staff. Technical training will include GIS management, hydrologic modeling, numerical analysis, and statistical modeling. Furthermore, the system will lead to fuller employment and enhanced skill sets for currently employed staff of the TSMS and regional authorities.

Technology Transfer and Productivity Enhancement

The flood forecasting and early warning system project for the TSMS will bring advanced computing/RDMS, weather and water monitoring equipment, sensors, communications networks, modeling systems, and GIS technologies into use in Turkey. The new technologies associated with the FFEWS will enhance the ability of the TSMS to process data, develop real-time models, and issue warnings. Some of these advanced systems will also be of use in other areas of the national economy, by utilities and industry.

Market Oriented Reform

At this time there are no specific market oriented reforms envisioned in connection with the FFEWS project implementation, but some changes in regulations regarding building in flood prone areas may be suggested in order to keep vulnerable structures out of the path of floods. These changes in regulation will reduce the probability of flooding in the basins, which will in turn reduce risk areas along rivers and streams. Consequently, there will be reduced damage to homes and businesses, reduced threat to life and health, and reduced business disruption. Implementation of this project will reduce personal and public costs experienced when floods occur, and will improve the business conditions for firms operating in areas now affected by floods. Moreover, these improvements will result in increased economic productivity in the currently affected flood areas as well as reduce the deterrence to business investments in affect areas.

Transboundary Relations

Through the improved flood water control gained by implementation of the Flood Forecasting and Early Warning System project, Turkey will improve the coordination of transboundary water management efforts, and will engender better relations with EU neighbors Bulgaria and Greece, as well as eastern neighbors Syria, Iraq, Iran, Armenia, and Georgia. Implementation of the advanced technologies associated with the FFEWS will also place Turkey in a position to play an important regional role in the coordination of international flood management efforts and in the dissemination of best practices. The positive economic improvements experienced by Turkish businesses and residents will have positive carry over impacts to transnational neighbors, thereby also benefiting these countries.

G. IMPACT ON THE ENVIRONMENT

The FFEWS project's environmental impacts are expected to be minimal; any environmental concerns can be mitigated with the careful design and layout of equipment and facilities. Evaluation of environmental impacts of the proposed measures will be important, especially balancing the positive environmental effects such as wetlands preservation or restoration for flood water retention/detention and reduction of pollution from flood events against the potential negative activities, such as stream channel and bank modifications.

The potential improvements under the FFEWS project will provide net benefits in environmental conditions throughout Turkey. The enhanced hydro-meteorological network and modeling systems will enable hazardous contamination tracking in flood flows. Ancillary programs that can be furthered by improved hydrological analysis of floods and improved public awareness have major environmental benefits. These programs illustrate and inform citizens of the problems inherent in living in flood prone areas, help them avoid moving into such areas, and assist regional authorities in developing policies to discourage construction in hazardous areas. This leads to more appropriate use of flood prone areas such as parks and appropriate agriculture rather than habitation. Where lands adjacent to flood-prone basins and streams are not used or suitable for urbanization or high value agriculture, the areas may be converted (or restored) as wetlands. Flood waters can then be directed to them in a controlled fashion to reduce flood peaks and so mitigate downstream risk and damage. There can also be a substantial environmental gain by allowing wildlife use of the wetlands created or restored for this purpose.

Reduction in, and preparation for, flooding can achieve substantial environmental benefits by reducing the chemical and bacterial pollution that floodwaters often release into the environment. At a minimum, the most hazardous chemicals can be removed from the areas expected to be flooded. Where this is not possible, for instance at sewage treatment plants and industrial waste ponds or tanks, the facilities may be protected from flooding by floodwalls or levees protecting a wide area, or by small ring walls surrounding the site of potential pollution. In either case, mixing of pollutants with the flood water can be reduced or stopped, with the concurrent elimination of possible harm or water shutoff in distant downstream cities.

H. IMPACT ON U.S. LABOR

The flood forecasting and early warning system project as currently envisioned will have no negative impact on U.S. labor, and no adverse consequences with respect to U.S. Foreign Operations, Export Financing and Related Programs legislation. The projects will not involve any special economic or export zones in Turkey; the study and projects will not violate internationally recognized worker's rights; and the project will be unrelated to the creation of foreign commodity production. No U.S. jobs will be lost, displaced, or relocated, and no enterprise will move offshore as a result of this project.

To the contrary, the FFEWS project is highly likely to create U.S. employment in the field of engineering and manufacturing. A positive impact on U.S. labor and industry is expected in the opportunity for approximately $48 million in exports of meteorological sensors, weather and water monitoring equipment, modeling systems, hardware, software, and services. No negative impacts are expected. U.S. firms can provide the necessary services and equipment, and the assistance of the USTDA grant to advance and highlight their products will aid in securing U.S. exports for this valuable project.

I. JUSTIFICATION

The Government of Turkey is clearly committed to enhancing its flood management capabilities. Following the severe flooding in Istanbul and northwestern Turkey last September, and floods in Artvin (northeast Turkey) and Giresun (Black Sea region) in July of 2009, the rapid implementation of real-time flood forecasting and early warning systems is high on the political agenda. Furthermore, the Turkish Government has made a formal decision to implement a fully integrated national flood management system, adapting an 'Integrated Flood Management' (IFM) approach to be carried out within the context of an 'Integrated Water Resources Management' (IWRM) program. For these reasons, the developmental priority of the project should be considered very high.

The potential grantee, the Turkish State Meteorological Service (TSMS) has the legal mandate, political support, commitment, and technical capacity to implement the planned Flood Forecasting and Early Warning System on a national level. The TSMS also has considerable experience in working with international organizations and projects. It is very likely that the TSMS will secure financing for a considerable portion of the FFEWS implementation from national sources. However, the TSMS clearly requires outside assistance in defining the FFEWS requirements, designing the system, and developing the specifications.

The FFEWS project will have a direct and measureable developmental impact on Turkey in the areas of public infrastructure, human capacity building, technology transfer, and productivity enhancement. The improved approach to flood risk and damage mitigation will result in fewer deaths and injuries, reduced economic losses, and an improved business climate in Turkey. The FFEWS will also provide major benefits in environmental conditions throughout the country, as well as beyond Turkey's borders.

If implemented on a national scale in Turkey, the FFEWS project has the potential to generate substantial U.S. exports of water and weather monitoring equipment, radars and sensors, networking equipment, hardware, software, and services. USTDA involvement at the feasibility study stage will also provide U.S. technology providers with a level playing field in an increasingly competitive environment.

J. TERMS OF REFERENCE

Please see Annex 5.

K. BUDGET RECOMMENDATION

Overall Budget

Cost Budget For: Project:								**USTDA Feasibility Study Budget Flood Forecasting & Early Warning**	
Labor (Loaded Rates)		Days	x	Unit Cost	=	Total Cost			
Project Manager		62		$ 1,280		$ 79,360			
Chief Engineer		86		$ 1,280		$ 110,080			
Water Resources Engineer		64		$ 1,280		$ 81,920			
Meteorologist		37		$ 1,080		$ 39,960			
GIS/CAD Specialist		31		$ 960		$ 29,760			
Computer Specialist		22		$ 960		$ 21,120			
Economist		32		$ 1,080		$ 34,560			
Environmental Scientist		14		$ 960		$ 13,440			
Total		348				$410,200		$410,200	
Travel	Count	Units		Cost Each		Item Total			
Airfare U.S.-Turkey for FS	18	trips @		$ 1,250		$ 22,500			
In-Country Travel	10	trips @		$ 200		$ 2,000			
Per Diem Turkey	180	days @		$ 254		$ 45,720			
Other (Van & driver)									
Ground Transport	12	weeks @		$ 1,000		$ 12,000			
Total						$ 82,220		$ 82,220	
Communications						$ 4,000		$ 4,000	
Other Costs (specify)									
Translation services						$ 7,000			
Printing						$ 1,500			
Administrative Costs for FS						$ 2,500			
						$ 11,000		$ 11,000	
Total Costs								$507,420	

Budget Detail by Task

Total Task Cost Summary	Labor Total	Travel	Equipment and Supplies	Communications	Other	Total
Task 1. Project Initiation	$ 76,960	$ 13,200		$ 500	$ 3,000	$ 93,660
Task 2. Technical Review	$ 202,640	$ 37,820		$ 1,500	$ 2,500	$ 244,460
Task 3. Implementation Plan	$ 81,840	$ 21,340		$ 1,500	$ 2,500	$ 107,180
Task 4. Final Report	$ 48,760	$ 9,860		$ 500	$ 3,000	$ 62,120
	$ 410,200	$ 82,220	$ -	$ 4,000	$ 11,000	$ 507,420

