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# Current Status of Flood Hazard Analysis in Turkey

İTÜ

Istanbul Technical University
Department of Civil Engineering
Division of Hydraulics **(ITU)**

In collaboration with
Bogazici University
Kandilli Observatory and Earthquake Research Institute **(KOERI)**

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| Hazard Type | What is lacking | Reasons/Drawbacks | SciNetNatHaz |
|---|---|---|---|
| **Floods** | **Cross Border cooperation.** | **Lack of Political will, lack of public awareness.** | **Raising public awareness, provide assistance to Decision Makers** |
| | Systematic **Flash Flood Hazard** assessment on a local scale in order to design preventive measures. | Multitude of methodologies, lack of reliable, accurate and harmonized data. | Harmonization of Methodologies, freely accessible GIS platform with PRODUCED by the Project Data & Results, Metadata according to INSPIRE provisions. |

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| | | |
|---|---|---|
| **Activity 8:** | Evaluation of existing flood hazard assessment models in terms of scientific soundness, data demands and result credibility.<br><br>Flood hazard assessment models used in different partners countries, will be tested / confronted to flood events recorded. Their effectiveness will be evaluated according to successful assessment of floods in close relation with the nature of data needed to be used as input, or with the difficulty/cost to obtain them | *LP will be responsible for synthesis of all partners deliverables and evaluation of the most successful and efficient models*<br>*IPA: evaluation of models used in Turkey, with local data*<br>*P3: evaluation of models used in Bulgaria, with local data*<br>*P4: evaluation of models used in Romania, with local data*<br>*P5: evaluation of models used in Moldova, with local data*<br>*P6: evaluation of models used in Ukraine, with local data* |
| Activity12: | Development/modification/adaptation of existing flood models that will be used to assess flood hazard, based on local conditions and needs of the proposal. Flood hazard will be examined at a regional scale on the areas proposed for implementation. | *LP will be responsible for the assessment of flood hazard models to be used in a regional scale. Partners IPA beneficiary, P3, P4, P5 and P6 will work in parallel with the LP, in order to define models' sensitivity regarding input data, and they will provide relevant data, if needed.* |

# FLOOD HAZARD ASSESSMENT METHODS

Statistical/Conceptual Tools

- Flood freqency analyses
- Historical flood maps

Basin Based Models (SWAT, WEAP, …)

- Hydrologic Models (HEC-HMS, …)
- Basin Management Models (MIKE-BASIN, …)

River Flow Network Based Models (MIKE11, HEC-RAS, …)

- 1D Models
- Quasi 2D Models (1D + inundation)

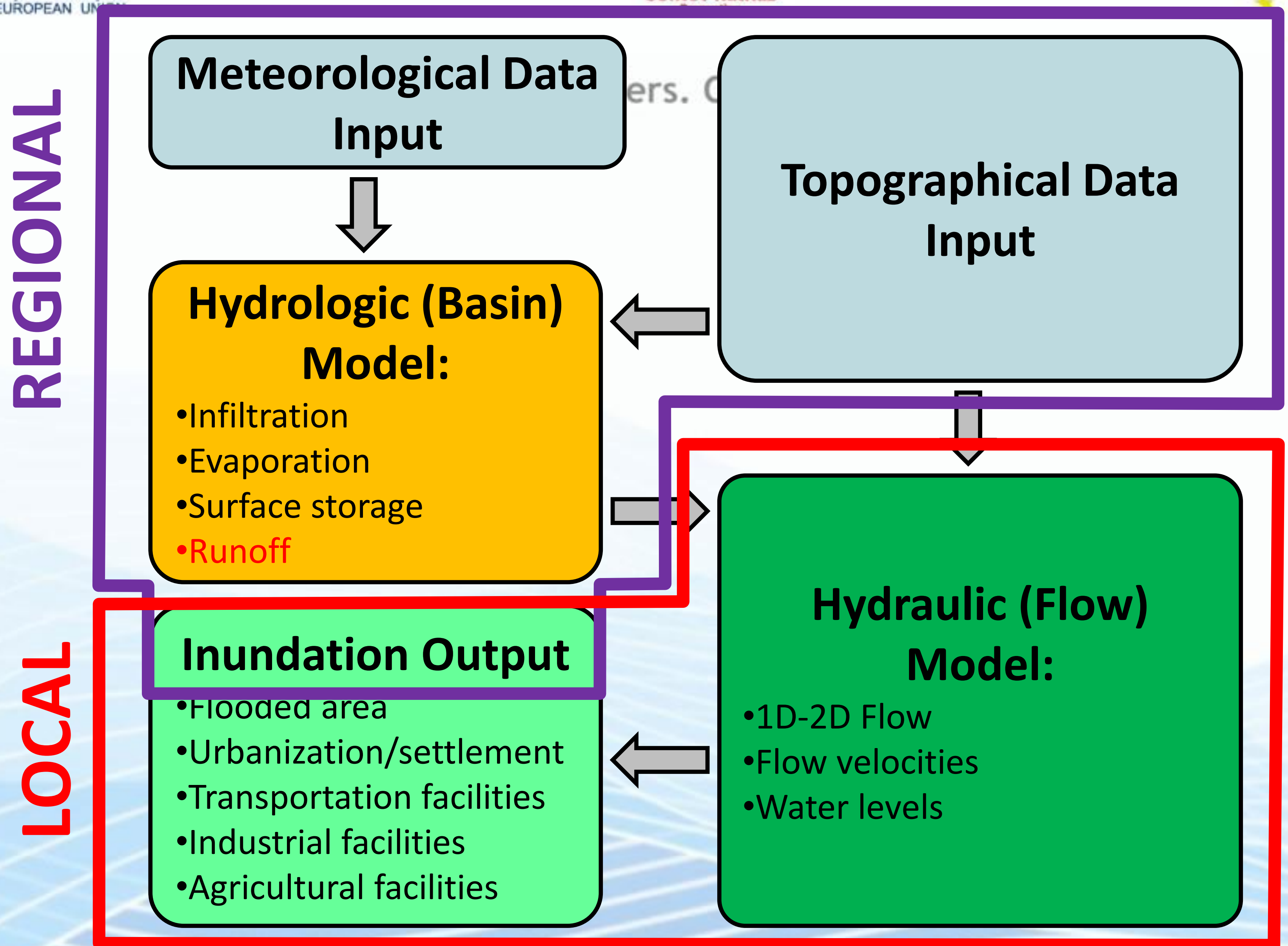
Spatial Flow Models (TUFLOW, RMA-4, SMS, MIKE21, POM, Aquadyn, …)

- 2D Models

Other Models (3D models such as Telemac, Delft 3, MIKE 3D, …)

# Regional Scale Model (preliminary screening)

- Must be morphology based
- Must be generic
- Must demand affordable data
- Must be easy to implement
- Must be GIS based (e.g. *Stream Power, TWI,…*)


REGIONAL
LOCAL
Meteorological Data Input
Topographical Data Input
Hydrologic (Basin) Model:
•Infiltration
•Evaporation
•Surface storage
•Runoff
Hydraulic (Flow) Model:
•1D-2D Flow
•Flow velocities
•Water levels
Inundation Output
•Flooded area
•Urbanization/settlement
•Transportation facilities
•Industrial facilities
•Agricultural facilities

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# FLOOD HAZARD ASSESSMENT PRACTICES IN TURKEY

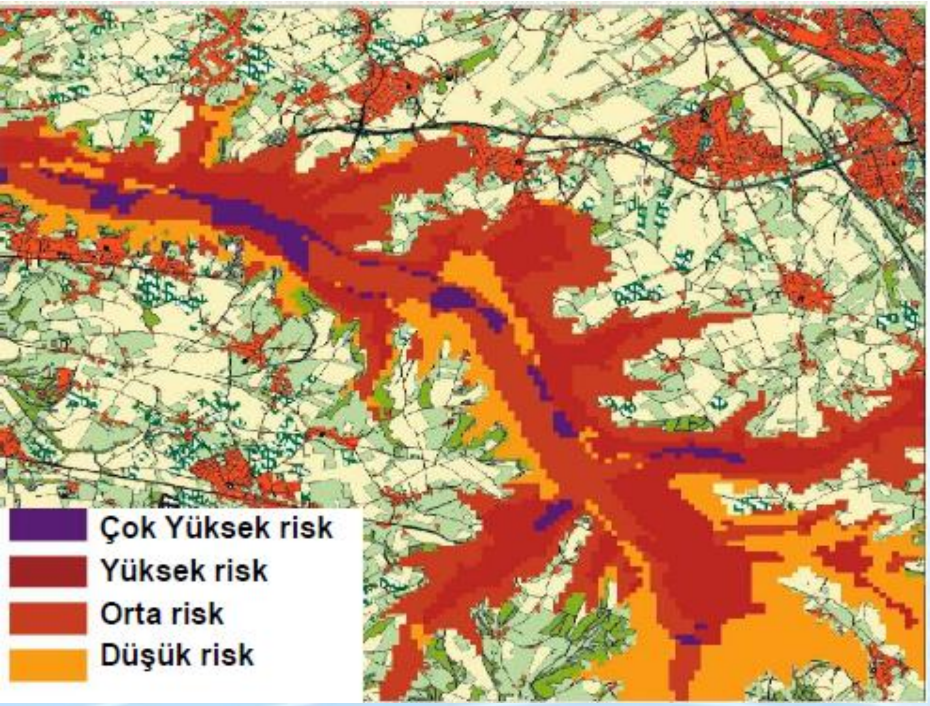
# * FLOOD STRATEGY ACTION PLAN OF STATE HYDRAULIC WORKS (DSİ)

250 of 1478 river flow measurement stations are able to make real time data connection (using modem)

GIS based inventory of flood events is available (for floods since 1955)

## FLOOD STRATEGY ACTION PLAN OF STATE HYDRAULIC WORKS

PREPARING FLOOD HAZARD MAPS




1.Hydrological Modelling

2. Obtaining maps

3. Hydraulic Modelling

The revised 'hazard rating' expression based, primarily, on consideration to the direct risks of people exposed to floodwaters is:

$$HR = d \times V + DF \qquad (\text{for } Q_{2.5} \text{ and } Q_{10})$$

$$HR = d \times (V+0.5) + DF \qquad (\text{for } Q_{25}, Q_{50}, Q_{100}, Q_{500})$$

where,
HR = (flood) hazard rating;
d = depth of flooding (m);
v = velocity of floodwaters (m/sec); and
DF = debris factor (= 0, 0.5, 1 depending on probability that debris will lead to a significantly greater hazard)

| d x (v + 0.5) | Degree of Flood Hazard | Description |
|---|---|---|
| <0.75 | Low | Caution *"Flood zone with shallow flowing water or deep standing water"* |
| 0.75 - 1.25 | Moderate | Dangerous for some (i.e. children) *"Danger: Flood zone with deep or fast flowing water"* |
| 1.25 - 2.5 | Significant | Dangerous for most people *"Danger: flood zone with deep fast flowing water"* |
| >2.5 | Extreme | Dangerous for all *"Extreme danger: flood zone with deep fast flowing water"* |

