

# PREPARING OF DISASTER HAZARD MAPS AND DISASTER RISK ANALYSIS SYSTEM (ARAS)



**AFAD** 

**Sinan DEMİR**

Planning and Risk Reduction Department  
2021

## **Preparing of Hazard and Risk Maps**

### **For Management of Risk;**

- Measure the risk,
- Evaluate the risk,
- Prioritize the risk,

### **Also using for basement of;**

- Land use (Spatial) plans
- Risk reduction plans
- Response and recovery works...

# For Preparing Disaster Hazard and Risk Maps

In order of:

1. Inventory of a disaster
2. Susceptibility map
3. Hazard maps
4. Data for Structures and Infrastructures
5. Risk maps

# Concept

**SUSCEPTIBILITY:** Probability of a disaster in a specific area.

-Spatial Probability



**HAZARD** : Probability of a disaster in a specific area and in a specific time interval.

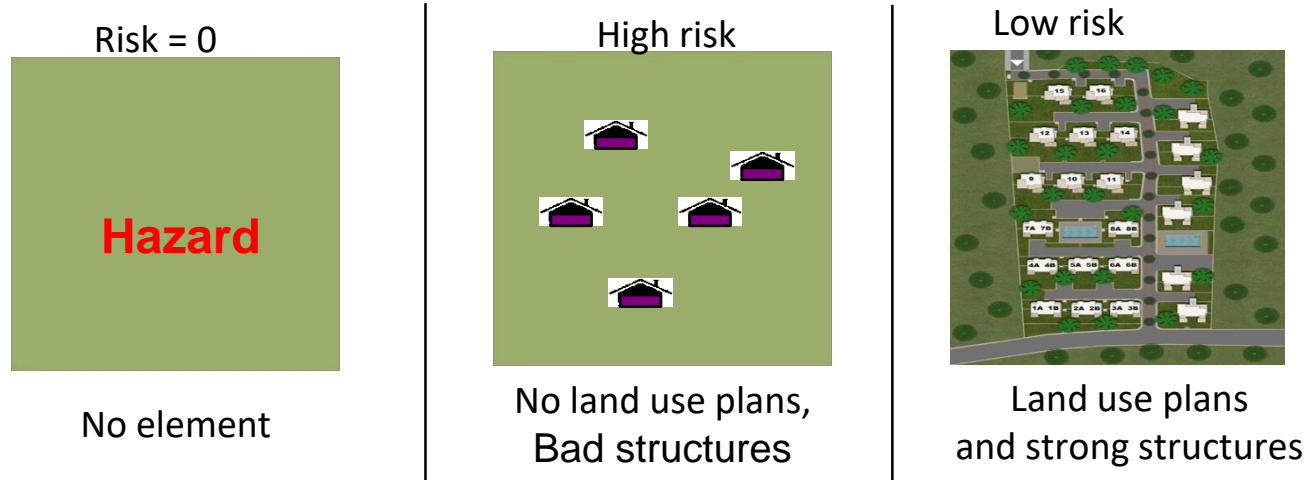
**HAZARD = Spatial Probability \* Time Probability**

# Concept

## RISK

It refers to the damages of values or elements that are exposed to a hazard, according to their vulnerability because of this hazard.

$$\text{Risk} = \text{Hazard} * \text{Vulnerability} \quad \text{“Loss Probability”}$$



## What we are doing?

---

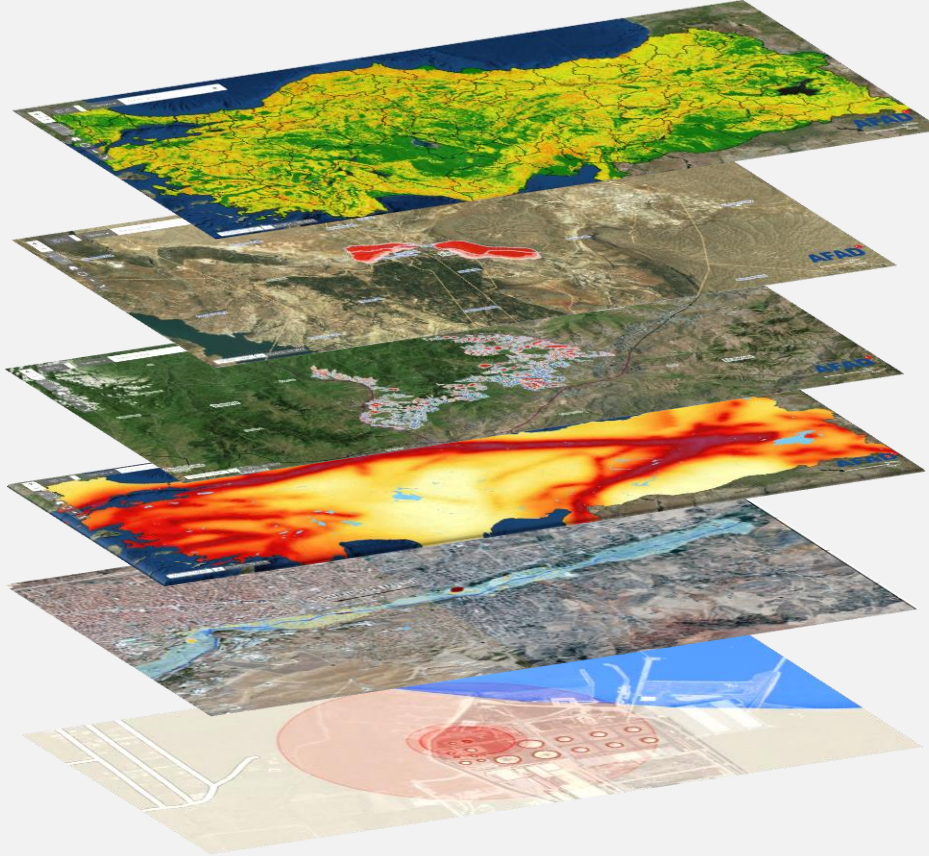
The Mechanism of disasters are different. So the hazard maps prepares separately according to disaster types.