Labor Cost Summary

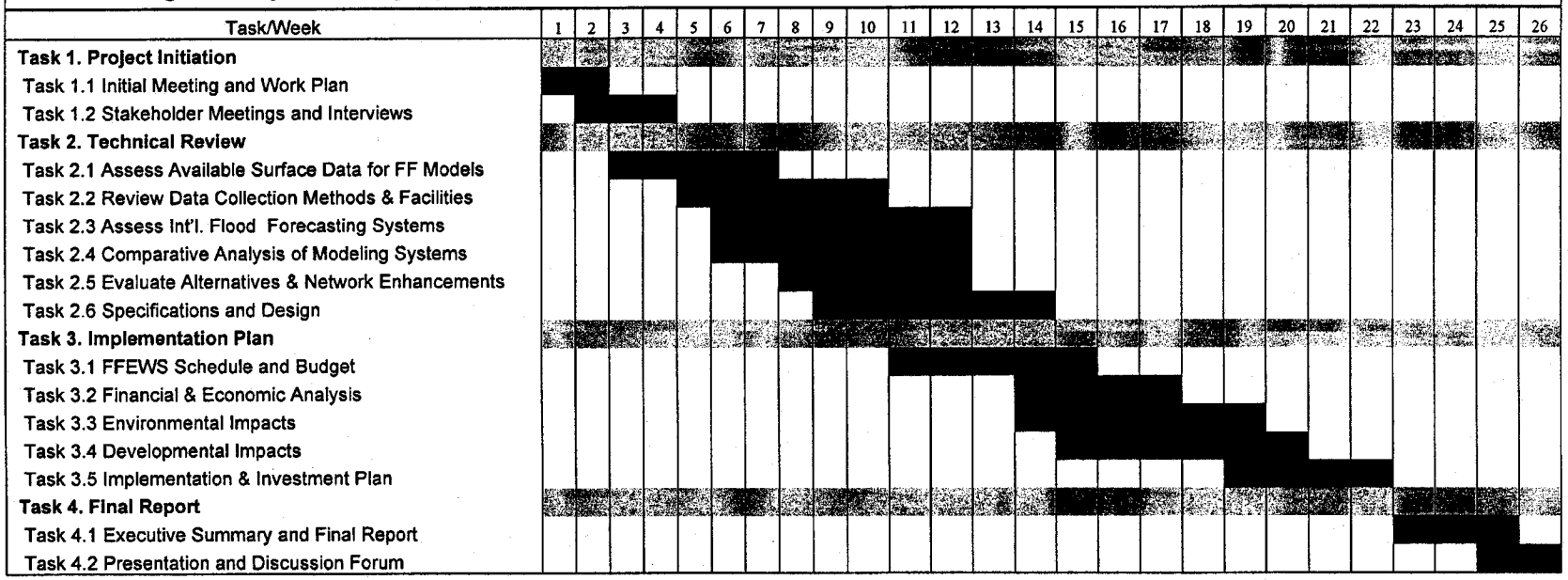
Task Summary Labor Days	Project Manager	Chief Engineer	Water Resources Engineer	Meteorologist	Computer Specialist	GIS/CAD Specialist	Economist	Environmental Scientist	Total Labor Days
Task 1. Project Initiation	17	18	12	10	2	2	2	0	63
Task 2. Technical Review	18	43	45	22	17	26	0	2	173
Task 3. Implementation Plan	12	15	3	4	2	2	22	12	72
Task 4. Final Report	15	10	4	1	1	1	8	0	40
	62	86	64	37	22	31	32	14	348
Labor Costs per Day	$ 1,280.00	$ 1,280.00	$ 1,280.00	$ 1,080.00	$ 960.00	$ 960.00	$ 1,080.00	$ 960.00	

Task Labor Cost Summary	Project Manager	Chief Engineer	Water Resources Engineer	Meteorologist	Computer Specialist	GIS/CAD Specialist	Economist	Environmental Scientist	Total Labor Cost
Task 1. Project Initiation	$ 21,760	$ 23,040	$ 15,360	$ 10,800	$ 1,920	$ 1,920	$ 2,160	$ -	$ 76,960
Task 2. Technical Review	$ 23,040	$ 55,040	$ 57,600	$ 23,760	$ 16,320	$ 24,960	$ -	$ 1,920	$ 202,640
Task 3. Implementation Plan	$ 15,360	$ 19,200	$ 3,840	$ 4,320	$ 1,920	$ 1,920	$ 23,760	$ 11,520	$ 81,840
Task 4. Final Report	$ 19,200	$ 12,800	$ 5,120	$ 1,080	$ 960	$ 960	$ 8,640	$ -	$ 48,760
	$ 79,360	$ 110,080	$ 81,920	$ 39,960	$ 21,120	$ 29,760	$ 34,560	$ 13,440	$ 410,200

Schedule

A tentative schedule for the conduct of the Feasibility Study would complete the study in a 26-week period after contract award.

Task Schedule
Project Name: Turkey – Flood Forecasting & Early Warning System



ANNEX 1 – List of Abbreviations

AFETACIL-	Prime Ministry Disaster and Emergency Management Organization
AWOS -	Automated Weather Observation System units
AKOM -	Istanbul Municipality Disaster Coordination Center
ALADIN -	Limited Area Numerical Weather Prediction Model (developed in international cooperation led by Météo France)
DSI -	Turkish State Hydraulic Works
ECMWF -	European Center for Medium-Range Weather Forecasts
EUMETSAT -	European Organization for the Exploitation of Meteorological Satellites
FAO -	United Nations Food and Agriculture Organization
FFEWS -	Flood Forecasting and Early Warning System
GIS -	Geographic Information System
GTS -	Global Telecommunications System
HEC -	Hydraulic Engineering Center, U.S. Army Corps of Engineer (HEC series of weather, stream flow and flood forecasting models)
INIDO -	United Nations Industrial Development Organization
MM5 -	Penn State Mesoscale Model (for creating weather forecasts & climate projections)
MIKE-11 -	Suite of dynamic river modeling software tools developed by DHI
NWS RFS -	U.S. National Weather Service, River Forecast System
RDMS -	Relational Database Management System
TOPKAPI -	TOPographic Kinematic Approximation and Integration hydrologic model for real-time operational forecasting (developed by the University of Bologna)
TSMS -	Turkish State Meteorological Service
UNDP -	United Nations Development Program
UNEP -	United Nations Environment Program
WMO -	World Meteorological Organization
WRF -	Weather Research & Forecasting model

VII. LIST OF KEY CONTACTS

A. US GOVERNMENT CONTACTS

U.S. Embassy and Consulate General

Embassy of the United States of America
U.S. Commercial Service
110 Ataturk Bulvari
06100 Kavaklidere, Ankara, Turkey
Tel.: +90 312 457-7203
Fax: +90 312 457-7302

Serdar Cetinkaya,
Senior Commercial Specialist
Email: Serdar.Cetinkaya@mail.doc.gov

Consulate General of the United States of America
U.S. Commercial Service
Kaplicalar Mevkii No: 2
34460 Istinye, Istanbul, Turkey
Fax: +90 212 335-9103

Ebru Olcay,
Commercial Specialist
Tel.: +90 212 335-9223
Email: ebru.olcay@mail.doc.go

Perim Akguner,
Commercial Specialist
Tel.: +90 212 335-9197
Email: perim.akguner@mail.doc.gov

USTDA
Jamie Merriman,
Country Manager, Europe & Eurasia
E-mail: jmerriman@ustda.gov
U.S. Trade and Development Agency
1000 Wilson Blvd., Suite 1600
Arlington, VA 22209-3901
Tel.: (703) 875-4357
Fax: (703) 875-4009

USAID

A. Sezin Tokar, Ph.D.

Hydrometeorological Hazard Advisor
USAID Office of U.S. Foreign Disaster Assistance
1300 Pennsylvania Ave., NW
Washington, DC 20004
Tel: 202-712-4033
Fax: 202-216-3706/07
E-mail: stokar@usaid.gov

B. *TURKISH GOVERNMENT CONTACTS*

Ministry of Environment and Forestry
Turkish State Meteorological Service (TSMS)

Mehmet Caglar,
Director General
Kutukcu Ali Bey Cad. No:4
06120 Ankara, Turkey
Tel.: +90 312 361-2350 - 359 5090
Fax: +90 312 361-2351
Email: mcaglar@dmi.gov.tr

Hayrettin Bacanli,
Head of Research and Data Processing Dept.
Tel.: +90 312 302-2626
Fax: +90 312 361-2040
Email: hbacanli@dmi.gov.tr

TSMS – Flood Team

06120 Kalaba – Ankara/Turkey
Tel.: +90 312 302-2676 / 2682
Fax: +90 312 361-2040

Ilker Alan,
Geomorphologist/GIS Expert
Email: ialan@dmi.gov.tr

Ayhan Sayin,
Meteorologist
Email: asayin@dmi.gov.tr

Zerrin Demirors, Systems & Software Expert
zdemirors@dmi.gov.tr

Prime Ministry Disaster and Emergency Management Authority

Mehment Ersoy,
Director
Eskisehir yolu 9. Km
Lodumlu, Ankara, Turkey
Tel.: +90 312 220-2600-03
Fax: +90 312 220-2612
Email: mehmet.ersoy@afetacil.gov.tr

Istanbul Provincial Directorate of Disaster and Emergency

Gokay Atilla Bostan,
Provincial Director of Disaster and Emergency
Istanbul Valiligi Il ADM Blok Alaykosku Cad. Cagaloglu
Istanbul, Turkey
Tel.: +90 212 455-5667
Fax: +90 212 455-5690
Email: gokay.bostan@istanbuladm.gov.tr

Istanbul Governorship Special Provincial Administration
Istanbul Project Coordination Unit (IPCU)

M. Kemalettin Mah. Tiyatro Cad. No: 16
34126 Beyazit, Istanbul, Turkey
Tel.: +90 212 518-5500
Fax: +90 212 518-5505

Kazim Gokhan Elgin,
Director
Email: kgelgin@ipkb.gov.tr

Yalcin Kaya,
Deputy Director
Email: ykaya@ipkb.gov.tr
Hikmet Guler,
Telecommunications & IT Expert
Email: hguler@ipkb.gov.tr

Istanbul Metropolitan Municipality

Turgay Gokdemir,
Director of Disaster Coordination Center
Kemerburgaz Cad. Sular Idaresi Mevkii Nurtepe Kagithane

Istanbul, Turkey
Tel.: +90 212 444-2566
Fax: +90 212 321-1768
Email: turgay.gokdemir@ibb.gov.tr

Ministry of Public Works and Settlement
General Directorate of Disaster Affairs

Dr. Nehir Varol,
Director of European Natural Disasters Training Center
Eskisehir Yolu 10 km
Lodumlu, Ankara, Turkey
Tel.: +90 312 285-5271
Fax: +90 312 287-2680
Email: nehirvarol@bayindirlik.gov.tr

Istanbul Technical University
Disaster Management Research and Implementation Center
Ayazaga, 34469 Istanbul, Turkey
Tel.: +90 212 285-6219
Fax: +90 212 285-6335
Prof. Mikdat Kadioglu,
Director (UNDP National Consultant)
Email: kadioglu@itu.edu.tr

C. *US COMPANY CONTACTS*

ESRI Turkey

13 Cadde, No: 14
Beysukent, 06800 Ankara, Turkey
Tel.: +90 312 233-5000
Fax: +90 312 235-5682

Dr. Halil Sogut,
President
Email: hsogut@islem.com.tr

Mehmet Tankut,
Vice President
Email: mtankut@esriturkey.com.tr

Lockheed Martin Global

Jerry R. Jones,
Vice President, Corporate International Business, Turkey
Cinnah Caddesi 45/2
Cankaya, Ankara, Turkey
Tel.: +90 312 441-5647
Fax: +90 312 441-7571
Email: jerry.r.jones@lmco.com