Defra /Environment Agency, Flood and Coastal Defence R&D Programme

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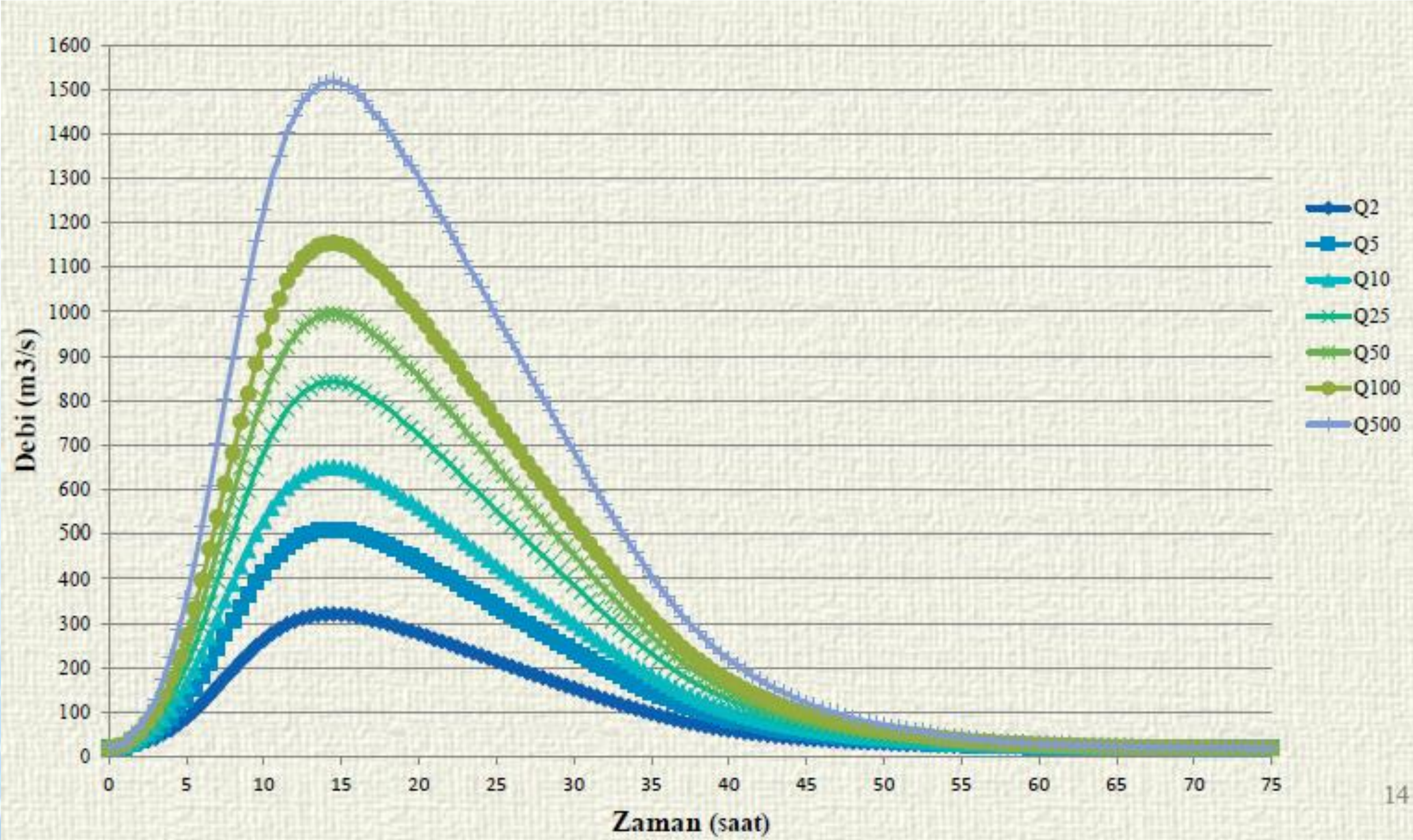
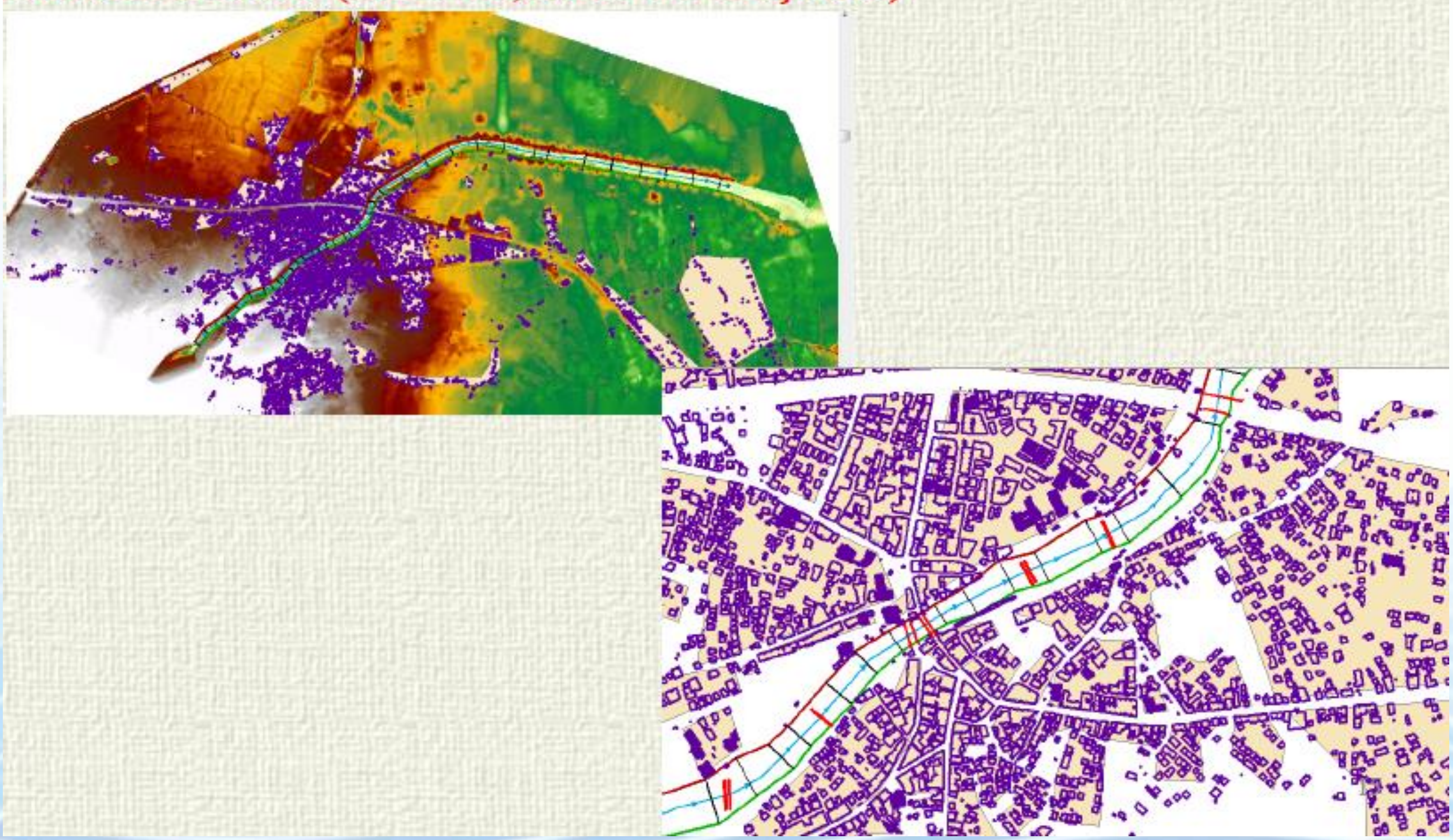
# 1. HYDROLOGIC MODELLING

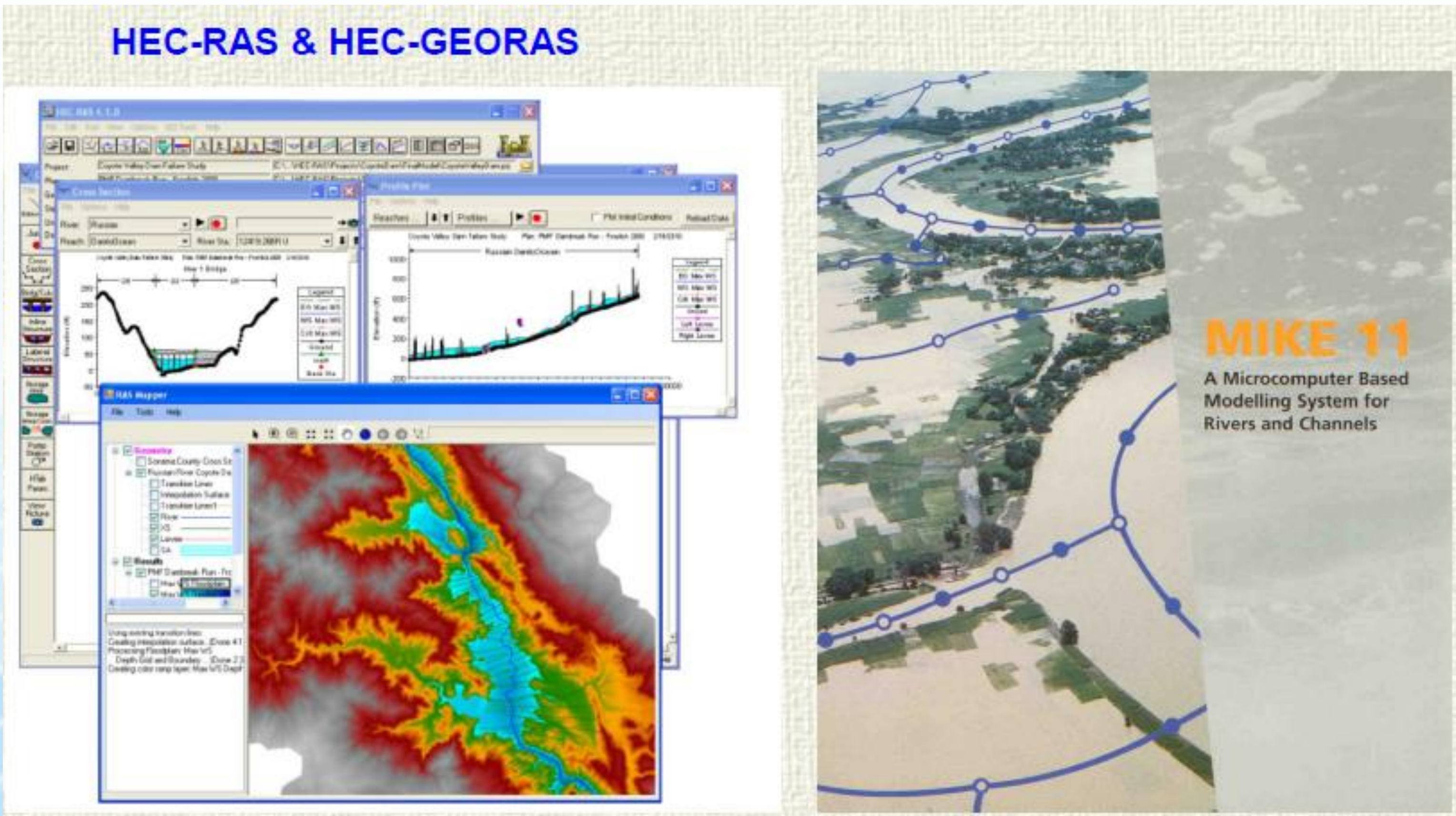


2.MAPS

## Harita Alımı (1/5000, 1/1000 Ölçekli)



# 3. HYDRAULIC MODELLING (1D)



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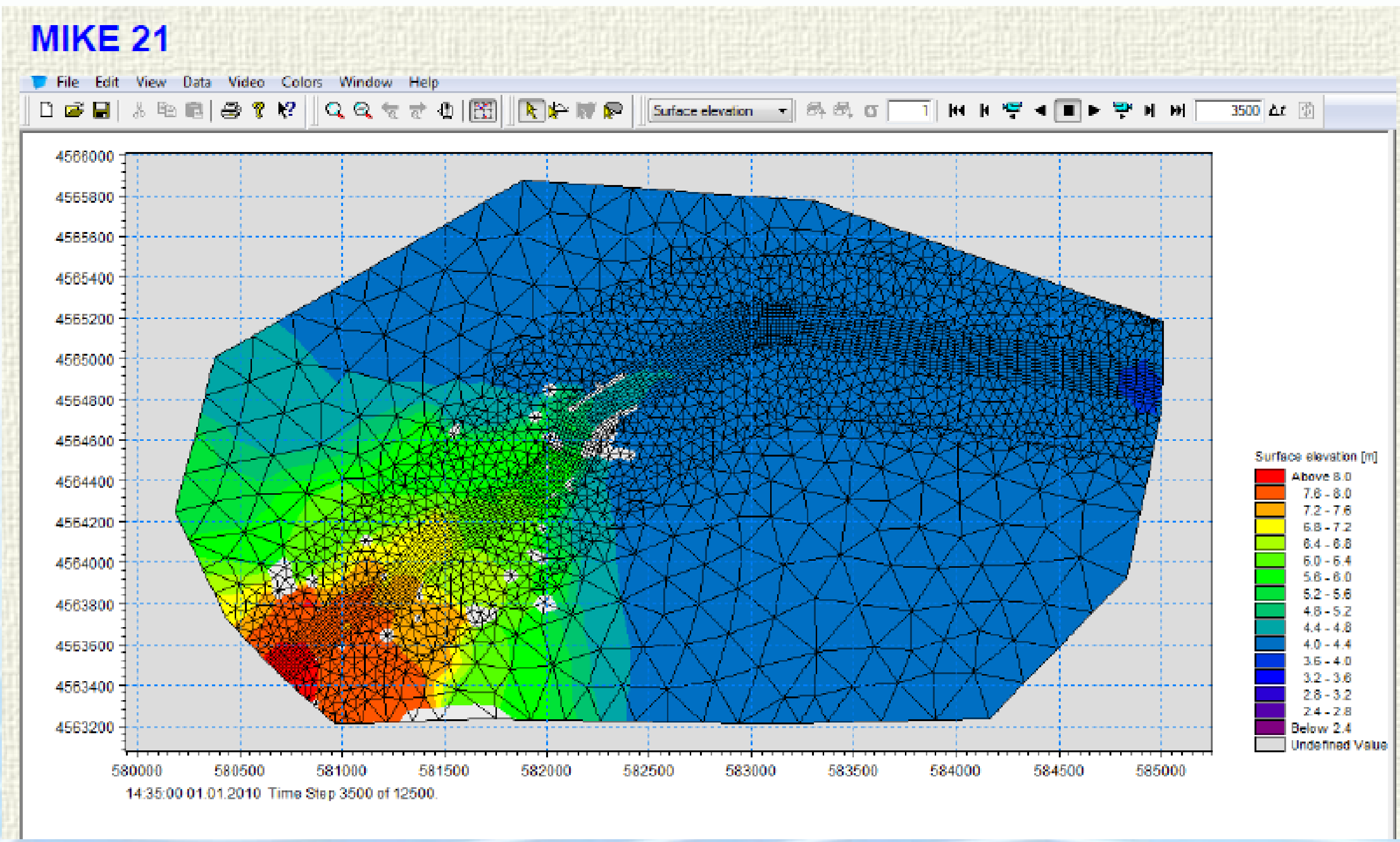
# HYDRAULIC MODELLING (2D)