**We are working on:**

- **LANDSLIDE**
- **ROCKFALL AND**
- **AVALANCHE**



## ARAS



**WEB Services**

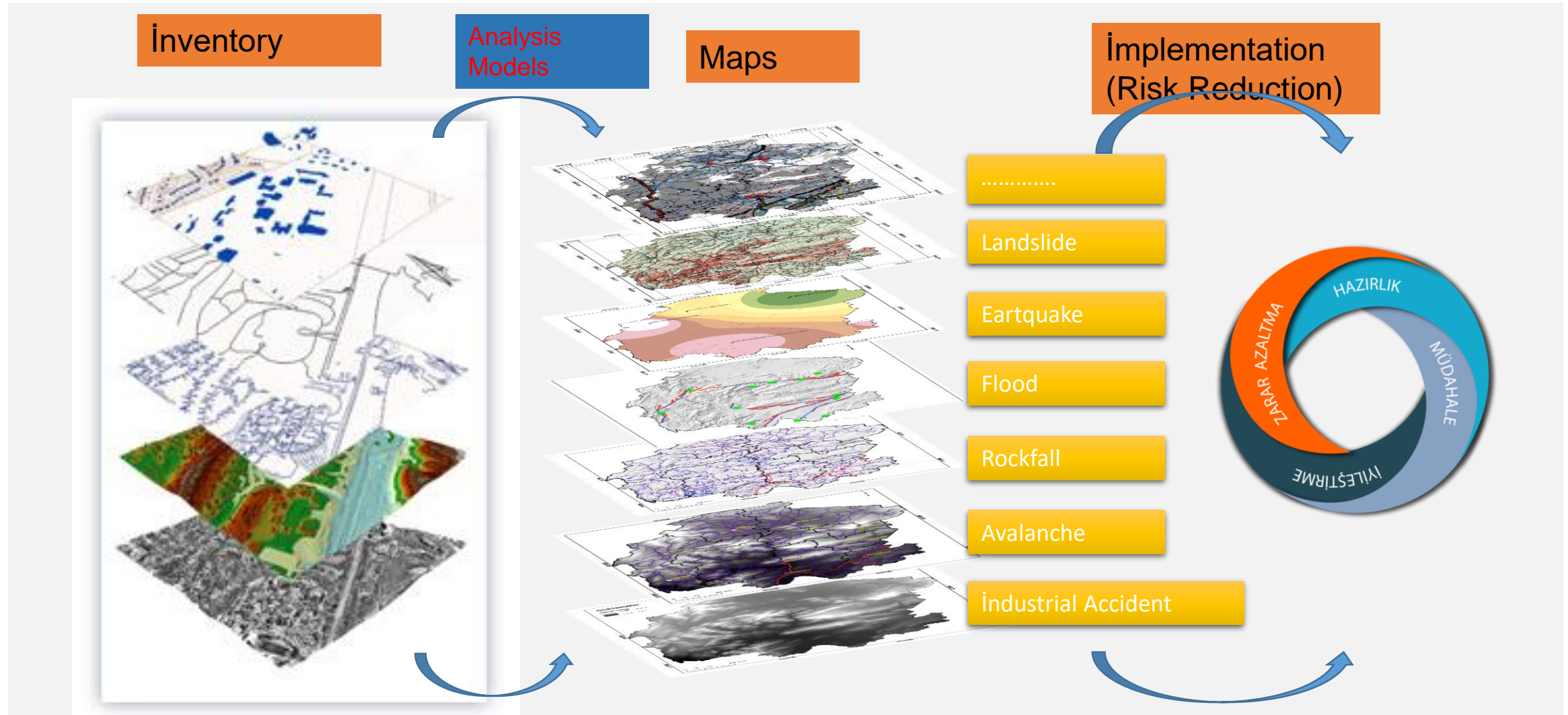
**Ministries and  
Other Systems**

**WEB Services**

**Ministries and  
Other Systems**

Noktasal Afet Karnesi				
Nokta	37.038, 35.791	Deprem	0.280 Gal	PGA 475
İl	Adana	Heyelan	Çok Düşük	Duyarlılık
İlçe	Ceyhan	Sel / Taşkın	0.100 Metre	Su Yüksekliği
Mahalle	Büyükmangıt Mh.	Kaya Düşmesi	Hazırlanıyor	Duyarlılık
Ada / Parsel	0 / 548	Çiğ	Hazırlanıyor	Duyarlılık
Tapu Kimlik	5078188	Endüstriyel Kaza	Hazırlanıyor	Duyarlılık
Tapu Cins	TARLA	Tehlikeli Madde	Hazırlanıyor	Duyarlılık

# ARAS Vision





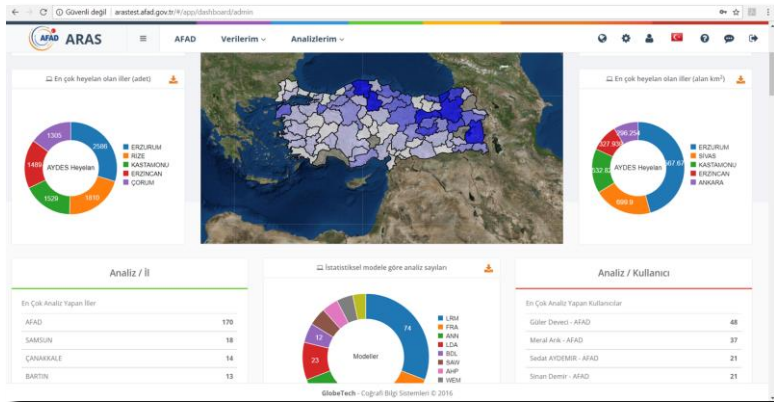
# Disaster Risk Analysis System (ARAS)

**EVIDENCE EXAMINER (LEE)**  
Downloaded by: [Name] Downloaded on: [Date]

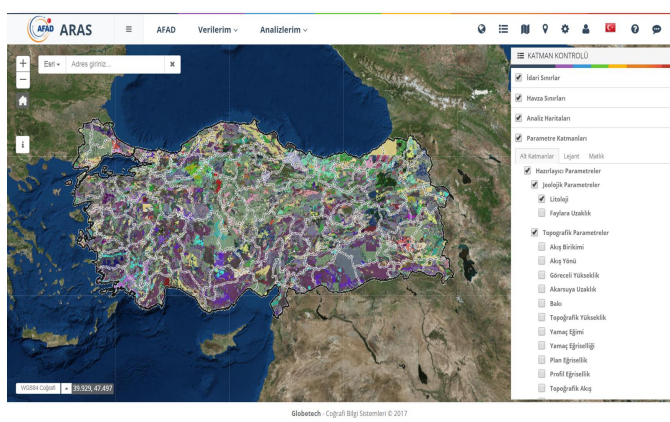
map

**1** **2** **3** **4** **5** **6** **7** **8** **9** **10** **11** **12** **13** **14** **15** **16** **17** **18** **19** **20** **21** **22** **23** **24** **25** **26** **27** **28** **29** **30** **31** **32** **33** **34** **35** **36** **37** **38** **39** **40** **41** **42** **43** **44** **45** **46** **47** **48** **49** **50** **51** **52** **53** **54** **55** **56** **57** **58** **59** **60** **61** **62** **63** **64** **65** **66** **67** **68** **69** **70** **71** **72** **73** **74** **75** **76** **77** **78** **79** **80** **81** **82** **83** **84** **85** **86** **87** **88** **89** **90** **91** **92** **93** **94** **95** **96** **97** **98** **99** **100** **101** **102** **103** **104** **105** **106** **107** **108** **109** **110** **111** **112** **113** **114** **115** **116** **117** **118** **119** **120** **121** **122** **123** **124** **125** **126** **127** **128** **129** **130** **131** **132** **133** **134** **135** **136** **137** **138** **139** **140** **141** **142** **143** **144** **145** **146** **147** **148** **149** **150** **151** **152** **153** **154** **155** **156** **157** **158** **159** **160** **161** **162** **163** **164** **165** **166** **167** **168** **169** **170** **171** **172** **173** **174** **175** **176** **177** **178** **179** **180** **181** **182** **183** **184** **185** **186** **187** **188** **189** **190** **191** **192** **193** **194** **195** **196** **197** **198** **199** **200** **201** **202** **203** **204** **205** **206** **207** **208** **209** **210** **211** **212** **213** **214** **215** **216** **217** **218** **219** **220** **221** **222** **223** **224** **225** **226** **227** **228** **229** **230** **231** **232** **233** **234** **235** **236** **237** **238** **239** **240** **241** **242** **243** **244** **245** **246** **247** **248** **249** **250** **251** **252** **253** **254** **255** **256** **257** **258** **259** **260** **261** **262** **263** **264** **265** **266** **267** **268** **269** **270** **271** **272** **273** **274** **275** **276** **277** **278** **279** **280** **281** **282** **283** **284** **285** **286** **287** **288** **289** **290** **291** **292** **293** **294** **295** **296** **297** **298** **299** **300** **301** **302** **303** **304** **305** **306** **307** **308** **309** **310** **311** **312** **313** **314** **315** **316** **317** **318** **319** **320** **321** **322** **323** **324** **325** **326** **327** **328** **329** **330** **331** **332** **333** **334** **335** **336** **337** **338** **339** **340** **341** **342** **343** **344** **345** **346** **347** **348** **349** **350** **351** **352** **353** **354** **355** **356** **357** **358** **359** **360** **361** **362** **363** **364** **365** **366** **367** **368** **369** **370** **371** **372** **373** **374** **375** **376** **377** **378** **379** **380** **381** **382** **383** **384** **385** **386** **387** **388** **389** **390** **391** **392** **393** **394** **395** **396** **397** **398** **399** **400** **401** **402** **403** **404** **405** **406** **407** **408** **409** **410** **411** **412** **413** **414** **415** **416** **417** **418** **419** **420** **421** **422** **423** **424** **425** **426** **427** **428** **429** **430** **431** **432** **433** **434** **435** **436** **437** **438** **439** **440** **441** **442** **443** **444** **445** **446** **447** **448** **449**

