Università degli Studi di Messina
DIPARTIMENTO DI SCIENZE MATEMATICHE E INFORMATICHE, SCIENZE FISICHE E SCIENZE DELLA TERRA

VERBALE DEL CONSIGLIO DI DIPARTIMENTO

Adunanza del 6 OTTOBRE 2022

Giorno 6 Ottobre 2022, alle ore 13:45, si riunisce il Consiglio del Dipartimento di Scienze Matematiche e Informatiche, Scienze Fisiche e Scienze della Terra, convocato a norma del Regolamento di Dipartimento presso Aula Magna "Vittorio Ricevuto" (Polo Papardo), per discutere e deliberare sui punti posti in Odg, come di seguito riportati.

Ordine del Giorno

1. Comunicazioni del Direttore;
2. Approvazione verbali sedute del 15 ottobre 2021, del 10 novembre 2021 e del 22 novembre 2021;
3. Ratifica decreti;
4. Autorizzazione stipula, rinnovo, ratifica e/o revoca convenzioni, contratti e accordi;
5. Relazioni annuali attività di ricerca e didattica RTD;
6. Commissione per l'Orientamento e Tutorato di Dipartimento: adempimenti;
7. Offerta formativa a.a. 2022/2023: modifica affidamenti carichi didattici;
8. Richieste nulla osta per attività di studio e di ricerca;
9. Richieste rinnovo assegni di ricerca tipo A;

seduta riservata ai professori di prima e seconda fascia e ai ricercatori

10. Proposte attivazione procedure per la stipula di contratti di ricercatore a tempo determinato;
11. Proposte attivazione procedure reclutamento professori di seconda fascia;
12. Proposte attivazione procedure reclutamento professori di prima fascia;

Ordine del Giorno aggiuntivo

13. Bandi per attività di ricerca, didattica e premialità: borse di studio, premi, prestazioni occasionali e tutor;
14. Proposte bandi per assegni di ricerca di tipo B (a valere su progetti di ricerca)

Di seguito viene riportato l'elenco dei componenti afferenti al Consiglio che hanno preso parte alla seduta. Sono altresì indicati gli assenti, che hanno o non hanno giustificato la loro assenza:

N	COGNOME	NOME	QUALIFICA	PRESENTE	ASSENTE GIUSTIFICATO	ASSENTE
1.	ANELLO	GIOVANNI	ORDINARIO			X
2.	BONANZINGA	MADDALENA	ORDINARIO	X		
3.	CRUPI	MARILENA	ORDINARIO		X	
4.	CRUPI	VINCENZA	ORDINARIO	X		
5.	CUBIOTTI	PAOLO	ORDINARIO	X		

Università degli Studi di Messina

6.	CURRO'	CARMELA	ORDINARIO	X		
7.	D'ANGELO	GIOVANNA	ORDINARIO	X		
8.	FAZIO	ENZA	ORDINARIO	X		
9.	LO FARO	GIOVANNI	ORDINARIO	X		
10.	MAGAZU'	SALVATORE	ORDINARIO	X		
11.	MAJOLINO	DOMENICO	ORDINARIO	X		
12.	MANGANARO	NATALE	ORDINARIO	X (uscita h. 14:10)		
13.	NERI	FORTUNATO	ORDINARIO	X		
14.	NERI	GIANCARLO	ORDINARIO	X		
15.	NUCCI	MARIA CLARA	ORDINARIO	X		
16.	OLIVERI	FRANCESCO	ORDINARIO			X
17.	ORECCHIO	BARBARA	ORDINARIO	X		
18.	PALUMBO	ANNUNZIATA	ORDINARIO	X		
19.	PATANE'	SALVATORE	ORDINARIO	X		
20.	PRESTI	DEBORA	ORDINARIO	X		
21.	RESTUCCIA	LILIANA	ORDINARIO	X		
22.	SAIJA	ROSALBA	ORDINARIO			X
23.	SAVASTA	SALVATORE	ORDINARIO	X		
24.	TORRISI	LORENZO	ORDINARIO	X		
25.	TRIPODI	ANTOINETTE	ORDINARIO			X
26.	VENUTI	VALENTINA	ORDINARIO	X		
27.	VILLARI	MASSIMO	ORDINARIO	X		
28.	BARBERA	ELVIRA	ASSOCIATO	X		
29.	BRANCA	CATERINA	ASSOCIATO			X
30.	CAMMAROTO	FILIPPO DOMENICO	ASSOCIATO	X		
31.	CONSOLO	GIANCARLO	ASSOCIATO	X (Entrata h 14:03)		
32.	COSTA	DINO	ASSOCIATO	X		
33.	DE SALVO	MARIO	ASSOCIATO			X
34.	DISTEFANO	SALVATORE	ASSOCIATO	X		
35.	FAZIO	RICCARDO	ASSOCIATO			X
36.	FINOCCHIO	GIOVANNI	ASSOCIATO		X	
37.	FIUMARA	GIACOMO	ASSOCIATO	X		
38.	IMBESI	MAURIZIO	ASSOCIATO	X		
39.	JANNELLI	ALESSANDRA	ASSOCIATO	X		
40.	MALESCIO	GIANPIETRO	ASSOCIATO	X		
41.	MANDAGLIO	GIUSEPPE	ASSOCIATO	X		
42.	MANDANICI	ANDREA	ASSOCIATO	X		
43.	MARRA	ANTONELLA CINZIA	ASSOCIATO			X
44.	MEZZASALMA	ANGELA MARIA	ASSOCIATO	X		
45.	PRESTIPINO GIARRITTA	SANTI	ASSOCIATO	X		

