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**POLICY-MAKING IN METROPOLITAN AREAS:
THE ANIENE RIVER AS A GREEN INFRASTRUCTURE
BETWEEN ROMA AND TIVOLI**

ABSTRACT: The European policies acknowledge greenways and “Green Infrastructure” as strategically planned and delivered networks comprising the broadest range of green spaces and other environmental features. The Aniene River, linking the eastern suburbs of Rome to the City of Tivoli, has been envisaged in a multi-level approach as a Green-Blue Infrastructure able to hinder land use fragmentation and provide new continuity to remainders of open space. In turn, landscape is taken into account as a biodiversity reservoir, the scenery of outstanding cultural heritage and the relevant backdrop of ordinary life.

KEYWORDS: Green Infrastructure, urban fringe, urban planning, urban design, urban governance, Aniene River.

The European framework

The European landscape, more than any other, has suffered a huge loss of natural habitats because of the fragmentation of land uses and landscapes due to human activities and infrastructure. Such processes, resulting in an alarming decrease in many wildlife populations, are likely to jeopardise biodiversity conservation. Lately, although the main natural areas are now largely protected by the Natura 2000 Network,¹ new concerns have been raised

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¹ Natura 2000 is a network of core breeding and resting sites for rare and threatened species, and some rare natural habitat types which are protected

related to climate challenges and to overall ecological performance within metropolitan areas. Green Infrastructures, encompassing further green (land) and blue (water) spaces, are strategically planned networks of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services such as water purification, air quality, space for recreation, and climate mitigation and adaptation.² Therefore, Green Infrastructures are expected to facilitate new connections between existing natural areas and to ensure the improvement of environmental conditions and, thus, citizens' health and quality of life.

As a part of its policy on biodiversity after 2010, the European Commission prepared a strategy for Green Infrastructure. In the Commission's proposals for the Cohesion Fund³ and for the European Regional Development Fund (ERDF),⁴ Green Infrastructure is especially identified as one of the investment priorities insofar as it supports green economies, creates job opportunities and enhances biodiversity, while contributing to smart regional policies and sustainable growth.⁵

Stories, geographies and economies of the Aniene River in the long run

Green Infrastructures encompass a very broad range of green spaces and other environmental features, often located in different parts of the metropolitan territories, such as suburbs, urban fringes, agricultural areas and natural landscapes. Quite often, they

in their own right. It stretches across all 28 EU countries, both on land and at sea. The aim of the network is to ensure the long-term survival of Europe's most valuable and threatened species and habitats, listed under both the *Birds Directive* and the *Habitats Directive*.

² EU Commission, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Green Infrastructure. Enhancing Europe's natural Capital, May 2013.

³ COM(2011) 612 final/2.

⁴ COM(2011) 614 final.

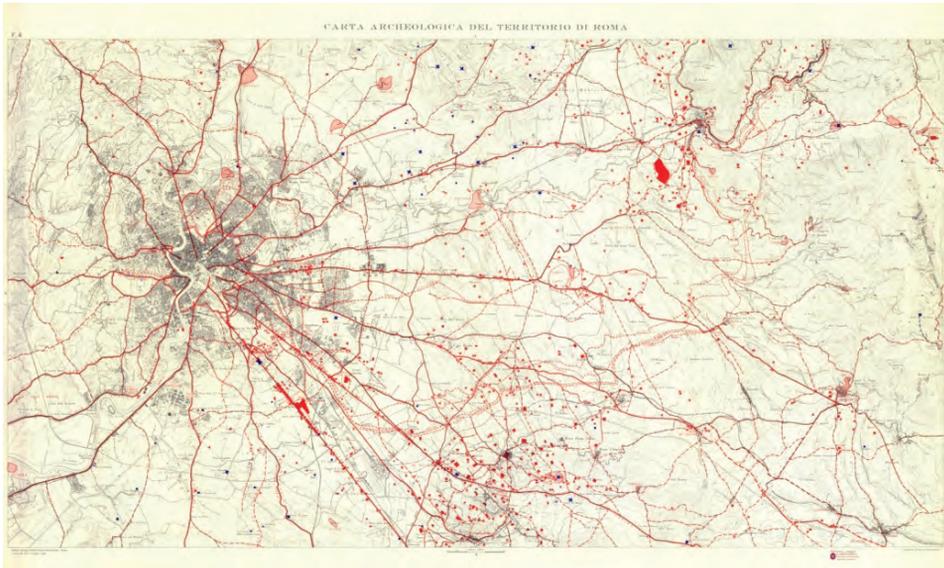
⁵ COM(2011) 17 final, Regional Policy contributing to sustainable growth in Europe 2020. Commission Staff Working Document, SEC(2011) 92 final; Connecting smart and sustainable growth through smart specialisation. European Commission, 2012.

