



SUTGMM PROGRAMME



Server based Unified Thematic Geological Mapping in Makran

2026 - 2030

The SUTGMM PROGRAMME

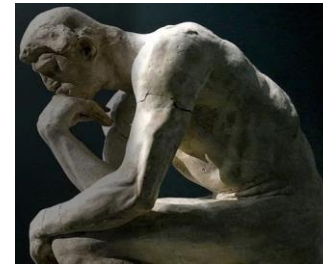
The Server based Unified Thematic Geological Mapping in Oman Programme (**SUTGMM**) is an multi-disciplinary geological mapping in cloud computing approached Machine learning and AI sponsored by Iranian Government.

This 2-Years programme aims at preparing a The Server based Thematic Geological Maps in territory of the Iranian Makran zone in scale of 1:50,000.

SUTGMM drive together a group of specialists whose expertise includes several domains of Geology, Remote sensing, Programming and Machine learning and Artificial Intelligence. One of the main feature of SUTGMM is transferring of the knowledge and technology as well as close relationships that develop between Iranian specialists under umbrella of the UNESCO Chair on Coastal Geo-Hazard Analysis (UCCGHA), through common field works and workshops organized during the programme.



OBJECTIVES

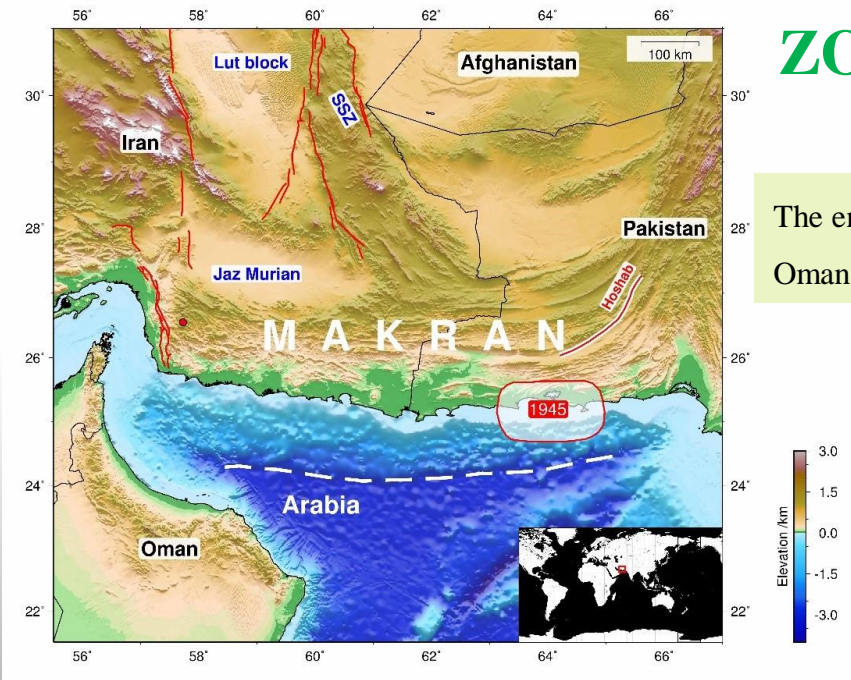


The **SUTGMO** program is ultimately designed to (1) provide new and modern information on server-based integrated thematic geological maps of the Makran domain through collaboration with regional specialists, and (2) to develop and evaluate a comprehensive and implement machine learning and AI in geological mapping in different aspects of geology.



BASIC IDEA OF THE SUTGMM PROGRAMME

The basic idea is, drawing inspiration from the abundant geological literature dealing with Makran geology, (1) to establish a synthesis of the complex polyphase tectonic and stratigraphic evolution of the main sedimentary and orogenic basins which developed in the Makran domain, and (2) provide an appropriate algorithm, compatible with the field of machine learning and cloud computing for segmentation and clustering of object bases, and (3) generate an integrated set of thematic maps in geology, environmental geology, mineral exploration, and (4) data sharing and knowledge and technology transfer.



ZONE OF INTEREST

The entire territory (~65,000 km²) of the Makran zone of Iran is limited to the Strait of Hormuz and the Gulf of Oman in the south and the Pakistan boarder in the east.

WORKING METHODE

Preface:

Server-based thematic mapping is the process of creating and displaying maps that show the spatial distribution of a theme or topic, such as population density, climate, or land use, using a server that hosts the data and the mapping software. Cloud computing is the delivery of computing services, such as servers, storage, databases, networking, software, analytics, and intelligence, over the internet.

AI or artificial intelligence is the use of computer systems to perform tasks that normally require human intelligence, such as data analysis, image recognition, natural language processing, and decision-making. AI has many potential applications in geology and hazard assessment, such as improving data collection and handling, enhancing modeling and prediction, and providing effective communication. AI and machine learning are techniques that enable computers to perform tasks that normally require human intelligence, such as data analysis, image recognition, natural language processing, and decision-making.

Precise identification and mapping of geological formations is crucial for geological research, environmental conservation, and natural resource exploration. The typical technique for mapping rock formations via remote sensing entails manually digitizing aerial photos or digital images or classifying individual pixels based on spectral characteristics using traditional classification methods on desktop systems. While this method is quicker and simpler than more advanced mapping techniques, it can occasionally possess misclassified pixels with similar spectral properties. This can lead to less precise mapping and also limitations for expansive regions.

Over the last few years, there has been a notable increase in the adoption of server-based cloud computing and Object-Based Image Analysis (OBIA) for geological mapping. This approach has proven to be cost-effective and efficient, particularly in a cloud computing environment, due to its ability to seamlessly integrate data from various sources and solutions while effectively managing complex geological features across vast areas. With its unique ability to consider the spatial context of objects, OBIA can distinguish between different geological features, aiding in precise identification.

The geological thematic maps, known as the second generation of geological maps, offer quick and efficient studies, integration of legends and geological units, and a significant reduction in the analysis and update of information to a global standard. In simpler terms, these maps are designed to provide a faster and more comprehensive understanding of geological data, making it easier to analyze and update information on a global scale. On the other hands, server-based unified thematic geological mapping in cloud computing is a modern approach to geological mapping that utilizes cloud-based servers to store and process geological data.

With this approach, geological data can be easily accessed and analyzed by different users from various locations. It allows geological surveys to be conducted more efficiently and at a lower cost. Cloud computing provides a cost-effective solution for storing and processing large amounts of data. It also allows geologists to collaborate with one another in real-time and share their findings instantly. With the advent of advanced technology and knowledge, there has been a shift towards liberalization and public access to medium and large-scale spatiotemporal data. This includes over three decades of continuous monitoring of the earth's crust using multisensory satellites in different orbits, which are now available on a public platform for research, government and commercial use. Access to pre-existing location-based data, fast processing in a server's cloud environment with pre-prepared samples, and the ability to load additional data have opened up new perspectives for the use of multisensory and server satellite data.

The main advantages of server-based unified thematic geological mapping in cloud computing are that it allows for the integration of different geological datasets from various sources. This helps to create a complete and more accurate geological map. The integration of different datasets also enables geologists to identify new patterns and trends in geological data that may not have been visible before. Furthermore, cloud-based servers allow geologists to access and analyze geological data in real-time, which can help to speed up the decision-making process during a geological survey. Another advantage of server-based unified thematic geological mapping is that it enables geologists to use advanced analytical tools to analyze geological data. These tools can help to identify relationships between different geological features, such as rock formations and fault lines. They can also help to identify areas that are likely to have mineral deposits or other geological resources. By using these tools, geologists can create more accurate and detailed geological maps that can be used for a variety of purposes, including mineral exploration, environmental management, and land-use planning.

The process and quality of producing server-based thematic maps depend largely on the input data, both pre-existing and generated data, during the geological study process. Choosing the right platform for processing information, spectral data and radar for satellite images, and even using aerial photographs suitable for the desired scale plays a crucial role in preparing and increasing the accuracy of the initial map. Field observations and sampling combined with laboratory results can help achieve maximum and possible final accuracy in the verification process. Rehabilitation and optimization of age, lithological, and geochemical data of each separated rock unit, in addition to using significant information published from the integration of laboratory data obtained from multiple stages of field control, are also important. Field verification based on the initial map, the possibility of access and targeted observation one or more times separated from each rock unit resulting from the process of data processing and satellite images, not only in the quadrilateral area of the map, but even beyond the study area cover. The nature of layered and multiple processing of spatial information and its online integration with pre-existing data, both in the area and in the surrounding areas, are among the factors that determine the final uncertainty coefficient in proportion to the amount and accuracy of processed information and data set.

Doing this process not only improves the accuracy and uncertainty of server-based second-generation geological maps from qualitative coefficient (speculation) to numerical coefficient, but also determines the error coefficient of each unit relative to the surrounding unit. However, at the end of this stage, not only is it possible to edit and correct (manually) point-by-point map correlations with satellite and aerial imagery with higher accuracy, which is necessary.

Second generation geological-thematic maps mean: rapidity of studies, integration of legends and geological units, significant reduction in the use of instrumental analysis, simultaneous saving of the process of updating information production with precision and global standards. So, due to the increasing geopolitical limitations and risks of geological surveys and mineral exploration in border or limited access areas, the use of a new method such as this protocol seems very useful and informative.

High precision, rapid project implementation and cost reduction up to 10 times compared to traditional mapping methods could be mentioned as important markers of the new protocol.

PILOT PROJECT

Our research introduces an innovative method for rock unit mapping, utilizing OBIA techniques in a cloud computing environment. By integrating clustering, field checking, and Random Forest (RF) machine learning algorithms, we extracted relevant features from various Remote Sensing datasets. Our study achieved a % overall accuracy of 82.1% in mapping geological rock units in Iran's Lut Desert (~30000km²), and also recently in ~ 6000km² SE Iran in Makran area. The aim of both of the pilot projects was to formulate and use the new methodologies to prepare geological thematic maps based on pre-existing data such as satellite imagery and cloud computing process on public servers such as Google Earth Engine (GEE) combined with field and laboratory controls. Implementing our RF methodology in a cloud computing environment allowed us to handle vast datasets and enhance computational efficiency. This approach provides a precise and efficient alternative to traditional geological mapping, supporting natural resource exploration and environmental management. Our research yields valuable insights into geological evolution, while also improving the scalability and efficiency of the thematic mapping procedure.