Università degli Studi di Messina

46.	RANDAZZO	GIOVANNI	ASSOCIATO			X
47.	RENNA	MARIA ROSARIA	ASSOCIATO		X	
48.	ROGOLINO	PATRIZIA	ASSOCIATO	X		
49.	SERGI	ALESSANDRO	ASSOCIATO		X	
50.	SILIPIGNI	LETTERIA	ASSOCIATO	X		
51.	SOMMA	ROBERTA	ASSOCIATO		X	
52.	SPECIALE	MARIA	ASSOCIATO	X		
53.	TRIFIRO'	ANTONIO	ASSOCIATO		X	
54.	TRIMARCHI	MARINA	ASSOCIATO			X
55.	UTANO	ROSANNA	ASSOCIATO	X		
56.	WANDERLINGH	ULDERICO	ASSOCIATO	X		
57.	ARCADI	GIORGIO	RICERCATORE	X		
58.	CACCAMO	MARIA TERESA	RICERCATORE	X		
59.	CARIDI	FRANCESCO	RICERCATORE	X		
60.	CARNEVALE	LORENZO	RICERCATORE	X		
61.	CASTAGNO	PASQUALE	RICERCATORE	X		
62.	CELESTI	ANTONIO	RICERCATORE	X		
63.	CONTI NIBALI	VALERIA	RICERCATORE	X		
64.	CORSARO	CARMELO	RICERCATORE	X		
65.	DE PASQUALE	MASSIMILIANO	RICERCATORE	X		
66.	DI STEFANO	OMAR	RICERCATORE	X		
67.	FAZIO	MARIA	RICERCATORE	X (entrata h 14:03)		
68.	FEDERICO	MAURO	RICERCATORE	X		
69.	GALLETTA	ANTONINO	RICERCATORE	X		
70.	GORGONE	MATTEO	RICERCATORE	X		
71.	MUNAO'	GIANMARCO	RICERCATORE	X		
72.	MUZIRAFUTI	ANSELME	RICERCATORE	X		
73.	NORDO	GIORGIO	RICERCATORE	X		
74.	PILLONI	ALESSANDRO	RICERCATORE		X	
75.	RINALDO	GIANCARLO	RICERCATORE	X		
76.	STASSI	ROBERTO	RICERCATORE	X		
77.	TOTARO	CRISTINA	RICERCATORE	X (uscita h 14:37)		
78.	TRIPODO	ALESSANDRO	RICERCATORE	X		
79.	VASI	SEBASTIANO	RICERCATORE	X		
80.	VILASI	LUCA	RICERCATORE	X		
81.	ZOCCALI	MARIOSIMONE	RICERCATORE		X	
82.	AMANTE	MARIACRISTINA	RAPPR. STUDENTI			X
83.	ANASTASI	ALICE	RAPPR. STUDENTI	X		
84.	AUDITORE	SALVATORE	RAPPR. STUDENTI			X
85.	BOLIGNANI	MATTEO	RAPPR. STUDENTI			X
86.	CALI'	GIORGIA	RAPPR. STUDENTI	X		
87.	CANNISTRACI	DANILO	RAPPR. STUDENTI			X
88.	CURRO'	ROBERTA	RAPPR. STUDENTI			X
89.	DE NOVI	DANNY	RAPPR. STUDENTI			X

90.	FICARRA	FEDERICA	RAPPR. STUDENTI			X
91.	FRENI	GABRIELE	RAPPR. STUDENTI	X		
92.	LEMBO	IGNAZIO DAVIDE GABRIELE	RAPPR. STUDENTI			X
93.	LEO	SIMONE	RAPPR. STUDENTI			X
94.	RICEVUTO	FRANCESCA	RAPPR. STUDENTI			X
95.	RUGGERI	ANDREA	RAPPR. STUDENTI			X
96.	INTERDONATO	MONICA	RAPPR. PTA	X		
97.	NOLI MAIO	MARCO	RAPPR. PTA	X		
98.	BARBERA	GIROLAMO	Segretario Amm.	X		
TOTALE (Presenti - Assenti giustificati - Assenti)				**69**	**8**	**21**

Presiede il Prof. Domenico Majolino, Direttore del Dipartimento. Assume la funzione di segretario verbalizzante il dott. Girolamo Barbera, Segretario Amm.vo.
E' presente, la dott.ssa Silvana Interdonato, Responsabile U. Staff "Segreteria di Direzione", per le attività di supporto amministrativo alla Direzione nello svolgimento dell'odierna seduta.
Il Presidente, constatato il raggiungimento del numero legale, dichiara aperta la seduta e procede alla trattazione dell'Odg.

O M I S S I S

Punto 4 OdG - Autorizzazione stipula, rinnovo, ratifica e/o revoca convenzioni, contratti e accordi.

Il Direttore relaziona sulle proposte formulate dalla Prof.ssa Roberta Somma, finalizzate alla stipula dei seguenti accordi:
- Accordo di collaborazione scientifica tra il Dipartimento e "Earth and Environmental Sciences Department, Alicante University" (Spain) per lo svolgimento di "*Studi e ricerche per acquisizione dati su Geology Applied to the search for clandestine graves*". Il Direttore illustra brevemente i contenuti dell'accordo, dettagliati nel testo sottoposto all'attenzione del Consiglio.
- Accordo di collaborazione scientifica tra il Dipartimento e "Departamento de Estratigrafía y Paleontología, Facultad de Ciencias, Universidad de Granada" (Spain) per lo svolgimento di <<*Studi e ricerche per acquisizione dati su "Paleozoic Volcanic – Sedimentary successions of the Calabria-Peloritani Terrane (Southern Italy)" e attività didattica nell'ambito della Gelologia*>>. Il Direttore illustra brevemente i contenuti dell'accordo, dettagliati nel testo sottoposto all'attenzione del Consiglio.
Entrambi gli accordi non prevedono oneri finanziari a carico delle parti. In caso di approvazione del Consiglio saranno sottoposti alle valutazioni e determinazioni degli organi accademici, come previsto dalle norme regolamentari di Ateneo.
Esaurita la disamina del punto, il Direttore pone in votazione la proposta di stipula:
a) dell'accordo di collaborazione scientifica tra il Dipartimento e "Earth and Environmental Sciences Department, Alicante University" (Spain) per lo svolgimento di "*Studi e ricerche per acquisizione dati su Geology Applied to the search for clandestine graves*", il cui testo è riportato in allegato pt. 4.a). **Il Consiglio approva all'unanimità.**

Università degli Studi di Messina

b) dell'accordo di collaborazione scientifica tra il Dipartimento e "Departamento de Estratigrafía y Paleontología, Facultad de Ciencias, Universidad de Granada" (Spain) per lo svolgimento di <<*Studi e ricerche per acquisizione dati su "Paleozoic Volcanic – Sedimentary successions of the Calabria-Peloritani Terrane (Southern Italy)" e attività didattica nell'ambito della Gelologia*>> il cui testo è riportato in allegato pt. 4.b). **Il Consiglio approva all'unanimità.**

O M I S S I S

Alle ore 14:55 non essendoci altri punti all'O.d.G., il Direttore dichiara conclusa la seduta, del che il presente verbale letto ed approvato seduta stante per le parti immediatamente deliberative.