coincide with rivers and their frequently neglected surroundings. This is the very case of the lower Aniene River Valley, between Tivoli and Rome, in the eastern hinterland of the Capital City, inhabited by 90% of the resident population of the entire basin (Municipalities of Tivoli, Guidonia and Rome).

Despite being located only 48 km away from Rome and hosting two UNESCO Sites – Villa Adriana (second century) and Villa d’Este (sixteenth century) – Tivoli is poorly perceived in the collective imaginary. A “must” in the Grand Tour, depicted and described countless times in tourist guides throughout the eighteenth and nineteenth centuries, nowadays Tivoli ranks only 29th among the destinations in Italy.

The site of Tivoli is well-renowned for its sulphur mineral water springs and for the exploitation of water resources in the impressive sceneries for the gardens of Villa Adriana (second century) and Villa d’Este (fourteenth century), both in the UNESCO list of World Heritage Sites. The long-lasting mutual interdependencies between Rome and Tivoli are physically marked both by the Aniene River and the Tiburtina Consular Road, and economically by a series of long-lasting trade exchanges. The Tivoli hills have always produced high-quality olive oil. Quarries lengthwise have provided a particular white calcium-carbonate rock – the “Travertino” – used in building most Roman monuments. The waterpower of the Aniene falls has been exploited since the early industrial period for paper mills and ironworks. From the twentieth century onwards, the river has partly provided for the capital’s electricity needs.

What remains of all this today? For some decades now, the whole territory has undergone anthropic changes that have hidden or completely changed the natural landscape. Uncontrolled anthropic pressure and illegal soil occupation have been transforming the typical rural landscape of the “Agro romano” into a city spread all along the Aniene River that lacks even basic community facilities and witnesses substantial carelessness towards the natural and cultural assets in the area, their history and destiny. Even though residents are not used to considering themselves part of the ecosystem larger than their own neighbourhood, the Aniene and its surroundings have been exploited and intensively used since the most remote antiquity: and the whole area still bears many formal and functional signs of such human presence, like the ruins of villas, necropolises, tombs, and other archaeological sites (Fig. 1).

Fig. 1. Archeological Map of the Roman territory

Source: Superintendence for Archaeological Heritage of Rome – author not specified.

The Aniene River (whose name comes from the legendary Tuscan king Anio) has been an important transport route and a valuable water resource, as well as a relevant ecological and productive element for its surroundings for centuries. In particular, its last section before flowing into the Tiber River, once called Teverone, corresponds to the ancient “Route of Travertine,” an important communication waterway for production and trade from the Imperial period to the Baroque one.

This area, early inhabited, underwent a complex evolution closely linked to the birth of Rome: in fact the first settlements that never attained a real urban status, should be reported to the proto-historic and archaic periods and identified as “rustic aggregates” distinguishable in “settlements” and “villas” (small aggregates of rustic buildings inhabited by colonists). As soon as the Imperial City, in the Christian era, began to expand outside the Aurelian city walls, most radical transformations of its rural hinterland occurred with the destruction of the headboard villages along the Aniene River, replaced by lavish patrician villas.

In the tenth and eleventh centuries, an imposing system of watch towers along the consular roads would be a valuable