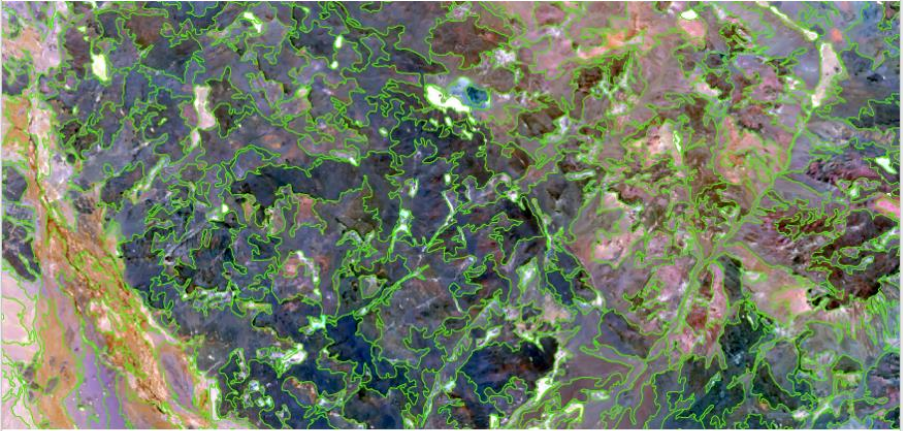
The project's achievements in the preparation of an integrated and homogeneous geological map in the western Lut and also in Makran area in the Coastal and Outer Makran zones include innovation in methods and procedures, fast and accurate data production, an integrated method for online geological studies, cost and time savings in engineering, exploration, and geology projects, optimization of geological-exploratory study costs with unlimited capability for simultaneous loading and processing of large data, and hardware/ software platforms for three-dimensional geological maps. The research was conducted using international standards and the latest scientific achievements in the field of Machine Learning.

In addition, it offers unlimited capabilities for simultaneous loading and processing of large data, preparing a suitable platform for the encyclopedia of earth sciences, and providing hardware and software platforms for the preparation of three-dimensional geological maps.

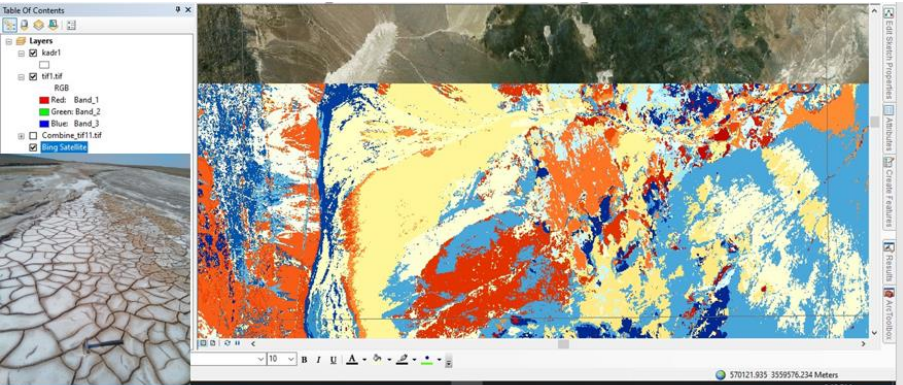
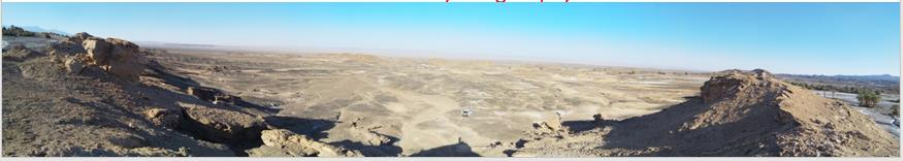
This research satisfied four counters of artificial intelligence in the field of machine learning: transfer learning, few-shot learning, reinforcement learning, and meta-learning.



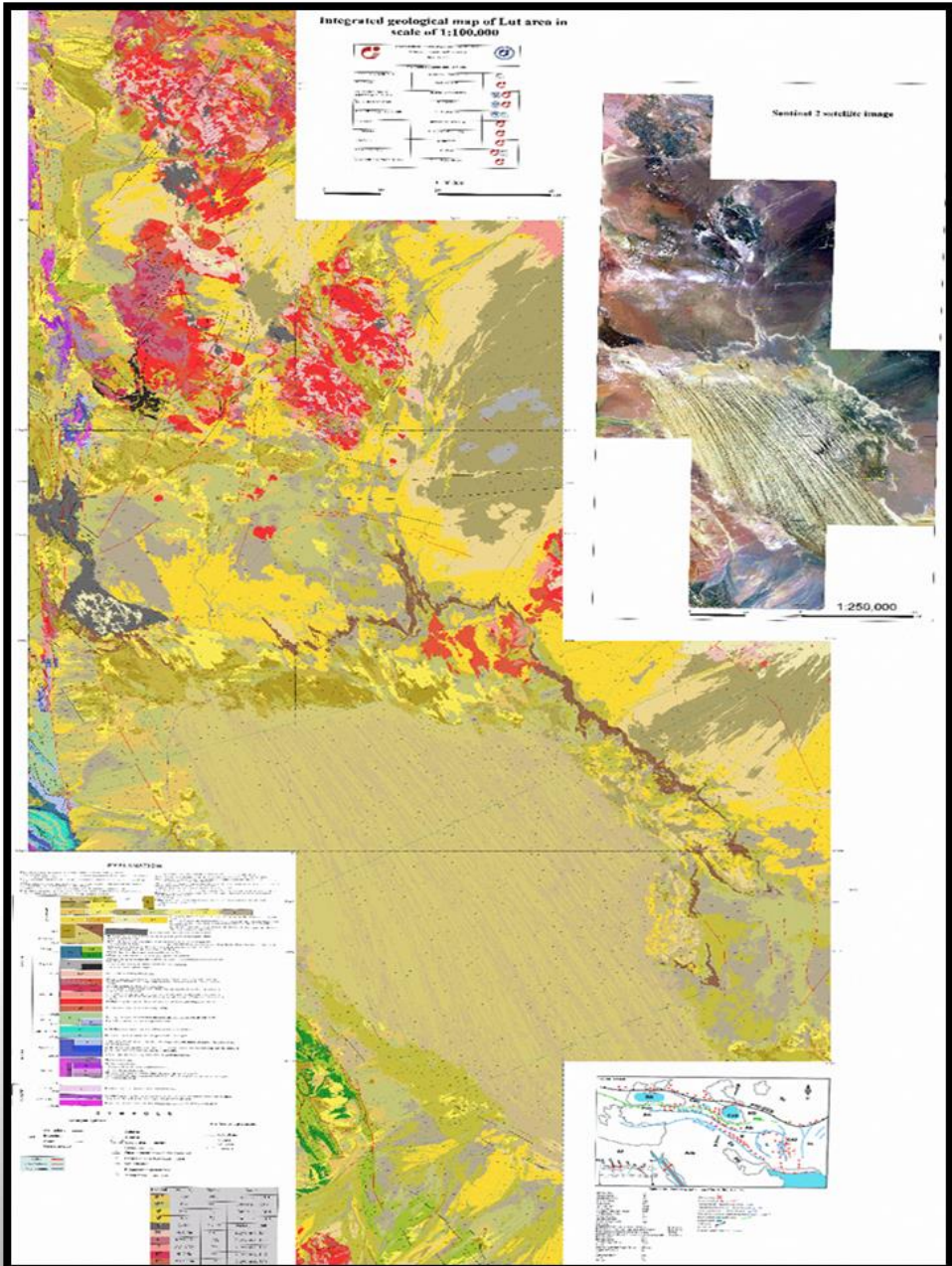
Formal editing of outcrops based on quantitative error computational simulation by segmentation method



Segmentation factor 600 to 200, ~scale 1:250000 to 1:50000
 Based on field observation by using 64 physical and chemical indices



Preliminary Geo Unit. Based on the existed documents



Workshop

The server based integrated geological mapping in Makran area

Dr. Hamid Alizadeh Dr. Hamid Nazari

Dr. Jalal Karami Dr. Mohammad Reza Ghassemi

5 & 6 Dec. 2023 time: 10-15

Research Institute for Earth Sciences

To register, send your details to ucggha.ries@gmail.com
 Connection link: <https://join.skype.com/EPdMPdPv5mU>

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 unesco Chair

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 انجمن زمین شناسی ایران
 1995
 جوش زمین شناسان
 ONE DAY WORKSHOP ON:

1397
 28 Nov 23
 news

Workshop The server based integrated geological mapping in Makran area

Tarbiat Modares University

ARTIFICIAL INTELLIGENCE GEOLOGICAL MAP OF MAKRAN AREA

H. Nazari,
Geological Mapping in the Era of AI: Leveraging Innovation for Precision and Speed

J. Karami,
Confusion Matrix and Uncertainty Prediction in Machine Learning

S. Arefipour,
Balanced Cross Section and Move Software

A. Fathian,
Online Field Observation and Epicollect

NOVEMBER 19TH 2024 11:00 AM (IN TEHRAN TIME)