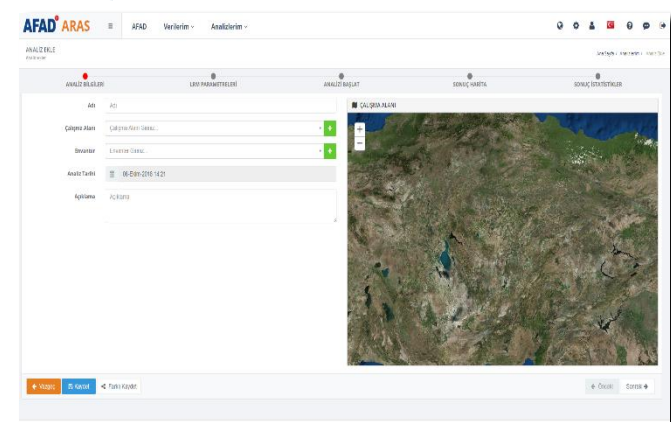
## inventory interface



## Manager interface

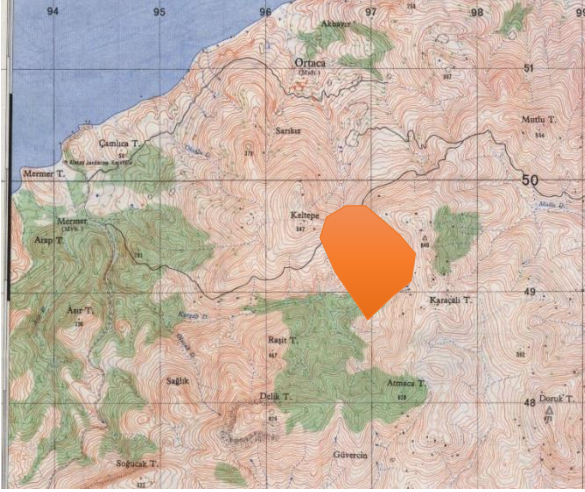


## Map interface

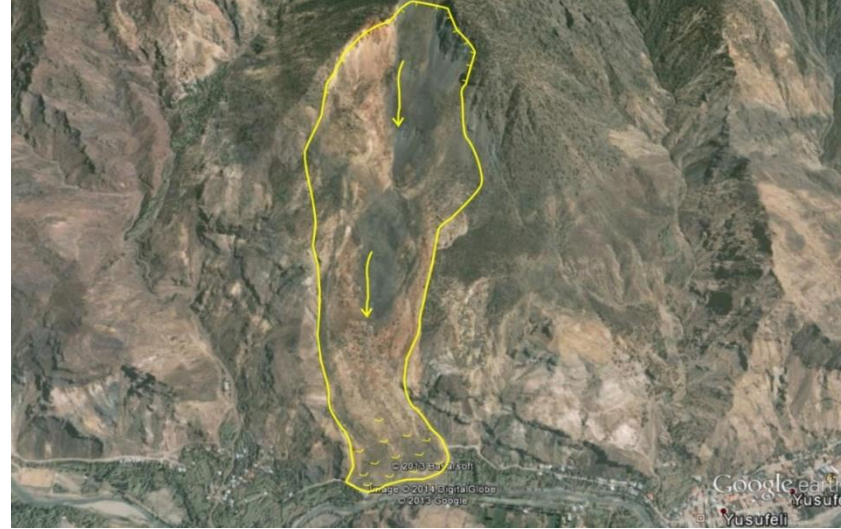


## Analyses interface

# Inventory Collection



## GATHERING INVENTORY/ SITE SURVEYS



Heyelan Kayıt Formu			
Kayıt Tarihi: 16.04.2012		Genel Görünüm	
Envanter No: K-5			
Heyelan Yeri: Kumluca Boğaz Mah.			
Pafta No: Zonguldak F28b2			
Litolojik Tanımlama: Üst Kretase filizi.			
Kaydı Alan: Aycan Kalender		Fotoğraf No: 8/9/10/11	
Heyelan Tarihi: 11.04.1998		Bitki Örtüsü: • Çok yoğun • Yoğun • Orta • Seyrek • Yok	
Uzunluk (m)	Genişlik (m)	Derinlik (m)	Su Durumu: • Kuru • Nemli • Damlama • Akış • Yok
450	108	16	
Yamaç Eğimi (°): 32		Tetikleyici Etken: • Var • Yok	
Bakı (°): 190		• Deprem • Yağış • İnsan	
Yamaç Şekli: • İçbükey • Dışbükey • Düz		Tetikleyici Etken Bilgisi: • Kayıtlardan • Kişilerden	
Süresizlik Denetimli: Evet		Hayır	
Süresizlik Konumu: -		Heyelan Zarar Bilgisi: • Var (Zarar Formu doldurunuz) • Yok	
Heyelan Aktivitesi (Hareket): • Aktif • Duraklamış • Yeniden Aktive Olmuş • Aktif Olmayan ( • Eski • Çok Eski • Durağan • Kalıntı)			
Heyelan Aktivitesi (Tür): • Karmaşık • Bileşik • İlerleyen • Tekil • Çoklu			
Heyelan Türü:			
Malzeme Türü			
Hareket Türü		Toprak	
		Kaya	İri Taneli İnce Taneli
1. Düşme	Kaya Düşmesi	Moloz Düşmesi	Toprak Düşmesi
2. Devrilme	Kaya Devrilmesi	Moloz Devrilmesi	Toprak Devrilmesi
3. Kayma	Kaya Kayması	Moloz Kayması	Toprak Kayması
4. Yayıma	Kaya Yayıması	Moloz Yayıması	Toprak Yayıması
5. Akma	Kaya Akması	Moloz Akması	Toprak Akması
6. Karmaşık	En az iki veya daha fazla sayıda heyelanın bir arada geliştiği heyelanlar	Krip	
Heyelan Sınıfı: 3.a.3 (Dönel Toprak Kayması)			
Açıklamalar:			



# Inventory Interface

Graphics and attributes can save and change

HEYELAN ENVANTERLERİ

İstemde kayıtlı Heyelan Envanterlerini listeler









































Ana Sayfa / Heyelan Envan

orgula

Tümünü Haritada Göster

Toplu Heyelan Envanterleri Ekle


Heyelan Envanterleri Ekle

İli	Tarihi	Açıklama	İşlemler
6373	Sivas		   
6372	Sivas		   
6371	Sivas		   
6370	Sivas		   
6369	Sivas		   
6368	Sivas		   
6367	Sivas		   
6366	Sivas		   
6365	Sivas		   
6364	Sivas		   

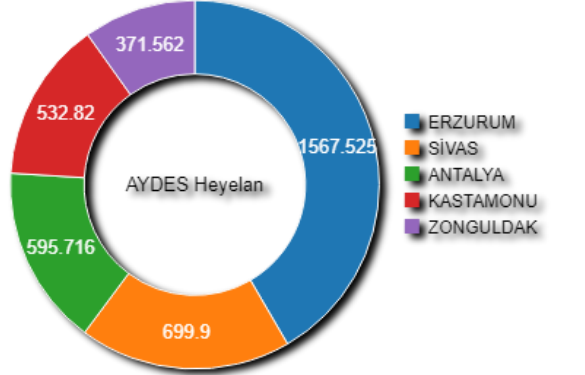
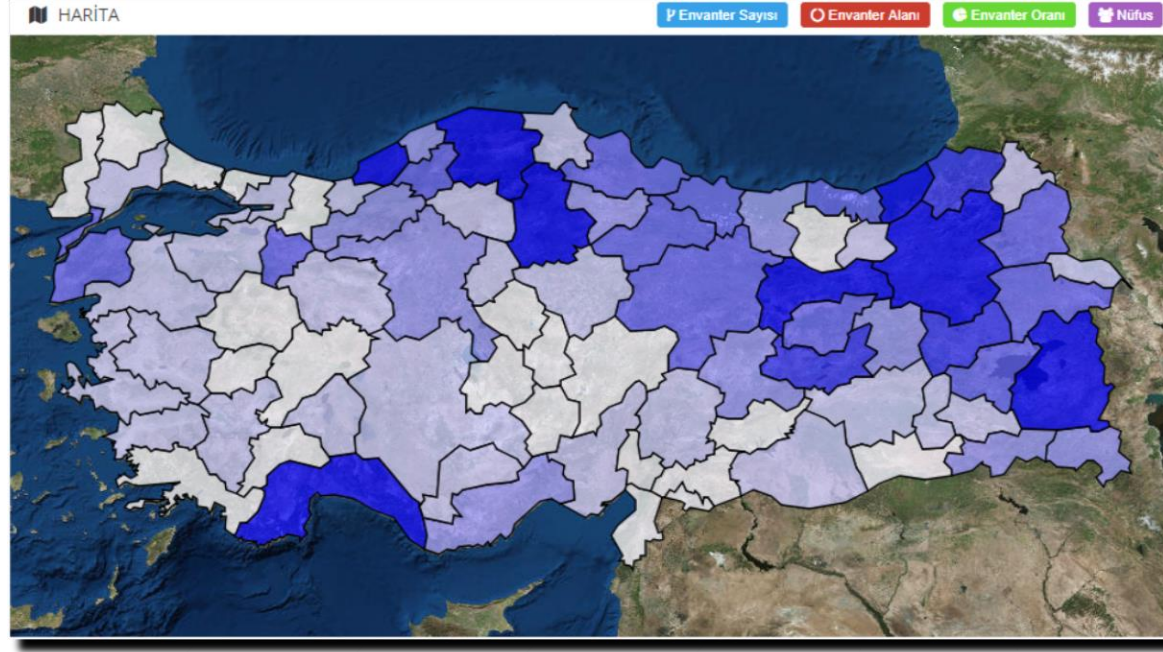
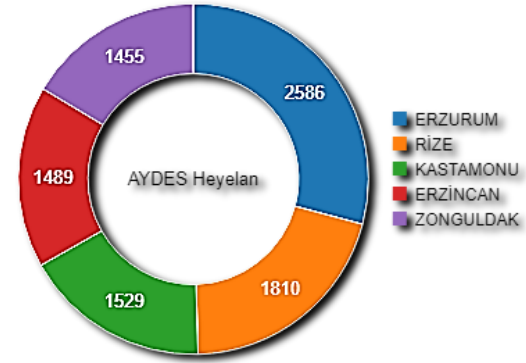
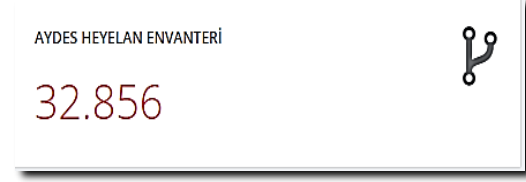
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1 - 10 / 33.275