Oracle Turkey

Uğur Mumcu Cad. No: 88 C Blok Kat:6
06700 Gaziosmanpaşa, Ankara, Turkey
Tel: +90 312 459-8900
Fax: +90 312 459-8989

Cem Satana,
Sales Manager, Government Solutions
Email: cem.satana@oracle.com

Murat Peker,
Territory Manager (TSMS account)
Email: murat.peker@oracle.com

Bluegrass GIS

David A. Riddle, President
Bluegrass GIS, Inc.
2110 Collins Highway
Pikeville, Kentucky 41501
Phone: (606) 653-3033
Mobile: (214) 793-1696
Fax: (801) 306-9839
Email: driddle@bluegrassgis.com

Riverside Technology

Riverside Technology, inc.
2950 E Harmony Road, Suite 390
Fort Collins, CO 80528
Dr. Timothy C. Martin,
Vice President and Director of Business Development
Phone: (970) 484-7573
Fax: (970) 484-7593
Email: tim.martin@riverside.com

D. Multilateral Organizations

World Bank Office - Ankara

Ugur Mumcu Caddesi No. 88, 2nd floor
06700 Gaziosmanpasa, Ankara, Turkey
Tel.: +90 312 459-8300
Fax: +90 312 446-2642

Mara Warwick,
Country Sector Coordinator, Sustainable Development
Email: mwarwick@worldbank.org

Elif Ayhan,
Disaster Management Specialist
Email: eayhan@worldbank.org

UNDP Turkey

Birlik Mahallesi, 2. Cadde, No.: 11
06610, Cankaya, Ankara, Turkey
Tel.: +90 312 454-1125
Fax: +90 312 496-1463

Katalin Zaim, Ph.D.
Program Manager, Environment & Sustainable Development
Email: katalin.zaim@undp.org

Deniz Gumusel,
Project Manager, Climate Change Action Plan
Email: deniz.gumusel@undp.org

Atila Uras,
UN Joint Program Manager, MDG-F 1680 Enhancing the Capacity of Turkey to Adapt to Climate Change
Email: atila.uras@undp.org

Alper Acar,
UN Joint Program, MDG-F 1680, Regional Project Coordinator
Email: alper.acar@undp.org

ANNEX 3

U.S. TRADE AND DEVELOPMENT AGENCY
Arlington, VA 22209-2131

NATIONALITY, SOURCE, AND ORIGIN REQUIREMENTS

The purpose of USTDA's nationality, source, and origin requirements is to assure the maximum practicable participation of American contractors, technology, equipment and materials in the prefeasibility, feasibility, and implementation stages of a project.

USTDA STANDARD RULE (GRANT AGREEMENT STANDARD LANGUAGE):

Except as USTDA may otherwise agree, each of the following provisions shall apply to the delivery of goods and services funded by USTDA under this Grant Agreement: (a) for professional services, the Contractor must be either a U.S. firm or U.S. individual; (b) the Contractor may use U.S. subcontractors without limitation, but the use of subcontractors from host country may not exceed twenty percent (20%) of the USTDA Grant amount and may only be used for specific services from the Terms of Reference identified in the subcontract; (c) employees of U.S. Contractor or U.S. subcontractor firms responsible for professional services shall be U.S. citizens or non-U.S. citizens lawfully admitted for permanent residence in the U.S.; (d) goods purchased for implementation of the Study and associated delivery services (e.g., international transportation and insurance) must have their nationality, source and origin in the United States; and (e) goods and services incidental to Study support (e.g., local lodging, food, and transportation) in host country are not subject to the above restrictions. USTDA will make available further details concerning these standards of eligibility upon request.

NATIONALITY:

1) Rule

Except as USTDA may otherwise agree, the Contractor for USTDA funded activities must be either a U.S. firm or a U.S. individual. Prime contractors may utilize U.S.

subcontractors without limitation, but the use of host country subcontractors is limited to 20% of the USTDA grant amount.

2) Application

Accordingly, only a U.S. firm or U.S. individual may submit proposals on USTDA funded activities. Although those proposals may include subcontracting arrangements with host country firms or individuals for up to 20% of the USTDA grant amount, they may not include subcontracts with third country entities. U.S. firms submitting proposals must ensure that the professional services funded by the USTDA grant, to the extent not subcontracted to host country entities, are supplied by employees of the firm or employees of U.S. subcontractor firms who are U.S. individuals.

Interested U.S. firms and consultants who submit proposals must meet USTDA nationality requirements as of the due date for the submission of proposals and, if selected, must continue to meet such requirements throughout the duration of the USTDA-financed activity. These nationality provisions apply to whatever portion of the Terms of Reference is funded with the USTDA grant.

3) Definitions

A "U.S. individual" is (a) a U.S. citizen, or (b) a non-U.S. citizen lawfully admitted for permanent residence in the U.S. (a green card holder).

A "U.S. firm" is a privately owned firm which is incorporated in the U.S., with its principal place of business in the U.S., and which is either (a) more than 50% owned by U.S. individuals, or (b) has been incorporated in the U.S. for more than three (3) years prior to the issuance date of the request for proposals; has performed similar services in the U.S. for that three (3) year period; employs U.S. citizens in more than half of its permanent full-time positions in the U.S.; and has the existing capability in the U.S. to perform the work in question.

A partnership, organized in the U.S. with its principal place of business in the U.S., may also qualify as a "U.S. firm" as would a joint venture organized or incorporated in the United States consisting entirely of U.S. firms and/or U.S. individuals.

A nonprofit organization, such as an educational institution, foundation, or association may also qualify as a "U.S. firm" if it is incorporated in the United States and managed by a governing body, a majority of whose members are U.S. individuals.

SOURCE AND ORIGIN:

1) Rule

In addition to the nationality requirement stated above, any goods (e.g., equipment and materials) and services related to their shipment (e.g., international transportation and insurance) funded under the USTDA Grant Agreement must have their source and origin in the United States, unless USTDA otherwise agrees. However, necessary purchases of goods and project support services which are unavailable from a U.S. source (e.g., local food, housing and transportation) are eligible without specific USTDA approval.

2) Application

Accordingly, the prime contractor must be able to demonstrate that all goods and services purchased in the host country to carry out the Terms of Reference for a USTDA Grant Agreement that were not of U.S. source and origin were unavailable in the United States.

3) Definitions

"Source" means the country from which shipment is made.

"Origin" means the place of production, through manufacturing, assembly or otherwise.

Questions regarding these nationality, source and origin requirements may be addressed to the USTDA Office of General Counsel.

ANNEX 4

GRANT AGREEMENT

This Grant Agreement is entered into force between the Government of the United States of America, acting through the U.S. Trade and Development Agency ("USTDA") and the Government of the Republic of Turkey, acting through the Turkish Undersecretariat of Treasury, acting through the Turkish State Meteorological Service ("Grantee"). USTDA agrees to provide the Grantee under the terms of this Agreement US$507,420. ("USTDA Grant") to fund the cost of goods and services required for a feasibility study ("Study") on the proposed Flood Forecasting and Early Warning System ("Project") in Turkey ("Host Country").

DW
JM
DC
JJ
MB
PD
NP

LZ
SW
PD

1. USTDA Funding

The funding to be provided under this Grant Agreement shall be used to fund the costs of a contract between the Grantee and the U.S. firm selected by the Grantee ("Contractor") under which the Contractor will perform the Study ("Contract"). Payment to the Contractor will be made directly by USTDA on behalf of the Grantee with the USTDA Grant funds provided under this Grant Agreement.

2. Terms of Reference

The Terms of Reference for the Study ("Terms of Reference") are attached as Annex I and are hereby made a part of this Grant Agreement. The Study will examine the technical, financial, environmental, and other critical aspects of the proposed Project. The Terms of Reference for the Study shall also be included in the Contract.

3. Standards of Conduct

USTDA and the Grantee recognize the existence of standards of conduct for public officials, and commercial entities, in their respective countries. The parties to this Grant Agreement and the Contractor shall observe these standards, which include not accepting payment of money or anything of value, directly or indirectly, from any person for the purpose of illegally or improperly inducing anyone to take any action favorable to any party in connection with the Study.

4. Grantee Responsibilities

The Grantee shall undertake its best efforts to provide reasonable support for the Contractor, such as local transportation, office space, and secretarial support.

5. **USTDA as Financier**

(A) USTDA Approval of Competitive Selection Procedures

Selection of the U.S. Contractor shall be carried out by the Grantee according to its established procedures for the competitive selection of contractors with advance notice of the procurement published online through *Federal Business Opportunities (www.fedbizopps.gov)*. Upon request, the Grantee will submit these contracting procedures and related documents to USTDA for information and/or approval.

(B) USTDA Approval of Contractor Selection

The Grantee shall notify USTDA at the address of record set forth in Article 17 below upon selection of the Contractor to perform the Study. Upon approval of this selection by USTDA, the Grantee and the Contractor shall then enter into a contract for performance of the Study. The Grantee shall notify in writing the U.S. firms that submitted unsuccessful proposals to perform the Study that they were not selected.

(C) USTDA Approval of Contract Between Grantee and Contractor

The Grantee and the Contractor shall enter into a contract for performance of the Study. This contract, and any amendments thereto, including assignments and changes in the Terms of Reference, must be approved by USTDA in writing. To expedite this approval, the Grantee (or the Contractor on the Grantee's behalf) shall transmit to USTDA, at the address set forth in Article 17 below, a photocopy of an English language version of the signed contract or a final negotiated draft version of the contract.