GeoNexus

Connection Link: <https://meet.google.com/dja-dpxi-rqj>

ID	Task Mode	Task Name	Duration	تاریخ شروع	تاریخ پایان	Predecessors
1		تهیه نقشه های موضوعی یکپارچه و همگن مبتنی بر سرور با استفاده از یادگیری ماشین و هوش مصنوعی	26- days	14-2/1/10	14-2/1/14	
2		گردآوری اطلاعات و خرید تجهیزات	2- days	14-2/1/10	14-2/1/14	
3		کارگاه آموزشی افتتاح پروژه	2 days	14-2/1/10	14-2/1/14	1FS +2- days
4		بررسی اطلاعات و آماده سازی نقشه های پایه زمین شناسی و پلاطونم GEE	2- days	14-2/1/10	14-2/1/14	1S S
5		ارائه گزارش اولیه	15 days	14-2/1/15	14-2/1/1	2
6		انجام عملیات میدانی و کنترل و ویرایش نقشه های پایه	15 days	14-2/1/10	14-2/1/25	1FS +15- days
7		پیمایش های لازم و نمونه برداری	2- days	14-2/1/10	14-2/1/14	5S S
8		تهیه ژاوند یکپارچه در هنگام مطالعات صحرایی	2- days	14-2/1/10	14-2/1/14	5S S
9		آماده سازی و مطالعات آزمایشگاهی بر روی نمونه ها	9- days	14-2/1/14	14-2/1/23	A
10		ارائه گزارش دوم	15 days	14-2/1/14	14-2/1/29	1S S
11		مدل سازی و برداشتن تصاویر ماهواره ای و باز تولید نقشه های یکپارچه	9- days	14-2/1/10	14-2/1/19	1FS +9- days
12		تهیه نقشه های یکپارچه به همراه ژاوند و نشانه ها	2- days	14-2/1/14	14-2/1/17	11
13		برش های ساختاری	9- days	14-2/1/18	14-2/1/27	12
14		کنترل نهایی و نمونه برداری تکمیلی	2- days	14-2/1/22	14-2/1/24	1FS S +2- days
15		تدوین گزارش	2- days	14-2/1/22	14-2/1/24	1FS S
16		ورقوی سازی نهایی GIS ، کار توپوگرافی	9- days	14-2/1/22	14-2/1/31	1FS S
17		تهیه بانک اطلاعاتی پروژه	24- days	14-2/1/25	14-2/1/19	1FS S +6- days
18		ارائه پروتکل و گزارش و نقشه های نهایی پروژه پایلوت	2- days	14-2/1/22	14-2/1/24	1FS S +2- days
19		انجام تصحیحات داوری	2- days	14-2/1/24	14-2/1/26	1A
20		کارگاه آموزشی 2 پایان پروژه	7 days	14-2/1/20	14-2/1/27	1S S
21		چاپ و تکثیر	2- days	14-2/1/27	14-2/1/29	1S S

Project: Dr Nazari-Makran-shamsi
 Date: 2023/12/07

Task Inactive Summary Manual Task Duration-only Manual Summary Rollup Inactive Task Inactive Milestone

External Tasks External Milestone Deadline Progress Manual Progress

Page 1

Makran Feb. 19-21 2023

ONE DAY WORKSHOP ON:

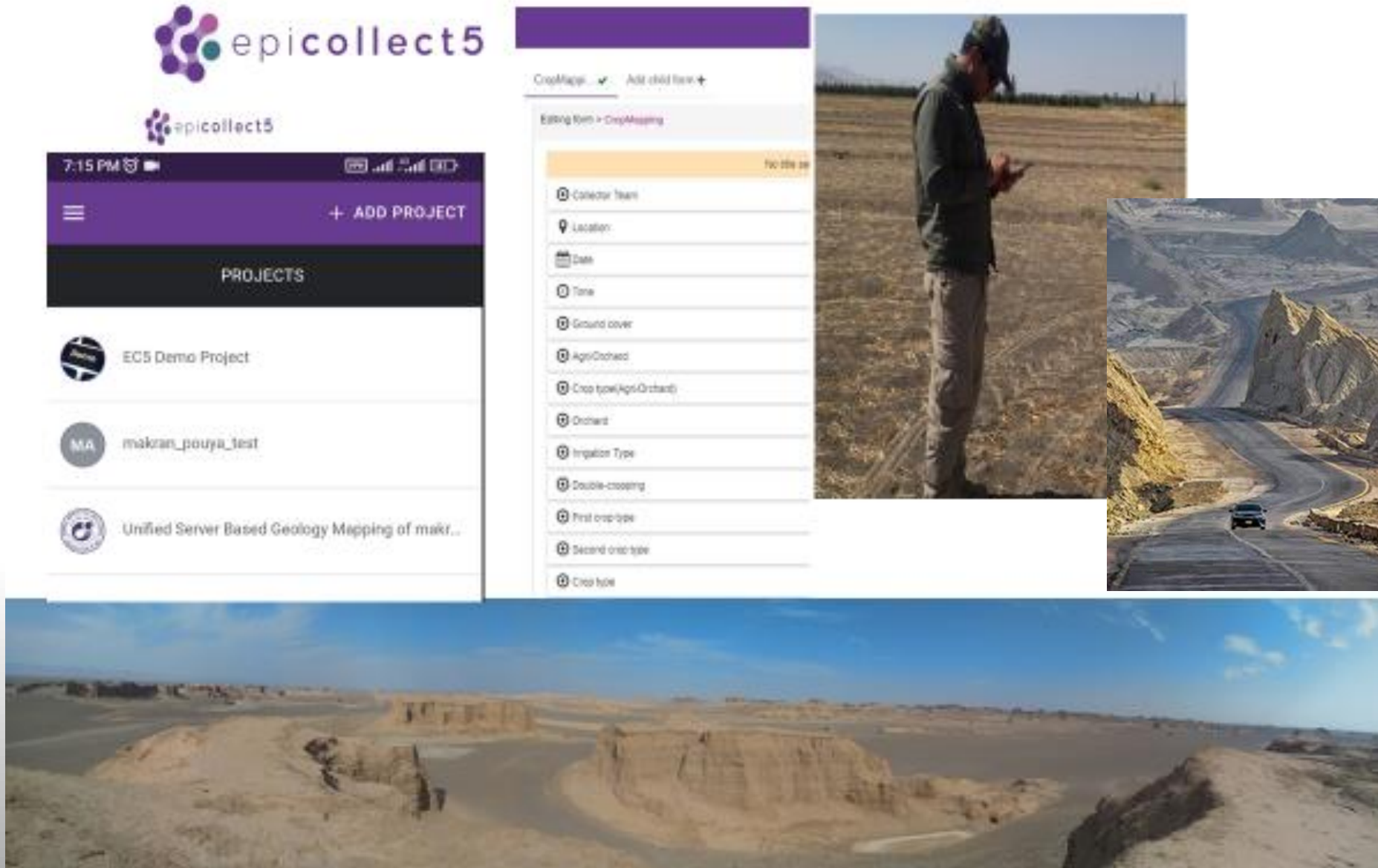
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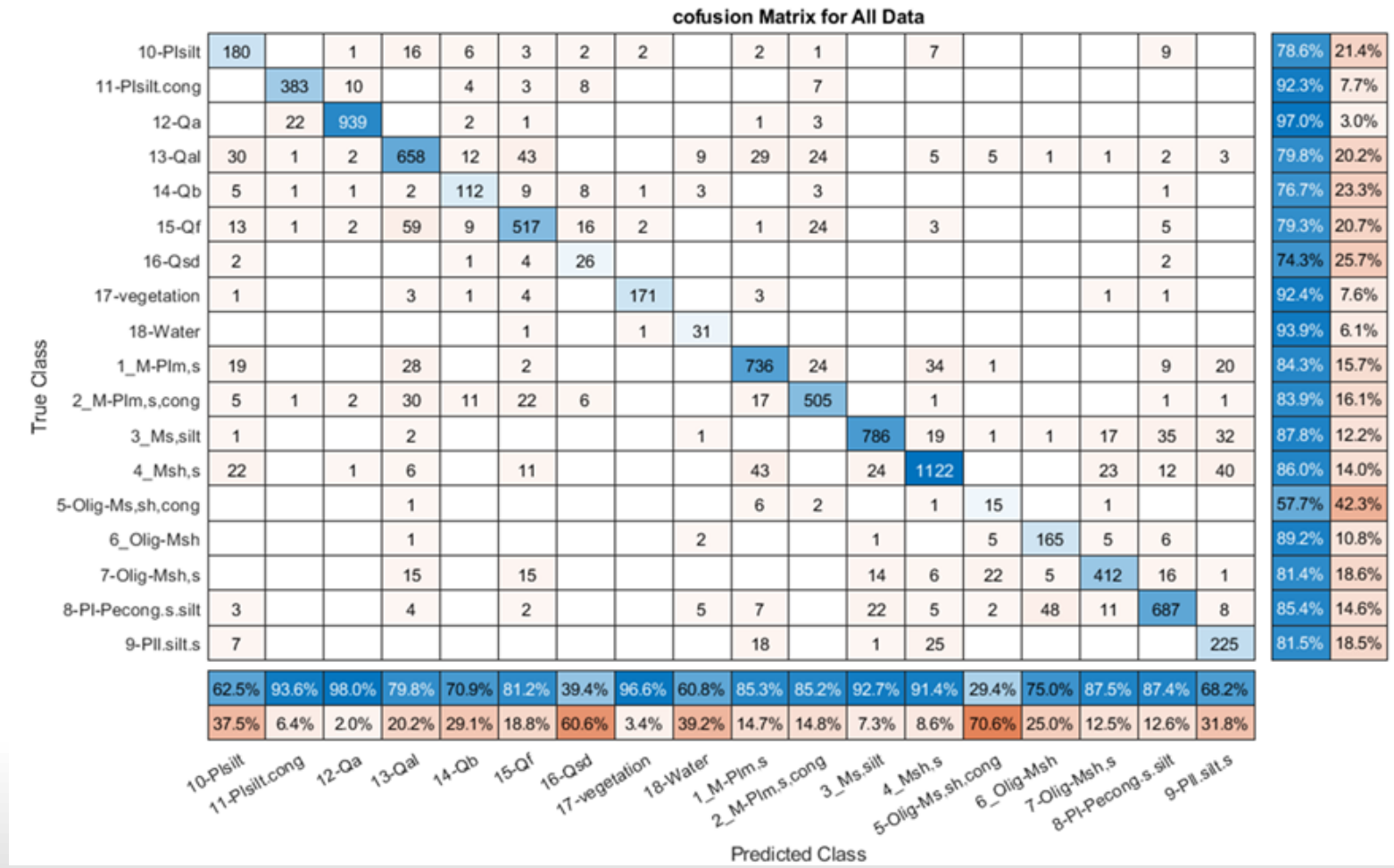
Makran Sustainable Development Plan