HARİTA



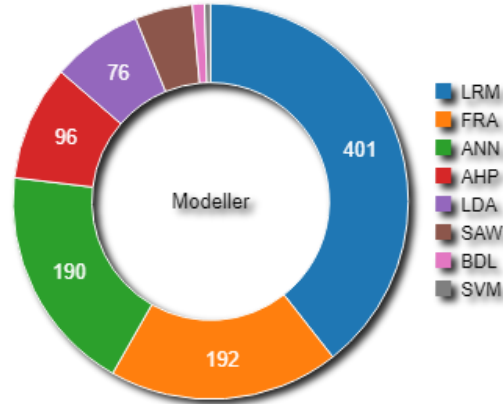
# Manager Interface



## Analiz / İl

### En Çok Analiz Yapan İller

AFAD	285
DÜZCE	46
ADANA	38
İSTANBUL	36
KOCAELİ	35



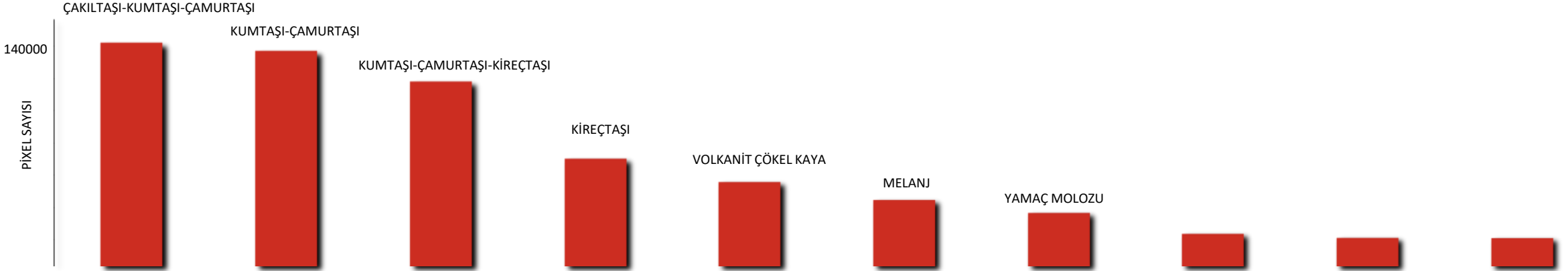
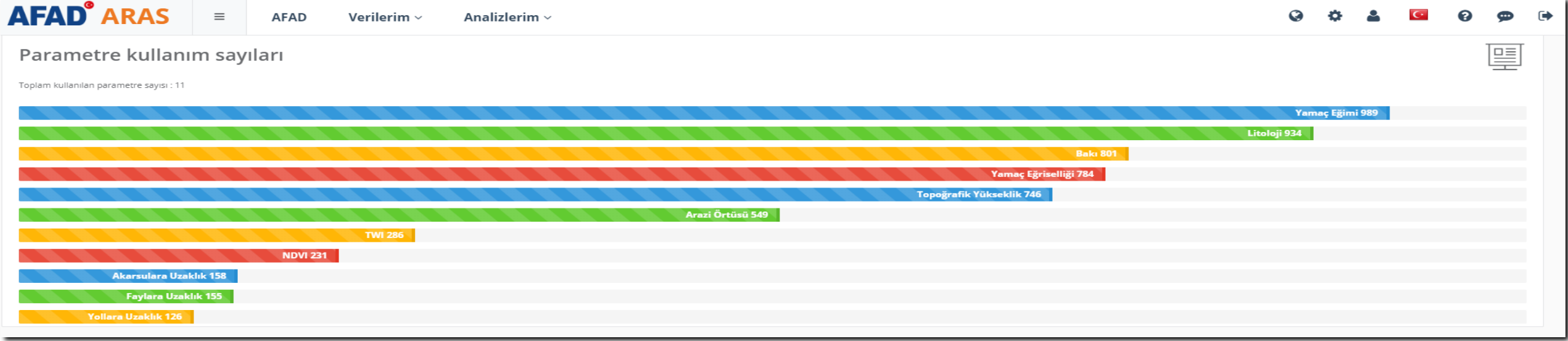
## Analiz / Kullanıcı

### En Çok Analiz Yapan Kullanıcılar

Sedat AYDEMİR - AFAD	92
Güler Deveci - AFAD	66
Meral Arık - AFAD	44
Satılmış KOCABAŞ - DÜZCE	37
Fatih AYDIN - AFAD	31



# Manager Interface



# Map Interface

The screenshot displays the ARAS map interface. The main map area shows a satellite view of Turkey with various data layers overlaid. The layers are categorized into administrative boundaries, watershed boundaries, analysis maps, and parameter layers. The layer control panel on the right lists the following layers:

- İdari Sınırlar (Administrative Boundaries)
- Havza Sınırları (Watershed Boundaries)
- Analiz Haritaları (Analysis Maps)
- Parametre Katmanları (Parameter Layers)

The parameter layers are further categorized into:

- Hazırlayıcı Parametreler (Preparation Parameters)
- Jeolojik Parametreler (Geological Parameters)
- Topografik Parametreler (Topographic Parameters)

The map interface also includes a search bar at the top left, a menu icon, and a status bar at the bottom left showing the WGS84 Coğrafi coordinate system and the coordinates 39.929, 47.497.

Globetech - Coğrafi Bilgi Sistemleri © 2017

# Analysis Interface

## MODELS FOR SUSCEPTIBILITY

- Simple Additive Weighting (SAW)
- Analytical Hierarchy Process (AHP)
- Logistic Regression (LRM)
- Linear Discriminant (LDA)
- Frequency Ratio (FRA)
- Artificial Neural Network (ANN)
- Bayesian Deep Learning (BDL)
- Support Vector Machine (SVM)

- Slope
- Aspect
- Elevation
- Curvature
- Land Cover
- Geology
- NDVI
- TWI
- Stream
- Fault
- Roads etc.....

## HAZARD ANALYSIS AND MAPS

- Triggered by Earthquake
- Triggered by Precipitation

5 Year  
10 Year  
25 Year  
50 Year  
100 Year

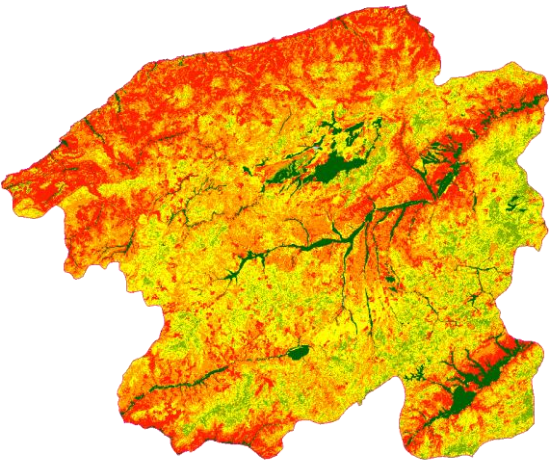


# Analysis Interface

SUSCEPTIBILITY

Artificial Neural  
Network (ANN)

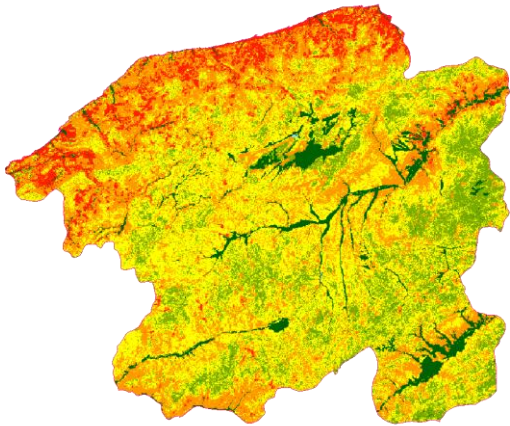
- Yamaç Eğimi
- Arazi Örtüsü
- Litoloji
- Bakı
- Yamaç Eğriselliği
- Topoğrafik Yükseklik