Il Segretario verbalizzante
Dott. Girolamo Barbera

Il Direttore
Prof. Domenico Majolino

Il presente estratto si compone di n° 5 pagine a facciata singola ed è copia conforme all'originale
Il Segretario Amministrativo
Dott. Girolamo Barbera

Firmato digitalmente da
Girolamo Barbera
CN = Girolamo Barbera
C = IT

Universidad de Alicante

Università degli Studi di Messina
DIPARTIMENTO DI SCIENZE MATEMATICHE E INFORMATICHE, SCIENZE FISICHE E SCIENZE DELLA TERRA

ACCORDO DI COLLABORAZIONE SCIENTIFICA

studi/ricerche su

"GEOLOGY APPLIED TO THE SEARCH FOR CLANDESTINE GRAVES"

Tra

Earth and Environmental Sciences Department, Alicante University, Carretera San Vicente del Raspeig s/n, 03690 San Vicente del Raspeig, Alicante Spain, rappresentato dal Direttore *pro tempore* Prof. Alice Giannetti**,** domiciliato per la carica presso la sede istituzionale (di seguito denominato, nel presente atto, DEPARTMENT);

e

Dipartimento di Scienze Matematiche e Informatiche, Scienze Fisiche e Scienze della Terra dell'Università degli Studi di Messina, rappresentato dal Direttore *pro tempore* Prof. Domenico Majolino, domiciliato per la carica presso la sede dipartimentale sita in Viale F. Stagno d'Alcontres, 31 - 98166 Messina (di seguito denominato, nel presente atto, MIFT)

nel prosieguo denominate anche le Parti

per

STUDI E RICERCHE PER ACQUISIZIONE DATI SU

"GEOLOGY APPLIED TO THE SEARCH FOR CLANDESTINE GRAVES"

PREMESSE

RITENUTO che il DEPARTMENT e il MIFT hanno un reciproco interesse ad addivenire ad una collaborazione istituzionale, finalizzata al raggiungimento di obiettivi comuni nell'ambito di studi geologici su "Geology applied to the search for clandestine graves";

CONSIDERATO che il DEPARTMENT e il MIFT sono impegnati in attività di ricerca nell'ambito sopra specificato;

CONSIDERATO che il DEPARTMENT intende avvalersi delle attrezzature e delle strutture di ricerca dei laboratori di cui è responsabile la Prof.ssa Roberta Somma del MIFT;

CONSIDERATO che il MIFT intende avvalersi delle attrezzature e delle strutture di ricerca dei laboratori di cui è responsabile il Prof. Ivan Martin-Rojas del DEPARTMENT;

CONSIDERATO che è interesse comune del DEPARTMENT e del MIFT attivare opportunità ed iniziative di collaborazione finalizzate ad un reciproco arricchimento, mediante un partenariato di attività di studi e ricerca;

CONSIDERATO che vengono correntemente stipulati accordi di collaborazione fra enti pubblici per lo svolgimento di attività di interesse comune, anche per quanto riguarda attività di studio e ricerca;

CONSIDERATO che il presente accordo di collaborazione non realizza, in ogni caso, alcuna forma associativa tra le parti, né comporta obblighi reciproci di natura economica o patrimoniale.

SI CONVIENE E SI STIPULA QUANTO SEGUE

Articolo 1

Validità delle Premesse

Le premesse costituiscono parte integrante del presente atto.

Articolo 2

Oggetto e finalità dell'accordo

Il presente accordo persegue l'intento di instaurare un rapporto di collaborazione nel quale le attività di studio, di ricerca scientifica e di didattica delle Parti possano integrarsi e coordinarsi reciprocamente. In particolare, le stesse si impegnano a promuovere, sviluppare e consolidare iniziative di collaborazione volte all'attuazione dei rispettivi obiettivi scientifici, tecnologici, di ricerca e di studio nell'ambito della tematica "Geology applied to the search for clandestine graves".

Articolo 3

Impegni di reciprocità e modalità di esecuzione delle attività

1. Le Parti si impegnano a:

a) mettere a disposizione le proprie competenze e professionalità ed i propri laboratori per lo svolgimento delle attività di interesse comune;

b) mettere a disposizione la documentazione esistente relativa alle aree interessate dallo studio;

c) operare in sinergia per l'esecuzione delle attività di ricerca secondo quanto riportato nel programma delle attività, allegato al presente accordo (Allegato 1);

d) programmare ed organizzare incontri/seminari per consentire la discussione e gli approfondimenti sulla materia.

2. Le attività dell'accordo potranno formare oggetto di tesi di laurea e tirocini formativi di cui le Parti si impegnano a darsi reciprocamente tempestiva notizia.

3. Per il conseguimento dei fini prefissati del presente accordo, le Parti consentono l'accesso alle rispettive strutture e quant'altro fosse ritenuto utile per il raggiungimento dei fini del presente Accordo, sempre compatibilmente con i rispettivi limiti imposti da risorse, finalità, oneri ed obblighi istituzionali.

4. Le Parti si impegnano a condurre le attività afferenti ai progetti di ricerca comuni nel rispetto delle leggi vigenti in materia di sicurezza dei luoghi di lavoro e di tutela della salute dei lavoratori.

5. Ciascuna Parte si farà carico di eventuali oneri o spese per lo svolgimento di attività di rispettiva competenza, ritenute necessarie dai Referenti scientifici per dare esecuzione al presente Accordo. Nello specifico, ogni eventuale spesa dovrà gravare sui rispettivi fondi di pertinenza dei Referenti scientifici o dei gruppi di ricerca coinvolti.

Articolo 4

Referenti scientifici

1. I referenti scientifici, responsabili degli studi e delle ricerche (Principal Investigator), individuati dalle Parti per il coordinamento e la gestione delle attività oggetto del presente Accordo, sono:

- per il DEPARTMENT Prof. Ivan Martin-Rojas;
- per il MIFT Prof.ssa Roberta Somma.

2. Ciascuna Parte si riserva il diritto di sostituire il Referente sopra individuato, dandone tempestiva comunicazione alla controparte, secondo le modalità previste dall'art. 5, comma 5 del presente Accordo.

Articolo 5

Durata, modifiche, rinnovo e facoltà di recesso

1. Il presente Accordo avrà la durata di anni due (2) rinnovabile e/o prorogabile per un uguale periodo, previo accordo scritto tra le Parti ed a seguito di autorizzazione dei rispettivi organi deliberativi.

2. Le parti concordano di portare a compimento, ove ritenuto possibile e utile, le attività in corso di svolgimento al momento della scadenza del presente Accordo.

3. Il presente Accordo potrà altresì essere soggetto a modifiche, previa verifica dei risultati, da concordare in specifico atto integrativo che le Parti potranno stipulare, previa autorizzazione dei rispettivi organi deliberativi.

4. Le Parti potranno recedere dal presente Accordo, mediante comunicazione scritta da inviarsi nel rispetto di un preavviso di mesi due (2).