The server based integrated and homogenized thematic geological mapping

The server based integrated and homogenized thematic geological mapping

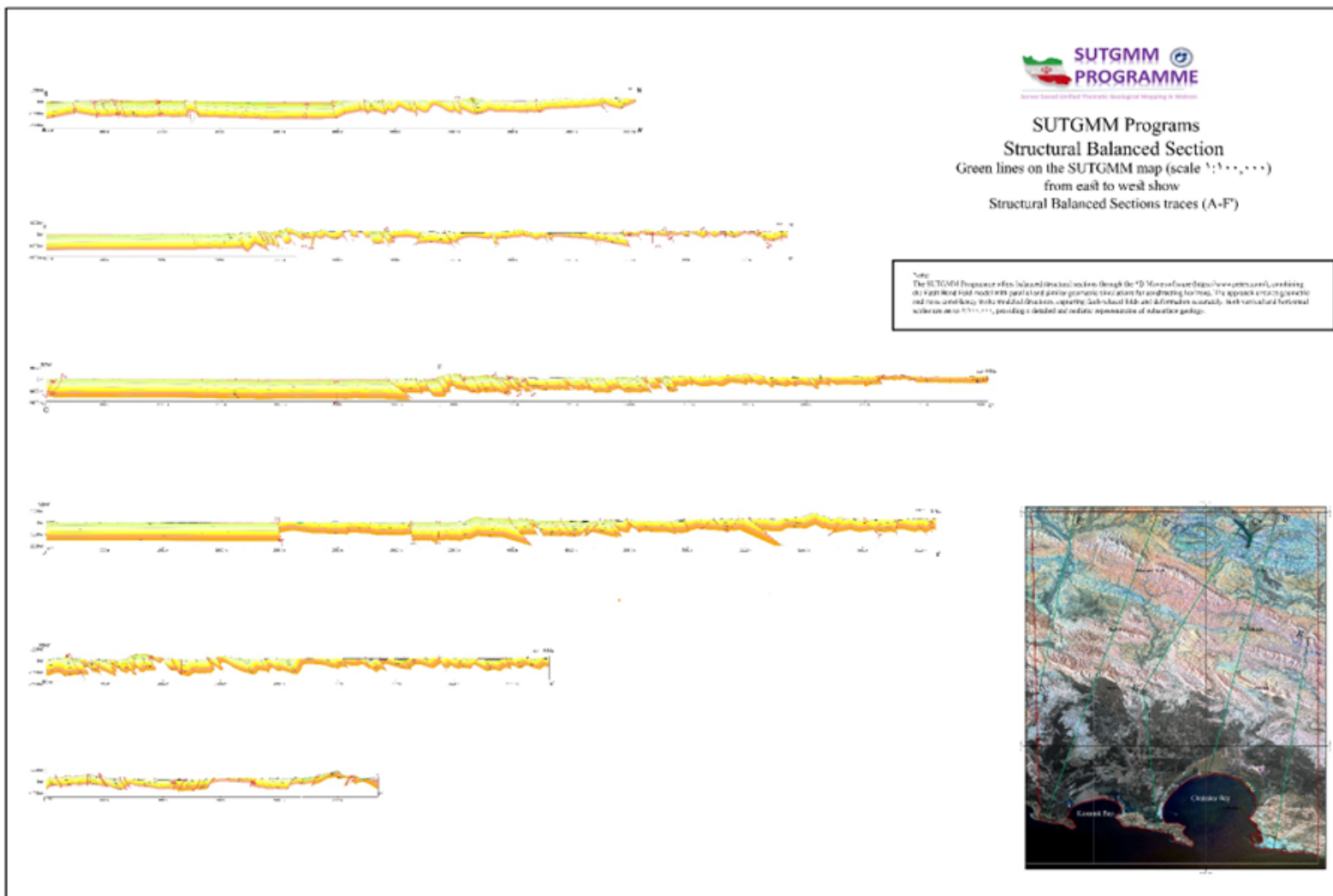


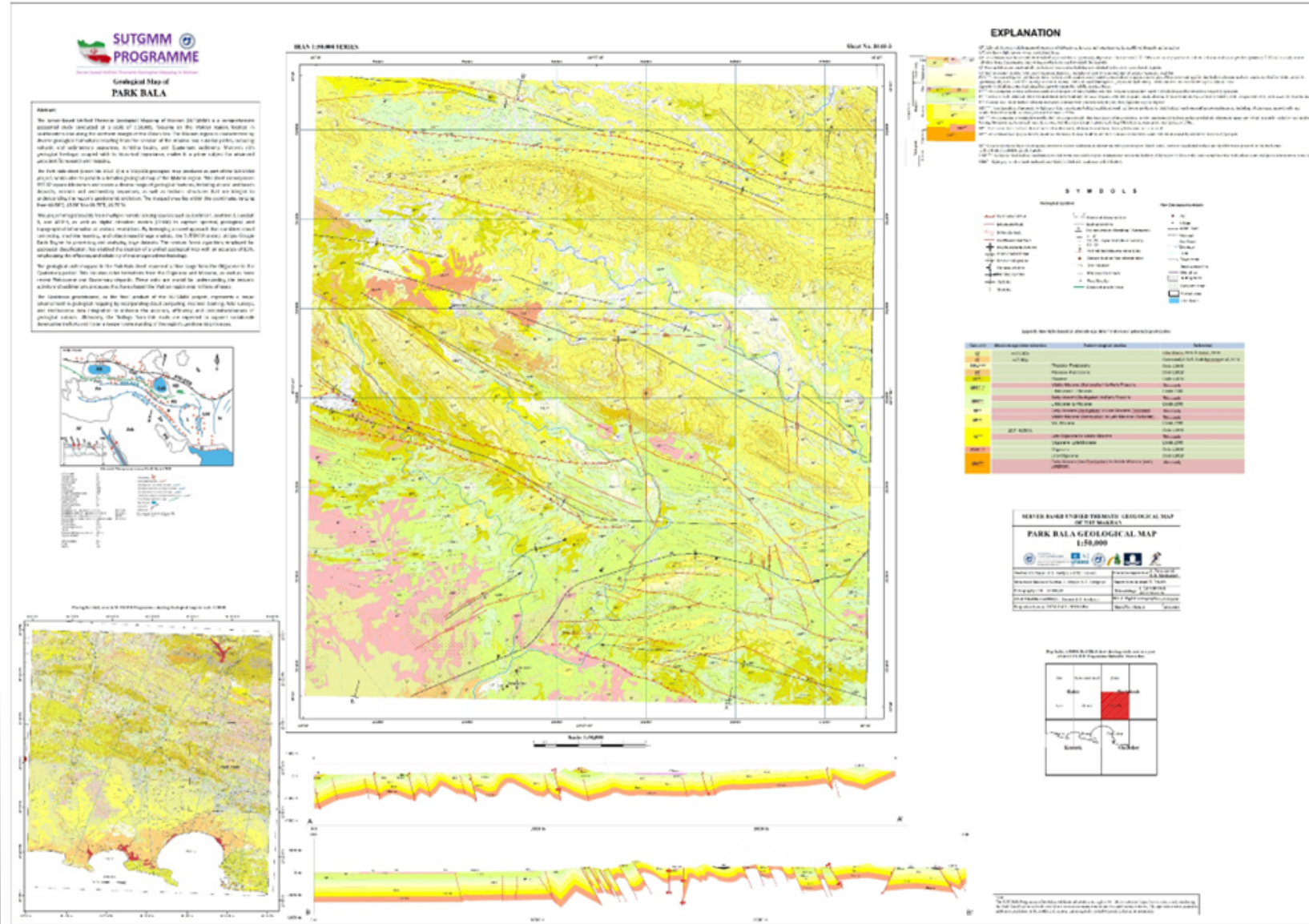
order	Rock unit	F1-Score CNN	F1-Score RF	support
1	Qa	0.96	0.98	958
2	vegetation	0.91	0.95	177
3	Pisilt.cong	0.83	0.93	409
4	Ms.silt	0.88	0.9	848
5	Msh.s	0.86	0.89	1228
6	Pl-Peocong.s.silt	0.81	0.86	786
7	M-Pim.s	0.83	0.85	863
8	M-Pim.s.cong	0.81	0.85	593
9	Olig-Msh.s	0.79	0.84	471
10	Olig-Msh	0.81	0.82	220
11	Qal	0.74	0.8	825
12	Qf	0.7	0.8	637
13	Qb	0.49	0.75	158
14	Pli.silt.s	0.71	0.74	330
15	Water	0.73	0.74	51
16	Pisilt	0.63	0.7	288
17	Qsd	0.51	0.52	66
18	Olig-Ms.sh.cong	0.51	0.39	51
total	12/22/2024	80.4%	84.7%	8959 GeoNexus