# HYDRAULIC MODELLING (1D + 2D COMBINED)

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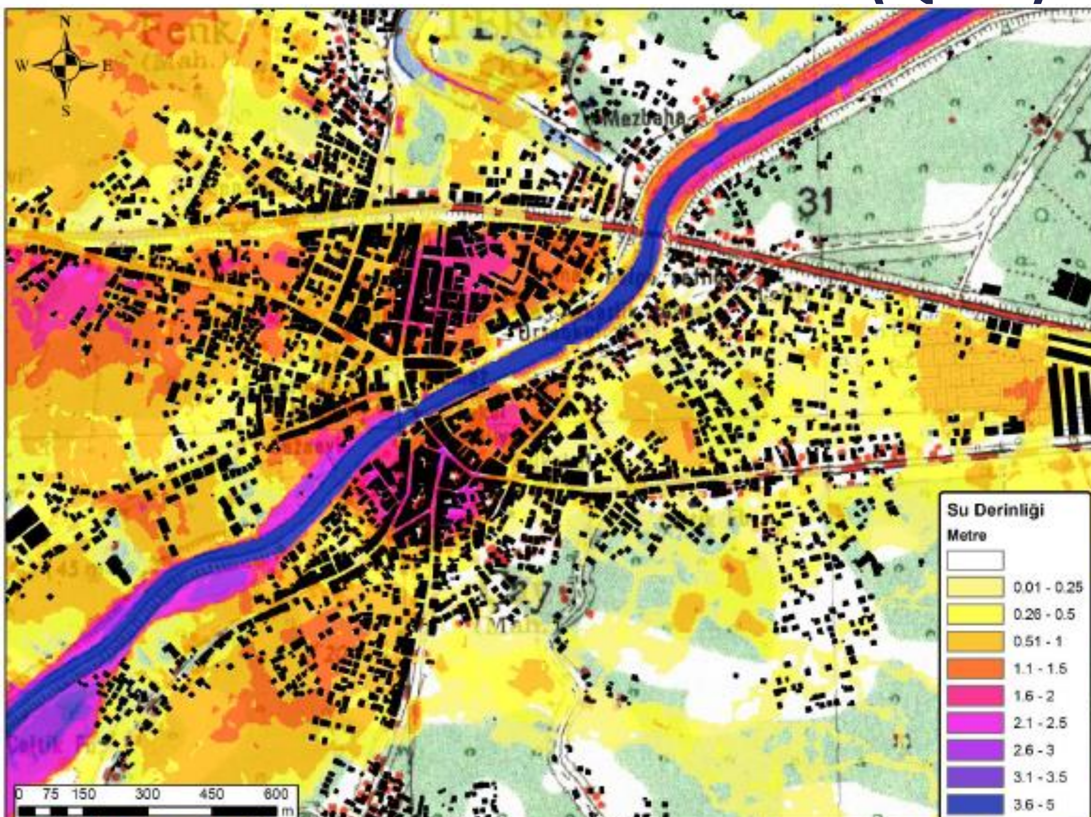
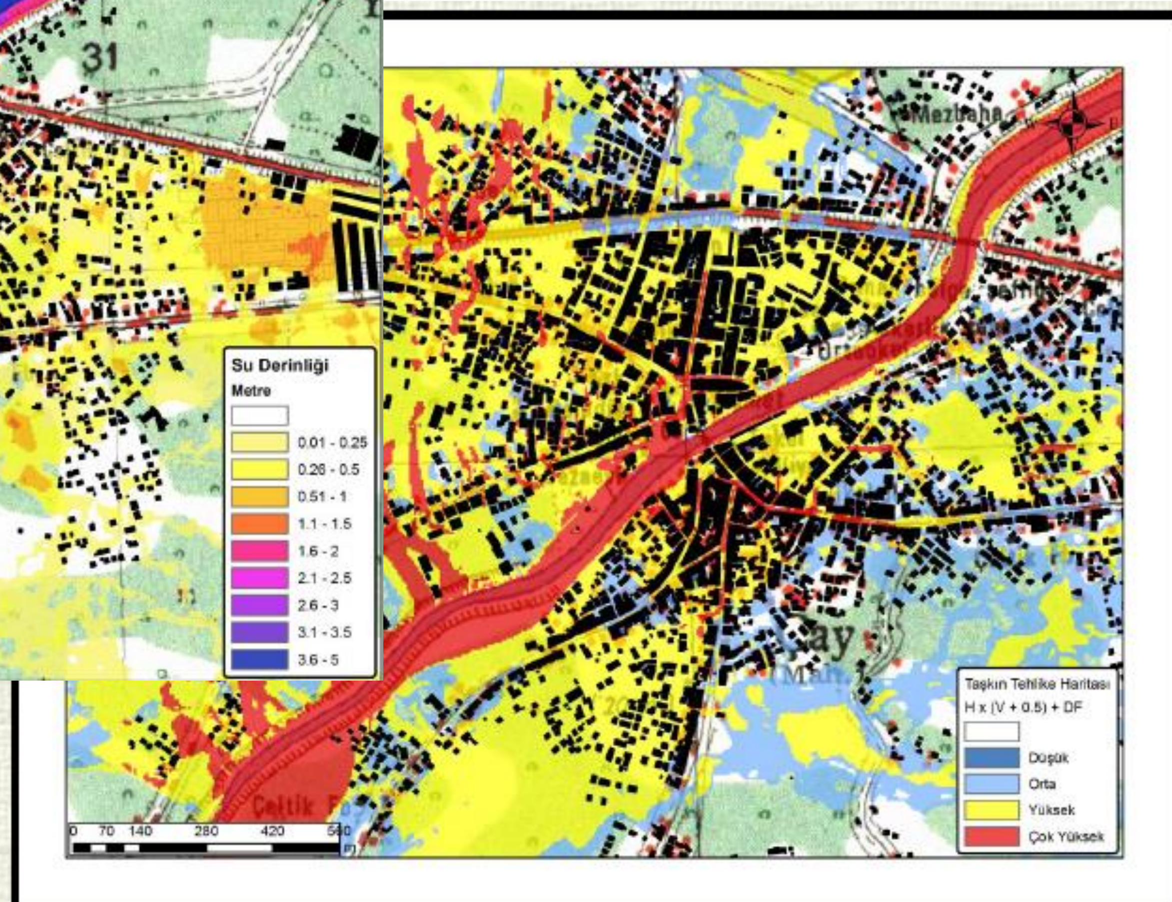
# WATER DEPTH AND FLOOD HAZARD MAPS FOR TERME RIVER (Q100)

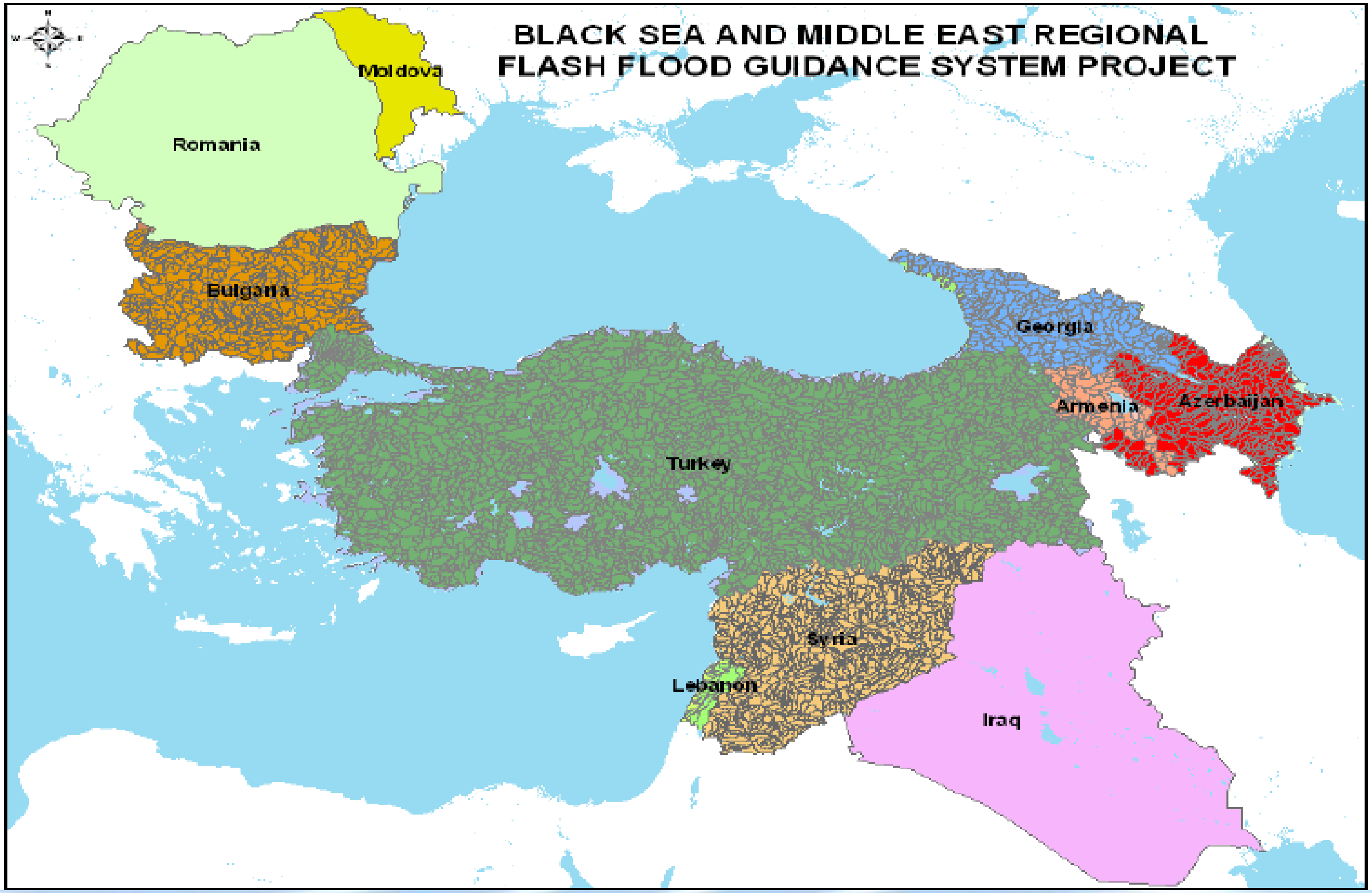


# FLOOD HAZARD MAPS

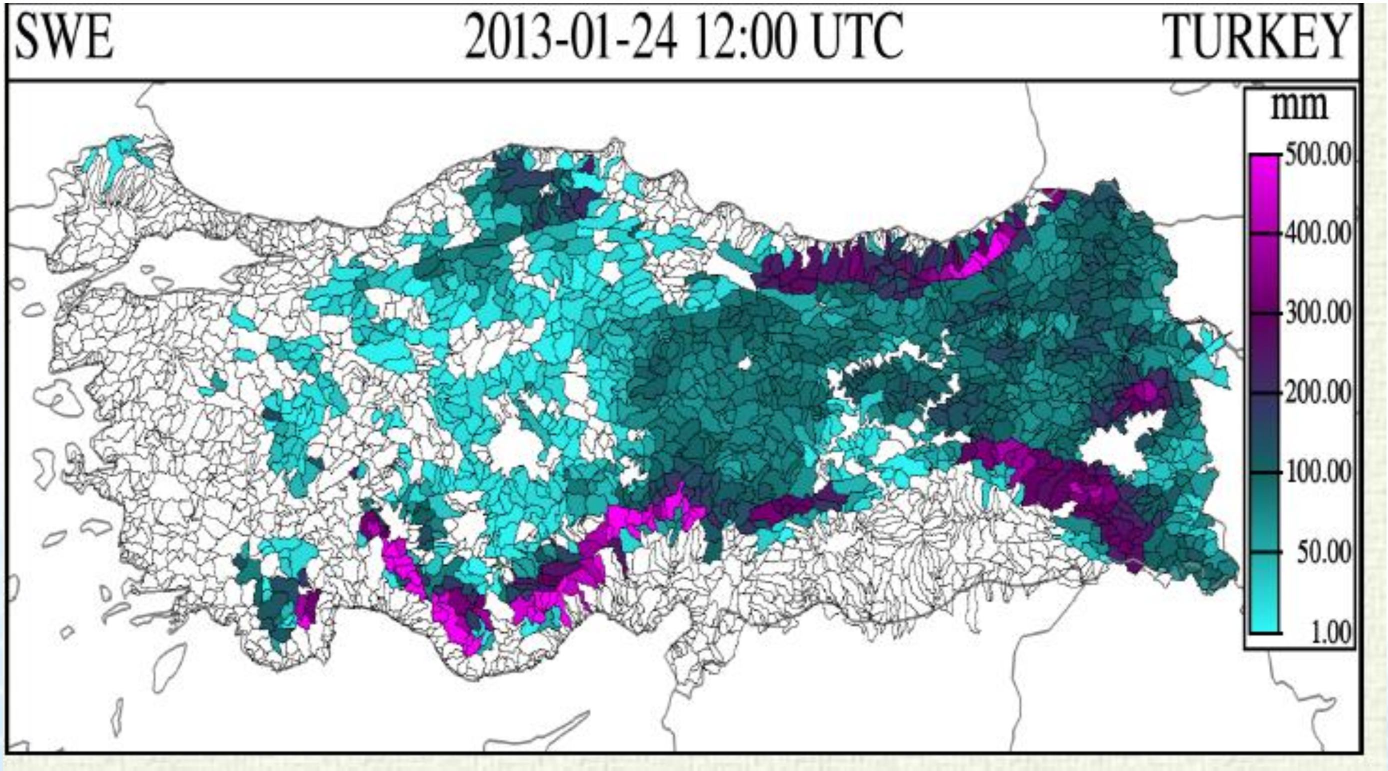
- are base for FLOOD RISK MAPS to be used/prepared by AFAD(Disaster and Emergency Management Presidency of Turkey)
- will be taken into consideration for construction (by municipalities and provinces)
- are necessary for insurance companies on determining possible flood areas
- are base for flood early warning systems.