5. Qualsiasi comunicazione, notifica, richiesta relativa al presente Accordo sarà eseguita per iscritto e inviata con qualsiasi mezzo atto a comprovarne l'avvenuta ricezione agli indirizzi di seguito indicati:

- per il DEPARTMENT

Earth and Environmental Sciences Department Alicante University, Carretera San Vicente del Raspeig s/n, 03690 San Vicente del Raspeig, Alicante Spain.

e-mail alice.giannetti@ua.es

- per il MIFT

Viale F. Stagno d'Alcontres, 31 - 98166 Messina

e-mail dipartimento.mift@unime.it

pec dipartimento.mift@pec.unime.it.

Articolo 6

Programma delle attività di studio e ricerche

Il programma sintetico di studi e ricerche, come previsto nell'annesso "Allegato 1", prevede le seguenti attività:

a. Ricerca bibliografica della letteratura esistente.
b. Ricerca di siti di occultamento in territorio italiano e spagnolo e loro inventario.
c. Analisi sedimentologica dei terreni oggetto di occultamento.
d. Analisi GIS dei siti di occultamento ed elaborazione di RAG map.
e. Elaborazioni dati risultanti dalle attività di cui al presente Accordo.
f. Pubblicazioni scientifiche.

Articolo 7

Utilizzo del logo

Le Parti si danno atto dell'esigenza di tutelare e promuovere l'immagine dell'iniziativa comune e quella di ciascuna di esse. In particolare il logo del DEPARTMENT e il logo del MIFT potranno essere utilizzati nell'ambito delle attività comuni oggetto del presente accordo, in conformità alle rispettive disposizioni normative e regolamentari vigenti.

Articolo 8

Attività in collaborazione e proprietà intellettuale dei risultati

1. Tutti i risultati totali o parziali derivanti dall'esecuzione delle attività oggetto del presente Accordo sono di proprietà comune delle Parti.

2. Le Parti si impegnano reciprocamente a dare atto, in occasione di presentazioni pubbliche dei risultati conseguiti o in caso di redazione e pubblicazione di documenti di qualsiasi tipo, che quanto realizzato consegue alla collaborazione instaurata con il presente Accordo.

Articolo 9

Trattamento dei dati personali

Il trattamento di dati personali relativi al presente Accordo è effettuato dalle Parti in qualità di Titolari, secondo quanto previsto dall'art. 4 del Regolamento (UE) 2016/679 del Parlamento Europeo e del Consiglio del 27 aprile 2016 (cd. "Regolamento") e dal decreto legislativo 30 giugno 2003, n. 196, come modificato dal decreto legislativo 10 agosto 2018, n. 101 (cd. "Codice") e avverrà nel rispetto dei principi di liceità, necessità, correttezza, pertinenza e non eccedenza, esclusivamente per le finalità del presente atto e nel rispetto di quanto previsto dalla normativa vigente in materia di protezione dei dati personali di cui al Regolamento e al Codice citati.

Articolo 10

Riservatezza

Ciascuna Parte si impegna a non divulgare le informazioni di cui sia venuta a conoscenza o trasmesse nell'ambito dell'esecuzione del presente Accordo, ed a trattarle con la massima riservatezza. I dipendenti e/o collaboratori a vario titolo coinvolti nello svolgimento delle attività dovranno tutelare con la dovuta riservatezza e cautela tutte le informazioni di cui verranno a conoscenza in occasione dell'esecuzione del presente Accordo. Il suddetto obbligo di riservatezza dovrà essere rispettato e fatto rispettare anche successivamente alla scadenza del presente Accordo.

Articolo 11

Copertura assicurativa, Salute e sicurezza nei luoghi di lavoro

1. Ciascuna Parte assume tutti gli obblighi e oneri, anche assicurativi, antinfortunistici, assistenziali e previdenziali nei confronti del proprio personale, studenti compresi, impegnato nelle attività sviluppate in attuazione del presente Accordo.

2. Le Parti, si impegnano a rispettare le disposizioni normative e regolamentari in materia di sicurezza dei luoghi di lavoro e di tutela della salute dei lavoratori.

3. Il personale e i collaboratori del DEPARTMENT e del MIFT, autorizzati a recarsi presso ciascuna Parte per lo svolgimento delle attività relative al presente Accordo, sono tenuti ad uniformarsi alle disposizioni normative, regolamentari o disciplinari ed alle disposizioni in materia di sicurezza vigenti nelle sedi ospitanti.

Articolo 12

Controversie

In caso di controversie in ordine all'applicazione del presente Accordo, le Parti si impegnano alla composizione amichevole delle stesse. In caso contrario, le eventuali controversie saranno devolute all'autorità giudiziaria competente.

Articolo 13

Oneri fiscali

1. Le Parti convengono che il presente accordo è soggetto a registrazione solo in caso d'uso, ai sensi della normativa vigente. Le eventuali spese di registrazione saranno a carico della parte richiedente.

2. Il presente atto, redatto in un unico originale e sottoscritto in formato digitale, è soggetto ad imposta di bollo assolta virtualmente dall'Università degli Studi di Messina, giusta autorizzazione dell'Agenzia delle Entrate di Messina n. 67760 del 2010.

Articolo 14

Validità dell'accordo

Il presente accordo di collaborazione è sottoscritto con firma digitale, ed avrà decorrenza a far data dall'ultima sottoscrizione.

Per l'Università di Alicante
Earth and Environmental Sciences Department
Il Direttore
Prof. Alice Giannetti

Per il Dipartimento di Scienze Matematiche e Informatiche
Scienze Fisiche e Scienze della Terra
Università degli Studi di Messina
Il Direttore
Prof. Domenico Majolino

ALLEGATO 1

Programma di ricerca su:

Geology applied to the search for clandestine graves

Keywords: Geology, Stratigraphy, Sedimentology, Soil Science, GIS applications, Forensics, Ground Searches, Clandestine Graves, Prioritization System

Introduction

The RAG color-coded prioritization systems for the discovery of clandestine graves may use a GIS-based quantitative approach. The method uses cross-referenced RAG maps with cumulative suitability factors to host a burial, allowing to obtain scenarios for ground searches with high-(Red), medium-(Amber), and low-(Green) priority areas.

The first phase of the GIS-based method had to consider the RAG maps of the geographic entities and to reconstruct a GeoDataBase considering: (i) bibliographic research (land use, geological, cadastral maps, etc.); (ii) inspection visits; (iii) high-resolution aerial/satellite orthophotographs; (iv) DTMs and DSMs; (v) ArcGIS (ver. 10) automated procedures.