HAZARD

Triggered by  
Precipitation

25 Year





# Maps Evaluation

kast\_ann  
Adı

HEYELAN  
Afet Türü

ANN  
Analiz Tipi

İl\_Kast  
Çalışma Alanı

03/Ekim/2018  
Analiz Tarihi

İl\_Kast, ANN, Eşit Aralıklı  
Açıklama

Yamaç Eğimi

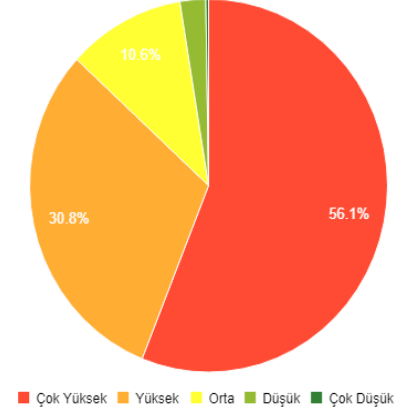
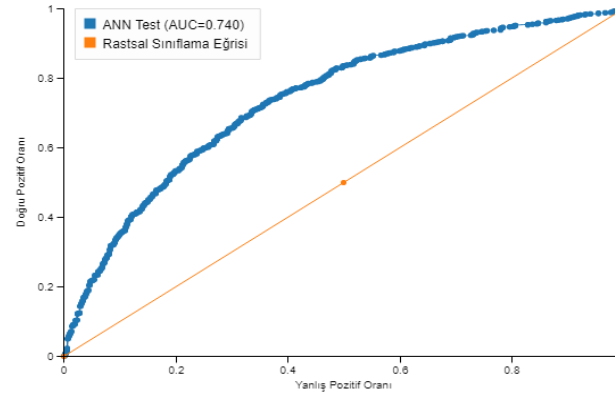
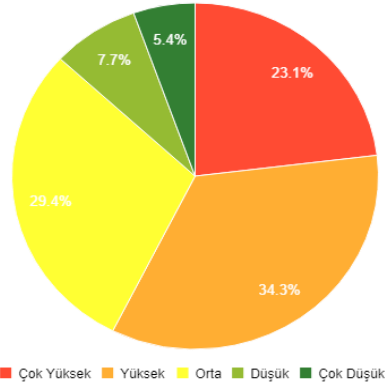
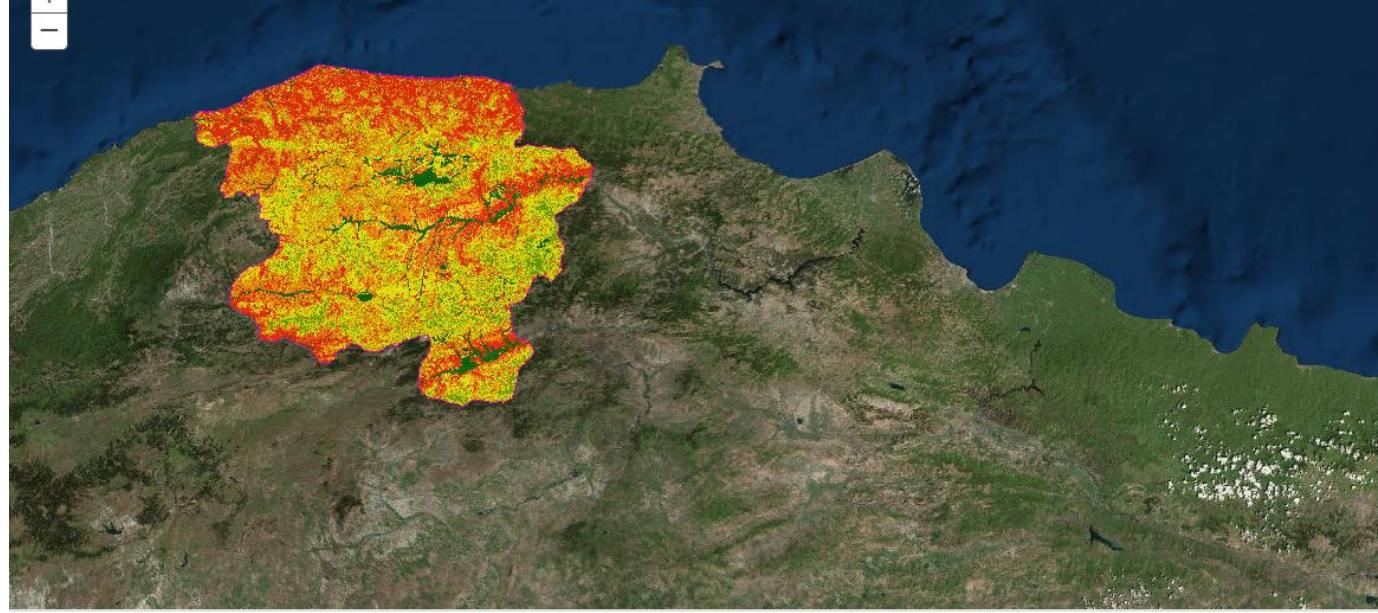
Arazi Örtüsü

Litoloji

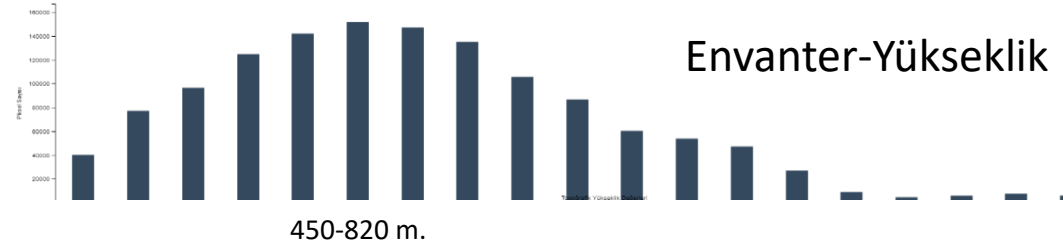
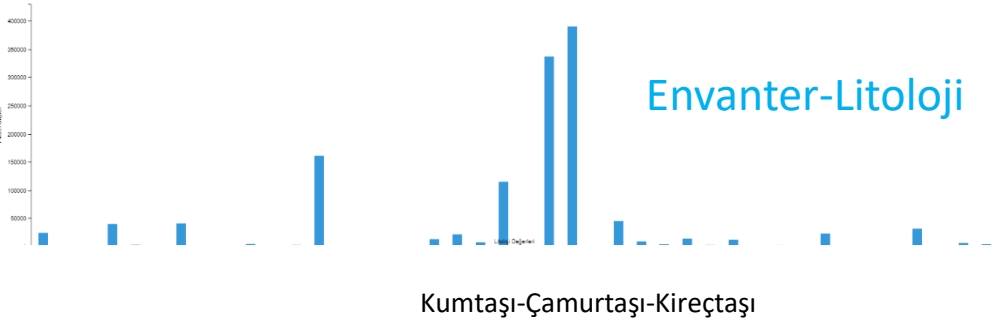
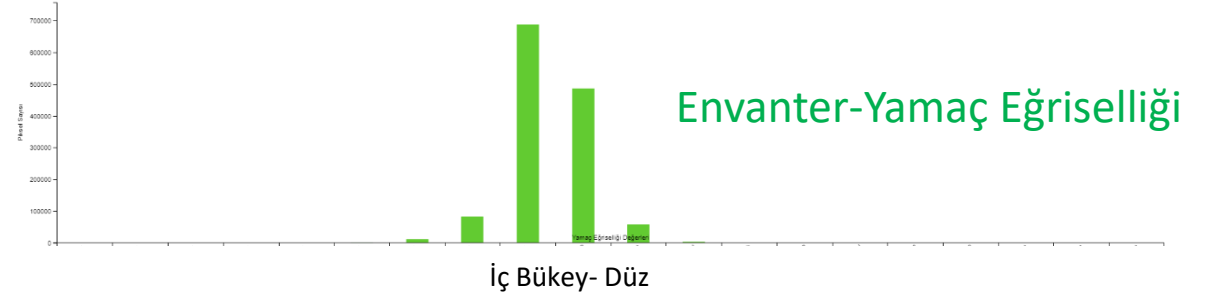
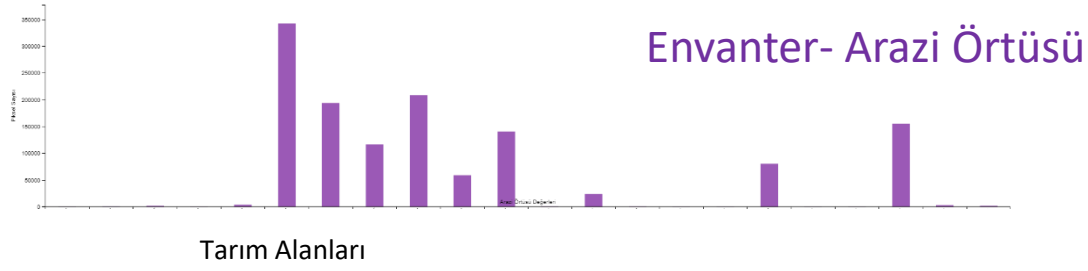
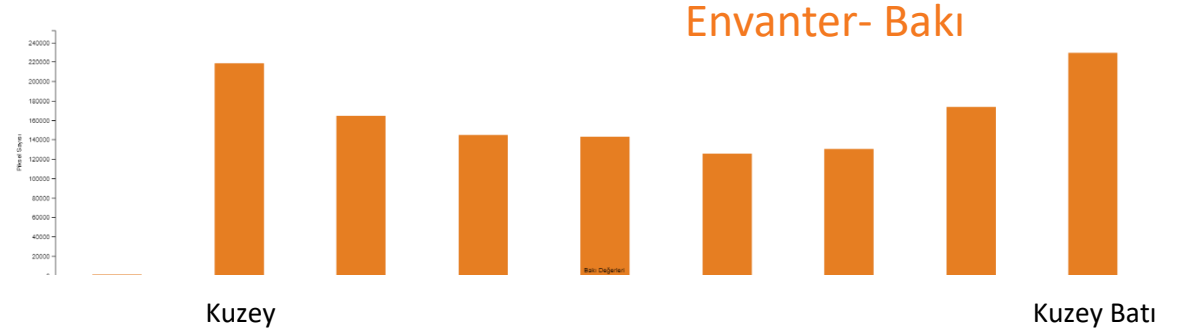
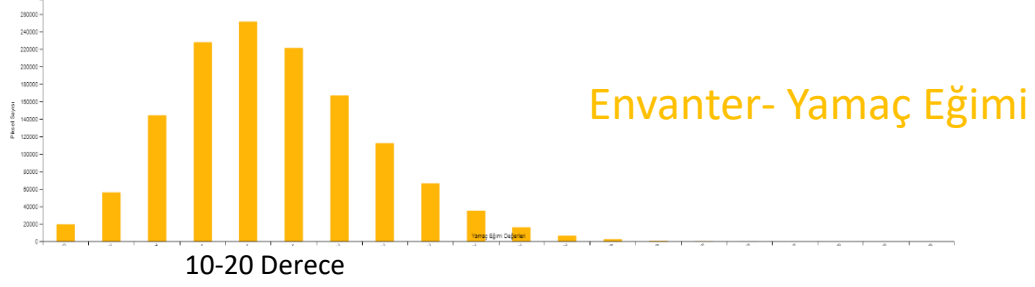
Bakı