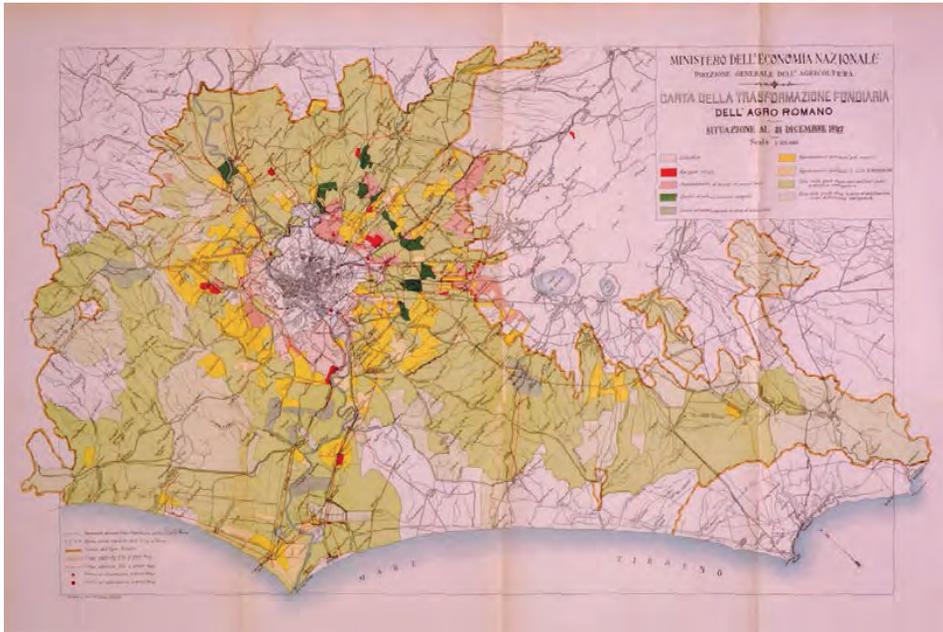
defense for new settlements (castles and farmhouses). This significant phase of territorialisation makes use of the river terrace reliefs, through the construction of towers and castles (Tower of the Cervelletta farmhouse, “Torraccia” of S. Eusebio, Tower of Rebibbia, Tower of Via Ripa Mammea, Tower of Casal de’ Pazzi), up to the farmhouses of the estates recorded in the Gregorian Cadastre (nineteenth century) that retained a clear defensive function.

After the feudal fights, many castles were abandoned or destroyed, and a new depopulation of the “Agro Romano” would follow. Agriculture resumed only in the eighteenth century, making it necessary to adapt existing rural buildings with the addition of granaries, stables and barns. However, malaria would compel more and more people to leave the area. It is only since 1870, with the end of the papal power, that the first legal measures for the rehabilitation and remediation were taken. The structures of the nineteenth-century defense system, the so-called military town, belong to modern times. The system consisted of a defensive ring that had been divided, in correspondence of the consular roads, in a number of structures, such as military forts and batteries, and then completed by annular road connections. In the area of the Aniene River or near its borders there are the Forts of Monte Antenne, Pietralata and Tiburtino, and Battery Nomentana witnessing the permanence of military traffic routes.

In the twentieth century, with the reclamation work, major transformations of the whole area took place with the splitting of the huge estates typical to the power-based relationships in the Agro romano (latifundia). It would mean better crop yields, new landowners and new tenants, new settlements patterns and hamlets (borgate rurali, centri di colonizzazione agricola), provided with facilities intended to assign new settlers to land (church, school, healthcare center, barrack), thus allowing for urban development in the following decades (Fig. 2).

From the 1920s onward, a minor network connecting the consular roads and a number of modern farmhouses were built. The dynamics intensified after World War II, with the economic boom and huge demand for housing estates in the hinterland of Rome. Many urban and industrial settlements occupied the stretch between Roma and Tivoli, among which there were illegal settlements in the suburbs, warehouses or junkyards, next to the water table and to the river itself.

Fig. 2. Land transformations of the Agro Romano in the 1920s



Source: Ministry of National Economy. General Directorate of Agriculture – author not specified.

The Greenway between Roma and Tivoli

The use of the Aniene River as a greenway could allow to address the manifold dimensions of open space, on the backdrop of the new “Metropolitan City,” whose extra powers could steer the inter-municipal planning process in a more strategic way.

The overall idea of the Municipality of Tivoli is to improve the rail connection to Rome and to enhance the living environment within and around the city in order to supply tourist flows with a powerful set of opportunities, such as the impressive sceneries of Villa Adriana and Villa d’Este, and the hot sulphur mineral water springs in Bagni di Tivoli. In addition to historic assets, the Aniene offers a huge amount of natural and environmental resources that could be very useful to hinder fragmentation of urban and peri-urban areas. We refer to a sort of resilience, that is the capability of the river and surrounding areas to regenerate and adapt themselves, after the transformations caused by external factors, such as climate change or human interventions. For example, in

some of the low-lying river bends, small parts of surface planted with vegetable gardens still survive. These areas are generally wedged in the urban context and represent a substantial value for the preservation of traditional agricultural and preindustrial landscape, dating back even to the classical period of Rome, when the fluvial terraces of the lower course of the Tiber and the Aniene were allocated to crops and fruit groves.