(D) USTDA Not a Party to the Contract

It is understood by the parties that USTDA has reserved certain rights such as, but not limited to, the right to approve the terms of the contract and any amendments thereto, including assignments, the selection of all contractors, the Terms of Reference, the Final Report, and any and all documents related to any contract funded under the Grant Agreement. The parties hereto further understand and agree that USTDA, in reserving any or all of the foregoing approval rights, has acted solely as a financing entity to assure the proper use of United States Government funds, and that any decision by USTDA to exercise or refrain from exercising these approval rights shall be made as a financier in the course of funding the Study and shall not be construed as making USTDA a party to the contract. The parties hereto understand and agree that USTDA may, from time to time, exercise the foregoing approval rights, or discuss matters related to these rights and the Project with the parties to the contract or any subcontract, jointly or separately, without thereby incurring any responsibility or liability to such parties. Any approval or failure to approve by USTDA shall not bar the Grantee or USTDA from asserting any right they might have against the

Contractor, or relieve the Contractor of any liability which the Contractor might otherwise have to the Grantee or USTDA.

(E) Grant Agreement Controlling

Regardless of USTDA approval, the rights and obligations of any party to the contract or subcontract thereunder must be consistent with this Grant Agreement. In the event of any inconsistency between the Grant Agreement and any contract or subcontract funded by the Grant Agreement, the Grant Agreement shall be controlling.

6. Disbursement Procedures

(A) USTDA Approval of Contract Required

USTDA will make disbursements of Grant funds directly to the Contractor only after USTDA approves the Grantee's contract with the Contractor.

(B) Contractor Invoice Requirements

The Grantee should request disbursement of funds by USTDA to the Contractor for performance of the Study by submitting invoices in accordance with the procedures set forth in the USTDA Mandatory Clauses in Annex II.

7. Effective Date

The effective date of this Grant Agreement ("Effective Date") shall be the date of signature by both parties or, if the parties sign on different dates, the date of the last signature.

8. Study Schedule

(A) Study Completion Date

The completion date for the Study, which is May 31, 2011, is the date by which the parties estimate that the Study will have been completed.

(B) Time Limitation on Disbursement of USTDA Grant Funds

Except as USTDA may otherwise agree, (a) no USTDA funds may be disbursed under this Grant Agreement for goods and services which are provided prior to the Effective Date of the Grant Agreement; and (b) all funds made available under the Grant Agreement must be disbursed within four (4) years from the Effective Date of the Grant Agreement.

9. USTDA Mandatory Clauses

All contracts funded under this Grant Agreement shall include the USTDA mandatory clauses set forth in Annex II to this Grant Agreement. All subcontracts funded or partially funded with USTDA Grant funds shall include the USTDA mandatory clauses, except for clauses B(1), G, H, I, and J.

10. Use of U.S. Carriers

(A) Air

Transportation by air of persons or property funded under the Grant Agreement shall be on U.S. flag carriers in accordance with the Fly America Act, 49 U.S.C. 40118, to the extent service by such carriers is available, as provided under applicable U.S. Government regulations.

(B) Marine

Transportation by sea of property funded under the Grant Agreement shall be on U.S. carriers in accordance with U.S. cargo preference law.

11. Nationality, Source and Origin

Except as USTDA may otherwise agree, the following provisions shall govern the delivery of goods and services funded by USTDA under the Grant Agreement: (a) for professional services, the Contractor must be either a U.S. firm or U.S. individual; (b) the Contractor may use U.S. subcontractors without limitation, but the use of subcontractors from Host Country may not exceed twenty percent (20%) of the USTDA Grant amount and may only be used for specific services from the Terms of Reference identified in the subcontract; (c) employees of U.S. Contractor or U.S. subcontractor firms responsible for professional services shall be U.S. citizens or non-U.S. citizens lawfully admitted for permanent residence in the U.S.; (d) goods purchased for performance of the Study and associated delivery services (e.g., international transportation and insurance) must have their nationality, source and origin in the United States; and (e) goods and services incidental to Study support (e.g., local lodging, food, and transportation) in Host Country are not subject to the above restrictions. USTDA will make available further details concerning these provisions upon request.

12. Taxes

USTDA funds provided under the Grant Agreement shall not be used to pay any taxes, tariffs, duties, fees or other levies imposed under laws in effect in Host Country. Neither the Grantee nor the Contractor will seek reimbursement from USTDA for such taxes, tariffs, duties, fees or other levies.

13. Cooperation Between Parties and Follow-Up

The parties will cooperate to assure that the purposes of the Grant Agreement are accomplished. For five (5) years following receipt by USTDA of the Final Report (as defined in Clause I of Annex II), the Grantee agrees to respond to any reasonable inquiries from USTDA about the status of the Project.

14. Implementation Letters

To assist the Grantee in the implementation of the Study, USTDA may, from time to time, issue implementation letters that will provide additional information about matters covered by the Grant Agreement. The parties may also use jointly agreed upon implementation letters to confirm and record their mutual understanding of matters covered by the Grant Agreement.

15. Recordkeeping and Audit

The Grantee agrees to maintain books, records, and other documents relating to the Study and the Grant Agreement adequate to demonstrate implementation of its responsibilities under the Grant Agreement, including the selection of contractors, receipt and approval of contract deliverables, and approval or disapproval of contractor invoices for payment by USTDA. Such books, records, and other documents shall be separately maintained for three (3) years after the date of the final disbursement by USTDA. The Grantee shall afford USTDA or its authorized representatives the opportunity at reasonable times to review books, records, and other documents relating to the Study and the Grant Agreement.

16. Representation of Parties

For all purposes relevant to the Grant Agreement, the Government of the United States of America will be represented by the U. S. Ambassador to Host Country or USTDA and Grantee will be represented by the Undersecretary of the Ministry of Environment and Forestry. The parties hereto may, by written notice, designate additional representatives for all purposes under the Grant Agreement.

17. Addresses of Record for Parties

Any notice, request, document, or other communication submitted by either party to the other under the Grant Agreement shall be in writing or through a wire or electronic medium which produces a tangible record of the transmission, such as a telegram, cable or facsimile, and will be deemed duly given or sent when delivered to such party at the following:

To: Mr. Mehmet Çağlar
Director General

Turkish State Meteorological Service
06120 Kalaba – ANKARA/TURKEY
Phone: +90 312 359 75 45
Fax: +90 312 359 34 30

To: U.S. Trade and Development Agency
1000 Wilson Boulevard, Suite 1600
Arlington, Virginia 22209-3901
USA

Phone: (703) 875-4357
Fax: (703) 875-4009

All such communications shall be in English, unless the parties otherwise agree in writing. In addition, the Grantee shall provide the Commercial Section of the U.S. Embassy in Host Country with a copy of each communication sent to USTDA.

Any communication relating to this Grant Agreement shall include the following fiscal data:

Appropriation No.:	11 10/11 1001
Activity No.:	2010-81015A
Reservation No.:	2010810017
Grant No.:	GH2010810002

18. Termination Clause

Either party may terminate the Grant Agreement by giving the other party thirty (30) days advance written notice. The termination of the Grant Agreement will end any obligations of the parties to provide financial or other resources for the Study, except for payments which they are committed to make pursuant to noncancellable commitments entered into with third parties prior to the written notice of termination.

19. Non-waiver of Rights and Remedies

No delay in exercising any right or remedy accruing to either party in connection with the Grant Agreement shall be construed as a waiver of such right or remedy.

20. U.S. Technology and Equipment

By funding this Study, USTDA seeks to promote the project objectives of the Host Country through the use of U.S. technology, goods, and services. In recognition of this purpose, the Grantee agrees that it will allow U.S. suppliers to compete in the procurement of technology, goods and services needed for Project implementation.

IN WITNESS WHEREOF, the Government of the United States of America and the Government of the Republic of Turkey, each acting through its duly authorized representative, have caused this Agreement to be signed in the English language in their names and delivered as of the day and year written below. In the event that this Grant Agreement is signed in more than one language, the English language version shall govern.

For the Government of the United States of America

By: Douglas A. Silliman,
Chargé D'Affaires,
U.S. Embassy,
Ankara, Turkey

Date: September 3, 2010

Witnessed:

By: Michael A. Lally,
Commercial Counselor,
U.S. Embassy

For the Government of the Republic of Turkey

By: Özgür Pehlivan,
Deputy Director General,
Foreign Economic Relations,
Undersecretariat of Treasury

Date: September 3, 2010

Witnessed:

By: Mehmet Çağlar,
Director General,
Turkish State Meteorological Service

Annex I -- Terms of Reference

Annex II -- USTDA Mandatory Clauses

Annex I

Terms of Reference

The Contractor shall perform the following tasks under the Flood Forecasting and Early Warning System Feasibility Study (Study):

Task 1 – Project Initiation and Initial Meeting

The Contractor shall lay the foundation of the Study by holding initial meetings to define the needs and expectations of the TSMS (the Grantee) and other stakeholders. The Contractor's Study staff shall travel to Turkey and meet with TSMS staff in Ankara to discuss the objectives, responsibilities, and schedule for the completion of deliverables. The Contractor shall conduct interviews and collect background information for the Study.

Task 1.1 - Initial Study Meeting and Work Plan

Under this task, the Contractor and the TSMS shall hold an initial Study meeting in Ankara that shall occur no more than three weeks following the approval of the Contract between the Contractor and the Grantee. The meeting shall be held at the offices of the Grantee.

Prior to the initial Study meeting, the Contractor shall prepare and distribute an agenda to ensure that the meeting accomplishes several objectives. The initial project meeting's objectives shall include, but not be limited to, the following:

- The Contractor, the Grantee, and others at the Grantee's discretion ("meeting participants"), shall discuss and reach full agreement on a detailed work plan for the Study and the project schedule, including future meetings, in-country work, and project deliverables;
- The objectives of the Study shall be reviewed; and
- The meeting participants shall determine and agree upon the extent to which the Grantee and other Turkish government staff and management will be involved in the Study, and what Turkish government resources shall be made available (for example, transportation, meeting translation, communications, office space in Ankara, and possibly other locations.).

After the initial Study meeting, the Contractor shall prepare a memorandum itemizing the major items discussed and agreed upon at the meeting. At a minimum, this shall include a list of all parties (organizations and individuals within those organizations) who will contribute to the Study, an itemized list of Turkish government and other resources that

will be provided to the Contractor, a schedule for completion of all tasks and subtasks, and detailed plans for the meetings to be held under Task 1.2.