Yamaç Eğriselliği

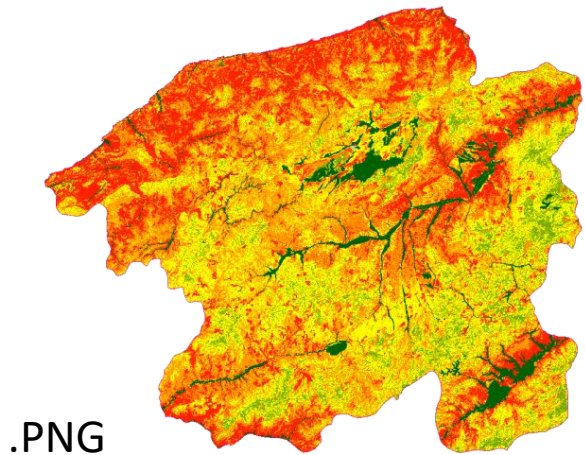
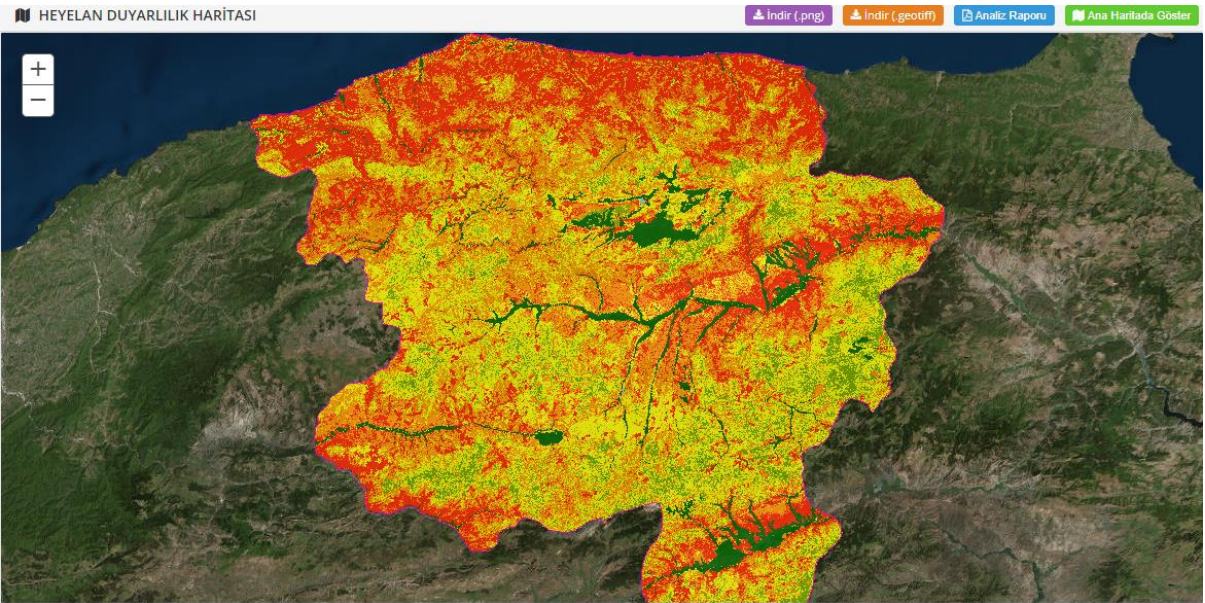
Topoğrafik Yükseklik