In general, the Aniene River displays absolute continuity, even with respect to riparian vegetation (Fig. 3); and several pockets of high naturality, even in urban areas, have survived thanks to difficult accessibility.

Fig. 3. Riparian vegetation along the Aniene River



Photo: Biancamaria Rizzo.

Wet environments between the river and the barrier of the Rome-Aquila highway are open into a valley space with two different configurations, the former defined by the reclamation canals and the latter by the artificial lakes formed by interception of the aquifer (Tor Cervara area) in former tufaceous quarries holding high cut escarpments. The accessibility of the river banks in this area offers the potential for a more intense use for sports activities related to navigation, even integrated to the existing ones, horseback riding and sport fishing among others.

The open areas with no tree cover are currently subjected to agricultural uses, among which the arable crops (cereal) prevail. The shrinking of wooded pastures, once functional to sheep

breeding, has recently offered the premise for the development of intensive cultivation. The characteristic of the agricultural landscape of the Aniene valley lies in its complexity. In fact, lacking a precise connotation to refer to, many features allow for a mix of urban, river and agricultural landscapes with valleys, creeks, small vegetable gardens, cultivated fields, fallow fields, buildings interpenetrating with infrastructures.

From the environmental standpoint, the low Aniene course is the emblem of the urban degradation perpetrated in the recent past. Strong pollution rates were reported in Tivoli valley, with a gradual increase until Ponte Salaris in Rome (confluence with the Tiber River). As a matter of fact, for many years now the river has poured in severe conditions, mainly caused by the depletion of the flow and by widespread environmental and urban decay along the banks, besides a reckless use of the riverbed as quarries and landfills. The tributaries have become sewage collectors, often buried under the streets; the river waters are polluted by residential and industrial waste.

Both sides of the river hold fluvial terraces witnessing the width of the Aniene during maximum flood events. Notwithstanding, the valley has been invaded by industrial and mining activities, partly abandoned (mainly paper mills, food processing industries and travertine quarries), by cementification and rectifying of the waterways; by roadway construction; by earth-moving for civil and industrial settlements (i.e. treatment plant "Roma est"). Many activities lie even within the river bed: this is the very case for several illegal settlements, so that the river space is confined by surrounding buildings and high-density neighbourhoods.

Towards a covenant for the Aniene River

A most promising way to deliver Green Infrastructure is to adopt an integrated approach to land management, careful in developing strategic spatial planning. From the very beginning, it would be appropriate to involve all the stakeholders, such as land users, citizens associations and political actors, called upon to take their share of responsibility in the management actions. We need to highlight that the levels of planning and governance operating on the Aniene River and its territory are more than one.

First of all, the Basin Plan includes, among its main objectives, the hydraulic protection of the metropolitan area and the recovery of the environmental features of all rivers and tributaries. In turn, the Metropolitan Plan of Rome makes use of the Ecological Network, charging the Aniene River and other linear signs with interconnection between core areas and buffer zones. The Plan of the Natural Reserve of the Aniene River defines a series of reasonable guidelines related to compatible agriculture and outdoor recreational activities. This tool is not in force and does not include the river stretch in the Municipalities of Guidonia and Tivoli, whereas continuity, regarding both the functional and the ecological governance, stays the main condition for a Green-Blue Infrastructure as the river should be.

Policy-making requires both a “Strategic Plan” and a “Control Room” for such governance. According to the EU Water Framework Directive (Directive 2000/60/EC), the tool envisaged to tackle issues related to sectoral and comprehensive policies is the River Contract, a voluntary instrument expected to promote environmental and landscape restoration through prevention, mitigation and monitoring of hydro-geological emergencies related to pollution and landscape. Unfortunately, the River Contract of the Aniene has only just begun: a website has been created, many subjects (Basin Authority, Region, Mountain Community, Park Authorities, Municipalities, employers’ and citizens’ associations) have signed the agreement and have entrusted the control room to the Mountain Community of the Aniene Valley, but there is no Strategic Plan at the moment. The Aniene River should be planned to all effects as a Green Infrastructure, to hinder land use fragmentation and address the manifold dimensions of open space, on the backdrop of the new “Metropolitan City,” whose powers will soon steer the inter-municipal planning process in a more strategic way.