Task 1.2 - Stakeholder Meetings and Interviews

Following the initial Study meeting, the Contractor shall conduct one-on-one meetings with the relevant departments/agencies identified during the initial Study meeting in Ankara. The Grantee shall assemble in Ankara the relevant officials from TSMS, DSI, and possibly the Prime Ministry Disaster and Emergency Management Authority (AFET ACIL) and representative regional agencies dealing with flood management (e.g. AKOM in Istanbul). In these meetings and interviews the Contractor shall:

- Review and confirm the TSMS Flood Forecasting and Early Warning System (FFEWS) project's high level goals and objectives with key Grantee staff; and
- Identify and assess past and existing work of the TSMS, DSI, and other relevant Turkish stakeholders including past and existing river basin models, flood control master plans, land use GIS databases, digital topography, past hydrology model development and other data available from high risk basin areas. This should include the World Meteorological Organization (WMO)-supported FFGS (Flash Flood Guidance System) to be implemented by TSMS, and the UNDP-funded early warning system needs survey, which is nearing completion.

Task 1 Deliverables:

The Contractor shall deliver and document the following as a result of the completion of Task 1:

Task	Deliv. No.	Deliverable
1.1	1	- Conduct initial Study meeting in Turkey (Ankara) - Detailed Study schedule and plan
1.2	2	- Stakeholder meetings, interviews (Ankara, and possibly Istanbul)

Task 2 - Technical Review

Task 2.1 – Assess Availability of Surface Data for Flood Forecasting Models

In this task the Contractor shall review the availability of land surface data, which is crucial to effective flood forecasting model development. Where appropriate, the Contractor shall recommend improvements to existing data, data gathering processes, or

possibly new data. The assessment will include, but not be limited to, the following data types:

- Topographic data and bathymetric data;
- Historical meteorological trends (rain, snow pack release, etc);
- Land use data, land cover and man-made features;
- Soils and surface permeability data;
- Storage and infiltration data;
- Drainage network data; and
- Other data as required for modeling.

The Contractor shall assess TSMS's requirements for topographic and flooding maps to more accurately determine flood risks, as well as for additional basin data to ensure successful modeling and simulation.

The Contractor shall assess the existing flood information GIS database and work with TSMS to enhance it. Working with TSMS staff, the contractor shall digitally compile core data into base layers for more in-depth analysis, and assist TSMS in developing the format for an enhanced GIS database of existing flood control and mitigation facilities.

Task 2.2 – Review Existing Data Collection Methods and Facilities

In this task the Contractor shall identify the extent and effectiveness of existing flood warning and control facilities. The Contractor shall assess the existing hydro-meteorological network of the TSMS including stream flow measurement, automatic weather stations, Doppler radars, etc.

The assessment will also cover the TSMS's existing data communications network, including the GTS currently in place, as well as the Grantees use of, and access to, satellite data.

Under Task 2.2, the Contractor's team shall travel to at least three selected high-risk basin areas to review and examine selected existing instrumentation and flood control facilities. The Contractor shall undertake the following:

- Obtain drawings and data on existing flood protection structures and facilities along major urban reaches of streams in high risk regions;
- Identify the extent and effectiveness of existing facilities and measures for flood risk mitigation and flood damage reduction; particular importance should be given to the current layout and density of hydro-meteorological stations in the basins;
- Evaluate the appropriateness of equipment, instrumentation, programs, and data base management systems; and
- Review proposed infrastructure, sensors, and databases in high risk regions.

Task 2.3 – Assessment of International Flood Forecasting Systems

The Contractor shall review the European Flood Forecasting System (EFFS) and, based on its knowledge of the Grantee's network and operations, make recommendations on how the system, or specific components of it, could be implemented in Turkey. The EFFS review will also include an assessment of how selected EU countries (e.g. Germany, France, Italy) generate numerical weather prediction models and risk maps using the system.

The Contractor shall also review the flood forecasting methods and technologies in use at the U.S. National Weather Service (NWS) and make recommendations on what aspects of the forecasting processes and systems could potentially be employed by the Grantee.

Task 2.4 – Comparative Analysis of Modeling Systems

The Contractor shall review the flood forecasting models currently being used by the Grantee (including HEC, MIKE-11, TOPKAPI, and others) as well as the meteorological models in operation (MM5, ALADIN, ECMWF) at the TSMS.

The Contractor will also review other models in use for large scale predictive applications internationally (e.g. RiverTrak, NWS RFS, ECMWF global model) and recommend to the Grantee an optimal combination of modeling systems to meet its technical and financial criteria as well as being compatible with the staffing, level of expertise, and preferences of the TSMS.

Task 2.5 – Technical Evaluation of Flood Mitigation Alternatives and Network Enhancements

In this task the Contractor shall conduct a technical evaluation of potential risk mitigation methods and network upgrades. The goals of this task are to: identify the most promising methods of flood risk forecasting and mitigation and rank the alternatives by effectiveness, public acceptance, and likely cost; and to determine the hydro-meteorological network and other hardware and software upgrades required by the Grantee to implement these methods. The Contractor shall undertake the following:

- Using the information gathered in the prior tasks, and using the GIS modeling system, develop and describe a series of flood mitigation alternatives over the studied areas.
- Develop a risk matrix of potential measures to mitigate flooding and flood damage.
- Identify facilities and network upgrade requirements in terms of equipment, instrumentation, databases, communications, hardware, and software. Recommend optimal density and layout of hydro-meteorological stations according to WMO standards.
- Determine the communication requirements to enhance the transfer of data from the basins to TSMS's central facility.

- Recommend enhancements to TSMS's central computing facility to improve its real-time flood forecasting capabilities.
- Develop a plan to implement selected flood models, to effectively enter data into them, and to maximize the value of outputs. (The focus should be on preparing the TSMS to implement real-time operational flood forecasting models.)
- Identify training and human resources needs of the Grantee in enhancing its network and processes, and in implementing its desired flood mitigation approach. Identify qualified training organizations and facilitate training sessions in Turkey or the US. (Training needs already identified by the Grantee include: GIS, hydrologic modeling, numerical analysis, and statistical modeling.) Assist the TSMS in establishing contacts with US flood forecasting centers for possible visits.
- Identify the locations and stream segments where major flooding is a threat, and mark these on appropriate maps in a GIS format.
- Estimate costs of the alternatives for the purpose of comparison and ranking.
- Rank the various network, equipment, computing, and modeling alternatives based on cost - benefit evaluations and public acceptance, and
- Recommend a general flood risk mitigation approach to the Grantee.

Task 2.6 – Preliminary Design and Specifications and Technical Report

Based on the results of Task 2.5, the Contractor shall develop a preliminary project design and specifications document that describes the recommended approach and network for the TSMS FFEWS project. In the design the Contractor shall identify any improvements in existing systems and networks that are warranted, and specify the systems for monitoring, predicting, and controlling of floods. At a minimum, the Project Design and Specifications document shall include the following elements:

- Requirements analysis and design criteria;
- Alternatives to the Project;
- Project concept;
- System architecture, including a data architecture;
- Prioritization of functions;
- Preliminary project design to the level required to develop specifications for FFEWS implementation;
- Concept of operations; and
- FFEWS specifications;
    - The Contractor shall develop an itemized list of required equipment, supplies and services needed to complete the enhanced FFEWS and operate it for five years, including all costs;
    - The Contractor shall produce a list of proposed supplies, equipment and services for Project implementation, including a list of U.S. sources of supply with company names and contact information for each item.

The Contractor shall discuss relevant institutional issues that impact upon the TSMS's effectiveness. In particular, the Contractor shall identify where communications channels, networks, and/or procedures between concerned organizations (e.g. TSMS, DSI, AFET ACIL, regional agencies, etc.) could be improved. The Contractor shall also conduct a SWOT analysis, which will assess TSMS's key strengths and weaknesses, from both a technical and intuitional perspective, and will evaluate specific opportunities (e.g. newly available technologies, funding prospects, etc.) and threats (e.g. delays in the procurement process, political changes, etc.)

The Contractor shall consolidate the findings of Task 2 including the preliminary design and specifications document in a Technical Analysis Report. The Contractor shall:

- Create a draft Technical Analysis Report for the Grantee's review;
- Revise the Technical Analysis Report based on the Grantee's comments;
- Create a final Technical Analysis Report;
- Create a summary electronic presentation of the final Technical Analysis Report; and
- Present the report to the Grantee's Study Steering Committee.

Task 2 Deliverables

Task	**Deliv. No.**	**Deliverable**
2.1	3	- Surface data availability assessment (summary document)
2.2	4	- Inspect facilities in selected regions (minimum of 3 locations) and provide a summary report - Hydro-meteorological network assessment (summary document)
2.3	5	- International flood forecasting systems assessment (summary document)
2.4	6	- Flood forecasting models assessment (summary document)
2.5	7	- Mitigation alternatives and network upgrade assessment (summary document): evaluates and ranks alternatives, recommends mitigation approach and enhanced network infrastructure to TSMS
2.6	8 9 10 11	- Preliminary project design and specifications document - Institutional and SWOT analysis (summary document) - Produce draft and final Technical Analysis Report document - Present Summary of final technical report to Grantee's Study steering committee in Ankara

Task 3 – Implementation and Investment Plan

In this task, the Contractor shall develop an Implementation and Investment Plan for the Project that will implement the selected/recommended flood forecasting, early warning and mitigation approach and network, with specific emphasis on high-risk regions (which will be identified by TSMS in Task 1, and confirmed in the Task 2.2 and 2.5 assessments). The Contractor shall meet national as well as World Bank Feasibility Study criteria.

Task 3.1 – FFEWS Schedule and Budget

The Contractor shall establish an implementation schedule and detailed budget for TSMS's planned roll-out of an enhanced national flood forecasting and early warning system (FFEWS). The Contractor shall:

- Identify implementation options and analyze issues and risks;
- Evaluate the training and human resources required by the Grantee to implement the FFEWS;
- Establish anticipated future steps required to implement the FFEWS; and
- Develop a detailed implementation schedule, budget and investment plan.