A conceptual and logical model must be planned. The geographical entities for the GeoDataBase obtained from the conceptual and logical model consider seven entities: (i) Search Area and Access/Exit, (ii) Diggability, (iii) Landscape/Slope, (iv) Vegetation, (v) Human-made Structures, (vi) Geomorphology, and (vii) Visibility (Table 1). Entities ii--vii are classified into three Red, Amber, and Green color-coded classes corresponding, respectively, to high, medium, and low "suitability" to host a burial site (Somma et al., 2018).

Clandestine graves

Criminal burials can occur in rural, urban, and remote sites and are very common in soils, both natural and anthropogenic, or superficial deposits (Donnelly and Harrison, 2013).

The search for clandestine graves dug in soils/sediments is a complex forensic investigation where sites with certain characteristics have to be searched, individuated, and evaluated by an intelligence-led multidisciplinary team, involving both law enforcements and several experts such as forensic geologists (experts of geopedology, geomorphology, geography, geophysics, geochemistry, remote sensing, etc.), as well as specialists of other important disciplines (forensic entomology, botany, microbiology, biochemistry, archeology, anthropology, and canine scent detection, etc.).

The main near- and far-field methods to assist in the search for clandestine graves started to be analysed and applied in the 90's for experiments on interred pigs (Davenport et al., 1992 and

Universidad de Alicante

Università degli Studi di Messina
DIPARTIMENTO DI SCIENZE MATEMATICHE E INFORMATICHE, SCIENZE FISICHE E SCIENZE DELLA TERRA

AGREEMENT OF SCIENTIFIC COLLABORATION

Studies / research on

"GEOLOGY APPLIED TO THE SEARCH FOR CLANDESTINE GRAVES"

between

Earth and Environmental Sciences Department, Alicante University, Carretera San Vicente del Raspeig s/n, 03690 San Vicente del Raspeig, Alicante Spain), represented by Head of Department, Prof. Alice Giannetti**,** domiciled for the office at the institutional headquarters (hereinafter referred to in this deed, DEPARTMENT);

and

Dipartimento di Scienze Matematiche e Informatiche, Scienze Fisiche e Scienze della Terra, University of Messina, represented by Head of Department, Prof. Domenico Majolino, domiciled for the office at the institutional headquarters in Viale F. Stagno d'Alcontres n. 31 - 98166 Messina (hereinafter referred to in this deed, MIFT).

Hereinafter also referred to as the Parties

for

STUDIES AND RESEARCH FOR DATA ACQUISITION ON

"GEOLOGY APPLIED TO THE SEARCH FOR CLANDESTINE GRAVES"

PREMISES

CONSIDERING that the DEPARTMENT and the MIFT have a mutual interest in reaching an institutional collaboration for achieving common purposes in the context of geological studies on "Geology applied to the search for clandestine graves";

CONSIDERING that the DEPARTMENT and the MIFT have been still engaged in research activities in the aforementioned area.

CONSIDERING that the DEPARTMENT intends to make use of the equipment and research facilities of the laboratories for which the Prof. Roberta Somma of the MIFT is responsible.

CONSIDERING that the MIFT intends to make use of the equipment and research facilities of the laboratories for which the Prof. Ivan Martin-Rojas is responsible;

CONSIDERING that it is in the common interest of the DEPARTMENT and MIFT, activate opportunities and collaborative initiatives aimed at mutual enrichment, through a partnership of study and research activities.

CONSIDERING that collaboration agreements are currently stipulated between public bodies for the performance of activities of common interest, also as regards study and research activities.

CONSIDERING that this collaboration agreement does not implement, in any case, any form of association between the parties, and does not entail mutual obligations of an economic or patrimonial nature.

IT IS AGREED AND IS STIPULATED THE FOLLOWING

Article 1
Validity of the Premises

The premises are an integral part of this deed.

Article 2

Object and purpose of the agreement

This agreement pursues the aim of establishing a relationship of collaboration in which activities of study and scientific and didactic research of the Parties may integrate and coordinate each other. In particular, they undertake to promote, develop, and consolidate collaborative initiatives, aimed at the implementation of the respective scientific, technological, and research objectives, and of study in the field of "Geology applied to the search for clandestine graves".

Article 3

Reciprocal commitments and methods of carrying out activities

1. The Parties undertake to:

a) make available their skills, professionalism, laboratories, and facilities for carrying out research and studies, for realizing activities of common interest;

b) make available the existing documentation relating to the areas affected by the study;

c) work in synergy for the execution of research activities as reported in the program of activities of this agreement (Annex 1);

d) plan and organize meetings / seminars at their offices to allow discussion and insights on the subject.

2. The activities of the agreement may be the subject of degree theses and training internships of which the Parties undertake to give each other timely notice.

3. To achieve the purposes set out in this agreement, the Parties allow access to their respective structures and anything else deemed useful for achieving the purposes of this Agreement, always

compatibly with the respective limits imposed by resources, purposes, charges, and institutional obligations.

4. The Parties undertake to conduct the activities relating to joint research projects in compliance with the laws in force on workplace safety and the protection of workers' health.

5. Each Party will be responsible for any charges or expenses for carrying out activities of its respective competence, deemed necessary by the Scientific Referents to implement this Agreement. Specifically, any expenditure must be borne by the respective funds pertaining to the scientific representatives or research groups involved.

Article 4
Scientific contacts

1. The scientific representatives, responsible for scientific studies and research (Principal Investigator) designated by the Parties for the management of the activities covered by this Agreement, are:

- For the DEPARTMENT Prof. Ivan Martin-Rojas;
- For the MIFT Prof. Roberta Somma.

2. Each Party reserves the right to replace the Contact Person identified above, promptly notifying the counterparty, in accordance with the procedures set out in Article 5, paragraph 5 of this agreement.

Article 5

Duration, changes, renewal and right of withdrawal

1. This agreement will cover a time span of two (2) years, renewable and extendable for an equal period, subject to written agreement between the Parties and following the authorization of the respective decision-making bodies.

2. The parties agree to carry out, where deemed possible and useful, the activities in progress at the time of the expiry of this agreement.

3. This Agreement may also be changed and subject to verification of the results, to be agreed in a specific supplementary deed that the Parties may stipulate, subject to the authorization of their respective decision-making bodies.

4. The Parties may withdraw from this Agreement, by written notice, to be sent in compliance with two (2) months' notice.