# * Black sea – Middle East Flash Flood Early Warnıng System



- In 2007, the 15th World Meteorological Congress requested preparation of early warning systems for floods
- In 29-31 March 2010, the first meeting of Black Sea – Middle East Flash Flood Early Warning System was held.
- Using meteorological observations, SNOW-17 (snow model), SAC-SMA (Sacramento soil moisture accounting model), runoff threshold model and flash flood warning model (FFG) the Project aims to make early warnings of flash floods.

SNOW-17




INPUT: Snow Depths
OUTPUT: Sow Water Equivalent

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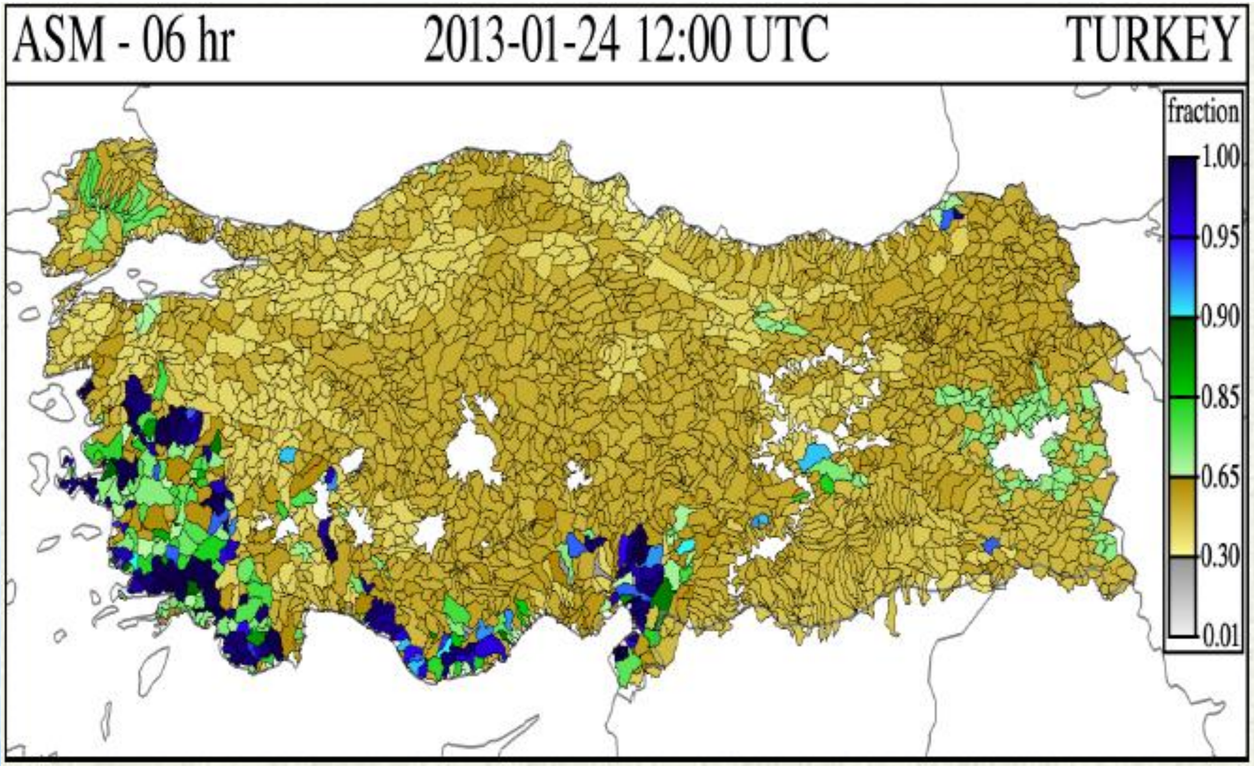
SAC - SMA




OUTPUT: Areal Soil Moisture

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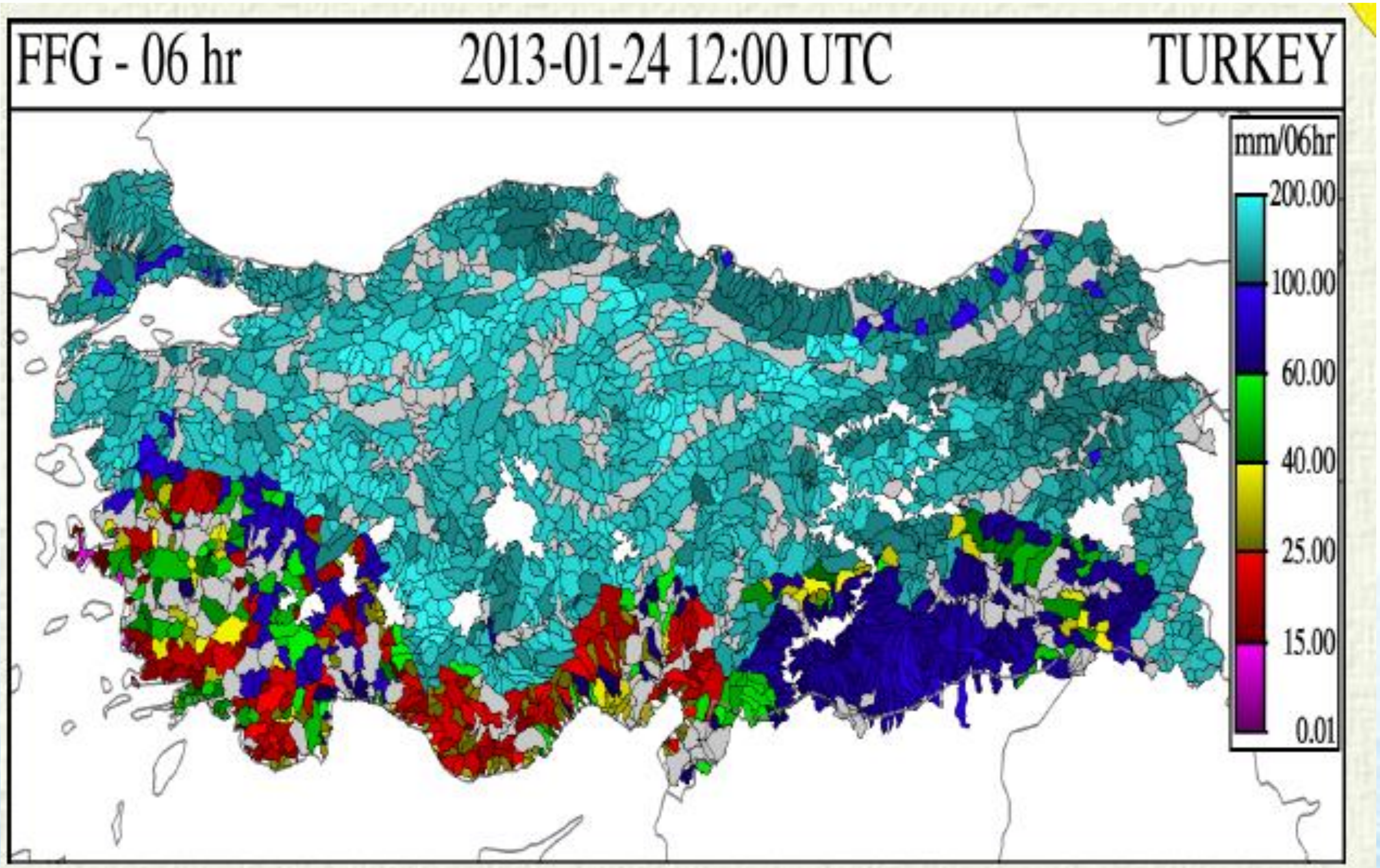
FFG (FLASH FLOOD GUIDANCE)



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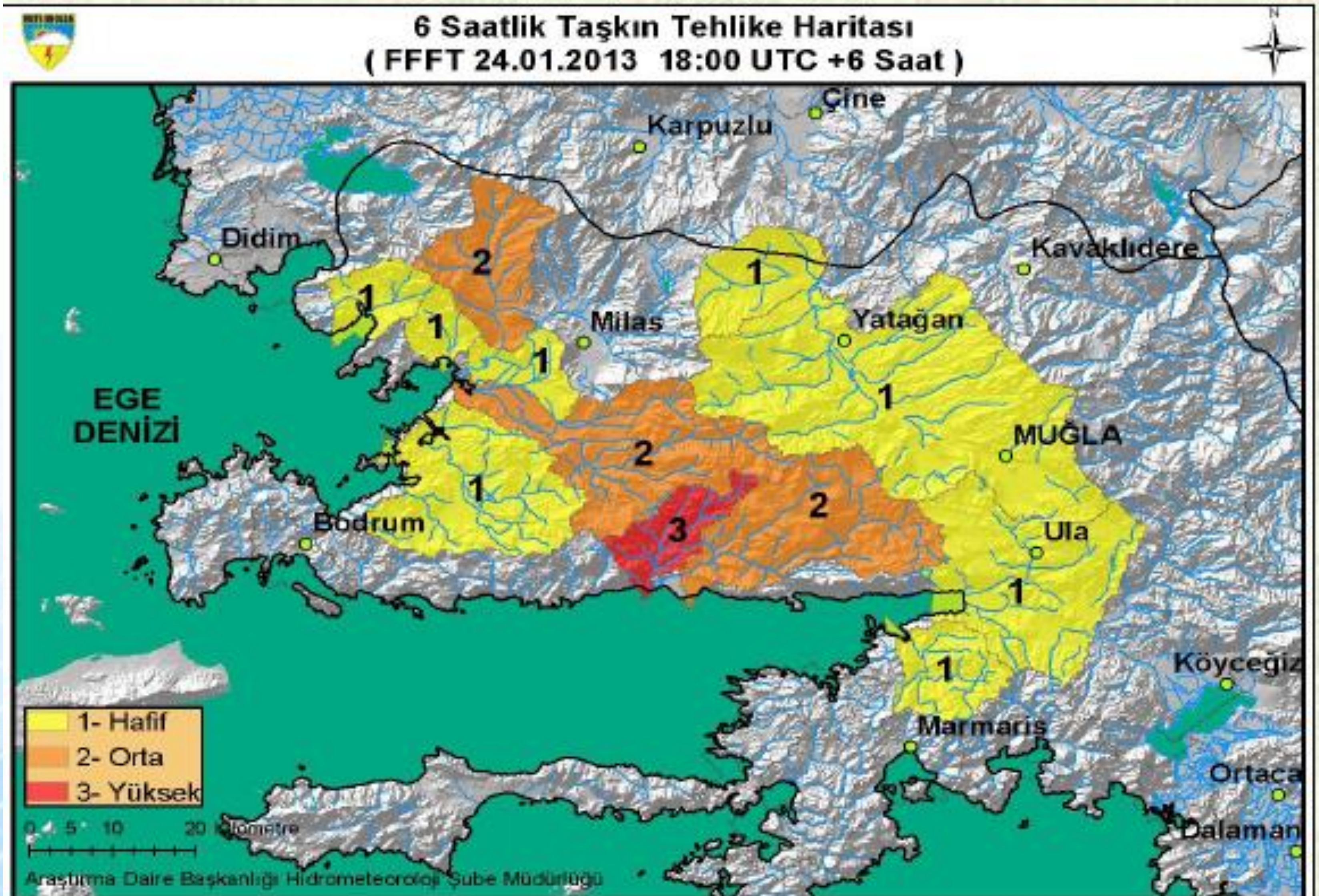


# * Flood Assessment Guidelines of DSI (State Hydraulic Works)

*This is a group of work packages to be followed for extreme flood assessment, rather than a single method. (Especially for design discharge of structures).*

- Meteorological and hydrological data are obtained from MGM (State Meteorological Service) and DSI (State Hydraulic Works).
- More suitable for riverine floods.
- Not GIS based