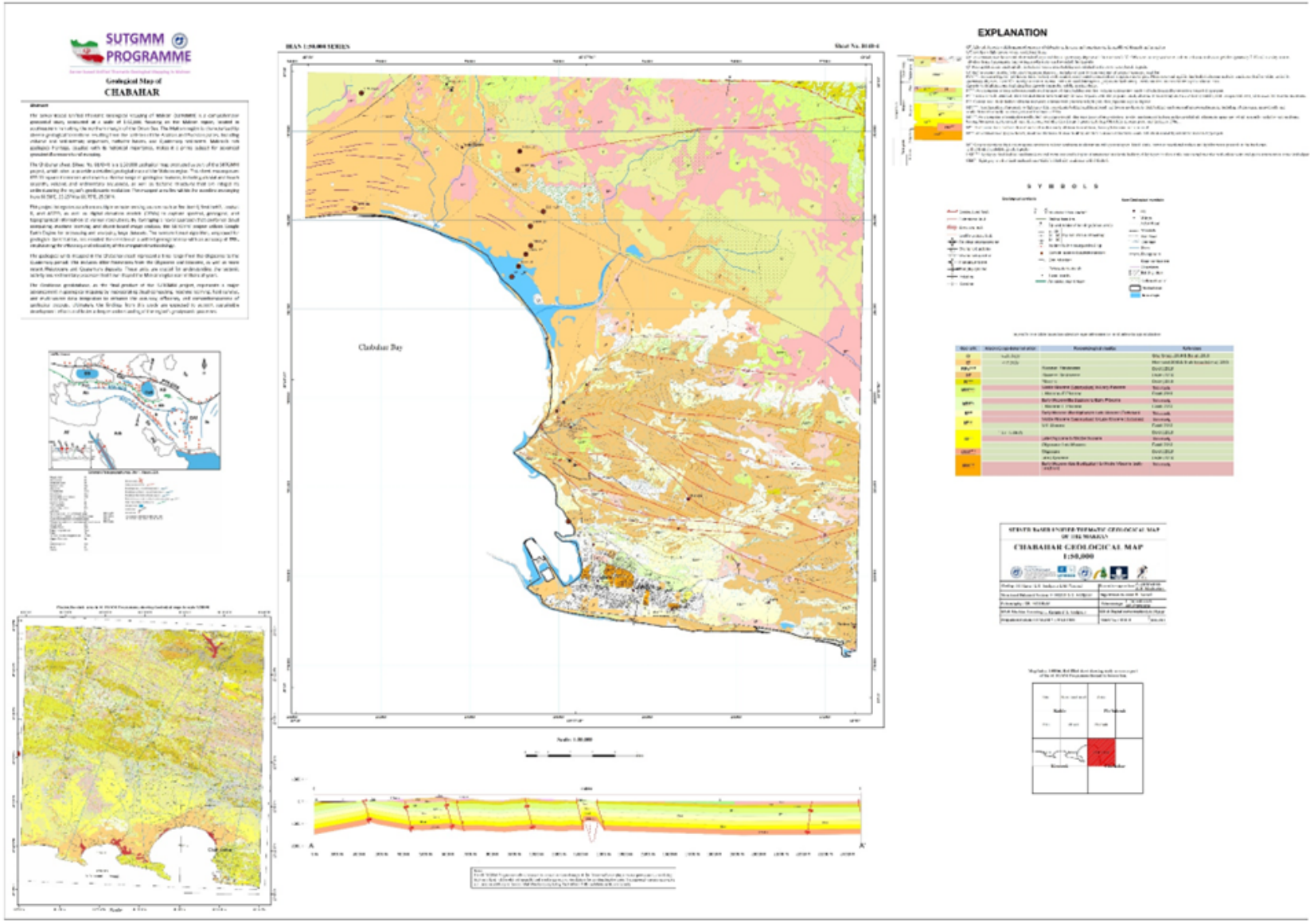


Makran Sustainable Development Plan

The server based integrated and homogenized thematic geological mapping

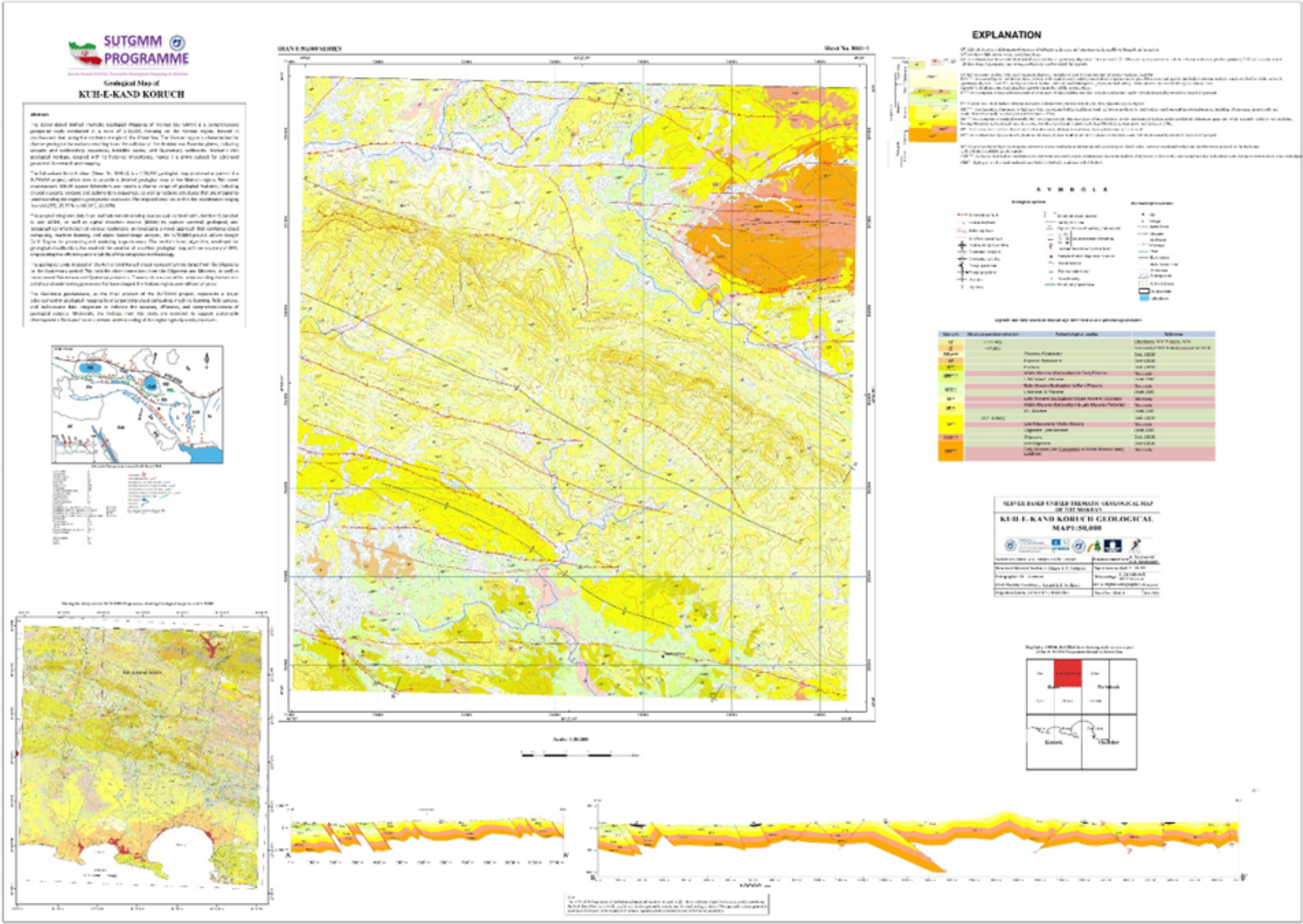


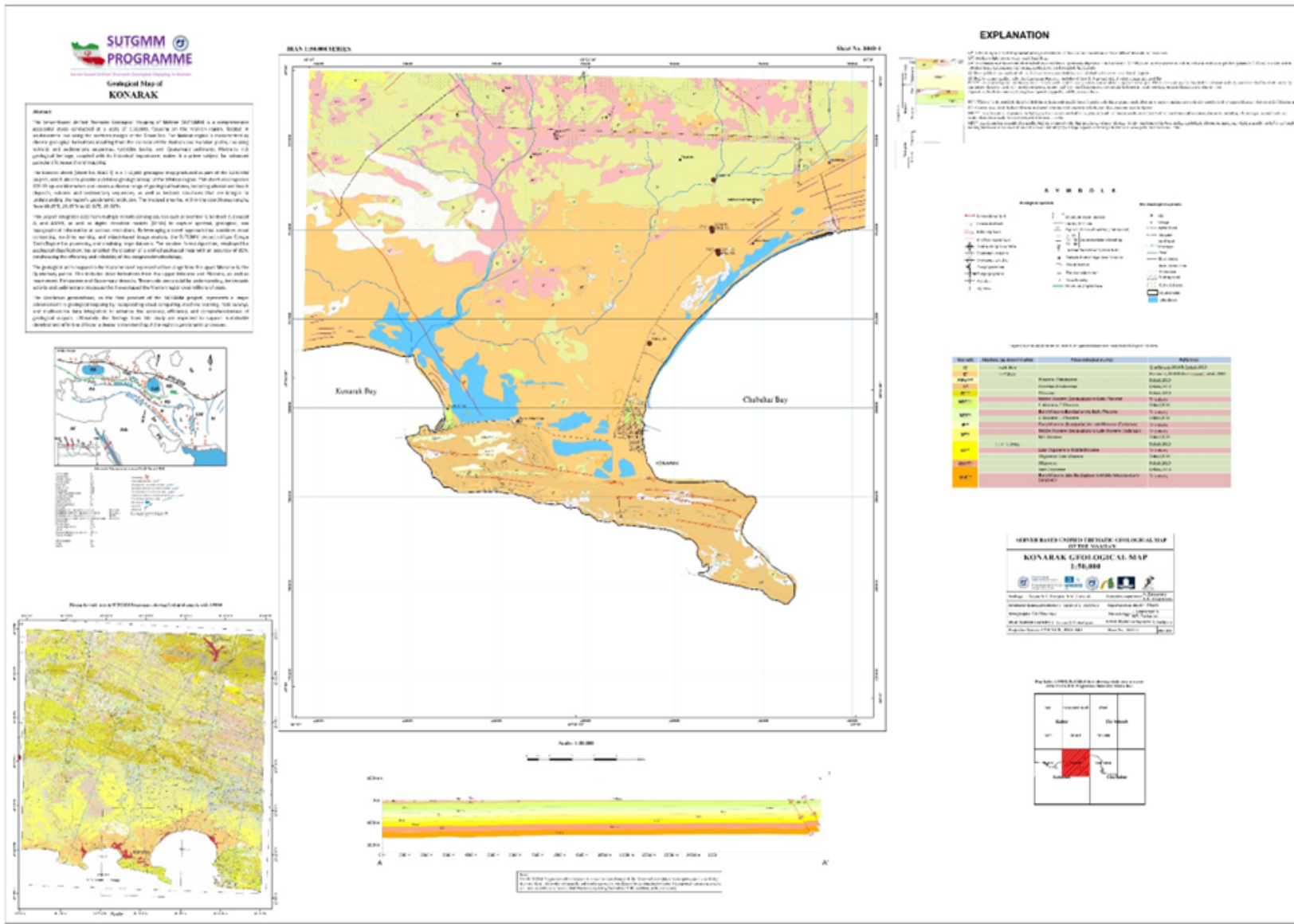




Makran Sustainable Development Plan

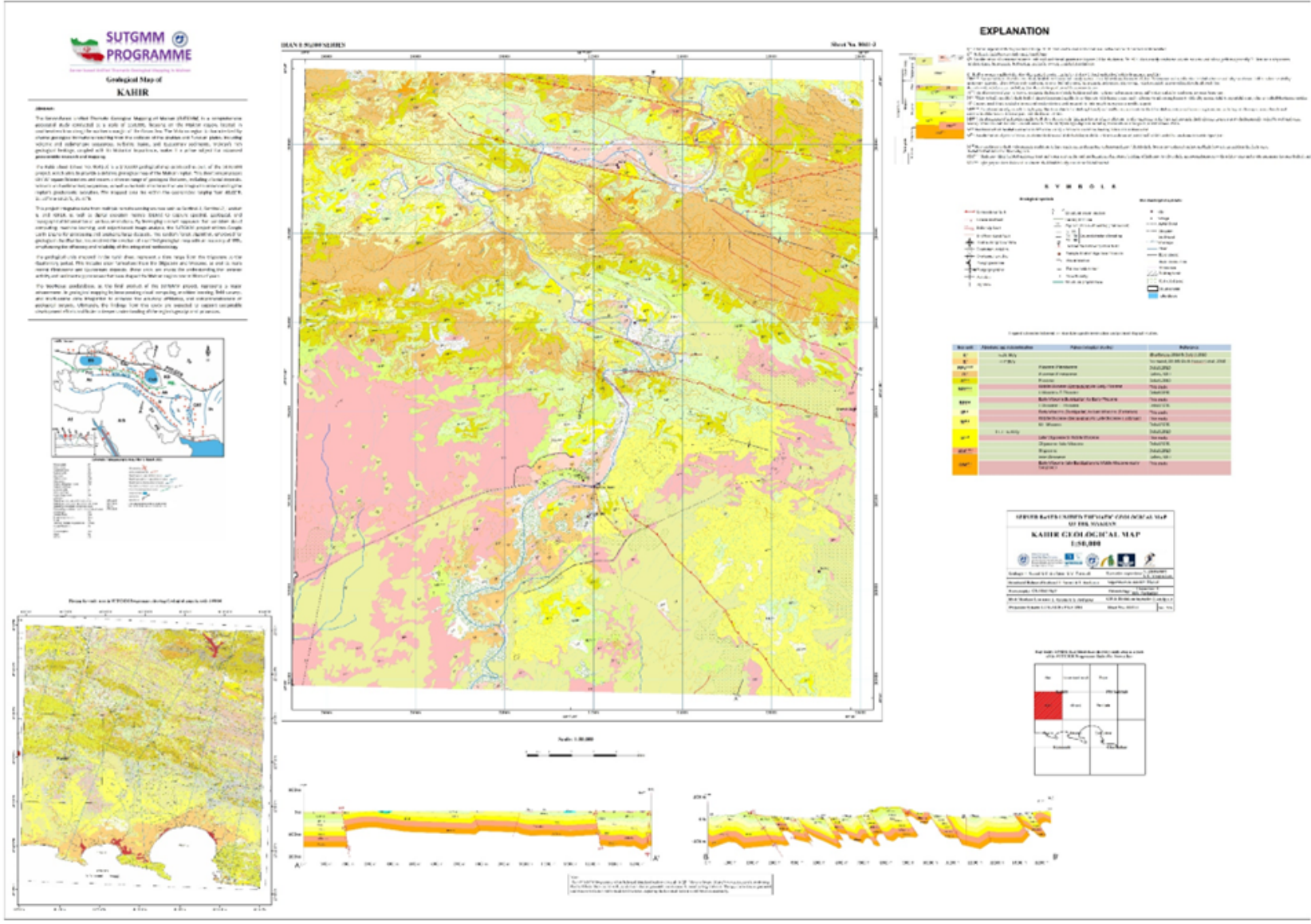
The server based integrated and homogenized thematic geological mapping





Makran Sustainable Development Plan

The server based integrated and homogenized thematic geological mapping



SUTGMM PRODUCTS

The Makran of Iran, with an area of approximately 65,000 Km² can become a major destination for geotourism and an increasing number of visitors are attracted by the spectacular outcrops that the country has to offer, which is covered by 29 sheets of geological maps at a scale of 1: 100,000 or 108 sheets of maps at a scale of 1: 50,000.

Due to time constraints, in addition to the very high international cost of preparing geological thematic maps with traditional methods, with all the problems caused by the inconsistency and heterogeneity of borders and legends in information layers such as: Geology, Exploration of mineral resources, Environmental geology at a scale of 1: 50,000. Nationwide coverage of a geologically diverse Makran region requires either more than 29 operational teams for 4 years or one single teams for more than 10 years. Meanwhile, the use of new instructions in the preparation of integrated base server maps, similar to what was mentioned above, allows for nationwide mapping in a two-year period with much higher accuracy and speed and much lower cost.

So, from a strategic point of view, the development of integrated thematic geological maps based on the Server in the path of sustainable development and economic resilience, both in the production of national wealth by providing the necessary mineral resources to the country for future, that in preserving national assets by assessing hazards such as climate change, floods and earthquakes and their rates in relation to national GDP over a short period seems not only very economical but also very important.

