Enhancement of the Roman Bridge of Canosa in the Ofanto Valley Rural Landscape

Enrico Liano, Silvana Fuina, Marcio A. Alberti and Giacomo Scarascia-Mugnozza

Abstract The ancient Roman Bridge, 2,000 years old, is located on the old Via Traiana route, three kilometers far from the town of Canosa (Apulia Region), and for many centuries it was the connection between northern and southern part of the Apulia Region along the Adriatic coast. It has an imposing structure stonework, with a donkey back shape, built with five round arches supported by piers sustained by rostrums. During the Second World War, a concrete access way was realized in order to let the British and American army tank pass through the bridge. The "Municipal Plan of the Tratturi" qualifies the area as "sheep trails or path" that preserves the original consistency or that can be at the same renovated. Aim of the research is the requalification of the study area through analyses, plan and restructuring the ancient routes. In this study, the current status of the area is analyzed in detail and the inconsistency of the interventions is highlighted. The project proposal provides for new tourism paths equipped with cycle/pedestrian tracks and small resting and refreshment areas, intermodal exchange car parks and management structures, allowing the creation of a green tourist-cultural route.

Keywords Roman bridge of canosa · Rural landscape · Sheep trails

1 Introduction

The Ofanto river (Fig. 1) is famous for many reasons linked to our history: the Battle of Cannae was fought by Hannibal (216 B.C.) along the bank of the river. It was celebrated several times in his lyrics by Quintus Horace Flaccus (Chelotti 1990).

Along its course were established ancient historical towns, including Compsa (present-day Conza della Campania), Canusium (present-day Canosa di Puglia) (Cassano 1992), ancient Aufidena and, not distant from it, the same Venusia (or today's Lucan city of Venosa) (Morea 1962, 1968, 1969; Sabbatini 2002).

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The Roman Bridge, 2,000 years old (Fig. 2), is located on the Via Traiana route (Stopani 1992) about 3 km far from the town of Canosa (Fig. 3). The Via Traiana was realized between 108–110 A.D. by the Roman emperor Traianus, starting from Benevento and ending in Brindisi that was in the ancient times the boarding harbor to Greece and Middle East (Pratilli 1745; Kirsten 2003). The Via Traiana was paved with basalt stones and partly with large basole stones (Ieva 2003; Bertelli 1981; Caselli 2011). It was 4.00 m wide, with two sidewalks 2.00 m wide, and 0.50 m high, bordered by a stone curb.

The case study of the Roman Bridge, located in the relevant archaeological area of Canosa, has been carried out by means of the drone investigation technique, or unmanned aerial vehicles (UAV). The use of the drone was introduced mainly for military purposes and then was extended to numerous applications (Adams and Friedland 2011). In particular, with photographic equipment, cameras or other specialized instruments, drones allow investigations and inspections more quickly than using aircraft, helicopters or other means. It is possible to detect an entire area or a delimited area, in order to check for possible dangers of collapse or to discover hidden and undiscovered areas with laser scanning. Architecture and arts take advantage from this technology, for methods of restoration and conservation, to make it useful to an ever increasing number of people and redevelop places respecting the landscape (Toccolini et al. 2006; Fumagalli et al. 2012; Tassinari et al. 2011).

The application of the unmanned aerial vehicles (UAV) supports archeology and cultural heritage to monitor the sites and help heritage management (Stek 2016). The

Fig. 1 Giuseppe De Nittis, Along the banks of the River Ofanto (1867; oil on canvas Firenze, Galleria d'arte moderna)

Fig. 2 19th century painting by unknown author representing the Roman Bridge of Canosa