Task 3.2 - Financial and Economic Analysis

The Contractor shall conduct an appropriate economic analysis for the FFEWS project, evaluating its implementation costs and benefits. Potential direct benefits may include reduced damages and increased productivity by improving the warning system and thus avoiding catastrophic flood disruption. Indirect benefits may include reduced urban, road or railroad flooding. Where benefits cannot be quantified, they shall be qualitatively described. The Contractor shall develop a plan for financing the costs of implementation as estimated in the Study. This shall include a review of organizational structures for developing and managing flood forecasting and control work. Potential financing agencies shall be identified and Turkey's ability to secure funding from such agencies shall be reviewed. The Contractor shall:

- Review the Project's economics and compile and analyze Project's qualitative benefits. One of the key aspects of the economic analysis shall be to estimate the environmental, property and agricultural risk savings generated by implementation of the FFEWS. Operational and maintenance cost shall be factored into the economic analysis; and
- Perform a financial analysis of the project funding. Conduct a review of the proposed sources of financing for the FFEWS. Review stipulations and requirements of financing sources.

Task 3.3 - Environmental Impacts

The Contractor shall conduct an environmental impact review for the flood forecasting and early warning system project. The Contractor shall obtain existing environmental reports related to sensitive species in the subject watersheds as provided by the Grantee. Using the information from these reports, along with data gathered in prior tasks, the Contractor shall review the existing environmental conditions of the subject drainage basins, determine the environmental impacts of the selected flood mitigation approach, and identify the existing environmental conditions and potential environmental impacts of project implementation.

Based on the qualitative assessment developed above, the contractor shall produce an appropriate Environmental Impact Analysis (EIA) of the Project, meeting the standards of the prospective funding sources. This assessment shall include the following elements:

- Identify potential environmental issues of project implementation;
- Identify applicable environmental legislation and standards, guidelines, and policies and evaluate how well the Project complies;
- Describe the key environment issues associated with the Project; and
- Identify the positive and negative environmental impacts of the FFEWS implementation.

Task 3.4 – Developmental Impacts

The Contractor shall report on the potential developmental impacts of the FFEWS project in Turkey. This shall include short term benefits to mitigate risk and damage to existing residents, businesses, and real estate. It shall also include long term benefits of restricting land use in flood prone areas, and expanding flood control infrastructure. A section of the Final Report produced in Task 4 shall focus primarily on key developmental impacts, including infrastructure and security, human capacity building, technology transfer and productivity, and market oriented reform. Other Turkish development impacts (e.g., positive impact on the environment, improved financial revenue flows to Turkish government, etc.) shall be mentioned where appropriate. The Contractor should focus on what the economic development outcomes will be if the project is implemented according to the Study recommendations. While specific focus shall be paid to the immediate impact of the specific project that is being considered, the Contractor shall include, where appropriate, any additional developmental benefits to the FFEWS, including spin-off and demonstration effects. The Contractor's analysis of potential benefits shall be as concrete and detailed as possible. Specifically, the Contractor shall provide estimates of the project's potential impacts in the following areas:

- Infrastructure & Security: a statement on the infrastructure impact giving a brief synopsis. Describe the contribution that the FFEWS project will make to the national infrastructure in terms of installed instrumentation and equipment as well as built items (levees, floodwalls, sensors etc.) that could result from FFEWS

and

(b) One (1) copy of the Final Report suitable for public distribution ("Public Version"). The Public Version shall have been approved by the Client in writing and must be in the English language. As this version will be available for public distribution, it must not contain any confidential information. If the report in (a) above contains no confidential information, it may be used as the Public Version. In any event, the Public Version must be informative and contain sufficient Project detail to be useful to prospective equipment and service providers.

and

(c) Two (2) CD-ROMs, each containing a complete copy of the Public Version of the Final Report. The electronic files on the CD-ROMs shall be submitted in a commonly accessible read-only format. As these CD-ROMs will be available for public distribution, they must not contain any confidential information. It is the responsibility of the Contractor to ensure that no confidential information is contained on the CD-ROMs.

The Contractor shall also provide one (1) copy of the Public Version of the Final Report to the Foreign Commercial Service Officer or the Economic Section of the U.S. Embassy in Host Country for informational purposes.

(3) Final Report Presentation

All Final Reports submitted to USTDA must be paginated and include the following:

(a) The front cover of every Final Report shall contain the name of the Client, the name of the Contractor who prepared the report, a report title, USTDA's logo, USTDA's mailing and delivery addresses. If the complete version of the Final Report contains confidential information, the Contractor shall be responsible for labeling the front cover of that version of the Final Report with the term "Confidential Version." The Contractor shall be responsible for labeling the front cover of the Public Version of the Final Report with the term "Public Version." The front cover of every Final Report shall also contain the following disclaimer:

> "This report was funded by the U.S. Trade and Development Agency (USTDA), an agency of the U. S. Government. The opinions, findings, conclusions or recommendations expressed in this document are those of the author(s) and do not necessarily represent the official position or policies of USTDA. USTDA makes no representation about, nor does it accept responsibility for, the accuracy or completeness of the information contained in this report."

(b) The inside front cover of every Final Report shall contain USTDA's logo, USTDA's mailing and delivery addresses, and USTDA's mission statement.

Camera-ready copy of USTDA Final Report specifications will be available from USTDA upon request.

(c) The Contractor shall affix to the front of the CD-ROM a label identifying the Host Country, USTDA Activity Number, the name of the Client, the name of the Contractor who prepared the report, a report title, and the following language:

> "The Contractor certifies that this CD-ROM contains the Public Version of the Final Report and that all contents are suitable for public distribution."

(d) The Contractor and any subcontractors that perform work pursuant to the Grant Agreement must be clearly identified in the Final Report. Business name, point of contact, address, telephone and fax numbers shall be included for Contractor and each subcontractor.

(e) The Final Report, while aiming at optimum specifications and characteristics for the Project, shall identify the availability of prospective U.S. sources of supply. Business name, point of contact, address, telephone and fax numbers shall be included for each commercial source.

(f) The Final Report shall be accompanied by a letter or other notation by the Client which states that the Client approves the Final Report. A certification by the Client to this effect provided on or with the invoice for final payment will meet this requirement.

J. Modifications

All changes, modifications, assignments or amendments to this contract, including the appendices, shall be made only by written agreement by the parties hereto, subject to written USTDA approval.

K. Study Schedule

(1) Study Completion Date

The completion date for the Study, which is May 31, 2010, is the date by which the parties estimate that the Study will have been completed.

(2) Time Limitation on Disbursement of USTDA Grant Funds

Except as USTDA may otherwise agree, (a) no USTDA funds may be disbursed under this contract for goods and services which are provided prior to the Effective Date of the Grant Agreement; and (b) all funds made available under the Grant Agreement must be disbursed within four (4) years from the Effective Date of the Grant Agreement.

L. Business Practices

The Contractor agrees not to pay, promise to pay, or authorize the payment of any money or anything of value, directly or indirectly, to any person (whether a governmental official or private individual) for the purpose of illegally or improperly inducing anyone to take any action favorable to any party in connection with the Study. The Client agrees not to receive any such payment. The Contractor and the Client agree that each will require that any agent or representative hired to represent them in connection with the Study will comply with this paragraph and all laws which apply to activities and obligations of each party under this Contract, including but not limited to those laws and obligations dealing with improper payments as described above.

M. USTDA Address and Fiscal Data

Any communication with USTDA regarding this Contract shall be sent to the following address and include the fiscal data listed below:

U.S. Trade and Development Agency
1000 Wilson Boulevard, Suite 1600
Arlington, Virginia 22209-3901
USA

Phone: (703) 875-4357
Fax: (703) 875-4009

Fiscal Data:

Appropriation No.:	11 10/11 1001
Activity No.:	2010-81015A
Reservation No.:	2010810017
Grant No.:	GH2010810002

N. Definitions

All capitalized terms not otherwise defined herein shall have the meaning set forth in the Grant Agreement.

O. Taxes

USTDA funds provided under the Grant Agreement shall not be used to pay any taxes, tariffs, duties, fees or other levies imposed under laws in effect in Host Country. Neither the Client nor the Contractor will seek reimbursement from USTDA for such taxes, tariffs, duties, fees or other levies.

ANNEX 5

TERMS OF REFERENCE

The Contractor shall perform the following tasks under the Flood Forecasting and Early Warning System Feasibility Study (Study):

Task 1 – Project Initiation and Initial Meeting

The Contractor shall lay the foundation of the Study by holding initial meetings to define the needs and expectations of the TSMS (the Grantee) and other stakeholders. The Contractor's Study staff shall travel to Turkey and meet with TSMS staff in Ankara to discuss the objectives, responsibilities, and schedule for the completion of deliverables. The Contractor shall conduct interviews and collect background information for the Study.

Task 1.1 - Initial Study Meeting and Work Plan

Under this task, the Contractor and the TSMS shall hold an initial Study meeting in Ankara that shall occur no more than three weeks following the approval of the Contract between the Contractor and the Grantee. The meeting shall be held at the offices of the Grantee.

Prior to the initial Study meeting, the Contractor shall prepare and distribute an agenda to ensure that the meeting accomplishes several objectives. The initial project meeting's objectives shall include, but not be limited to, the following:

- The Contractor, the Grantee, and others at the Grantee's discretion ("meeting participants"), shall discuss and reach full agreement on a detailed work plan for the Study and the project schedule, including future meetings, in-country work, and project deliverables;
- The objectives of the Study shall be reviewed; and
- The meeting participants shall determine and agree upon the extent to which the Grantee and other Turkish government staff and management will be involved in the Study, and what Turkish government resources shall be made available (for example, transportation, meeting translation, communications, office space in Ankara, and possibly other locations.).

After the initial Study meeting, the Contractor shall prepare a memorandum itemizing the major items discussed and agreed upon at the meeting. At a minimum, this shall include a list of all parties (organizations and individuals within those organizations) who will contribute to the Study, an itemized list of Turkish government and other resources that will be provided to the Contractor, a schedule for completion of all tasks and subtasks, and detailed plans for the meetings to be held under Task 1.2.