5. Any communication, notification, request relating to this Agreement will be made in writing and sent by means of any means capable of proving its receipt at the addresses indicated below:

-for the DEPARTMENT

Earth and Environmental Sciences Department Alicante University, Carretera San Vicente del Raspeig s/n, 03690 San Vicente del Raspeig, Alicante Spain.

e-mail alice.giannetti@ua.es

- for the MIFT

Viale F. Stagno d'Alcontres, 31 - 98166 Messina

e-mail dipartimento.mift@unime.it

pec dipartimento.mift@pec.unime.it.

Article 6

Program of study and research activities

The synthetic program of the studies and researches, as provided in the annex "Annex 1", includes the following activities:

a. Bibliographic research of existing literature.

b. Search for concealment sites in Italian and Spanish territory and their inventory.

c. Sedimentological analysis of the terrains involved by the concealment activities.

d. GIS analysis of concealment sites and Red-Amber-Green (RAG) map processing.

e. Data processing resulting from the activities referred to in this Agreement.

f. Scientific articles.

Article 7
Use of the logo

The Parties acknowledge the need to protect and promote the image of the joint initiative and that of each of them. In particular, the logos of the DEPARTEMENTO and the MIFT may be used as part of the common activities covered by this agreement, in accordance with the respective laws and regulations in force.

Article 8
Collaborative activities and intellectual property of the results

1. All total or partial results deriving from the execution of joint research projects are the common property of the Parties.

2. Parties mutually undertake to acknowledge, on the occasion of public presentations of the results achieved or in the event of the drafting and publication of documents of any kind, that what has been achieved results from the collaboration established with this Agreement.

Article 9
Treatment of personal data

The processing of personal data relating to this Agreement is carried out by the Parties as Holders, in accordance with the provisions of art. 4 of the Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 (so-called "Regulation") and by the legislative decree of 30 June 2003, n. 196, as amended by Legislative Decree 10 August 2018, n. 101 (so-called "Code") and will take place in compliance with the principles of lawfulness, necessity, correctness, relevance and not excess, exclusively for the purposes of this deed and in compliance with the provisions of current legislation on the protection of personal data of referred to in the aforementioned Regulation and Code.

Article 10
Confidentiality

Each Party undertakes to not disclose the information it has become aware of or transmitted as part of the execution of this Agreement, and to treat it with the utmost confidentiality. Employees and

collaborators must protect with due confidentiality and caution all information they become aware of during the execution of this Agreement. The aforementioned confidentiality obligation must be respected and enforced even after the expiry of this Agreement.

Article 11
Insurance coverage, health, and safety in the workplace

1. Each Party assumes all obligations and obligations, including insurance, accident prevention, welfare, and social security obligations towards its staff, including students, engaged in the activities developed in implementation of this Agreement.
2. The Parties undertake to comply with the laws and regulations regarding workplace safety and the protection of workers' health.
3. The staff and collaborators of the DEPARTMENT and MIFT, authorized to go to each Party to carry out the activities relating to this Agreement, are required to comply with the laws, regulations or disciplinary provisions and the safety provisions in force in the host offices.

Article 12
Disputes

In the event of disputes regarding the application of this Agreement, the Parties undertake to settle them amicably. Otherwise, any disputes will be devolved to the competent judicial authority.

Article 13
Tax charges

1. The parties agree that this agreement is subject to registration only in case of use, in accordance with current legislation. Any registration fees will be borne by the requesting party.
2. This deed, drawn up in a single original and signed in digital format, is subject to stamp duty paid virtually by the University of Messina, with proper authorization of the Messina Inland Revenue n. 67760 of 2010.

Article 14
Validity of the agreement

This collaboration agreement is signed with a digital signature and will take effect from the last signing.

For the Earth and Environmental Sciences Department University of Alicante	For the *Dipartimento di Scienze Matematiche e Informatiche Scienze Fisiche e Scienze della Terra* (MIFT) University of Messina
Head of Department Prof. Alice Giannetti	Head of Department Prof. Domenico Majolino

ANNEX 1

Research program

Geology applied to the search for clandestine graves

Keywords: Geology, Stratigraphy, Sedimentology, Soil Science, GIS applications, Forensics, Ground Searches, Clandestine Graves, Prioritization System

Introduction

The RAG color-coded prioritization systems for the discovery of clandestine graves may use a GIS-based quantitative approach. The method uses cross-referenced RAG maps with cumulative suitability factors to host a burial, allowing to obtain scenarios for ground searches with high-(Red), medium-(Amber), and low-(Green) priority areas.

The first phase of the GIS-based method had to consider the RAG maps of the geographic entities and to reconstruct a GeoDataBase considering: (i) bibliographic research (land use, geological, cadastral maps, etc.); (ii) inspection visits; (iii) high-resolution aerial/satellite orthophotographs; (iv) DTMs and DSMs; (v) ArcGIS (ver. 10) automated procedures.

A conceptual and logical model must be planned. The geographical entities for the GeoDataBase obtained from the conceptual and logical model consider seven entities: (i) Search Area and Access/Exit, (ii) Diggability, (iii) Landscape/Slope, (iv) Vegetation, (v) Human-made Structures, (vi) Geomorphology, and (vii) Visibility (Table 1). Entities ii--vii are classified into three Red, Amber, and Green color-coded classes corresponding, respectively, to high, medium, and low "suitability" to host a burial site (Somma et al., 2018).

Clandestine graves

Criminal burials can occur in rural, urban, and remote sites and are very common in soils, both natural and anthropogenic, or superficial deposits (Donnelly and Harrison, 2013).

The search for clandestine graves dug in soils/sediments is a complex forensic investigation where sites with certain characteristics have to be searched, individuated, and evaluated by an intelligence-led multidisciplinary team, involving both law enforcements and several experts such as forensic geologists (experts of geopedology, geomorphology, geography, geophysics, geochemistry, remote sensing, etc.), as well as specialists of other important disciplines (forensic entomology, botany, microbiology, biochemistry, archeology, anthropology, and canine scent detection, etc.).

The main near- and far-field methods to assist in the search for clandestine graves started to be analysed and applied in the 90's for experiments on interred pigs (Davenport et al., 1992 and

references therein).

Surface evidence to search to find a clandestine burial dug in the soil/sediment are furnished by ground disturbances (physical disruption associated with burial) and anomalies, such as (Fig. 1): 1) ground elevation on the grave or around it, due to exceeding soil after reinstatement of the soil/sediment or to the deposition of rock blocks, branches or other coverage items; 2) markers on the ground left by the tools used to distribute and homogenize the exceeding soil around the grave; 3) soil disturbance related to test pits made by the offender to choose the better site for concealment; 4) depression above the grave (that can host standing water) due to the soil/sediment subsidence after the reinstatement and/or the volume loss of the thorax of the decomposing body; 5) different colour, composition, texture, and structure of the exceeding or the surface filling soil/sediment of the grave with respect to the topsoil surrounding the grave; 6) broken roots in the exceeding soil after reinstatement of the soil/sediment into the grave (Donnelly and Harrison, 2013); 7) leaves or broken roots partially stuck in the surface of the filling soil/sediment of the grave. Variations and anomalies related to a different growth of vegetation over the grave, the occasional presence of certain plants (Molina et al., 2015) or the development of certain insects and other arthropods are also important characteristics to be examined on the ground (Nuorteva, 1977; Smith, 1986; Byrd and Castner, 2009, and references therein).