# Flood Assessment Guidelines of DSI (State Hydraulic Works)

Get a representative storm's D-A-D curve

Obtain maximum probable precipitation

Calculate Pmax with t□24 hours A□basin area

Calculate Pmax from physical method

Calculate Pmax from statistical method

Get Pmax as the maximum of these

Get U24hrs using Snyder's method

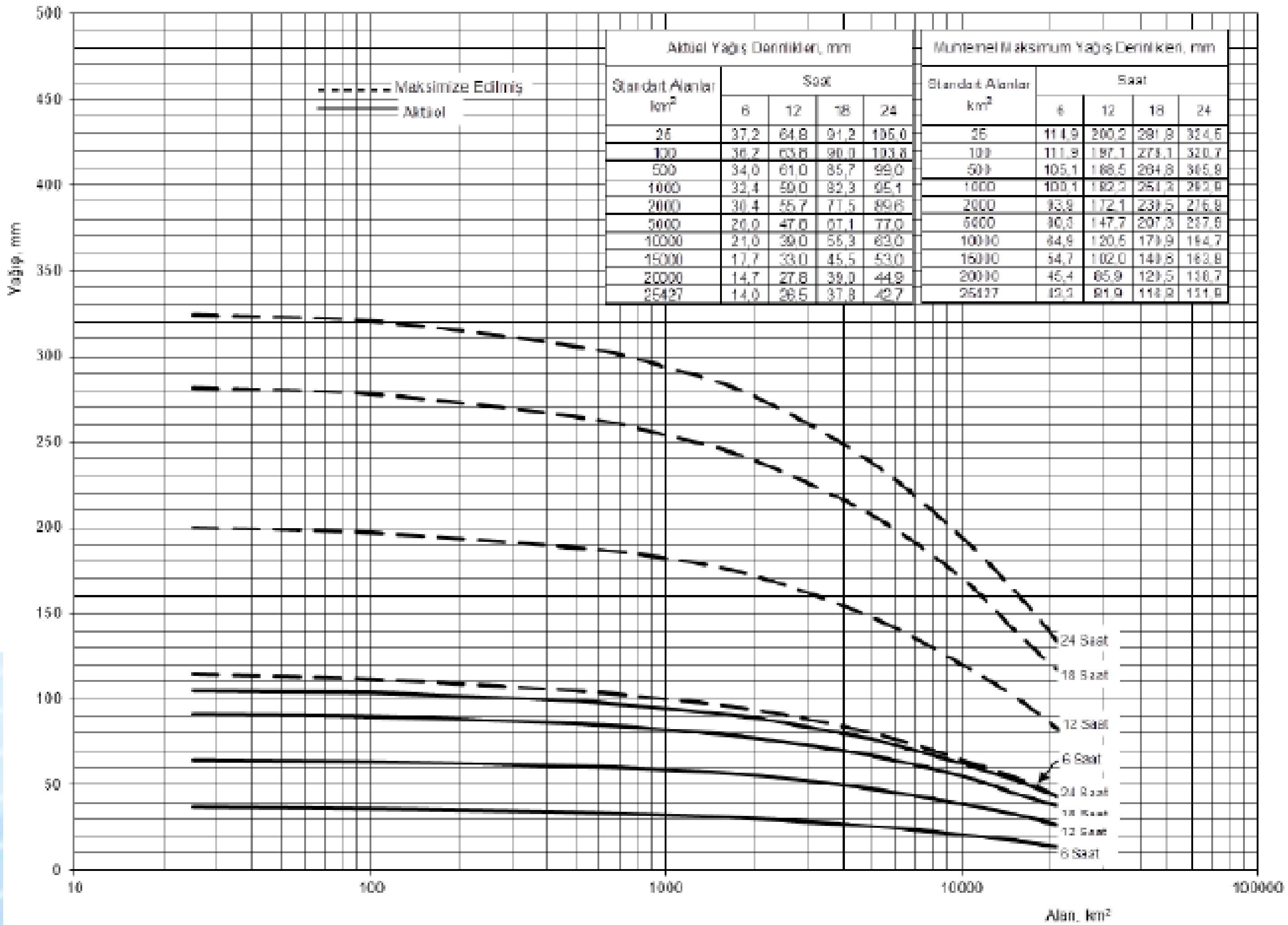
Hydrograph of snowmelt (obtained from daily melting & hypsometric curves

Obtain baseflow from average flow

Superpose all three with peaks intersecting.

# APPLICATION OF STATE HYDRAULIC WORKS GUIDELINE IN MURAT RIVER BASIN

## ANALYSIS OF PAST STORM EVENTS / DEPTH-AREA-DURATION CURVES




| Aktüel Yağış Derinlikleri, mm | | | | |
|---|---|---|---|---|
| Standart Alanlar km² | Saat | | | |
| | 6 | 12 | 18 | 24 |
| 25 | 37,2 | 64,8 | 91,2 | 105,0 |
| 100 | 36,2 | 63,6 | 90,0 | 103,8 |
| 500 | 34,0 | 61,0 | 85,7 | 99,0 |
| 1000 | 32,4 | 59,0 | 82,3 | 95,1 |
| 2000 | 30,4 | 55,7 | 77,5 | 89,6 |
| 5000 | 26,0 | 47,6 | 67,1 | 77,0 |
| 10000 | 21,0 | 39,0 | 55,3 | 63,0 |
| 15000 | 17,7 | 33,0 | 45,5 | 53,0 |
| 20000 | 14,7 | 27,8 | 39,0 | 44,9 |
| 25427 | 14,0 | 26,5 | 37,8 | 42,7 |

| Muhtemel Maksimum Yağış Derinlikleri, mm | | | | |
|---|---|---|---|---|
| Standart Alanlar km² | Saat | | | |
| | 6 | 12 | 18 | 24 |
| 25 | 114,9 | 200,2 | 281,9 | 324,6 |
| 100 | 111,9 | 197,1 | 278,1 | 320,7 |
| 500 | 105,1 | 188,5 | 264,8 | 305,8 |
| 1000 | 100,1 | 182,2 | 251,2 | 292,9 |
| 2000 | 93,9 | 172,1 | 239,5 | 276,8 |
| 5000 | 80,3 | 147,7 | 207,3 | 237,8 |
| 10000 | 64,9 | 120,5 | 170,9 | 194,7 |
| 15000 | 54,7 | 102,0 | 140,6 | 163,8 |
| 20000 | 45,4 | 85,9 | 120,5 | 138,7 |
| 25427 | 43,3 | 81,9 | 118,9 | 131,9 |

Şekil: 1.8 Yukarı Kaleköy Barajı Yağış Alanının Yağış Derinlik - Alan - Süre Eğrileri (01 - 02 / 05 / 1993 Tarihli Fırtına)

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# PROBABLE MAXIMUM PRECIPITATION ESTIMATION USING PHYSICAL METHOD

By using the formula

Pmax = Pac * Wmax / Wac

Pmax : Probable maximum precipitation

Pac: Observed average precipitation

Wmax: precipitable water

Wac: maximum precipitable water

| Fırtına Tarihi | Ortalama Yağış(mm) | | | Fırtına Gerçek Süresi (saat) | İstasyon Sayısı | Wmax / Wac | Olası En Büyük Yağış(mm) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Y. Kalekōy Barajı(A = 21 337 km²) | A. Kalekōy Barajı(A = 22 243 km²) | Beyhan II - I Barajları(A = 25 427 km²) | | | | Y. Kalekōy Barajı(A = 21 337 km²) | A. Kalekōy Barajı(A = 22 243 km²) | Beyhan II - I Barajları(A = 25 427 km²) |
| 29 - 30 Nisan 1972 | 29,7 | 30,7 | 34,2 | 24 | 7 | 32,6 / 15,6 = 2.10 | 62,4 | 64,5 | 71,8 |
| 11 - 12 Nisan 1976 | 30,8 | 32,2 | 36,8 | 24 | 8 | 25,2 / 13,0 = 1,94 | 59,8 | 62,5 | 71,4 |
| 7 - 8 Mayıs 1988 | 45,6 | 44,7 | 41,1 | 24 | 16 | 28,2 / 13,0 = 2.17 | 99,0 | 97,0 | 89,2 |
| 1 - 2 Mayıs 1993 | 42,7 | 43,4 | 45,5 | 24 | 13 | 33,1 / 10,7 = 3,09 | 131,9 | 134,1 | 140,6 |
| 2 - 3 Mayıs 1998 | 42,1 | 42,0 | 42,2 | 24 | 10 | 33,7 / 14,0 = 2,41 | 101,5 | 101,2 | 101,7 |
| 29 - 30 Mart 1998 | 31,8 | 33,6 | 41,2 | 48 | 11 | 21,2 / 10,6 = 2,00 | 63,6 | 67,2 | 82,4 |
| 17 - 18 Nisan 1999 | 34,8 | 36,3 | 38,1 | 24 | 11 | 27,6 / 16,0 = 1,74 | 60,6 | 63,2 | 66,0 |

## PROBABLE MAXIMUM PRECIPITATION ESTIMATION USING HERSHFIELD'S (STATISTICAL) METHOD

By using the formula Pmax = P + KS

Pmax : Probable maximum precipitation

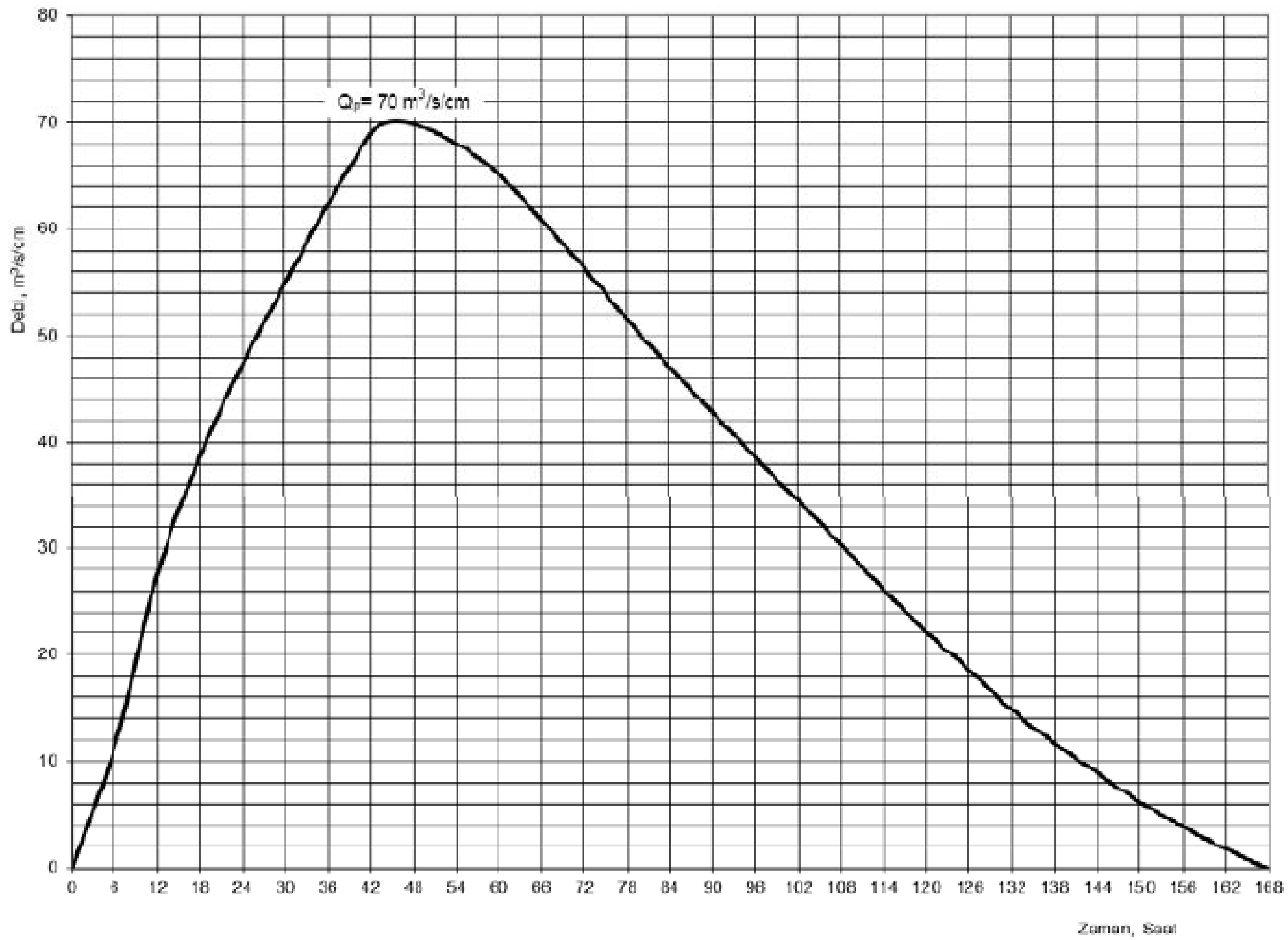
P: average of yearly maximum precipitation series

K: frequency factor

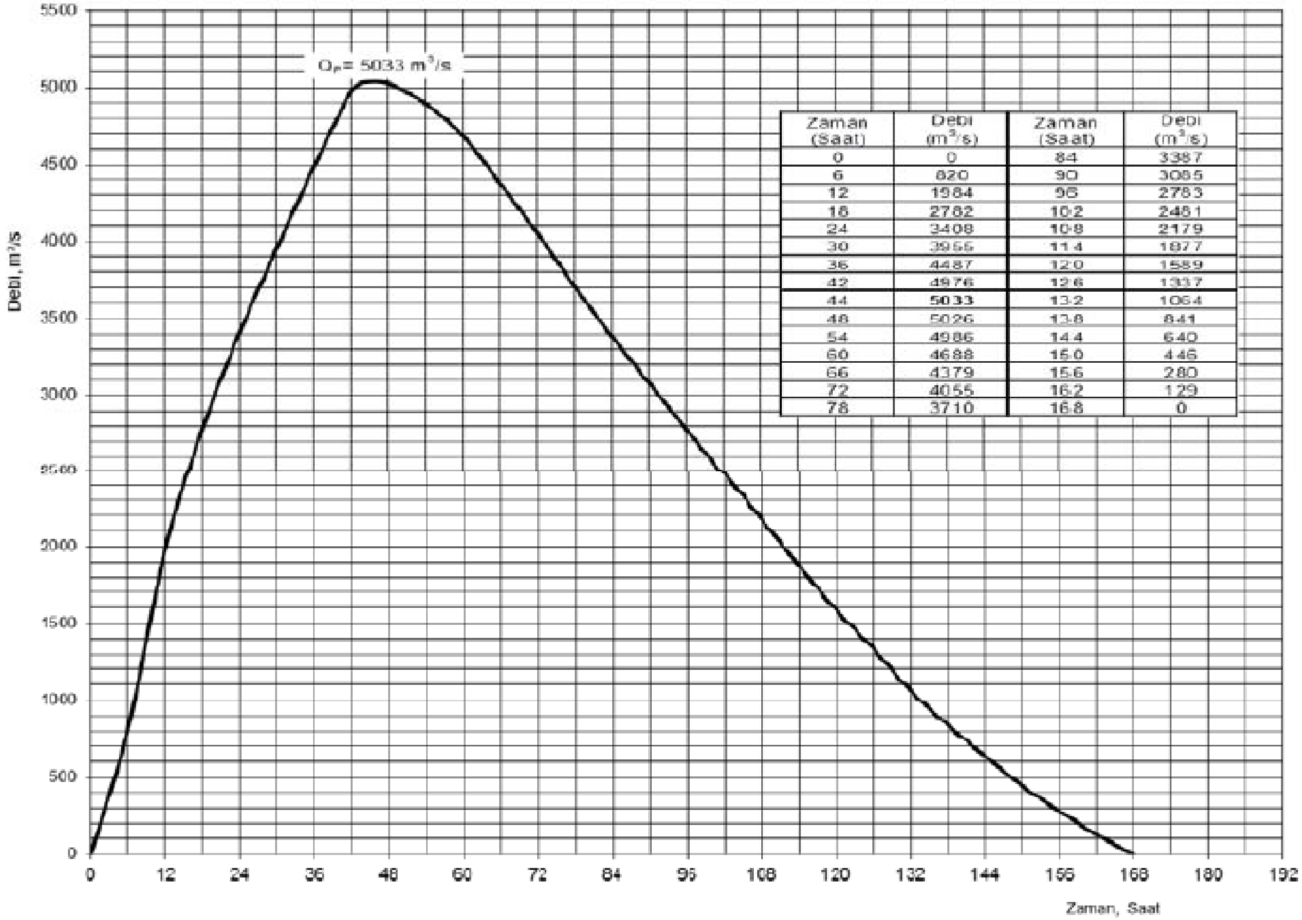
S: standard deviation of yearly maximum precipitation series