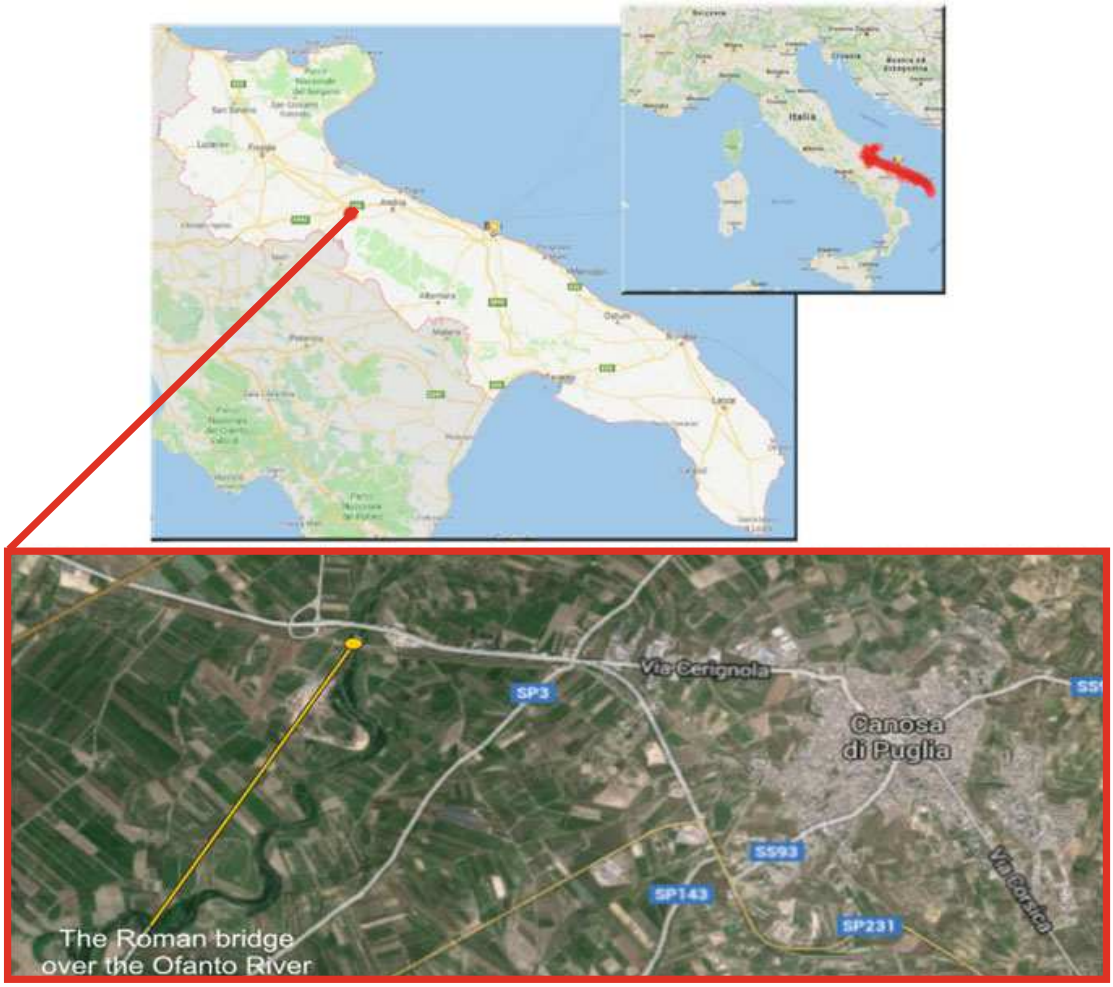

Fig. 3 Location of the bridge near the town of Canosa

possible applications are numerous: low-level photogrammetric surveys, documentation of the phases of stratigraphic archaeological excavation, analysis of ancient residential nuclei, the dynamics of the urban fabric and paleomorphologies, inspections and photo surveys graphs of architectural structures (monuments, historic buildings, aqueducts).

The integration of laser scanning technology with that of drone shots also responds to the need to obtain interior surveys of buildings that are not directly accessible. For this task "micro-drones" with a size of few cubic centimeters are generally used (Stek 2016).

The utilization of these devices together with the methods of visual anthropology are applied also to landscape management.

The main goals of this investigation are:

– To use UAV technologies in a historical important area such as the Roman bridge of Canosa;
– To identify instrument and protocol to assessment of the area of interest;

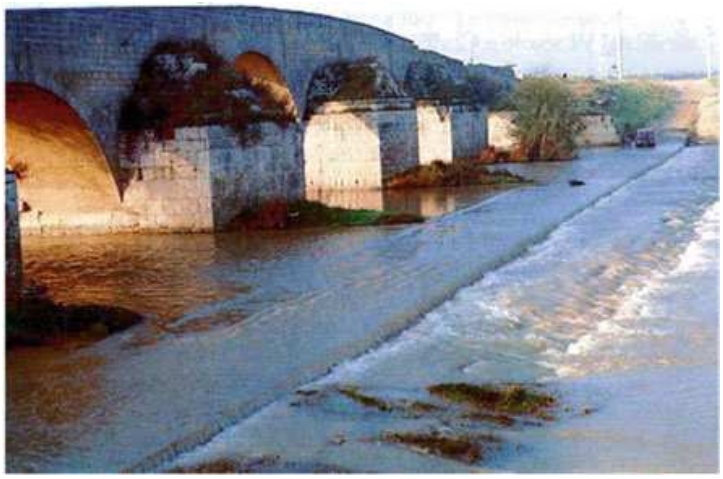

Fig. 4 Concrete route built during the Second World War for the military tanks transit Photo of 1944 of the Italian National Research Center

– To enhance the area, to identify the critical aspects of the current situation and to propose interventions suitable for a naturalistic and historic tourist itinerary.

2 The Old Roman Bridge on the Ofanto River

2.1 Construction Aspects

The Roman Bridge is 160.00 m long with a donkey's back shape. Its structure consists of 7 arches: 5 principal round arches, having different heights, and 2 lateral smaller ones. The 5 principal round arches are supported by thick massive pillars, of different dimensions, made of squared limestone blocks and equipped at the bottom with rostrum which guaranteed its stability against the stream of the river (Figs. 4, and 5). The structure is supported on a grid of wooden piles foundation filled up with concrete and coated with limestone blocks. It should be noted that during the Second World War a concrete route was built next to the bridge in the river bed to allow the military tanks to pass through (Fig. 4).