During a not-intrusive examination of the search area, most of these ground disturbance and vegetation anomalies can be detected by means remote-sensing by using high resolution infrared and ultra-violet photography (Ruffell and McKinley, 2005). The advantages of using remotely sensed-based data (aerial photography, satellite imagery, global positioning systems) for geoforensic investigation are fully discussed in Davenport 2016 (references therein).

Subsurface evidence to be investigated during forensic search of clandestine graves are related to the characteristics and architecture of the first meters of the underground (drift geology) where the burial took place. The knowledge of the pedogenic soil profile in test pits is important to discriminate BSs where the profile is not in a normal state (Davenport et al., 1992). Sub-surface features have to be investigated following recommended procedures carried out by means of the geophysical (metal detecting, ground penetrating radar, infra-red, electromagnetic method, magnetic susceptibility survey, etc.) and geochemical (VOCs surveying by means of gas-chromatography) methods in either linear or grid arrays (Davenport et al.,1991, 1992; France et al., 1992; Noves, 2000; Buck, 2003; Molina et al., 2015 among many others) usually used for archeological purposes (Annon, 2008; Salsarola and Cattaneo, 2009; and references therein). A full description of the main search techniques and limits is reported by Ruffell and McKinley (2009), Donnelly (2013), Donnelly and Harrison (2013).

Most of the criminal diggers usually prefer BSs provided of the following characteristics: 1) quickly and efficiently diggable with soft and thick soil (or at least thick as the object to bury); 2) located in a plain or a gentle slope; 3) without (or little) surface expression related to changes of the soil features (Donnelly and Harrison, 2013); 4) invisible by potential eyewitnesses (for the presence of hedges, woods, trees, etc.); 5) familiar and known (to control the site, to easily recognize the grave after the burial and/or the escape directions); 6) easy accessible with respect to the vegetation; 7) easy reachable on foot or by vehicle (to satisfy the principle of the least effort).

Noteworthy to report is that clandestine graves have been also carried out in disturbed ground related to activity of phenomena as landslides (Donnelly and Harrison, 2013) or wild boars.

In more complex criminal cases, it is noteworthy that the body after a first burial can underwent an exhumation accomplished by the offender to transfer the body/human remains in another deposition/BS to cover-up, sidetrack investigation (**disappearance of U.S. Drug Enforcement Administration agent of the DEA,** Enrique Kiki Camarena, 1985, Mexico; Murray and Tedrow, 1975) or because the offender believes that the BS is not anymore secure (murder case of the American pilgrim of the *camino de Santiago*, Astorga, Spain, 2012).

In Italy, as reported by mass media, most of the offenders that dug clandestine graves in the last decade it seems that usually choose BSs provided of the following features: 1) flat areas of the countryside, as cultivated fields, victim/offender home's gardens, or abandoned and/or remote properties; 2) alluvial depositional environments stretched along the actual and quaternary alluvial plains, or coastal (beaches); 3) dry sands or soft soil/sediments; 4) sites easy diggable by means of shovels (and in minority mechanical excavator).

Particularly, in southern Italy one modality of the mafia to conceal the victims of *lupara bianca* consists into bury the body/human remains in clandestine graves dug in remote sites, nearby cultivated fields or along the banks of the *fiumare* (streams).

As concerns the deep of the graves dug by hand tools, it is around 50-80cm and ranges from 30cm to 100cm, whereas the medium deep of a digging made by mechanical excavator is around 200-250cm. The width and length is variable depending on the fact that cadaver can be represented by a body, parts of it, can rest horizontal or vertical (in rare cases) or can be folded in fetal position.

Noteworthy to report is that when the clandestine grave is realized in attended sites (as home gardens, etc.), the offender uses to cover the body in the grave with layers of rock blocks, bricks, building detritus (even a mattress was found in a murder case at Macerata, Italy, 2014) or of quicklime on its turn covered by other soil (common also in the cases of victims of *Lupara Bianca* as at Olevano – Salerno, Italy, 2002).

Differently, if the BS is realized in anthropogenic structures, it is common that the offender chooses,

as preferential concealment sites, the basement or crawlspace ("house of horrors" of the monster of Cleveland, 2002-2013, America) of his/her home or the construction site for a new building. In the murder case of Bruino (Italy, 2010), the victim was buried under a sidewalk constructed above the clandestine grave in the offender's home garden.

Clandestine grave in Italy

A thirty of clandestine graves dug by offenders in the underground during a century were examined in Italy in order to understand if burial sites and correlated events of finding may show common and recurring features and if these may be used during investigations to assist law enforcement and judicial authority into the search of burial sites.

Most of concealed cadavers and human remains are found casually by runners, hunters, farmers or passersby. Few are the cases of victims found by investigators without the collaboration provided by the same offender or eye witness. Among the examined cases, the oldest and two most recent ones showed interesting investigative features.

The first examined pit is old and regarded the murder and cadaver concealment of a man, Giacomo Matteotti, a well-known deputy and secretary of the unitary Socialist Party kidnapped, murdered, and concealed by the fascist political police. This case, going back to the fascist epoch in the 1924, demonstrated for the first time as the search for clandestine graves carried out by police may be effective. A Brigadier of Carabinieri, Ovidio Caratelli, found a cadaver in a grave dug in the Quartarella wood, about twenty kilometers from Rome (central Italy). The suspect burial site was reported to the Brigadier by his sniffer dog; he pierced the ground with a stick and smelled the cadaver smell. The cadaver was found without clothing in a clandestine grave dug with a car jack and a rasp up to a 50 cm of deepness and at a distance of 150 m from the Flaminia Street.

The second studied pit regarded the murder and cadaver concealment of a woman 52 years old, named L. Z. The investigated pit was dug in the spring 2021 in the alluvial gravels of the Oglio river in the Val Camonica (Brescia, northern Italy). The pit was 140 cm long, 70 cm wide and 50 cm deep. The walls of the pit were sub-vertical and showed the occurrence of pebbles and boulders in a sandy-silty matrix. Near one side of the pit, stretched along the long dimension, there was a pile of alluvial pebbles and boulders. Along the pit walls several broken roots up to some centimeters in diameters were present. This pit dug by the three killers (the two daughters with the boy-friend of the major) was not used for the concealment probably because too little and too difficult to be dug. The condition of diggability of these deposits is very difficult.