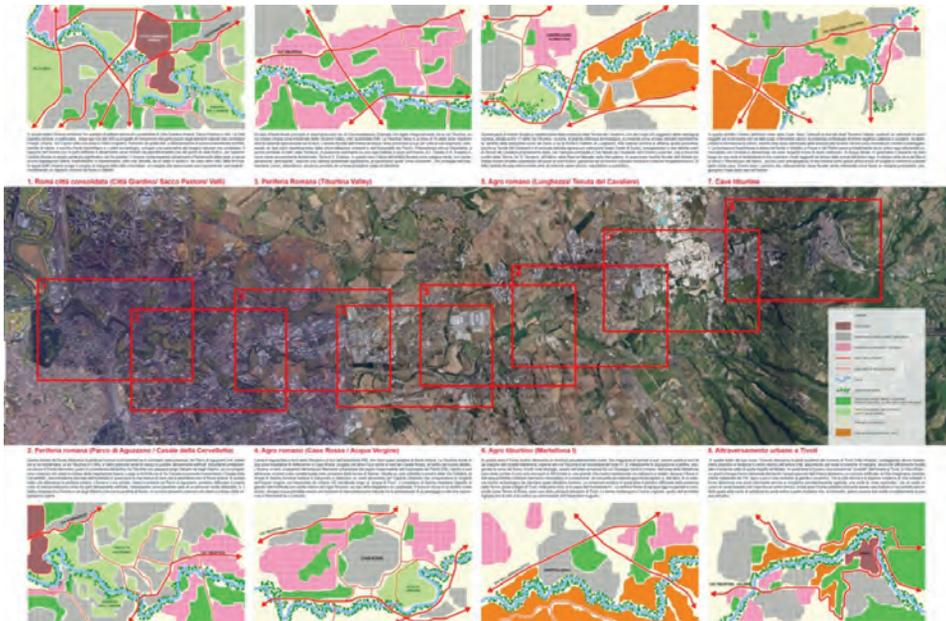
Several issues and scales are involved: urban agriculture and urban greening, but also re-use, re-cycle and the transformation of former factories into a sort of “quality incubators,” with both small-scale and large-scale solutions, able to regenerate urban and environmental resources. First of all, it needs a correct methodology to analyse the different landscapes crossed by the river infrastructure, in order to comprehend limits and potentialities of each of them, and to build an integrated and complex intervention strategy linking points, lines and surfaces within the river areas.

In order to meet this challenge, the research programme “Sustainable policies and resilient landscapes in the metropolitan territory of Rome: Enhancing the lower course of the Aniene River” was carried out in 2015, focusing on the linear “City of the Aniene River.” Currently, the river holds an ever different function, mainly as an element of decay, not quite often as an element of environmental and historical quality, whose regeneration can convey the improvement of the surroundings. Different features, such as peri-urban and suburban settlements, rural and natural areas allow for eight cross sections on the different types of landscape – Urban crossing in Tivoli; Quarries of Tivoli; Countryside of Tivoli; Countryside of Rome; Tiburtina Valley; Roman Suburbs; Urban crossing in Rome – scanning the Aniene Valley from the City of Tivoli to the confluence into the Tiber River (Fig. 4). For each of these “transects,” after formal and functional analysis, we highlighted the potential and strategic role that the river can perform for a sustainable and resilient development within the metropolitan area. As regards the historic city (Città Giardino Aniene in Rome and the City of Tivoli), it can be re-designed as an urban edge creating a more correct relationship, both formal and functional, between the built-up environment and the natural areas. As regards suburbs and peri-urban areas, the river can offer an occasion for social and environmental regeneration linked to urban agriculture, sport and leisure activities, and to landscape protection.

In addition to a general Master Plan, the implementation of the Green Infrastructure should also involve the drafting of guidelines useful to define rules, regulations, instructions, methodologies to be set forth by local authorities. In order to define the guidelines better, we referred to a certain number of best practices, collected and catalogued in a thematic dossier, related to the latest and most innovative interpretations of the “river project,” selected from cases of Park Plans, Basin Plans, and River Contracts.⁶

⁶ Each guideline is structured along different specific objectives. If we aim at protecting valuable natural heritage, we need to achieve objectives such as: protecting, preserving, restoring and developing the functioning of natural systems and habitats in order to halt the loss of biodiversity; promoting green space in urban and peri-urban areas; appropriately restoring areas with significant landscape values related to the river; using adequate protection technologies.