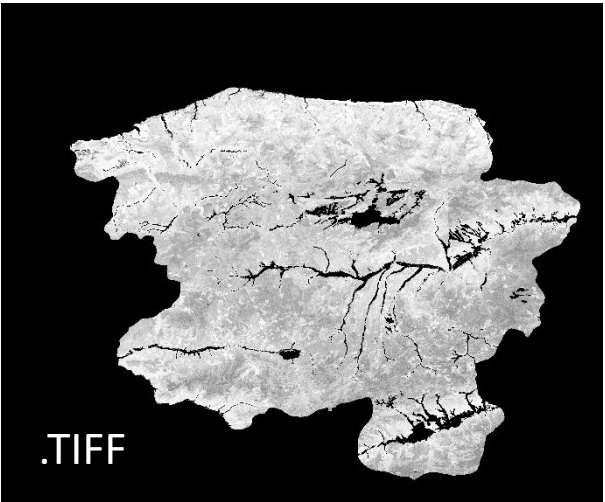
# Maps Evaluation



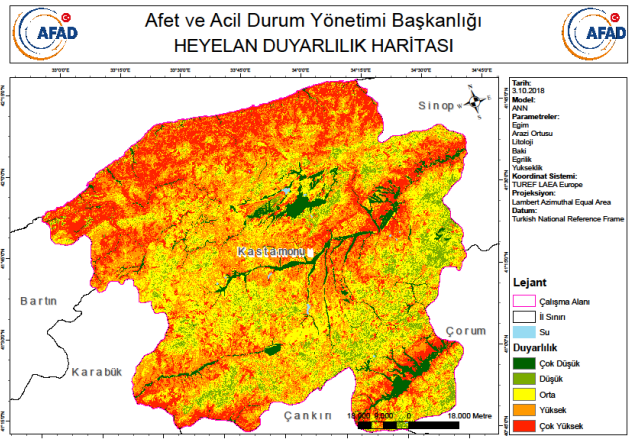
# Outputs



.PNG



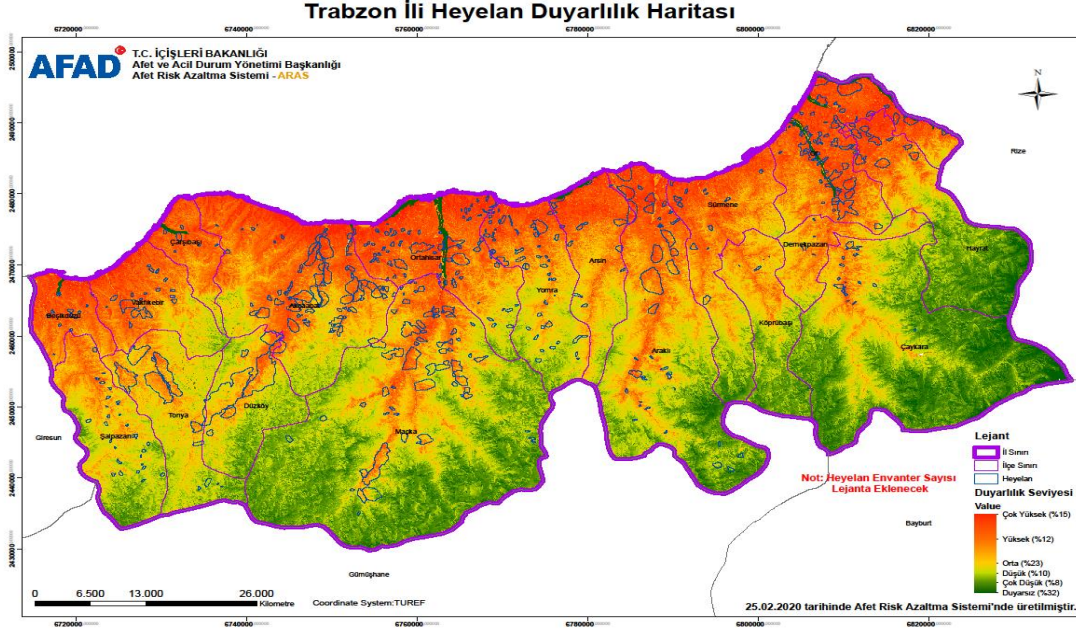
.TIFF



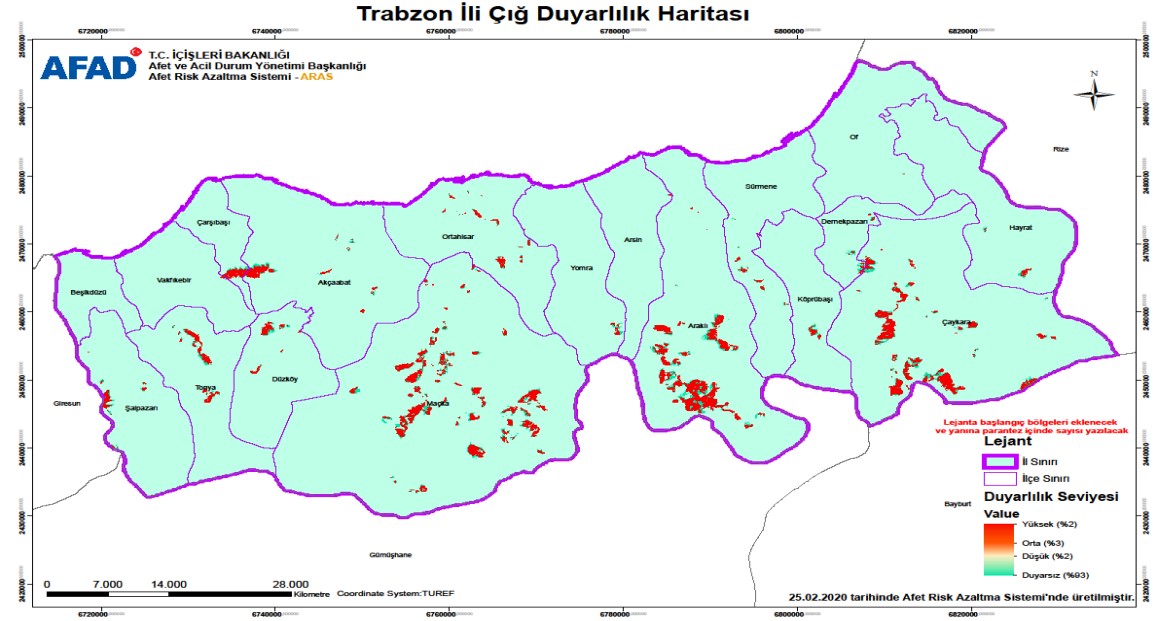
ANALİZ  
RAPORU  
(PDF)



# Local Maps



20\*20 m. resolution Province maps

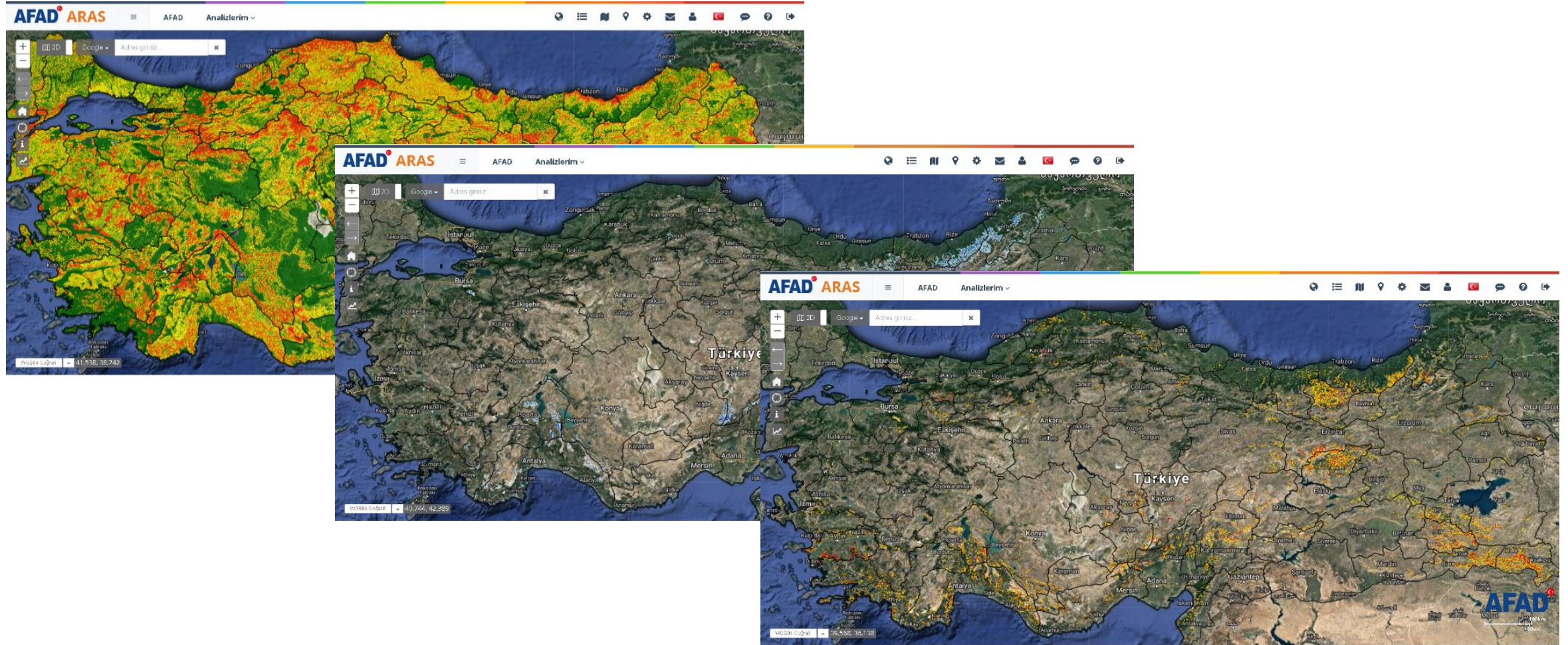




# Produts

Lanslide 20\*20, Rockfall 20\*20 , avalanche 20\*20

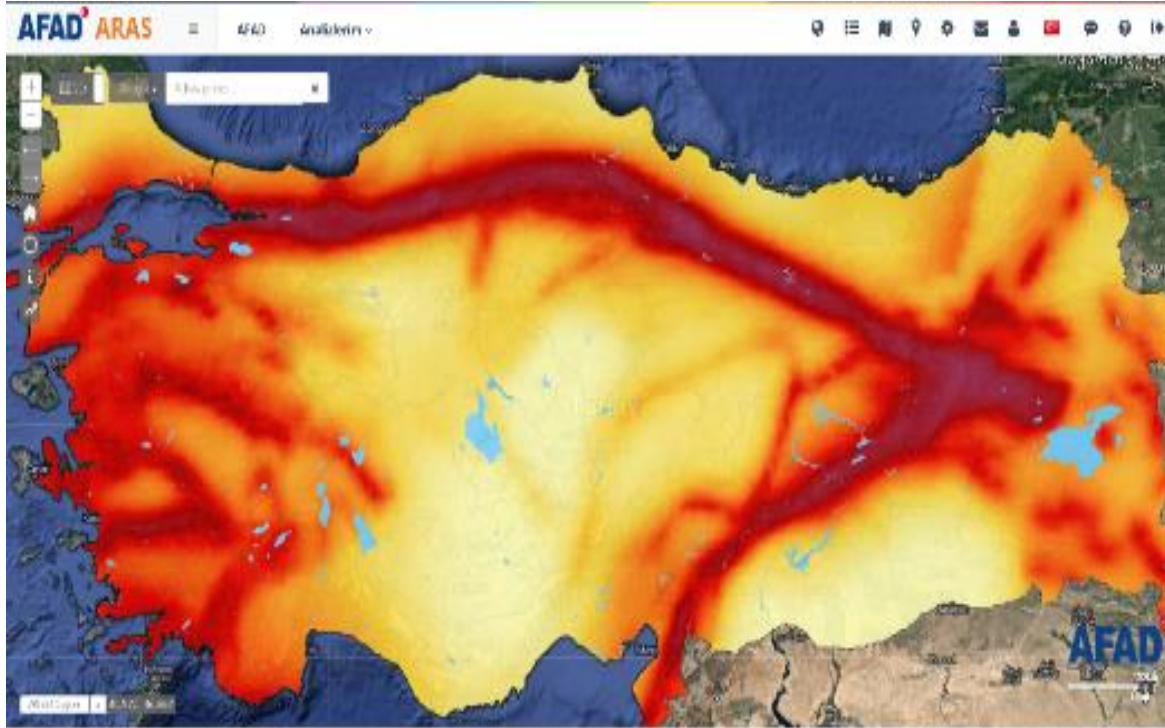
These maps are services the other governmental institutions via web services.