| Fırtına Tarihi | Ortalama Yağış(mm) | | | Fırtına Gerçek Süresi (saat) | İstasyon Sayısı | Wmax / Wac | Olası En Büyük Yağış(mm) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Y. Kaleköy Barajı(A = 21 337 km2) | A. Kaleköy Barajı(A = 22 243 km2) | Beyhan II - I Barajları(A = 25 427 km2) | | | | Y. Kaleköy Barajı(A = 21 337 km2) | A. Kaleköy Barajı(A = 22 243 km2) | Beyhan II - I Barajları(A = 25 427 km2) |
| 29 - 30 Nisan 1972 | 29,7 | 30,7 | 34,2 | 24 | 7 | 32,6 / 15,6 = 2.10 | 62,4 | 64,5 | 71,8 |
| 11 - 12 Nisan 1976 | 30,8 | 32,2 | 36,8 | 24 | 8 | 25,2 / 13,0 = 1,94 | 59,8 | 62,5 | 71,4 |
| 7 - 9 Mayıs 1988 | 45,6 | 44,7 | 41,1 | 24 | 16 | 28,2 / 13,0 = 2.17 | 99,0 | 97,0 | 89,2 |
| 1 - 2 Mayıs 1993 | 42,7 | 43,4 | 45,5 | 24 | 13 | 33,1 / 10,7 = 3,09 | 131,9 | 134,1 | 140,6 |
| 2 - 3 Mayıs 1995 | 42,1 | 42,0 | 42,2 | 24 | 10 | 33,7 / 14,0 = 2,41 | 101,5 | 101,2 | 101,7 |
| 29 - 30 Mart 1998 | 31,8 | 33,6 | 41,2 | 48 | 11 | 31,2 / 10,6 = 2,00 | 63,6 | 67,2 | 82,4 |
| 17 - 18 Nisan 1999 | 34,8 | 36,3 | 39,1 | 24 | 11 | 27,6 / 16,0 = 1,74 | 60,6 | 63,2 | 68,0 |

# HYDROGRAPH OF PROBABLE MAXIMUM PRECIPITATION




Şekil: 1.11 Yukarı Kaleköy Baraj Yeri Yağış Alanı 24 Saat - 1 cm'lik Birim Hidrografı (Snyder Yöntem)




| Zaman (Saat) | Debi (m$^3$/s) | Zaman (Saat) | Debi (m$^3$/s) |
|---|---|---|---|
| 0 | 0 | 84 | 3387 |
| 6 | 820 | 90 | 3085 |
| 12 | 1984 | 96 | 2783 |
| 18 | 2782 | 102 | 2481 |
| 24 | 3408 | 108 | 2179 |
| 30 | 3956 | 114 | 1877 |
| 36 | 4487 | 120 | 1589 |
| 42 | 4976 | 126 | 1337 |
| 44 | 5033 | 132 | 1064 |
| 48 | 5026 | 138 | 841 |
| 54 | 4986 | 144 | 640 |
| 60 | 4688 | 150 | 446 |
| 66 | 4379 | 156 | 280 |
| 72 | 4055 | 162 | 129 |
| 78 | 3710 | 168 | 0 |

Şekil: 1.14 Yukarı Kaleköy Baraj Yeri Olası En Büyük Yağmurun Akış Hidrografı

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# SNOWMELT FLOW AND HYDROGRAPH

Snowmelt flow is calculated by degree-day approach. Daily temperature, snow depth, snow water equivalent data is obtained from meteorological stations. Then snowmelt is calculated for every day.

Probable maximum snowmelt hydrographs are obtained from these calculations.

| [illegible] | [illegible] (°C) | [illegible] (°C) | [illegible] (°C) | [illegible] (°C) | | | [illegible] (cm) | | | [illegible] (MM) | | | [illegible] (m³/s) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| 1 | 14,9 | 14,9 | 14,9 | 10,5 | 10,8 | 10,5 | 1,33 | 1,35 | 1,31 | 279,3 | 256,5 | 262,9 | 3260,5 | 3060,8 | 3010,3 |
| 2 | 38,0 | 15,1 | 15,1 | 10,8 | 11,0 | 10,7 | 1,35 | 1,38 | 1,34 | 283,5 | 261,3 | 247,4 | 3281,5 | 3033,7 | 2863,9 |
| 3 | 44,0 | 14,9 | 15,5 | 11,3 | 11,5 | 11,2 | 1,41 | 1,44 | 1,39 | 296,6 | 273,1 | 260,0 | 3433,2 | 3161,2 | 2997,7 |
| 4 | 55,1 | 14,1 | 15,8 | 11,3 | 11,7 | 11,4 | 1,44 | 1,48 | 1,43 | 301,9 | 277,9 | 262,6 | 3493,9 | 3216,1 | 3031,3 |
| 5 | 73,2 | 15,1 | 15,9 | 11,6 | 11,8 | 11,5 | 1,45 | 1,48 | 1,44 | 304,5 | 280,3 | 265,9 | 3524,3 | 3243,6 | 3075,0 |
| 6 | 88,5 | 15,5 | 16,1 | 11,8 | 12,0 | 11,7 | 1,48 | 1,50 | 1,46 | 309,5 | 285,0 | 270,6 | 3583,1 | 3298,6 | 3131,5 |
| 7 | 104,4 | 15,9 | 16,2 | 11,9 | 12,1 | 11,8 | 1,49 | 1,51 | 1,48 | 313,4 | 287,4 | 272,9 | 3616,1 | 3326,1 | 3158,3 |
| 8 | 120,2 | 15,8 | 16,3 | 12,0 | 12,2 | 11,9 | 1,50 | 1,53 | 1,49 | 315,0 | 290,8 | 275,2 | 3645,5 | 3353,6 | 3185,0 |
| 9 | 136,2 | 16,1 | 16,7 | 12,4 | 12,6 | 12,3 | 1,55 | 1,58 | 1,54 | 325,8 | 299,3 | 284,4 | 3767,4 | 3463,8 | 3292,1 |
| 10 | 161,9 | 16,6 | 16,8 | 12,5 | 12,7 | 12,4 | 1,56 | 1,59 | 1,55 | 328,1 | 301,9 | 286,8 | 3797,7 | 3491,9 | 3318,9 |
| 11 | 155,4 | 16,5 | 16,5 | 12,2 | 12,4 | 12,1 | 1,53 | 1,55 | 1,51 | 320,3 | 294,5 | 279,6 | 3706,6 | 3408,6 | 3235,5 |
| 12 | 184,8 | 15,8 | 16,3 | 12,0 | 12,2 | 11,9 | 1,50 | 1,53 | 1,49 | 315,0 | 290,8 | 275,2 | 3645,5 | 3353,6 | 3185,0 |
| 13 | 200,1 | 16,0 | 16,2 | 11,9 | 12,1 | 11,8 | 1,49 | 1,51 | 1,48 | 313,4 | 287,4 | 272,9 | 3616,1 | 3326,1 | 3158,3 |
| 14 | 216,8 | 15,8 | 16,0 | 11,7 | 11,9 | 11,6 | 1,46 | 1,49 | 1,45 | 307,1 | 282,6 | 268,3 | 3554,7 | 3271,1 | 3104,7 |
| 15 | 233,1 | 16,2 | 15,9 | 11,6 | 11,8 | 11,6 | 1,45 | 1,48 | 1,44 | 304,5 | 280,3 | 265,9 | 3524,3 | 3243,6 | 3075,0 |
| 16 | 248,6 | 15,8 | 15,6 | 11,3 | 11,5 | 11,2 | 1,41 | 1,44 | 1,39 | 296,6 | 273,1 | 260,0 | 3433,2 | 3161,2 | 2997,7 |
| 17 | 265,3 | 16,3 | 15,3 | 11,0 | 11,3 | 10,9 | 1,38 | 1,40 | 1,36 | 288,8 | 266,0 | 252,1 | 3342,0 | 3085,7 | 2917,4 |
| 18 | 281,6 | 16,2 | 15,1 | 10,8 | 11,0 | 10,7 | 1,35 | 1,38 | 1,34 | 283,5 | 261,3 | 247,4 | 3281,5 | 3033,7 | 2863,9 |
| 19 | 298,3 | 15,7 | 14,1 | 9,8 | 10,0 | 9,7 | 1,23 | 1,25 | 1,21 | 257,3 | 237,5 | 225,3 | 2977,4 | 2748,8 | 2606,2 |
| 20 | 314,4 | 15,2 | 14,0 | 9,7 | 9,9 | 9,6 | 1,21 | 1,24 | 1,20 | 254,6 | 235,1 | 222,0 | 2947,0 | 2721,4 | 2569,4 |

Not:

1- [illegible]

2- [illegible] ........ 1500 m

3- [illegible] ........ [illegible]

4- [illegible] ........ [illegible]

5- [illegible] ........ [illegible]

6- [illegible] ........ [illegible]

BEYHAN II - I BARAJLARI

AŞAĞI KALEKÖY BARAJI

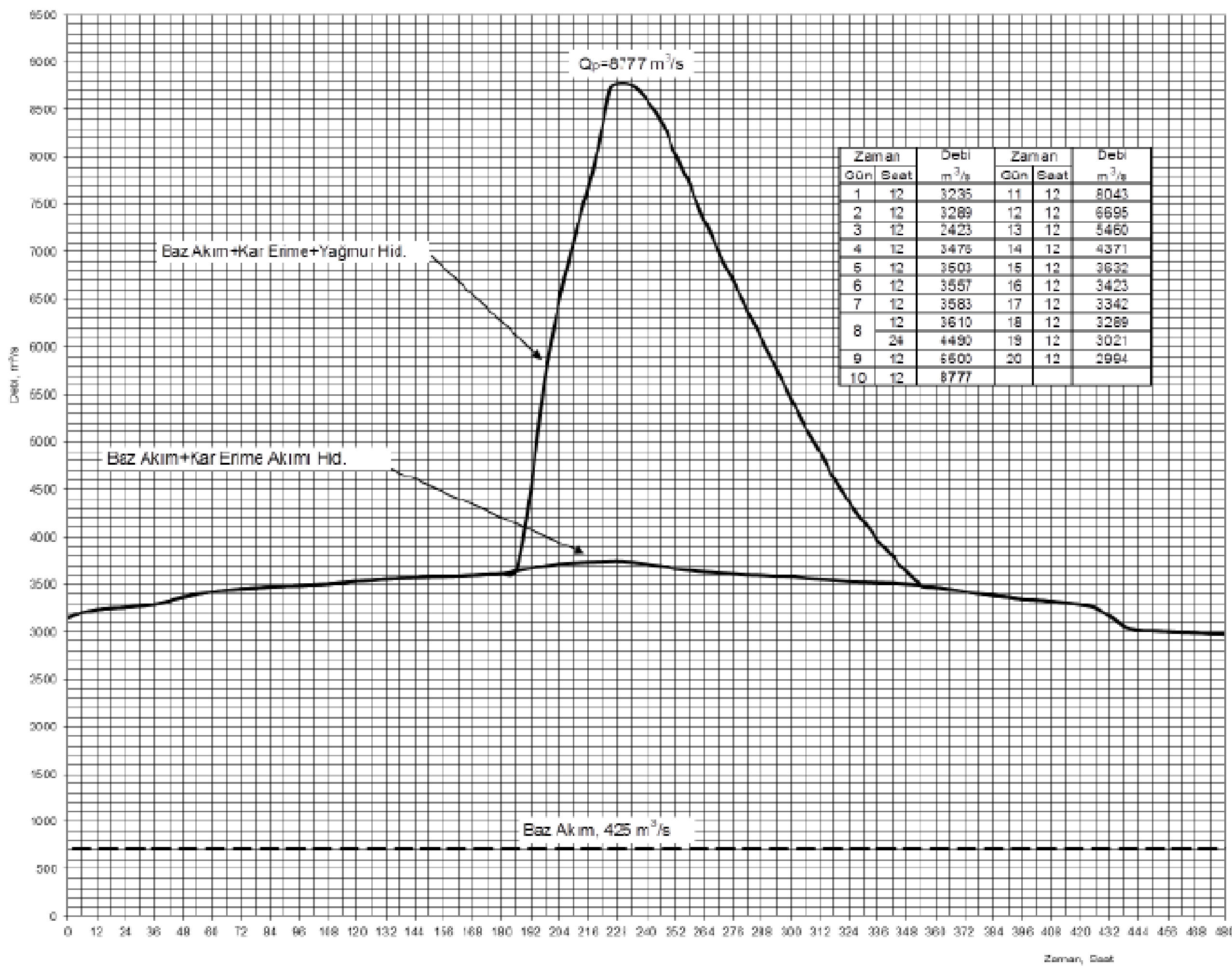
1500 m
1660 m
[illegible]