The third studied pit is recent and regarded the murder and cadaver concealment of an almost 5 years old child, named E. D. P. The little cadaver was found the day after the homicide, the 13 June 2022,

semi buried in a clandestine grave, at Mascalucia in the Catania province (southern Italy). The burial site was indicated by the offender. The perpetrator was the child's mother who confessed crumbled under pressure of investigating authority and police. The cadaver was found in the pit, without the short, inside 5 black plastic garbage bags, one inside the other one.

The pit presented the following dimensions: 120 cm long, 85 cm wide and 32 cm deep. The pit was very little for his shallowness. The diggability of these deposits is very easy.

The deepness of the Italian thirty pits studied ranges from 20 to 250 cm with an average value of 91 cm. Deepness lower and higher than 150 cm indicate graves dug by hand with spade and shovel and by excavator, respectively. Only the 14% of the sample of graves analyzed resulted dug by women. Available data on the grave's deepness and shape indicate grave dug by hand with spade and shovel with a medium value of 30 cm.

Clandestine graves in Spain

Among the examined cases in Spain, the oldest and the most recent one showed interesting investigative features.

The first pit analysed regarded the murder and cadaver concealment during the 05 April 2015 in Astorga of a 41 years old woman, D.T. The pit was very shallow and it was previously dug by wild animals and later enlarged by hands by the offender.

The second studied pit hosted the cadavers of two fiances. It was very deep and was dug by excavator. Mass graves dug during the Spanish civil may be object of further investigations.

The burial sites

The choice of a site where to realize a clandestine grave is not casual but depends on the offender's mental map.

Clandestine graves may be dug in the underground or in anthropogenic contexts, such as the concrete floor and underlying underground of a cellar or garage. The form of the pit may be ellipsoidal or rectangular. Ellipsoidal graves are typical forms in the pits dug in the underground; they are dug with instruments as shovel and spade or pickaxe and jackhammer when concrete is present. Rectangular graves with sharp angles are typical forms in the pits dug by mechanical excavators; generally these pits show considerable deepness. Notwithstanding, this form may be also obtained by means hand instruments but in these cases the deepness rarely exceed 150 cm.

Form and dimensions (length, width, deepness) of a clandestine grave are useful features to consider during judicial investigations. These features may suggest if the homicide is premeditated or not.

Form and dimensions (length, width, deepness) of a clandestine grave are useful features to consider during judicial investigations. The entity of the pit's length and width is generally projected by the offender considering the body dimensions of the victim, whereas the pit's deepness, widely ranging from 20 to 250 cm, depends by several factors such among which the most relevant, the ease of diggability, the ability and force of the offender, and the available time lapse.

METHOD

The RAG (Red-Amber-Green) color-coded map of the prioritisation system (known as the traffic light system) may be used in criminalistics for delineating and prioritizing the ground search for crime-related buried cadavers or items (weapons, explosives, etc.). The reconstruction of a such search scenario may be useful to law enforcements for an efficient deployment of search teams and dogs handlers and to limit costs.

The application of the RAG system for the search of clandestine graves has never been documented in Italy before the research of Somma et al. (2018). Several ground search scenarios were created and simulated using a RAG color-coded prioritisation system for the search of a clandestine grave in a test site prepared in the county side of a hilly country of Southern Italy (Alì in the north-eastern Sicily) and in a wood in the Messina University campus.

The RAG prioritisation system was based on a conceptual and logical model and constructed considering those factors mainly influencing the offender in the choice of the burial site (diggability, landscape/slope, vegetation, anthropogenic structures, geomorphology, and visibility). These factors were examined and stored as geographic entities in different layers of a GeoDataBase, developed in ArcGIS. For each of these entities, the Red, Amber, and Green color-coded classes were assigned (as attributes) to the areas provided of high, medium, and low susceptibility to host the burial. The geographic entities were linked both to the Digital Surface Model (DSM) and the Digital Terrain Model (DTM). The RAG map was obtained overlaying and crossing, according to certain criteria (established in the conceptual and logical model), all the different entities with the related RAG susceptibilities (of the RAG system). Three different search scenarios were elaborated using DTM or DSM and considering or not the visibility factor. Each scenario resulted to be composed of areas assigned to the Red, Amber, and Green color-coded classes corresponding to the high, medium, and low priority search, respectively.

The here reconstructed (GIS)-based RAG search scenarios were submitted to a blind test in the field in which the red areas were carefully investigated by searching vegetation and ground anomalies. The findings of a few of suspect areas allowed to further investigate them by means of near surface geophysics (metal detector, GPR surveys). On the basis of the geophysical survey data, only one

suspect site was considered particularly promising and the simulated victim (manikin) buried in the grave was finally recovered by means of techniques of the forensic archeology.

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The application of the RAG system for the search of clandestine graves has never been documented until now in Italy. For this reason, several ground search scenarios were created using a RAG color-coded prioritisation system for the search of a clandestine grave in a test site prepared in the county side of a hilly country of Southern Italy (Alì in the north-eastern Sicily).

The RAG prioritisation system was based on a conceptual and logical model and constructed considering those factors mainly influencing the offender in the choice of the burial site (diggability, landscape/slope, vegetation, anthropogenic structures, geomorphology, and visibility). These factors were examined and stored as geographic entities in different layers of a GeoDataBase, developed in ArcGIS. For each of these entities, the Red, Amber, and Green color-coded classes were assigned (as attributes) to the areas provided of high, medium, and low susceptibility to host the burial. The geographic entities were linked both to the Digital Surface Model (DSM) and the Digital Terrain Model (DTM). The RAG map was obtained overlaying and crossing, according to certain criteria (established in the conceptual and logical model), all the different entities with the related RAG susceptibilities (of the RAG system). Three different search scenarios were elaborated using DTM or DSM and considering or not the visibility factor. Each scenario resulted to be composed of areas assigned to the Red, Amber, and Green color-coded classes corresponding to the high, medium, and low priority search, respectively.

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Based on the above, the study and research program includes the following activities:

a. Bibliographic search of existing literature.

b. Search for clandestine burials in Italian and Spanish territory and their inventory.

c. Geological analysis of the land subject to concealment.

d. GIS analysis of concealment sites and RAG map processing.

e. Data processing resulting from the activities referred to in this Agreement.

f. Scientific publications.

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