# Integrated Maps

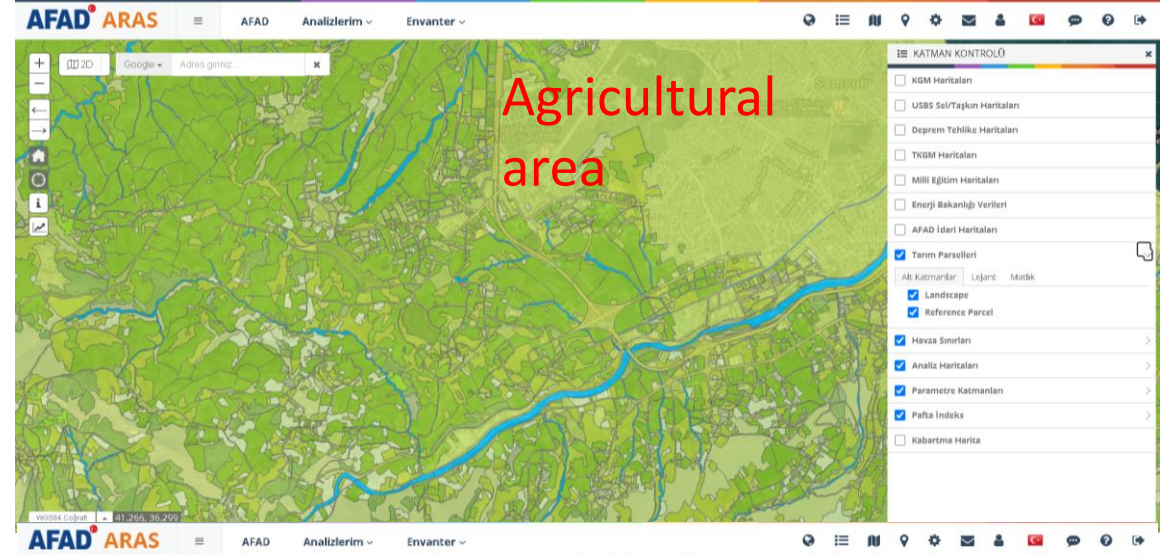
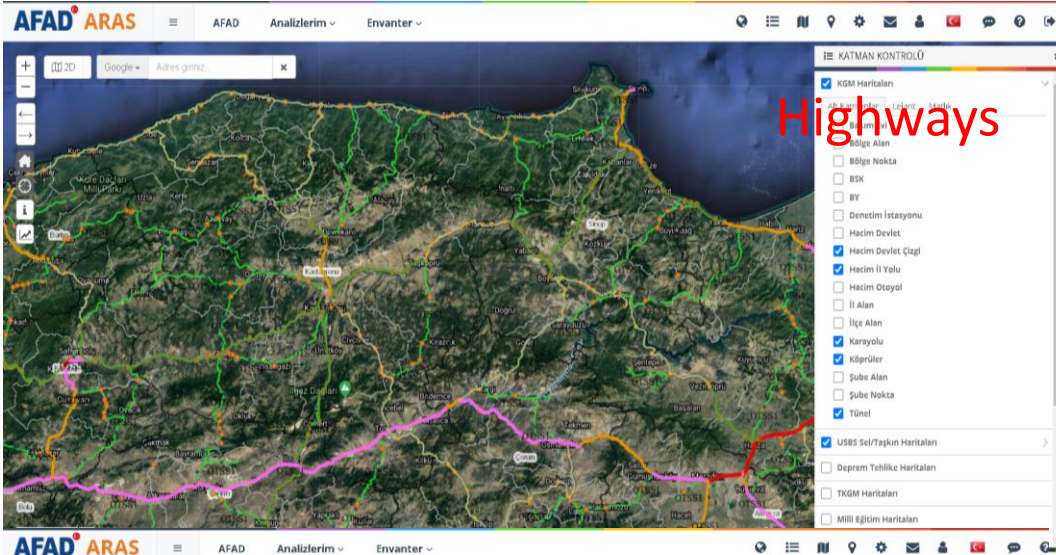
- ✓ Earthquake hazard map (Produced by Earthquake department of AFAD)
- ✓ Flood hazard maps (Produced by General Directories of Water Management)





# Integrated Data

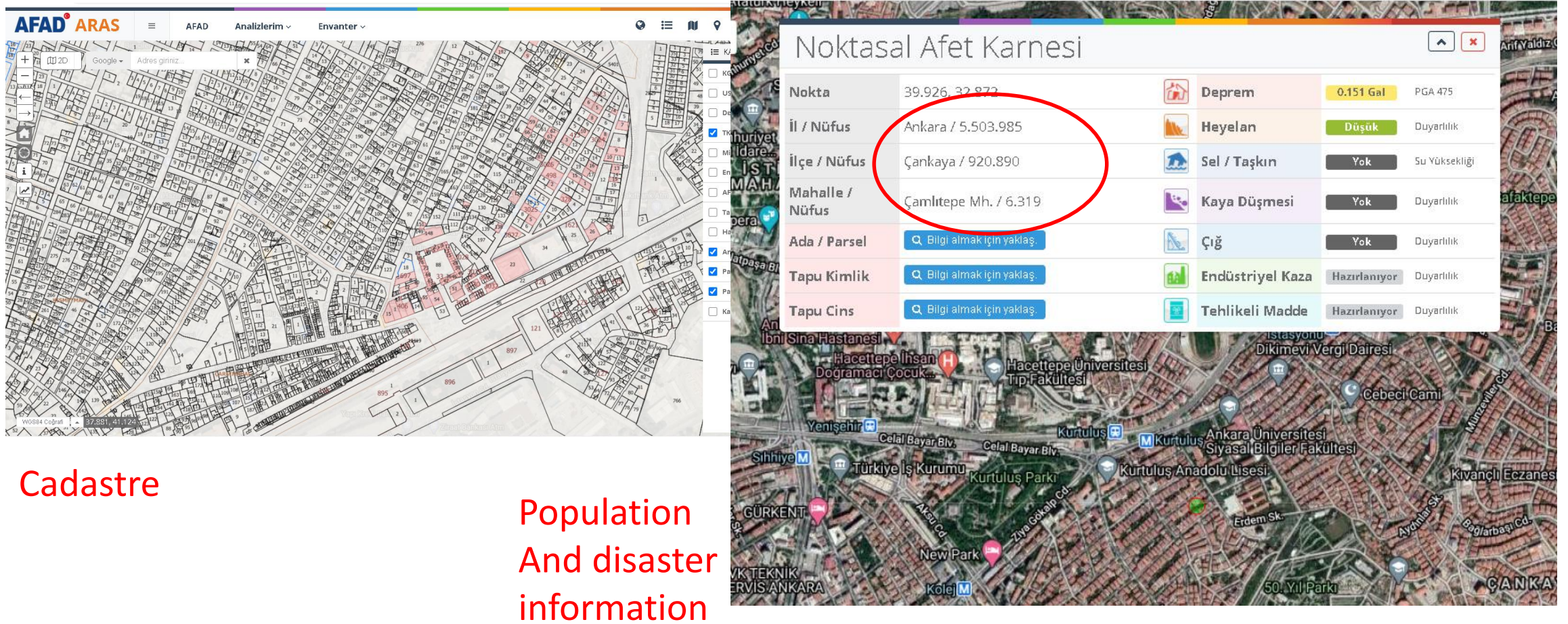
- ✓ Vector datas are necessary to use in risk analysis models.





# Integrated Data

- ✓ Vector datas are necessary to use in risk analysis models.



Noktasal Afet Karnesi			
Nokta	39.926, 32.872	Deprem	0.151 Gal PGA 475
İl / Nüfus	Ankara / 5.503.985	Heyelan	Düşük Duyarlılık
İlçe / Nüfus	Çankaya / 920.890	Sel / Taşkın	Yok Su Yüksekliği
Mahalle / Nüfus	Çamlıtepe Mh. / 6.319	Kaya Düşmesi	Yok Duyarlılık
Ada / Parsel	<a href="#">Bilgi almak için yaklaş</a>	Çığ	Yok Duyarlılık
Tapu Kimlik	<a href="#">Bilgi almak için yaklaş</a>	Endüstriyel Kaza	Hazırlanıyor Duyarlılık
Tapu Cins	<a href="#">Bilgi almak için yaklaş</a>	Tehlikeli Madde	Hazırlanıyor Duyarlılık

**Cadastre**

**Population  
And disaster  
information**





**Thank You**