

#### Citizens education to hydrogeological risk through the HERASE project results



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#### A brief overview on soil erosion

#### EX + RODERE

**Erosion** (from the latin *erodere* = ex + rodere) is the action of surface processes (such as <u>water</u> flow or wind) that removes <u>soil</u>, <u>rock</u>, or dissolved material from one location on the <u>Earth's crust</u>, and then <u>transports</u> it to another location.



http://www.bandifacili.net/contributo-a-fondo-perduto-per-laprevenzione-dellerosione-del-suolo-abruzzo/



Every year mostly about 10 million ha of fertile soil are lost, reducing harvestable area to produce food crops, thus reducing food. (Pimentel, 2006)

#### The rain splash effects and solid transportation

Detachment, transport, and deposition are basic processes that occur on upland areas (Foster 1982). Detachment occurs when the erosive forces of rainfall drop impact or when flowing water exceeds the soil's resistance to erosion. Detached particles are transported by the splash and flow of raindrop. Deposition occurs when the sediment load of eroded particles exceeds its corresponding transport capacity. (Choi et



Brady and Weil (2002)

## **The HERASE project**

The focus of HERASE is to estimate the dynamics of soil erosion for the Oglio River basin (an Alpine area of northern Italy) under future climate change scenarios (until 2100), through a dynamic empirical model driven by multi-temporal satellite-generated land cover information. The project is funded by Fondazione Cariplo.



## **The HERASE project**



Dipartimento di Ingegneria Civile e Ambientale, Partner



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Progetto finanziato da Fondazione Cariplo, Grant No. 2016-0768.

### The HERASE project in the social

- > FACEBOOK: <u>https://www.facebook.com/ProgettoHERASE/</u>
- > TWITTER: <a href="https://twitter.com/ProgettoHERASE">https://twitter.com/ProgettoHERASE</a>
- > INSTAGRAM: <a href="https://www.instagram.com/ProgettoHERASE/">https://www.instagram.com/ProgettoHERASE/</a>



#### A partecipatory activities: meeting with the stakeholders

Kick-off meeting (13th July 2017)

Intermediate meeting (26th July 2018)

A series of conclusive meetings and dissemination activities (to be planned)







#### **RUSLE – Revised Universal Soil Loss Equation**

RUSLE (Revised Universal Soil Loss Equation). The RUSLE is a quantitative procedure for estimating soil loss by multiplying the following factors:



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#### A [t/ ha y] = R \* K \* LS \* C \* P

### In situ experiments

Rainfall simulation experiments were carried out in the alpine areas of Brescia, at Ponte di Legno (BS) to assess the erosivity factor by rain under three different scenarios on areas with different soil coverage and initial moisture condition. Large plots were used thanks to the use of rainfall simulators, each of them able to cover an area of approximatively 15m<sup>2</sup>.

#### 2 experiment on grassland:

- Dry soil and wet soil

6 sprinklers on 2 lines Parcel size 144 sqm Outlet: 1692 masl





## **Planning activities**

Planning activities:

- Location analysis
- Rainfall intensity -
- Sprinklers location
- Expected erosion -

The field



#### **Few pictures: sprinklers at work**



## **Collected samples**

35 jars with water and sediment were collected, one every two minutes

12 jars with soil samples for identifying soil type

Ex-post analysis were carried out in a lab in order to have:

- Liquid discharge
- Soil discharge
- Soil type





#### Liquid and solid discharge – V1a

	Samples	t [min]	t [s]	Vol [ml]	SSD [mg/l]	Tr [s]	Q [l/s]	Qsolid [mg/s]	V [mc]
Results:	tO	0	0	0	0	0	0,000	0,000	
	V11	1	60	200	284	60	0,0033	0,9467	0,0001
	V12	3	180	200	400	60	0,0033	1,3333	0,0004
	V13	5	300	180	265	60	0,0030	0,7950	0,0004
	V14	7	420	950	1230	60	0,0158	19,4750	0,0011
	V15	9	540	1040	86	60	0,0173	1,4907	0,0020
	V16	11	660	820	228	60	0,0137	3,1160	0,0019
	V17	13	780	360	38	60	0,0060	0,2280	0,0012



#### Liquid and solid discharge – V1b and V2



### FROM PLOT TO BASIN

Plot results have been modelled and compared with the general erosion model for the basin scale (resolution of 30m\*30m) in the same cells. After the check, model results has been extended to the Oglio basin.

![](_page_14_Figure_2.jpeg)

During summer average erosion rates in the Oglio basin is 1.86t ha-1y -1 and during winter months is 2.01t ha-1y -1.

### SEASONAL ANALYSIS

![](_page_15_Figure_1.jpeg)

Figure 2. Detail of seasonal soil erosion rates. Top: basin upper section for Summer months (a) and Winter months (b). Bottom: basin lower section for Summer (c) and Winter months (d).

## 

Results of the application of the RUSLE-like proposed approach to estimate soil water erosion in an Italian alpine basin, have shown that integrating satellite-derived spectral information within the land-cover based C-factor estimate can generate a more reliable soil loss estimate related to seasonal and long-term land cover changes.

This information is required for developing appropriate conservation policies regarding land use and agricultural practices, to avoid irreversible soil loss. Thus, the use of satellite derived spectral information opens new ways for modelling the dynamics of soil erosion, including both short-term (i.e. seasonal) and long-term land cover changes.

![](_page_17_Picture_0.jpeg)

![](_page_17_Picture_1.jpeg)

# Summer students camp

Asita (Federazione italiana delle Associazioni Scientifiche per le Informazioni Territoriali e Ambientali) **COnference** 

![](_page_17_Picture_4.jpeg)

#### **THE TEAM – A REAL ITALIAN TEAM**

![](_page_18_Picture_1.jpeg)