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SOIL EXCAVATION AS THE MAIN MORPHOGENETIC AGENT IN THE TORRENT CORLO VALLEY (NORTHERN APENNINES, ITALY)

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KEY WORDS: Soil excavation, morphogenesis, GIS, geomorphological mapping, Modena Apennines

INTRODUCTION

This work deals with morphological changes in the landscape of the valley of the Torrent Corlo from the mid-20th century to date and provides their relationships with soil excavations.

The valley of the T. Corlo is located in the western sector of the Modena Apennine margin, with elevations ranging from 123 to 298 m a.s.l. The valley is located in the Municipality of Fiorano Modenese, in the district of Sassuolo-Fiorano-Maranello-Formigine where hundreds of factories were built after World War 2 for the production of ceramic tiles (Fig. 1). The T. Corlo is a small watercourse which runs through the Modena Apennines for about 3 km; it reaches the Po Plain at Fiorano and, some 3 km downstream, flows into the Fossa di Spezzano stream, which belongs to the River Secchia catchment.

As regards climate, the T. Corlo valley is comprised within the sub-continental temperate climate with average precipitation of about 700-800 mm/year and average temperatures of 12-13 °C (Fazzini, 2007).

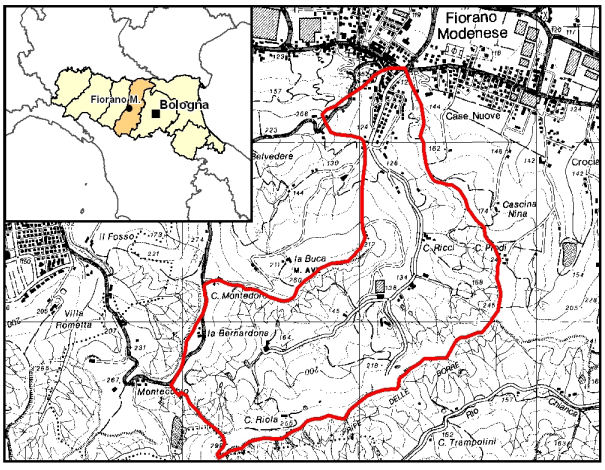

Figure 1 – Geographic setting of the Torrent Corlo valley.

The area studied stretches over 175 ha and, from a lithological standpoint, only marine silt-clay soil types (Plio-Pleistocene in age) are exposed (Gasperi et al., 2005). The most evident natural morphological features to be observed on the slopes of the valley, as well as in the surrounding valleys, are badland landforms locally named “calanchi”. These badlands are one of the most spectacular erosion landforms of the Apennine margin. Typically, they are composed of clayey-silty soils and are characterised by a very fine drainage network and short, steep slopes with narrow interfluves. Various small to average-sized earth slides and earth flows are found in the area.

The deposits are mostly made up of very fine materials deposited by the T. Corlo on the valley floor and by rill-wash at the foot of the slopes.

The main anthropogenic landforms are represented by abandoned soil pits on the slopes of the mid-sector of the valley. The materials used in the ceramic tile industry are, in fact, the clayey soils which crop out in the low and medium sectors of the Northern Apennines.

STUDY METHODOLOGY AND RESULTS

This study was carried out according to the traditional methods used in geomorphology (bibliographic research; research on historical maps, morphological analysis by means of interpretation of aerial photographs taken in various periods, geomorphological field-survey) as well as digital processing methods on maps and aerial photographs. The available digital data have been overlaid and compared using GIS software also by means of 3D elaborations in order to better appreciate the morphological features. The documents considered in this study are shown in Table 1.

The research led to the elaboration of four schematic geomorphological maps related to morphological features as surveyed in different periods in a time range of 73 years.

The morphological features of 1954, 1973, 1994 and 2011 were mapped. The main landscape changes occurring in these years are described as follows.

Type of document	Date	Scale/ Resolution	Note
IGM map	1935	1:25,000	B/W
GAI aerial photos	1954	1:33,000	B/W
RER aerial photos	1973	1:15,000	B/W
CTR map	1977	1:10,000	B/W
Volo Italia aerial photos	1994	1:70,000	B/W
CTR map	2005	1:10,000	B/W
AGEA orthophotos	2008	0.5 m	C

Table 1 – Documents considered in this study. IGM: Italian Military Geographic Institute; GAI: Aerial Italian Group; CTR: Regional Technical Maps (CTR) of Emilia-Romagna Region; RER: Emilia-Romagna Region; AGEA (Agenzia per le Erogazioni in Agricoltura); B/W: black & white; C: colour.

In 1954 the landscape of the study area still looks quite "natural", showing just three small soil excavation zones in the medium sector of the valley. Soil pits are concentrated in the slope's lower portion on the left hydrographic side of the T. Corlo. In 1973 soil excavation activity is much more extended, affecting also the right hydrographic side of the valley as well as upstream and downstream areas. Various artificial ponds and large levelled-out areas are present. These were constructed in order to mitigate rill-wash erosion and safeguard dirt service roads leading to the soil pits. In addition, at its lowest extremity, the valley is now developed, following the intense urban expansion of the village of Fiorano Modenese. In 1994 the soil exploitation areas on the left slope are abandoned whereas on the right slope soil exploitation activities are further expanded uphill with new excavation fronts which in some cases have removed stretches of the watershed with the conterminous T. Chianca valley. To date, man-made changes are clearly visible all over the T. Corlo valley, which appears to be characterised by levelled-out surfaces and slopes with artificial morphological profiles typical of excavation areas (Fig. 2). Nevertheless, at present the remodelling of excavation fronts resulting from concentrated rill wash processes can be observed in various points. In some cases, the action of water running freely along slopes previously affected by artificial shaping tends to give them a more natural aspect. Some of the artificial ponds are now filled by sediments. Furthermore, in the upper portion of the slopes natural badlands can still be observed. In these areas rill wash water tends to thin the slopes' crests, owing also to the fundamental contribution of superficial earth slides and earth flows. Indeed, present-day evolution of badlands takes place in many areas also because of small slope movements, which cause the rapid withdrawal of the badlands' heads and the filling of their valley floors with clayey deposits.

CONCLUSIONS

According to ASQ-ConsultinGroup (2008), soil excavation began in an improvised, makeshift way in the 1930s. By the 1960s, though, excavation was carried out in a more organized, industrial way. Extraction of soil for the ceramic tile industry ceased completely in 2008. Soon after the whole area previously affected by the presence of several soil pits was the object of a project of landscape and environmental reclamation and upgrading, with the implementation of a horse riding centre and some small ponds for recreational purposes. The study describes and maps some stages of the evolutional trend determined by soil excavation. Finally, a detailed assessment is made of the fundamental role played by excavation activity as a morphogenetic agent of the T. Corlo valley as well as its impact on the natural evolution of the landscape.

Figure 2 – The medium sector of T. Corlo valley in which abandoned soil pits are visible.

ACKNOWLEDGEMENTS

The authors are grateful to the Municipality of Fiorano Modenese for providing the financial support for this research.

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