YUKARI KALEKÖY BARAJI

1500 m
1660 m
[illegible]

# PEAK DISCHARGE FOR SPILLWAY CONSTRUCTION (PROBABLE MAXIMUM FLOOD HYDROGRAPH)

Hydrograph for probable maximum precipitation + maximum snowmelt + baseflow are superposed (and peak flows of these hydrographs are overlapped)




| Zaman | | Debi | Zaman | | Debi |
|---|---|---|---|---|---|
| Gün | Saat | $m^3/s$ | Gün | Saat | $m^3/s$ |
| 1 | 12 | 3235 | 11 | 12 | 8043 |
| 2 | 12 | 3289 | 12 | 12 | 6695 |
| 3 | 12 | 2423 | 13 | 12 | 5460 |
| 4 | 12 | 3476 | 14 | 12 | 4371 |
| 5 | 12 | 3503 | 15 | 12 | 3632 |
| 6 | 12 | 3557 | 16 | 12 | 3423 |
| 7 | 12 | 3583 | 17 | 12 | 3342 |
| 8 | 12 | 3610 | 18 | 12 | 3289 |
| | 24 | 4490 | 19 | 12 | 3021 |
| 9 | 12 | 6600 | 20 | 12 | 2994 |
| 10 | 12 | 8777 | | | |

Şekil: 1.21 Yukarı Kaleköy Baraj Yeri Dolusavak Proje Giriş Hidrografı (Olası En Büyük Taşkın Debi Hidrografı)

Project funded by the EUROPEAN UNION

SciNet NatHaz Prevention

Black Sea CROSS BORDER COOPERATION

Common borders. Common solutions.

# * An Investigation on the Evaluation of Flood Potential In Northwest Black Sea Region

- Flood potential in Northwest Black Sea region with the aid of Geographical Information System (GIS).
- Input Parameters: Precipitation climatology, Digital Elevation Model (DEM), land-use and drainage network characteristics are considered
- Potential flood areas are determined for a period of 50 years.
- Flow measurements between 1969-2002 are used.
- Peak flows are calculated and corresponding water depths are determined using the rating curve.
- Using GIS, DEM and water depths are buffered.

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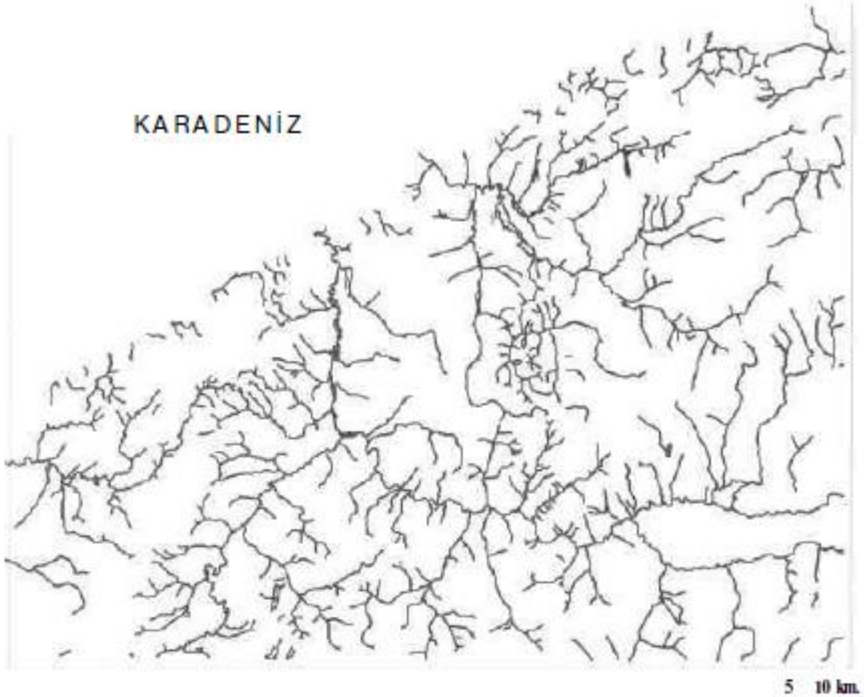
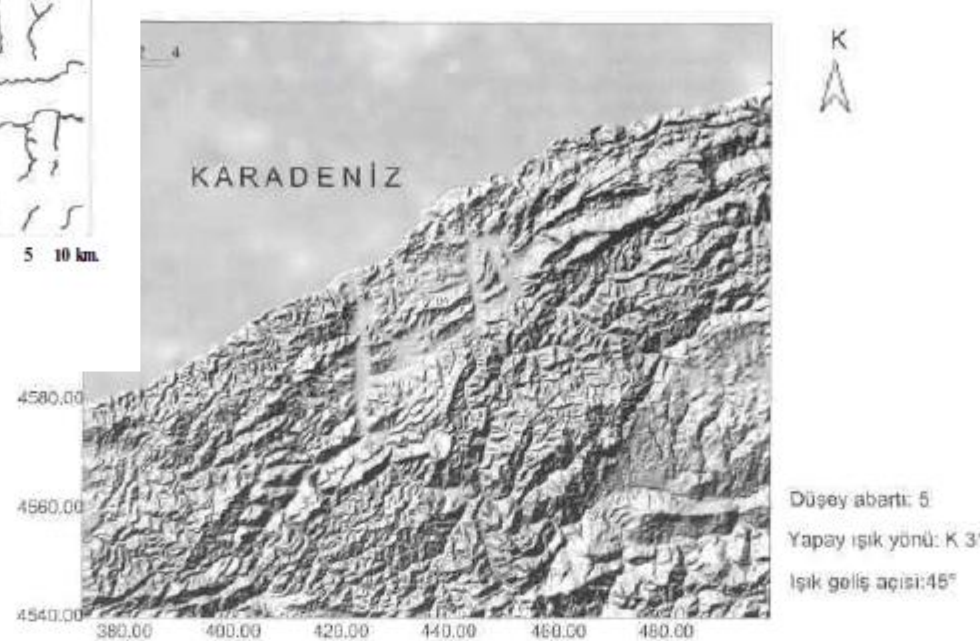
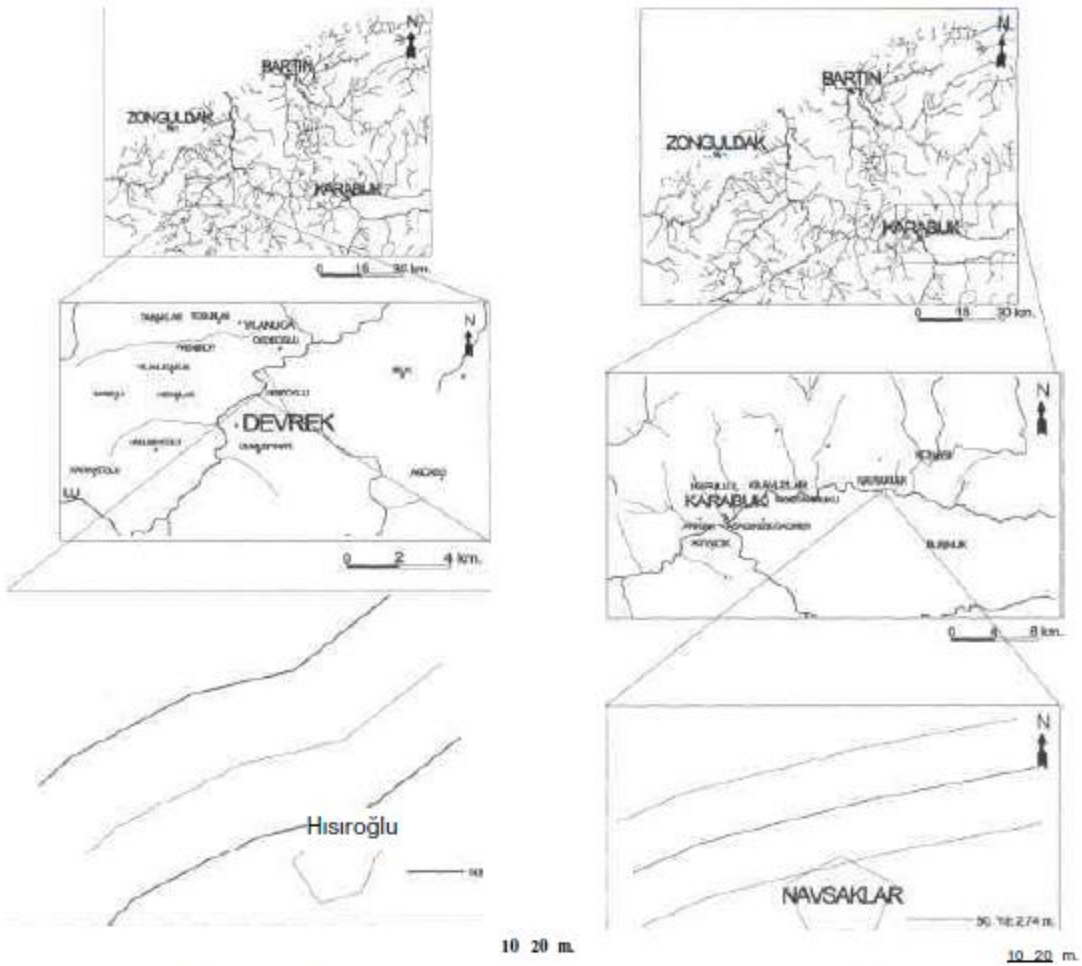
mmon solutions.




Şekil 3. İnceleme alanının sayısal drenaj ağı haritası
*Figure 3. Digital drainage map of the studied area*




Şekil 4. İnceleme alanının Sayısal Arazi Modelinden oluşturulmuş topoğrafik kabartı haritası
*Figure 4. Shaded relief map of the study area produced from digital elevation model*




Şekil 6.(a) Hısıroğlu-Devrek (b) Navsaklar-Karabük yerleşim bölgesi için hesaplanan 50 yılda beklenen taşkın alanları

*Figure 6. Flood areas calculatedfor (a) Hısıroğlu- Devrek (b) Navsaklar- Karabük settlement regions*

# EU FLOODS DIRECTIVE

Preliminary Flood Risk Assesment

Flood Hazard and Flood Risk Mapping

Flood Risk Management Plans

# * EU - Turkey Twinning Project: Methodologies

1. EXZECO Method (France)

**Based on elevation of water level using Aster GDEM**

2. Water Level Rise Method (Romania)

**Based on elevation of water level using SRTMDEM**

3. Aluvion Method (France)

**Determining the places alluvials deposited to find out possible flood area**

***Chosen method: Alluvial deposition***

- **Covers both past events and other two methods’ considerations.**
- **Less computational time**

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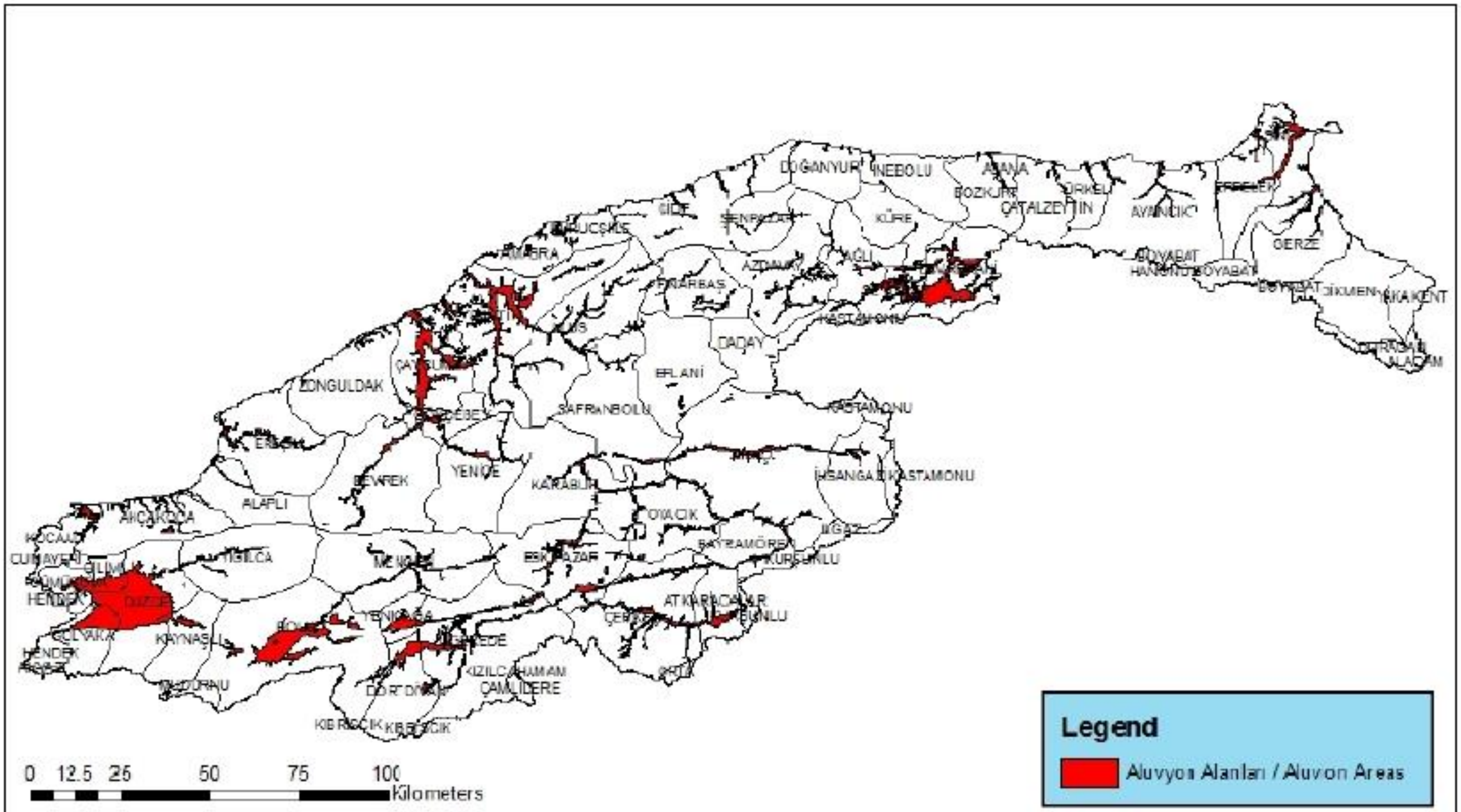


**ALÜVYON ALANLARI YÖNTEMİNE GÖRE TAŞKIN ALANLARI**

**FLOOD AREAS ACCORDING TO ALUVION METHOD**

SU YÖNETİMİ GENEL MÜDÜRLÜĞÜ

GENERAL DIRECTORATE OF WATER MANAGEMENT

Çizen - Drawn By: F.GIRAYHAN

Tarih-Date: 06/2013

Project funded by the EUROPEAN UNION

SciNet NatHaz Prevention

Black Sea CROSS BORDER COOPERATION

Common borders. Common solutions.