Task 1.2 - Stakeholder Meetings and Interviews

Following the initial Study meeting, the Contractor shall conduct one-on-one meetings with the relevant departments/agencies identified during the initial Study meeting in Ankara. The Grantee shall assemble in Ankara the relevant officials from TSMS, DSI, and possibly the Prime Ministry Disaster and Emergency Management Authority (AFET ACIL) and representative regional agencies dealing with flood management (e.g. AKOM in Istanbul). In these meetings and interviews the Contractor shall:

- Review and confirm the TSMS Flood Forecasting and Early Warning System (FFEWS) project's high level goals and objectives with key Grantee staff; and
- Identify and assess past and existing work of the TSMS, DSI, and other relevant Turkish stakeholders including past and existing river basin models, flood control master plans, land use GIS databases, digital topography, past hydrology model development and other data available from high risk basin areas. This should include the World Meteorological Organization (WMO)-supported FFGS (Flash Flood Guidance System) to be implemented by TSMS, and the UNDP-funded early warning system needs survey, which is nearing completion.

Task 1 Deliverables:

The Contractor shall deliver and document the following as a result of the completion of Task 1:

Task	Deliv. No.	Deliverable
1.1	1	- Conduct initial Study meeting in Turkey (Ankara) - Detailed Study schedule and plan
1.2	2	- Stakeholder meetings, interviews (Ankara, and possibly Istanbul)

Task 2 - Technical Review

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In this task the Contractor shall review the availability of land surface data, which is crucial to effective flood forecasting model development. Where appropriate, the Contractor shall recommend improvements to existing data, data gathering processes, or possibly new data. The assessment will include, but not be limited to, the following data types:

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- Historical meteorological trends (rain, snow pack release, etc);
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- Storage and infiltration data;
- Drainage network data; and

- Other data as required for modeling.

The Contractor shall assess TSMS's requirements for topographic and flooding maps to more accurately determine flood risks, as well as for additional basin data to ensure successful modeling and simulation.

The Contractor shall assess the existing flood information GIS database and work with TSMS to enhance it. Working with TSMS staff, the contractor shall digitally compile core data into base layers for more in-depth analysis, and assist TSMS in developing the format for an enhanced GIS database of existing flood control and mitigation facilities.

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In this task the Contractor shall identify the extent and effectiveness of existing flood warning and control facilities. The Contractor shall assess the existing hydro-meteorological network of the TSMS including stream flow measurement, automatic weather stations, Doppler radars, etc.

The assessment will also cover the TSMS's existing data communications network, including the GTS currently in place, as well as the Grantees use of, and access to, satellite data.

Under Task 2.2, the Contractor's team shall travel to at least three selected high-risk basin areas to review and examine selected existing instrumentation and flood control facilities. The Contractor shall undertake the following:

- Obtain drawings and data on existing flood protection structures and facilities along major urban reaches of streams in high risk regions;
- Identify the extent and effectiveness of existing facilities and measures for flood risk mitigation and flood damage reduction; particular importance should be given to the current layout and density of hydro-meteorological stations in the basins;
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The Contractor shall also review the flood forecasting methods and technologies in use at the U.S. National Weather Service (NWS) and make recommendations on what aspects of the forecasting processes and systems could potentially be employed by the Grantee.

Task 2.4 – Comparative Analysis of Modeling Systems

The Contractor shall review the flood forecasting models currently being used by the Grantee (including HEC, MIKE-11, TOPKAPI, and others) as well as the meteorological models in operation (MM5, ALADIN, ECMWF) at the TSMS.

The Contractor will also review other models in use for large scale predictive applications internationally (e.g. RiverTrak, NWS RFS, ECMWF global model) and recommend to the Grantee an optimal combination of modeling systems to meet its technical and financial criteria as well as being compatible with the staffing, level of expertise, and preferences of the TSMS.

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In this task the Contractor shall conduct a technical evaluation of potential risk mitigation methods and network upgrades. The goals of this task are to: identify the most promising methods of flood risk forecasting and mitigation and rank the alternatives by effectiveness, public acceptance, and likely cost; and to determine the hydro-meteorological network and other hardware and software upgrades required by the Grantee to implement these methods. The Contractor shall undertake the following:

- Using the information gathered in the prior tasks, and using the GIS modeling system, develop and describe a series of flood mitigation alternatives over the studied areas.
- Develop a risk matrix of potential measures to mitigate flooding and flood damage.
- Identify facilities and network upgrade requirements in terms of equipment, instrumentation, databases, communications, hardware, and software. Recommend optimal density and layout of hydro-meteorological stations according to WMO standards.
- Determine the communication requirements to enhance the transfer of data from the basins to TSMS's central facility.
- Recommend enhancements to TSMS's central computing facility to improve its real-time flood forecasting capabilities.
- Develop a plan to implement selected flood models, to effectively enter data into them, and to maximize the value of outputs. (The focus should be on preparing the TSMS to implement real-time operational flood forecasting models.)
- Identify training and human resources needs of the Grantee in enhancing its network and processes, and in implementing its desired flood mitigation approach. Identify qualified training organizations and facilitate training sessions in Turkey or the US. (Training needs already identified by the Grantee include: GIS, hydrologic modeling, numerical analysis, and statistical modeling.) Assist the TSMS in establishing contacts with US flood forecasting centers for possible visits.
- Identify the locations and stream segments where major flooding is a threat, and mark these on appropriate maps in a GIS format.
- Estimate costs of the alternatives for the purpose of comparison and ranking.
- Rank the various network, equipment, computing, and modeling alternatives based on cost - benefit evaluations and public acceptance, and

- Recommend a general flood risk mitigation approach to the Grantee.

Task 2.6 – Preliminary Design and Specifications and Technical Report

Based on the results of Task 2.5, the Contractor shall develop a preliminary project design and specifications document that describes the recommended approach and network for the TSMS FFEWS project. In the design the Contractor shall identify any improvements in existing systems and networks that are warranted, and specify the systems for monitoring, predicting, and controlling of floods. At a minimum, the Project Design and Specifications document shall include the following elements:

- Requirements analysis and design criteria;
- Alternatives to the Project;
- Project concept;
- System architecture, including a data architecture;
- Prioritization of functions;
- Preliminary project design to the level required to develop specifications for FFEWS implementation;
- Concept of operations; and
- FFEWS specifications;
    - The Contractor shall develop an itemized list of required equipment, supplies and services needed to complete the enhanced FFEWS and operate it for five years, including all costs;
    - The Contractor shall produce a list of proposed supplies, equipment and services for Project implementation, including a list of U.S. sources of supply with company names and contact information for each item.

The Contractor shall discuss relevant institutional issues that impact upon the TSMS's effectiveness. In particular, the Contractor shall identify where communications channels, networks, and/or procedures between concerned organizations (e.g. TSMS, DSI, AFET ACIL, regional agencies, etc.) could be improved. The Contractor shall also conduct a SWOT analysis, which will assess TSMS's key strengths and weaknesses, from both a technical and intuitional perspective, and will evaluate specific opportunities (e.g. newly available technologies, funding prospects, etc.) and threats (e.g. delays in the procurement process, political changes, etc.)

The Contractor shall consolidate the findings of Task 2 including the preliminary design and specifications document in a Technical Analysis Report. The Contractor shall:

- Create a draft Technical Analysis Report for the Grantee's review;
- Revise the Technical Analysis Report based on the Grantee's comments;
- Create a final Technical Analysis Report;
- Create a summary electronic presentation of the final Technical Analysis Report; and
- Present the report to the Grantee's Study Steering Committee.

Task 2 Deliverables

Task	Deliv. No.	Deliverable
2.1	3	- Surface data availability assessment (summary document)
2.2	4	- Inspect facilities in selected regions (minimum of 3 locations) and provide a summary report - Hydro-meteorological network assessment (summary document)
2.3	5	- International flood forecasting systems assessment (summary document)
2.4	6	- Flood forecasting models assessment (summary document)
2.5	7	- Mitigation alternatives and network upgrade assessment (summary document): evaluates and ranks alternatives, recommends mitigation approach and enhanced network infrastructure to TSMS
2.6	8 9 10 11	- Preliminary project design and specifications document - Institutional and SWOT analysis (summary document) - Produce draft and final Technical Analysis Report document - Present Summary of final technical report to Grantee's Study steering committee in Ankara

Task 3 – Implementation and Investment Plan

In this task, the Contractor shall develop an Implementation and Investment Plan for the Project that will implement the selected/recommended flood forecasting, early warning and mitigation approach and network, with specific emphasis on high-risk regions (which will be identified by TSMS in Task 1, and confirmed in the Task 2.2 and 2.5 assessments). The Contractor shall meet national as well as World Bank Feasibility Study criteria.

Task 3.1 – FFEWS Schedule and Budget

The Contractor shall establish an implementation schedule and detailed budget for TSMS's planned roll-out of an enhanced national flood forecasting and early warning system (FFEWS). The Contractor shall:

- Identify implementation options and analyze issues and risks;
- Evaluate the training and human resources required by the Grantee to implement the FFEWS;
- Establish anticipated future steps required to implement the FFEWS; and
- Develop a detailed implementation schedule, budget and investment plan.

Task 3.2 - Financial and Economic Analysis

The Contractor shall conduct an appropriate economic analysis for the FFEWS project, evaluating its implementation costs and benefits. Potential direct benefits may include

reduced damages and increased productivity by improving the warning system and thus avoiding catastrophic flood disruption. Indirect benefits may include reduced urban, road or railroad flooding. Where benefits cannot be quantified, they shall be qualitatively described. The Contractor shall develop a plan for financing the costs of implementation as estimated in the Study. This shall include a review of organizational structures for developing and managing flood forecasting and control work. Potential financing agencies shall be identified and Turkey's ability to secure funding from such agencies shall be reviewed. The Contractor shall:

- Review the Project's economics and compile and analyze Project's qualitative benefits. One of the key aspects of the economic analysis shall be to estimate the environmental, property and agricultural risk savings generated by implementation of the FFEWS. Operational and maintenance cost shall be factored into the economic analysis; and
- Perform a financial analysis of the project funding. Conduct a review of the proposed sources of financing for the FFEWS. Review stipulations and requirements of financing sources.