2.2 Environmental and Landscape Aspects

As a result of the survey conducted at the National State Archives of Foggia, the bridge over the centuries underwent numerous interventions of maintenance and restoration without involving the pillars, the rostrums and the foundation stalls. During the centuries the Roman Bridge was also part of the paths and livestock trails "Tratturi". From December 2015 was given the public concession of the municipal agricultural land of the town of Canosa along the "Tratturo Regio" livestock trails to voluntary organizations or social cooperatives in order to promote pedestrian or cycling tourism.

Fig. 5 Aerial view from the drone of the bridge

The purpose was to promote the area under the archaeological and agricultural productive point of view, also by means of a historical-tourist cultural itinerary. The maintenance of the area was given in concession by the Municipal Authority to the State Forestry Department. The land on the Tratturo Regio, in the section between the Roman Bridge on the Ofanto and the Mausoleo Bagnoli, should be subjected to protection, according to the "Town Plan of the Tratturi", where they are qualified as Armento trails that preserve the original consistency or that can be restored at the same time.

3 Design of Redevelopment of the Old Roman Bridge Area

3.1 Materials and Methods

The study and survey of the Roman Bridge has been carried out by means of the drone investigation technique, or unmanned aerial vehicles (UAV).

We provided a quadrocopter drone with open dimensions 322 × 242 × 84 mm and the flight plans were set to cover entirely the selected area, at a flight altitude of 3-10 m above ground level. The camera took pictures every 3 or 5 s with the following features: 12 million effective pixels, aperture f/2.8 (24 mm)–f/3.8 (48 mm), number of photos 100–1600 (automatic) or 100–3200 (manual).

Fig. 6 Lack of maintenance of the area

3.2 The Current Status of the Bridge Area

To date, after the field survey and the reconnaissance flight, it appears that the Roman Bridge, 2.000 years old, continues to be steady and stable but abandoned with spontaneous vegetation that covers a large part of the structure, especially the side ones (Figs. 5 and 6). Although the area is visited by tourists, the lack of a properly equipped and maintained touristic area should be pointed out.

3.3 Project Proposal

The design proposal enhances the Via Traiana through a path that involves the remaining pieces of the old sheep trails "Tratturi".

The redevelopment of the area is based also on new infrastructures equipped with: a pedestrian and cycle trail; rest areas; intermodal exchange parking; management facilities. These equipment would allow the creation of a continuous green tourist route. The "Municipal Plan of the Tratturi" also provides for the planting of new bushy, shrubby and arboreal essences, made up of myrtle, boxwood, lavender, rosemary, holm oaks and oaks.

The criteria used for the design of the archeological path are:

Fig. 7 The design proposal of the redevelopment of the area

– Sustainable planning: services in the planning area will be based in the use of renewable sources and passive technologies, use of environment friendly technologies and materials;
– Preservation of natural resources: sustainable project should commit to the preservation of natural habitat and archeological sites as well as among the others minimizing waste, sewage, noise and maximizing of the use of renewable sources.

The proposed path starts from the town of Canosa (Fig. 7). Leaving Canosa in the direction of Cerignola, immediately after the Barletta—Spinazzola railway we meet the Arco Traiano (A.D. 109). Continuing before reaching the provincial road 231 we find Il Mausoleo Barbarossa (I century A.D.), remains of a sepulchral building. Continuing immediately after a crossroads we meet the building of the Mausoleo Bagnoli (2nd and the beginning of the 3rd century A.D.) a large two-story funerary monument with a typical pattern of tombs defined as a podium or a temple. Just turn your back to the mausoleum and turn towards the Ofanto River it is possible to admire the almost intact stretch of a sheep trail. Recently restored by the students of a Professional Institute for Agriculture and the Environment that allow us to continue either on a cycle path or a paved track (simulation of the old Via Traiana). On the entrance, RT or Regio Tratturo (4th century B.C.) is clearly marked.

Continuing along the sheep trail paths, we reach two rest areas from which we can see and reach the Roman bridge over the Ofanto River (Fig. 7).

4 Conclusions

Currently the Roman Bridge continues to be steady and stable but abandoned with spontaneous vegetation that covers a large part of the structure and lack of a properly

maintenance. The design proposal enhances the Via Traiana through a path that involves the remaining pieces of the old sheep trails "Tratturi".

The studied area should be enhanced by means of:

- Planned green maintenance operations repeated two-three times a year;
- The correct cleaning of the bridge and the surrounding area;
- The creation of a real bike and pedestrian path;
- The strengthening of the bridge's connection with the city of Canosa and the nearby archaeological areas;
- The realization of infrastructures equipped with a pedestrian and cycle trail, rest areas, intermodal exchange parking, management facilities;
- The realization of tourist information points;
- Event organizations that promote the area.

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