# * Turkey – Bulgaria Cross Border Cooperation for Meriç/Maritza Flood Forecast and Early Warning

EU Funded Project
Between 2008 – 2010

Transfer of past event and real time data between two countries
Preparation of DEM for Maritza river
Hydrologic model for basin + hydraulic model for river bed
MIKE11 and Mike FloodWatch are used for modelling

Real time data on dynamic web portal : www.dsiedirnenehir.com
50 – 100 – 500 year floodplain maps
First early flood warning project in Turkey

Project funded by the EUROPEAN UNION

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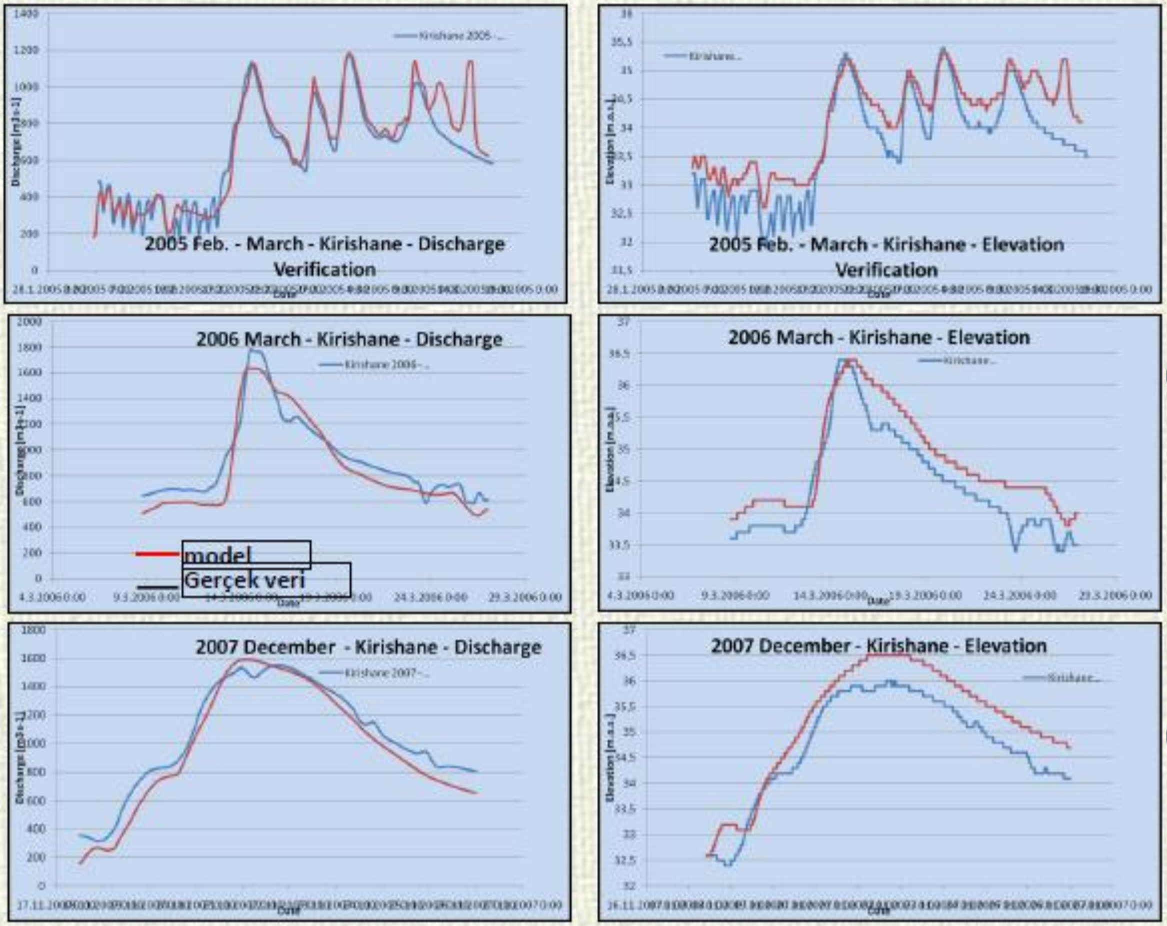
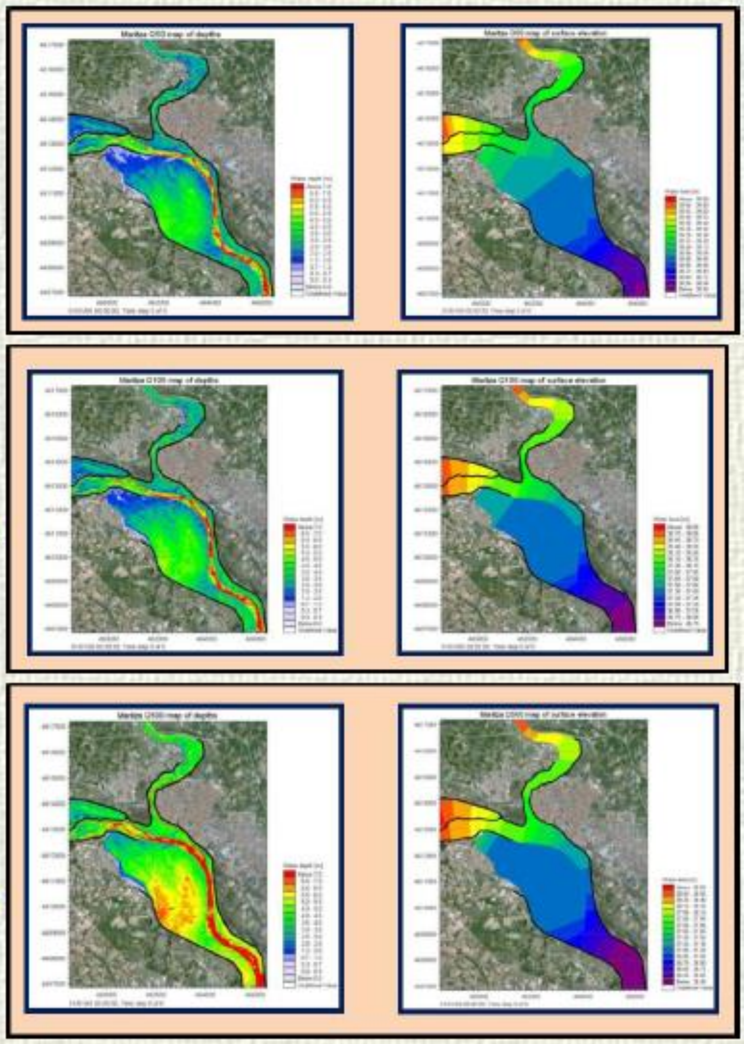
Black Sea CROSS BORDER COOPERATION

Common borders. Common s

Results



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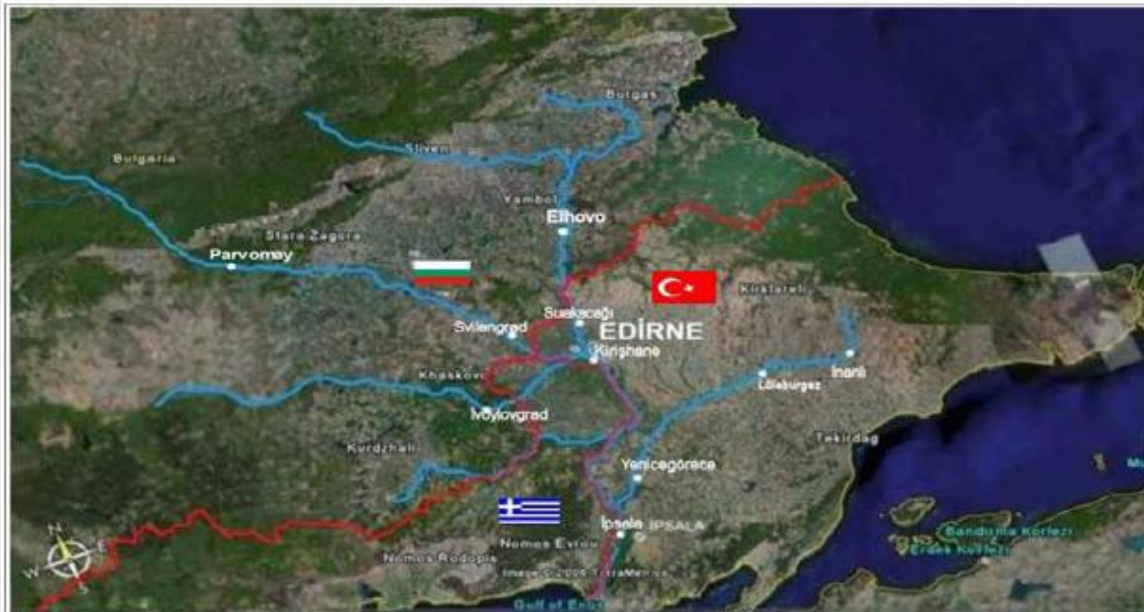
Black Sea CROSS BORDER COOPERATION

www.dsiedirnenehir.com

Edirne Hava Tahmini | Kırklareli Hava Tahmini | Tekirdag Hava Tahmini

## GÜNCEL NEHİR DEBİLERİ

| | 25.04.2013 | DEBİ (m3/sn) | |
|---|---|---|---|
| NEHİR ADI | İSTASYON ADI | 08:00 | 16:00 |
| ARDA | Ivoylovgrad | 303 | 180 |
| TUNCA | Elhova | 40 | 43 |
| | Suakacağı | 42 | 45 |
| MERİÇ | Parvomay | 62 | 62 |
| | Svilengrad | 117 | 125 |
| | Kirişhane | 234 | 290 |
| | İpsala | 362 | 365 |
| ERGENE | İnanlı | 7 | 9 |
| | Lüleburgaz | 11 | 13 |
| | Yenicegörece | 32 | 33 |




# What's Next?

- Evaluation of existing flood hazard assessment models.
  - Already underway
- Choose a model for development/ modification/ adaptation to the needs of the proposal
  - *Regional Scale*
  - *Local Scale*

  - First step is this workshop

# A proposal for model *rating*

| MODEL NAME | X Model | Y Model | Z Model |
|---|---|---|---|
| Model Type | Conceptual Model | Basin Based Model | Hydraulic Model |
| Equations | Rational formula, TWI, SPI | SCA precipitation-to-runoff model, water budget, conceptual flood routing,… | Empirical concentration times, Continuity, Conservation of Momentum |
| Temporal Domain & Resolution | Steady, Return period basis (10~100 years) | Steady, 1 day-1 month | Unsteady, 1 min-10 hrs |
| Spatial Domain & Resolution | Raster Image, 1~10 km | GIS based, 250 m~2 km | GIS+Local Coordinates, 5 m~100 m |
| Input Parameters | Extreme pdf of precipitation, catchment area, slope, bed character,… | Mean monthly precipitation data, DEM with 1/25000, land use data,… | Daily precipitation data, DEM with 1/5000, flow crosssections, land use,… |
| Output Parameters | "Flood Hazard Risk" index | Max. flow rate, estimate of water level variation, estimate of inundation area | Flow rate timeseries (hydrograph), flow depth, flow velocity,inundation areas, urban flooding, estimate of flood damage,… |
| **RATING OF THE MODEL** | | | |
| GIS based? (0 to 2) | 0 | 2 | 2 |
| Generic? (0 to 2) | 2 | 1 | 0 |
| Data Demand (0 to 2) | 2 | 1 | 0 |
| Resolution (0 to 2) | 0 | 1 | 2 |
| Result Accuracy (0 to 2) | 1 | 1 | 2 |
| Ease of Implementation (0 to 2) | 1 | 2 | 1 |
| … | … | … | … |
| **TOTAL** | **6** | **8** | **7** |