Task 3.3 - Environmental Impacts

The Contractor shall conduct an environmental impact review for the flood forecasting and early warning system project. The Contractor shall obtain existing environmental reports related to sensitive species in the subject watersheds as provided by the Grantee. Using the information from these reports, along with data gathered in prior tasks, the Contractor shall review the existing environmental conditions of the subject drainage basins, determine the environmental impacts of the selected flood mitigation approach, and identify the existing environmental conditions and potential environmental impacts of project implementation.

Based on the qualitative assessment developed above, the contractor shall produce an appropriate Environmental Impact Analysis (EIA) of the Project, meeting the standards of the prospective funding sources. This assessment shall include the following elements:

- Identify potential environmental issues of project implementation;
- Identify applicable environmental legislation and standards, guidelines, and policies and evaluate how well the Project complies;
- Describe the key environment issues associated with the Project; and
- Identify the positive and negative environmental impacts of the FFEWS implementation.

Task 3.4 – Developmental Impacts

The Contractor shall report on the potential developmental impacts of the FFEWS project in Turkey. This shall include short term benefits to mitigate risk and damage to existing residents, businesses, and real estate. It shall also include long term benefits of restricting land use in flood prone areas, and expanding flood control infrastructure. A section of the Final Report produced in Task 4 shall focus primarily on key developmental impacts,

including infrastructure and security, human capacity building, technology transfer and productivity, and market oriented reform. Other Turkish development impacts (e.g., positive impact on the environment, improved financial revenue flows to Turkish government, etc.) shall be mentioned where appropriate. The Contractor should focus on what the economic development outcomes will be if the project is implemented according to the Study recommendations. While specific focus shall be paid to the immediate impact of the specific project that is being considered, the Contractor shall include, where appropriate, any additional developmental benefits to the FFEWS, including spin-off and demonstration effects. The Contractor's analysis of potential benefits shall be as concrete and detailed as possible. Specifically, the Contractor shall provide estimates of the project's potential impacts in the following areas:

- Infrastructure & Security: a statement on the infrastructure impact giving a brief synopsis. Describe the contribution that the FFEWS project will make to the national infrastructure in terms of installed instrumentation and equipment as well as built items (levees, floodwalls, sensors etc.) that could result from FFEWS implementation. Indirect benefits (e.g. protection of other infrastructure such as highways, water and wastewater facilities, power plants, etc) should also be discussed;
- Market Oriented Reform: a description of any regulation, laws, or institutional changes that are recommended and the effect they would have if passed;
- Human Capacity Building: The Contractor shall address the number and type of positions that would be needed to run the enhanced FFEWS, as well as the number of people who will receive training and a brief description of the training programs. Assess the training and employment as a result of the FFEWS project, including construction, operation, and management of the hydro-meteorological network and facilities;
- Technology Transfer and Productivity Enhancement: a description of any advanced technologies that will be implemented as a result of the project. Provide descriptions of any efficiencies that will be gained and describe any advanced technologies, such as sensors and communication equipment, that will be brought into use in Turkey as a result of implementing the FFEWS project; and
- Other: any other developmental benefits to the project, including any spin-off or demonstration effects. This shall include an evaluation of the impacts of the project on the region. Describe any other developmental impacts or benefits that will result from implementation of the FFEWS Project in Turkey. Items to note include reduced damage to homes and businesses, reduced threat to life and health, reduced business disruption, and enhanced flood management cooperation with EU countries as well as with its neighbors.

Task 3.5 - Implementation and Investment Plan Document

In this task the Contractor shall create a Project Implementation and Investment Plan document for the FFEWS project. The Plan shall include the products of the previous tasks, including a detailed project schedule and budget, the economic and financial analysis, the environmental impacts, and the developmental impacts.

The deliverable for this task shall be an Implementation and Investment Plan including a detailed FFEWS implantation schedule broken down by tasks and subtasks, with estimated costs, a schedule of expenditures, and an overall project budget. The plan shall also include a final list of required instrumentation, equipment, hardware and software for the network upgrade, a list of services required, and a list of potential U.S. sources of supply for products and services. The plan shall include separate sections for the economic analysis of the project, the financial analysis of the project, the environmental analysis of the project. A section shall be devoted to the projected host country Developmental Impact of the Study recommendations if they are implemented. The Contractor shall present a draft Project Implementation and Investment Plan for the FFEWS project to the Grantee, and revise the plan based on the Grantee's comments. An electronic summary presentation shall accompany the final plan.

Task 3 Deliverables:

Task	Deliv. No.	Deliverable
3.5	12	Draft and final project implementation and investment plan

Task 4 – Final Report

The Contractor shall prepare and deliver to the Grantee and USTDA a substantive and comprehensive Final Report of all work performed under these Terms of Reference ("Final Report"). The Final Report shall be organized according to the above tasks, and shall include all deliverables and documents that have been provided to the Grantee. The Final Report shall be prepared in accordance with Clause I of Annex II of the Grant Agreement. The Final Report shall be presented to Grantee's Steering Committee and its invitees. The Contractor shall also prepare an Executive Summary of the Study that will be included as an introduction in the Final Report.

Task 4.1 - Formal Presentation and Discussions

The Contractor shall facilitate a formal presentation and executive discussion forum at appropriate facilities in Ankara where the Contractor shall deliver to the Grantee and its invitees a final oral presentation of the key findings and conclusions of the Flood Forecasting and Early Warning System Feasibility Study.

Task 4.2 - Final Report

The Final Report shall incorporate feedback and suggestions from the presentation and discussion forum, and shall include firm recommendations on strategic investments the Grantee, and possibly other Turkish organizations, will need to make in order to set the stage for any further outside investments. The Contractor shall develop the Final Report in the following manner:

- Contractor shall submit to the Grantee a Draft Final Report including final conclusions;
- Contractor shall revise the Final Report based on Grantee's comments; and
- Contractor shall produce a Final Report. The Final Report shall be delivered in English to the Grantee. Contractor shall provide the Final Report to USTDA and the U.S. Embassy in Turkey pursuant to Clause I of Annex II.

Task 4 Deliverables

Task	Deliv. No.	Deliverable
4.1	13	Formal presentation and executive discussion forum
4.2	14	Draft and revised final report document

Notes:

(1) The Contractor is responsible for compliance with U.S. export licensing requirements, if applicable, in the performance of the Terms of Reference.

(2) The Contractor and the Grantee shall be careful to ensure that the public version of the Final Report contains no security or confidential information.

(3) The Grantee and USTDA shall have an irrevocable, worldwide, royalty-free, non-exclusive right to use and distribute the Final Report and all work product that is developed under these Terms of Reference.

ANNEX 6

COMPANY INFORMATION

A. Company Profile

Provide the information listed below relative to the Offeror's firm. If the Offeror is proposing to subcontract some of the proposed work to another firm(s), the information below must be provided for each subcontractor.

1. Name of firm and business address (street address only), including telephone and fax numbers:

2. Year established (include predecessor companies and year(s) established, if appropriate).

3. Type of ownership (e.g. public, private or closely held).

4. If private or closely held company, provide list of shareholders and the percentage of their ownership.

5. List of directors and principal officers (President, Chief Executive Officer, Vice-President(s), Secretary and Treasurer; provide full names including first, middle and last). Please place an asterisk (*) next to the names of those principal officers who will be involved in the Feasibility Study.

6. If Offeror is a subsidiary, indicate if Offeror is a wholly-owned or partially-owned subsidiary. Provide the information requested in items 1 through 5 above for the Offeror's parent(s).

7. Project Manager's name, address, telephone number, e-mail address and fax number .

B. Offeror's Authorized Negotiator

Provide name, title, address, telephone number, e-mail address and fax number of the Offeror's authorized negotiator. The person cited shall be empowered to make binding commitments for the Offeror and its subcontractors, if any.

C. Negotiation Prerequisites

1. Discuss any current or anticipated commitments which may impact the ability of the Offeror or its subcontractors to complete the Feasibility Study as proposed and reflect such impact within the project schedule.

2. Identify any specific information which is needed from the Grantee before commencing contract negotiations.

D. Offeror's Representations

Please provide exceptions and/or explanations in the event that any of the following representations cannot be made:

1. Offeror is a corporation *[insert applicable type of entity if not a corporation]* duly organized, validly existing and in good standing under the laws of the State of _____. The Offeror has all the requisite corporate power and authority to conduct its business as presently conducted, to submit this proposal, and if selected, to execute and deliver a contract to the Grantee for the performance of the Feasibility Study. The Offeror is not debarred, suspended, or to the best of its knowledge or belief, proposed for debarment, or ineligible for the award of contracts by any federal or state governmental agency or authority. The Offeror has included, with this proposal, a certified copy of its Articles of Incorporation, and a certificate of good standing issued within one month of the date of its proposal by the State of _____.

2. Neither the Offeror nor any of its principal officers have, within the three-year period preceding this RFP, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a federal, state or local government contract or subcontract; violation of federal or state antitrust statutes relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or

destruction of records, making false statements, tax evasion, violating federal or state criminal tax laws, or receiving stolen property.

3. Neither the Offeror, nor any of its principal officers, is presently indicted for, or otherwise criminally or civilly charged with, commission of any of the offenses enumerated in paragraph 2 above.

4. There are no federal or state tax liens pending against the assets, property or business of the Offeror. The Offeror, has not, within the three-year period preceding this RFP, been notified of any delinquent federal or state taxes in an amount that exceeds $3,000 for which the liability remains unsatisfied. Taxes are considered delinquent if (a) the tax liability has been fully determined, with no pending administrative or judicial appeals; and (b) a taxpayer has failed to pay the tax liability when full payment is due and required.

5. The Offeror has not commenced a voluntary case or other proceeding seeking liquidation, reorganization or other relief with respect to itself or its debts under any bankruptcy, insolvency or other similar law. The Offeror has not had filed against it an involuntary petition under any bankruptcy, insolvency or similar law.

The selected Offeror shall notify the Grantee and USTDA if any of the representations included in its proposal are no longer true and correct at the time of its entry into a contract with the Grantee. USTDA retains the right to request an updated certificate of good standing from the selected Offeror.

Signed: _____
(Authorized Representative)

Print Name: _____

Title: _____

Date: _____