In this way, the UNESCO chair on Coastal Geo-Hazard Analysis and its wide network of partners and colleagues and world-renowned scientists and experts, within the framework of the scientific council, will be a suitable platform to ensure the training and implementation of such a pioneering project.



SCIENTIFIC PROGRAMME

The Server Based Thematic Geological Mapping in the Makran, scale: 1:50,000

The stretches of east-west mountains in the south-east of Iran and south-west of Pakistan, between the Strait of Hormuz and the port of Karachi, are known as Makran (Mukran). Makran is taken from the name of an ancient state with an age of more than 3000 years, which is from Kerman it had spread to the Mehran River (Indus) along the Oman Sea (Kent, 1953; Mayrhofer, 1978; Schmitt, 1991), based on the stone inscriptions in Biston and Persepolis, this state (Mecca) is considered to be the fourteenth state of Achaemenid rule (6th century BC). The growing wedge of Makran in the southeast of Iran and southwest of Pakistan is known as a sparsely populated and mostly nomadic region, which today faces the ever-increasing urban development on the coast of the Oman Sea. It is said that Alexander returned from India in 324-325 BC when he was leading the Macedonians from India 700 Km away across the Makran desert towards the Persian Gulf, before reaching Pura (present-day Iran) in December 325. BC, he lost thousands of his soldiers and followers during the war due to fatigue, thirst and malnutrition.



Subduction zone of Makran

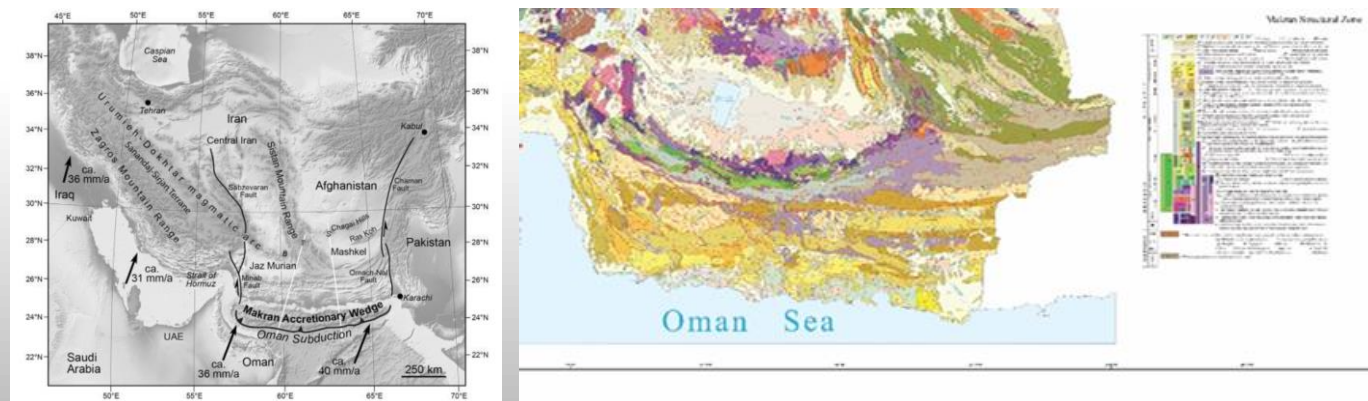
The accretionary and slightly arc-shaped wedge of Makran (hereafter Makran) with a length of nearly 1000 kilometers is limited between the Rastal Ghazminab-Sabzevaran fault system in the west and the Chaman-OrnachNal fault system in the east and the Oman Sea in the south.