Fig. 4. Interpretative schemes of the eight “transects” along the Aniene River between Rome and Tivoli



Author: Biancamaria Rizzo.

The identified operational paradigms for the river areas are mainly three: the “margin,” the “environmental connection” and the “route of enjoyment.” For margin, we intend a buffer zone interposed between two different areas that have no connection: not so paradoxically, the landscape ecology approach has demonstrated that such transition areas between different biomes, called ecotones, allow for high biodiversity, since different plant and animal communities meet and integrate. In other cases, the margin has to be planned in order to capture pollution and separate different environments: for example, the vegetation along the river near the industrial settlements of the Tiburtina Valley could work to isolate from pollution, traffic and noises the agricultural areas on the other side of the Aniene River while facilitating the movement of several species (Fig. 5).

The river as a major environmental connection could work as a green corridor, whose role is to rebuild both a correct formal and functional relationship between different kinds of land uses in the open space and between urbanised areas needing a greater ecological balance. It is the case, for example, of the peri-urban

residential settlement of Case Rosse, near the Agribusiness Center of Rome. This area is set apart from the historic rural areas by the river, called upon to act as a major link between the patches of rural and urban areas (Fig. 6).

The route of enjoyment is especially devoted to the human needs towards relevant natural and historic areas (such as parks, urban gardens, historic gardens, archeological sites, religious buildings), to be linked through pedestrian streets, thematic routes or cycle paths. It is the case of the Aniene stretch between the historic centre of Tivoli and the residential settlement of Villa Adriana, a linear space characterised by vegetable gardens and wooded landscapes. In this area, the river could be usefully made accessible and its surrounding area could be arranged as a viable greenway between the historic city and the modern neighbourhoods that are currently separated from each other (Fig. 7).

Conclusions

Environmentally and ecologically speaking, the Aniene River represents a major challenge in the Roman area, a Metropolitan City collecting some 100 municipalities and 4 million inhabitants. The point is to come to grips with an idea of resilience, embedding spatial coherence and landscape connectivity both at the local and territorial scale. The whole area lies under different planning tools (Municipal Master Plans, Landscape Plan, Basin Plan, Plan of the Natural Reserve of the Aniene River, Metropolitan Plan of Rome, World Heritage Management Plans), to which the idea of the Green Infrastructure should be linked. The improvement of the habitat and the quality of the river can enhance opportunities for a range of economic and social benefits, such as the promotion of advanced recreational resources, the increase in quality of life and, last but not least, the increase in land values.

The pursuit of the different roles of the Aniene River towards the metropolitan area is supported, of course, by the achievement of several strategic guidelines: a) the protection of valuable natural heritage, b) the development of agricultural areas adjacent to the river, c) the development of areas of historic/cultural interest, and d) the rebalancing of areas at risk of degradation.

The essential condition for achieving each goal is undoubtedly the reduction of decay and neglect of the river areas, aiming at

integration with local communities in a perspective of protection, compatible development, better fruition and development of related activities. Environmental quality system is closely linked to the quality of agriculture. Agriculture, when interpreted in sustainable terms, certainly holds a central role in land protection, because it constitutes both a productive and an environmentally friendly activity, based on biological and natural rules. Agriculture, therefore, should be used to return identity to a place, to protect the beauty of rural landscapes, to conserve natural resources, to provide numerous benefits to the urban system.

In the still rural areas, the river and its environment are to be connected to the surrounding settlement patterns by re-generating ecological networks, creating thematic paths and encouraging new forms of sustainable tourism based on the discovery of pre-industrial activities located along the river (paper mills, ironworks factories, hydropower stations). Such landscape approach offers the ideal ground to comprehend and guide future transformations, focusing on different aspects: landscape as a biodiversity reservoir, the scenery of outstanding cultural heritage, the relevant backdrop of ordinary life. The set of guidelines stemming from these landscape quality objectives aims to complement rules and regulations issued by the planning system, notably the Municipal Plans and the ongoing Strategic Plan of the Metropolitan City of Rome.

Fig. 5. The Aniene River along the “Tiburtina Valley”



Source: Google Maps.

Fig. 6. The Aniene River near the peri-urban settlement of Case Rosse



Source: Google Maps.

Fig. 7. The Aniene River between Tivoli and the settlement of Villa Adriana



Source: Google Maps.

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