Despite the fact that more than half of Makran thrust belt system is located on land and despite the lack of dense vegetation in this area, however, very limited geological studies have been carried out. Among the comprehensive systematic studies that have been carried out in this area, we can refer to the project studies of preparing geological maps with a scale of 1:250,000 Southeastern Iran in the period from 1979 to 1985 and McCall's collection of articles (2003, 2002, 1996, 1994, 1983, 1982). The late Cenozoic erosional fault of this region along with the dating of Makran sea has been noted in Ghorashi's doctoral dissertation (1985). After that, 1:100,000 geological maps of the Makran coast and different areas of the Makran zone were prepared from the 1370s onwards.

The eastern area of Makran was the focus of the Zurich Polytechnic University and several doctoral theses with different topics were prepared about this area. Geological map, Structure analysis and age determination studies of tectonic activity of Makran (Dolati, 2010), Determining the origin of Makran sediments (Mohammadi, 2016) Systematic studies on the present day activity of Makran based on dating on Quaternary sediments (Haghipour, 2013) and numerical modeling on the dynamic evolution of this The folded belt drive (Ruh, 2013) was done.

Makran Subduction Zone (MSZ) extends from east to west along the banks of Pakistan and Iran. The Makran MSZ subduction zone is an important region from the point of view of tectonic earthquakes and tsunami generation, and it is the second most important region in the Indian Ocean after Indonesia (Haiderzadeh et al., 2009). The tsunami related to the Makran earthquake in 1945 caused 4000 casualties and has been reported along the coasts of Oman, North India and even Seychelles (Bourget et al., 2010; Byrne et al., 1992; Howells, 1983). Subduction of the Arabian plate under the blocks of Central Iran and Afghanistan, which started during the Cretaceous (for example, Alavi, 2007; Berberian et al., 1982; Rico, 1994) continues until now.

GPS measurements show a convergence rate of approximately NS, about 2 cm/year between the Arabic plates and Eurasia during the geography of the Gulf of Oman (Masson et al., 2007; Vernant et al., 2004; Vigny et al., 2006).



DESIRED AND NEEDS

Desired goals and achievements:

- Accurate correction of satellite images through modeling in the Google Earth Engine environment and the simultaneous launch of the national parallel processor system.
- High atmospheric modeling of images and with the help of spectral samples.
- Determining the added value of satellite images (multispectral and hyperspectral) based on spectral samples and determining the efficiency of different images.
- Creating ground scale results based on different images.
- Validation of the results of different radar and optical image sources in the preparation of integrated geological and engineering maps.
- Comprehensive geological information, mineralogical analysis, soil mechanics and rock mechanics of the samples in the form of a geoportal (GIS system).
- Presenting a new and up-to-date method in preparing thematic geological maps.
- Preparation of an integrated map of geology, Environment Geology, Mineral resources at a scale of 1: 50,000.
- Creating an integrated database of geology, engineering and earthquake-construction
- Equipping and setting up a parallel processing system.
- Equipping and setting up the drone system for high precision coastal mapping.
- Conducting educational workshops.

The need for work and the economic approach of the plan:

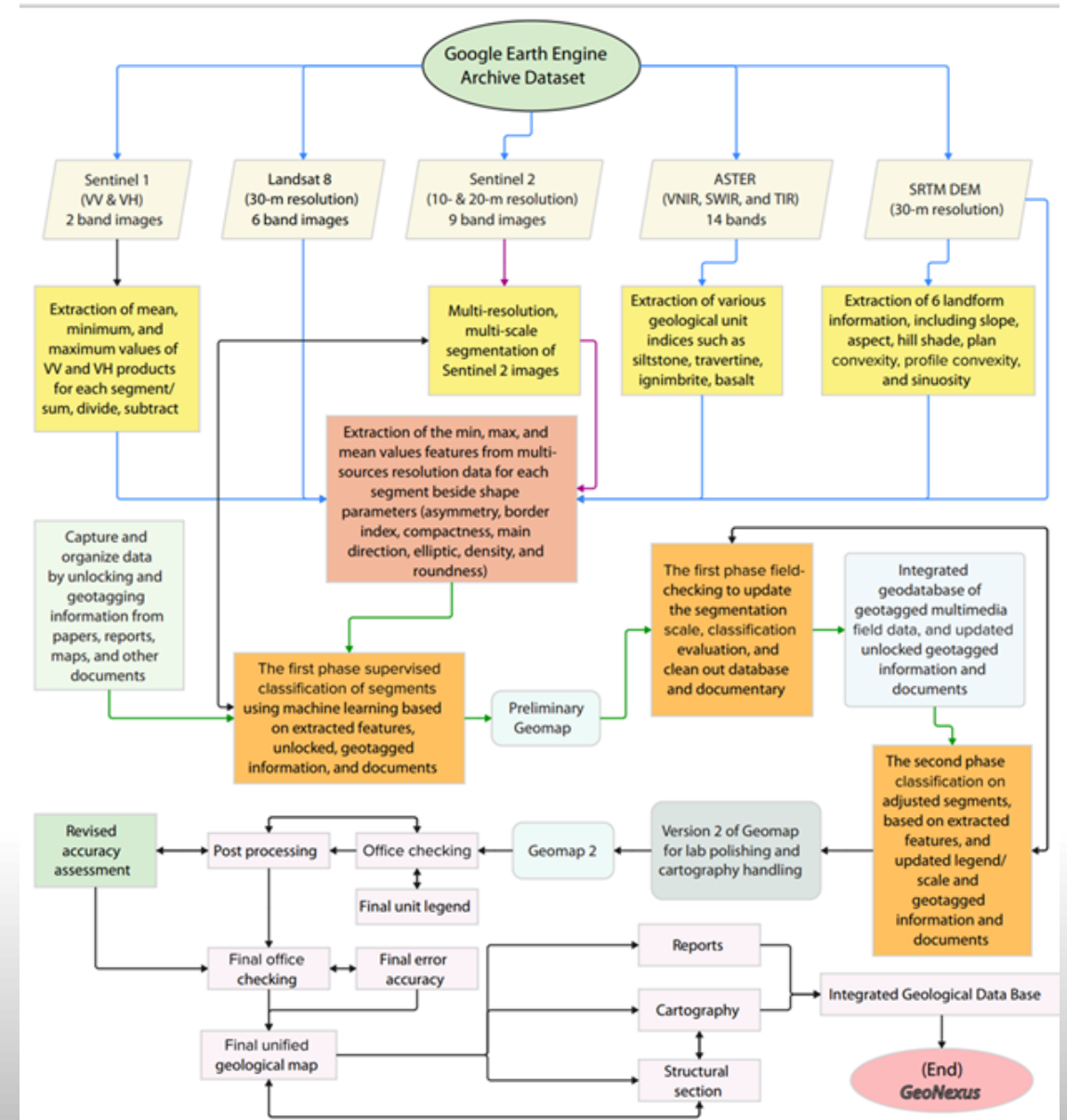
- The possibility of better detection and more accurate determination of outcrops using accurate ground and satellite information.
- Reducing the high costs of ground sampling.
- Significant reduction of errors in map preparation.
- Detailed analysis of minerals in a superficial and broad way, instead of point analyses.
- Lack of proper development in infrastructure.
- Determining a precise scientific framework in geological studies with satellite data.
- Absence of a local spectral library based on the geological conditions of the country.
- Examining the capabilities and added value of existing satellite images.
- Determining the exact ground scale for spectral measurements.
- Creating a geoportal for geoscience researchers and professionals.
- Knowledge and technology transfer.



TASK FORCES ACTIVITIES

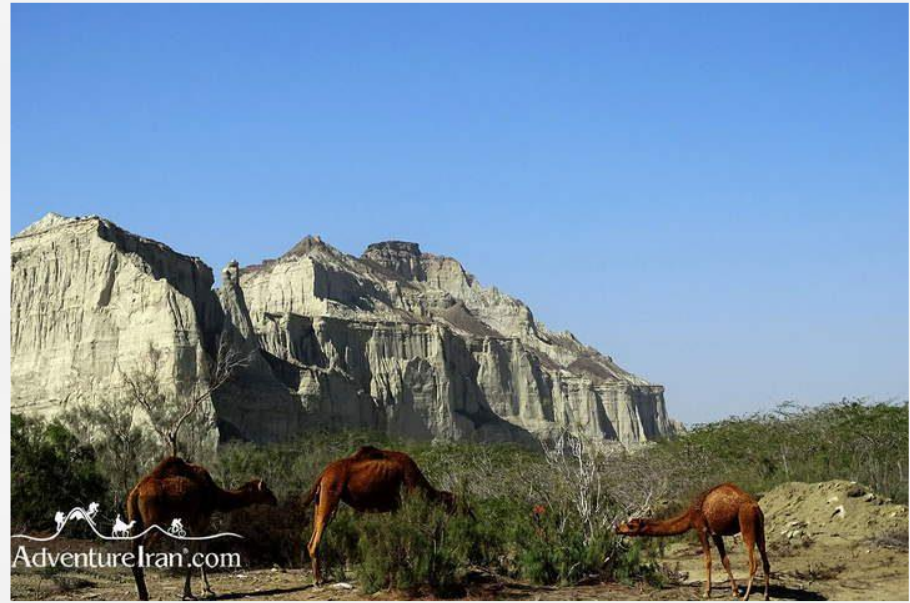
Procedure:

- Unlocking Trapped data on Paper: Collecting information and reviewing past studies
- Checking the collected information and preparing basic geological maps and GEE platform
- Segmentation
- Field opening training workshop of the project
- Presentation of the initial report
- Conducting online field operations and controlling and editing basic maps
- Necessary surveys and sampling
- Preparation of integrated legend during field studies
- Preparation and laboratory studies on samples
- Presentation of the second report
- Modeling and processing of satellite images and reproduction of integrated maps with optimal clustering Preparation of integrated maps at a scale of 1:100,000 with legends and signs
- Transverse Structural Section in the MOVE
- Final control of the map on the ground and additional sampling
- Modification of integrated maps on a scale of 1:50,000 with a legend
- Compilation of the report of thematic geological maps
- Cartography, GIS and final digitization
- Preparation of database
- Designing and setting up a parallel processing system
- Using and operationalizing the drone system for accurate coastal mapping
- Presentation of final reports and maps
- Making referee corrections
- Seminar at the end of the project
- The final training workshop of the project
- WebGIS backup



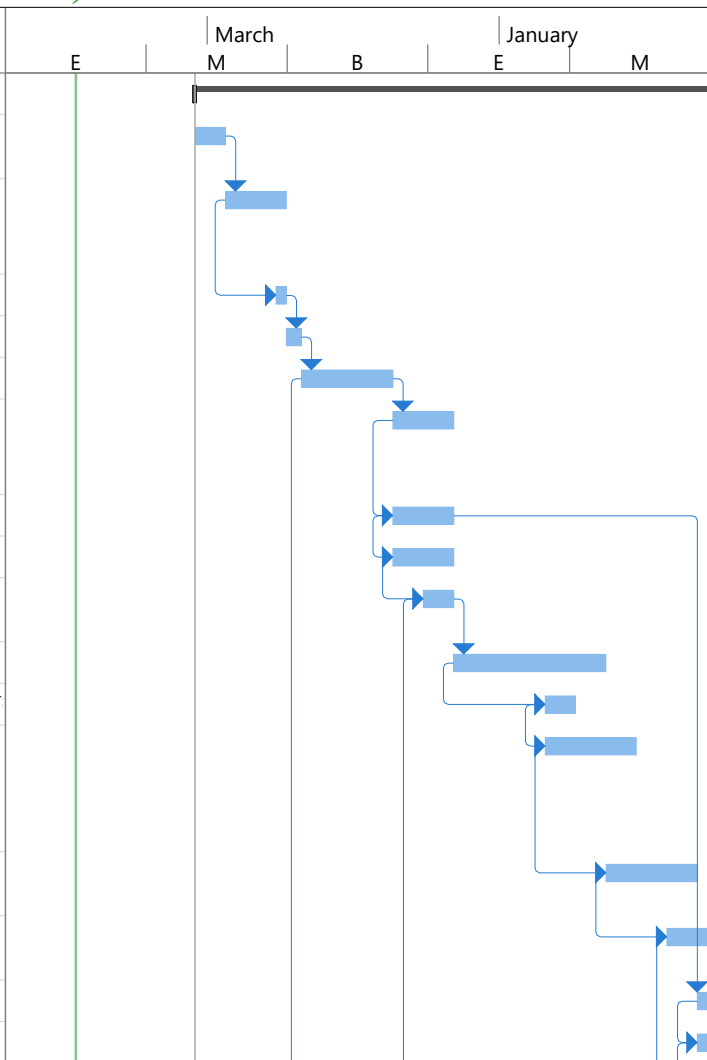
PROJECT SCHEDULE

R	Topics	Weighted %	02	04	06	08	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	48
01	Documentary/ Unlocking trapped data on paper	4																					
02	Review of collected data/ produce geological base maps on GEE	6																					
03	Project Opening Workshop	1			20 d																		
04	Progress report 1	2				30 d																	
05	Runtime Infrastructure	4																					
06	Field operation, checking and revising the base maps (10 field teams)	10																					
07	Sampling	5																					
08	Drilling and engineering tests	5																					
09	Preparing the Unified legend (1st version)	3																					
10	laboratory analysis	8																					
11	Progress report 2	1																					
12	Optimizing satellite image processing and integrated map reproduction through advanced clustering techniques	5																					



DETAILED SCHEDULE / (MS PROJECT)

ID	Task Mod	Task Name	Duration	Start	Finish	Predecessors					
							E	March	B	E	January
1		SUTGMM	1230 days	Sun 2/1/26	Sat 1/5/30						
2		Documentary/ Unlocking trapped data on paper	60 days	Sun 2/1/26	Sat 4/11/26						
3		Review of collected data/ produce geological base maps on GEE	120 days	Sun 4/12/26	Sat 8/29/26	2					
4		Project Opening Workshop	20 days	Thu 8/6/26	Sat 8/29/26	3SS+100 days					
5		Progress report 1	30 days	Sun 8/30/26	Sat 10/3/26	4					
6		Runtime Infrastructure	180 days	Sun 10/4/26	Sat 5/1/27	5					
7		Field operation, checking and revising the base maps (10 field teams)	120 days	Sun 5/2/27	Sat 9/18/27	6					
8		Sampling	120 days	Sun 5/2/27	Sat 9/18/27	7SS					
9		Drilling and engineering tests	120 days	Sun 5/2/27	Sat 9/18/27	8SS					
10		Preparing the Unified legend (1st version)	60 days	Sun 7/11/27	Sat 9/18/27	9SS+60 days					
11		laboratory analysis	300 days	Sun 9/19/27	Sat 9/2/28	10					
12		Progress report 2	60 days	Sun 4/16/28	Sat 6/24/28	11SS+180 day					
13		Optimizing satellite image processing and integrated map reproduction through advanced clustering techniques	180 days	Sun 4/16/28	Sat 11/11/28	12SS					
14		Integrated Maps 1:50,000 with Legend and geological Signs	180 days	Sun 9/3/28	Sat 3/31/29	13SS+120 days					
15		Balanced structural section using MOVE software	180 days	Sun 1/21/29	Sat 8/18/29	14SS+120 days					
16		Sampling	60 days	Sun 4/1/29	Sat 6/9/29	8FS+480 days					
17		Drilling and engineering tests	60 days	Sun 4/1/29	Sat 6/9/29	16SS					



Project: SUTGMM Date: Sat 5/3/25	Task		Inactive Summary		External Tasks	
	Split		Manual Task		External Milestone	
	Milestone		Duration-only		Deadline	
	Summary		Manual Summary Rollup		Progress	
	Project Summary		Manual Summary		Manual Progress	
	Inactive Task		Start-only			
	Inactive Milestone		Finish-only			

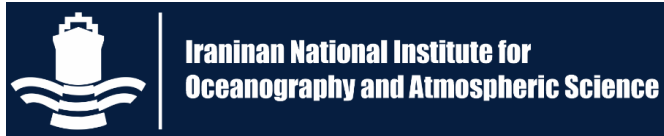
ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors	21		June 11		August 01		September 21		November 11	
							08/03	02/22	09/12	04/03	10/23	05/14	12/03	06/24	01/13	
26		انجام تصحیحات داوری	۳۰ days	۲۰۲۳/۰۲/۱۲	۲۰۲۳/۰۵/۲۲	۲۵ S										
27		سینار پایان پروژه تهران	۲ days	۲۰۲۳/۰۵/۲۳	۲۰۲۳/۰۵/۲۵	۲۵										
28		کارگاه آموزش تئوری - عملی	۳۰ days	۲۰۲۳/۰۵/۲۵	۲۰۲۳/۰۷/۰۴	۲۷										
29		پرداخت ۱۰۰ درصد مبلغ قرارداد	۳۰ days	۲۰۲۳/۰۶/۱۴	۲۰۲۳/۰۷/۲۴	۲۵ S - ۱۵ days										

Project: Dr Nazari-Makran Date: 2021/04/10	Task		Inactive Summary		External Tasks	
	Split		Manual Task		External Milestone	
	Milestone		Duration-only		Deadline	
	Summary		Manual Summary Rollup		Progress	
	Project Summary		Manual Summary		Manual Progress	
	Inactive Task		Start-only			
Inactive Milestone		Finish-only				

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PARTICIPANTS



Iranian National Institute for Oceanography and Atmospheric Science

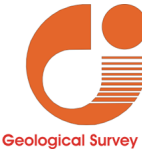


UNESCO Chair on Coastal Geo-Hazard Analysis

*Research Institute for Earth Sciences
Geological Survey of Iran*



Iranian Space Agency



Geological Survey Of Iran



IGM
Intelligent Geo-Mine
هوش زمین کانسار



University of Sistan and Baluchestan



University of Hormozgan



Tarbiat Modares University



Chabahar Maritime University (CMU)



شرکت ملی نفت ایران



COST

- Personnel expenses
- The cost of necessary trips, including the cost of tickets, accommodation, food and transportation
- Laboratory costs
- The cost of devices, equipment, and materials needed to be purchased from the project credit facility
- Parallel processing system cost
- The cost of the drone system
- Short Well drilling costs
- Meeting and workshops
- Other expenses
- Total costs
- Tax and other Statutory deductions

Estimated Cost per kilometer square 15 million IRR



DESIGNER AND SCIENTIFIC PERFORMER

Biography

Birthday on February 18th 1968 in Tehran-Iran; Languages: Persian, French and English; UNESCO Chairholder of Coastal Geo-Hazard Analysis since 2021, former Vice-Director and Deputy in Research (2009- 2021) in Research Institute for earth Sciences (RIES), and current Head of the Innovation department in RIES; Bachelors and Masters in Iranian universities in Geology and then 2002-2006 educated as PhD student in Paleoseismology from Université Montpellier II in Montpellier- France; Post Doctorate in Active Tectonics from Cambridge University, Cambridge-UK between 2007-2011 and the HDR (Habilitation à Diriger des Recherches) in Science of Universe from Université de Montpellier in Montpellier- France at 2015.

A Geologist with more than three decades of professional experience at the Geological Survey of Iran (GSI) and the Research Institute of Earth Sciences (RIES) as well as a social activist and a critical socio-political analyst in the Iranian media, who has extensive formal experience in many international scientific collaborations in the field of geohazards, geo-archaeology, paleoclimatology and recently machine learning and AI in geological mapping and working closely with the Organization of the United Nations for Education, Science and Culture as UNESCO Chairholder, with numerous WOS publications.

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