

Doctoral School in Environmental Engineering

Roads and Verticality **strategy and design in mountain landscape**

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To my wife Luisella

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CONTENTS

1.	INTRODUCTION	
1.1	One piece of the puzzle	p. 8
1.2	Structure, purposes and tools	p. 12
1.3	Scientific and Cultural Context: The European Landscape Convention and the Manifesto for the Project of the European Landscape	p. 16
1.3.1	Beyond mitigation: the road as opportunity for landscape development	p. 18
1.3.2	From the project of artefacts to the project of artificial grounds	p. 22
1.4	Architecture <i>strategies</i>	p. 23
1.5	Experimentations	p. 26
	Notes to chapter 1	p. 33
	Interviews:	
	Adriano Venudo	p. 37
	Costanza Pera	p. 41
2.	ANALYSIS	
2.1	Vertical elements. Interpretation	p. 46
2.2	Overlapping: the hierarchy of the elements	p. 51
2.2.1	Plans and overlapping spaces: Northern Trento and Cornedo all'Isarco	p. 53
2.3	Slope: land and perception	p. 59
2.3.1	Slope and perception: case studies of Pineta di Laives and Moena	p. 60
2.4	Difference in altitude: artefacts, orography and landscape	p. 66
2.4.1	Orographic gradients: a classification	p. 67
2.4.2	The difference in altitude in mountain roads: hairpin bends, tunnels and bypasses	p. 71
2.4.3	Bridges and viaducts: differences in height, shape and structure	p. 74
2.4.4	The Space in “between”: an alternative reading of the road body based on the difference in altitude	p. 79
2.5	Perception: the leading role of orography	p. 86
	Notes to chapter 2	p. 90

3. DESIGNING LANDSCAPE WITH ROADS

3.1	Boulevard in open spaces: the road crossing in mountain contexts	p. 93
3.1.1	Interferences	p. 96
3.1.2	Planning sections: the waterfront of Anversa	p. 104
3.1.3	Rarefied intersections: Detour, landscape road	p. 107
3.2	Continuity/contiguity: the design of places and landscapes through sequences of spaces	p. 112
3.3	Architecture and overlapping	p. 121
3.3.1	Between: vertical space and road support	p. 125
3.3.2	Use of the between: vertical interstitial space	p. 130
	Notes to chapter 3	p. 136

4. DESIGNING ROADS WITH GROUND AND LAND

4.1	Ground and mountain roads	p. 141
4.2	Ground/architecture - ground/road	p. 143
4.3	Making space: the position of the road relative to the ground	p. 147
4.4	Outcrops: infrastructure traces	p. 154
4.5	Gradient and edge: road thickness	p. 157
	Notes to chapter 4	p. 165

CONCLUSIONS

Architectural operating tools	p. 168
Notes to conclusions	p. 165

BIBLIOGRAPHY

Main Bibliography	p. 173
Thematic Bibliography	p. 177

ABSTRACT

This PhD thesis provides design strategies to control changes produced in mountain places and landscapes following constructions of roads. Strategies are based on the activation of *unexpressed potentialities* in places, although compromised, characterized by presence of roads. With the term *unexpressed potentialities* we refer to functions, attitudes, uses which, during the process of road realization, have not found an appropriate design solution. Topic of the thesis is to demonstrate that these *design gaps* can be properly addressed by an architecture project, obtaining two results: create a link between places, landscapes and roads and consolidate the participation of architecture discipline in a field (roads production) in which, today in Italy, it is less integrated than others.

Changes in mountain landscapes are characterized by morphology and orography of the territory crossed: the factor that most influences in this direction is the verticality of the space.

This specificity is discussed in the thesis through the analysis of road segments, infrastructure nodes or other specific situations, divided according to the topography in which there are: *high gradients, slope* or *bottom of valleys*. Specific characteristics which correspond to the three different orographic situations are explained by an interpretative study of the cross section, highlighting the potentiality of the space related with its vertical dimension.

Most study cases belong to the geographical area of Trentino Alto Adige, an Italian region characterized by mountain landscapes. Some study cases are taken from other Italian regions or known experiences of the international context.

The proposed strategies are developed through study of architectural projects, joined by devices that interpret the vertical (*overlapping, slope* and *difference in altitude*) of the spaces, reposable in cases of mountain road. All strategies can be applied at any step of road production, from concept to design to construction. In addition, and we assume that this is the most frequent case, can be applied *ex post*, when the road is built, intervening to change situations already in place.

CHAPTER 1: INTRODUCTION

1.1 One piece of the puzzle.

Shielding his eyes from the sunlight, Maitland saw that he had crashed into a small traffic island, some two hundred yards long and triangular in shape, that lay in the waste ground between three converging motorway routes. The apex of the island pointed towards the west and the declining sun, whose warm light lay over the distant television studios at White City. The base was formed by the southbound overpass that swept past seventy feet above the ground. Supported on massive concrete pillars, its six lanes of traffic were sealed from view by the corrugated metal splash-guards installed to protect the vehicles below.

Behind Maitland was the northern wall of the island, the thirty-feet-high embankment of the westbound motorway from which he had crashed. Facing him, and forming the southern boundary, was the steep embankment of the three-lane feeder road which looped in a north-westerly circuit below the overpass and joined the motorway at the apex of the island. Although no more than a hundred yards away, this freshly grassed slope seemed hidden behind the overheated light of the island, by the wild grass, abandoned cars and builder's equipment. Traffic moved along the westbound lanes of the feeder road, but the metal crash barriers screened the island from the drivers. The high masts of three route indicators rose from concrete caissons built into the shoulder of the road¹

The scenario chosen by J.G. Ballard's novel *Concrete Island* is set in what seems to be a nightmare: high viaducts and inaccessible cliffs that trap the leading actor in a place that everyone knows exists repeatedly and endlessly in the territory, and in which nobody would want to stay for more than a minute. A place designed to perform technical requirements and not to be inhabited, but to the actor's and the reader's surprise, is attended by people who have similar social rules to those of any other place. The surprise is a ploy not only of the novelist Ballard, but also of the sociologist Ballard, who aims to trigger the following thought: actually each and every one of us stops, crosses and lives in such places every day, but is disgusted by them.

Roads have been at the heart of the debate on architecture and landscape for years, and have now been catalogued, studied and quoted in numerous examples in which the road will not be considered exclusively as a technical matter but as a local *generator of transformations*, that in order to be controlled needs the contribution of different

Francois Schuiten, cover for the Italian edition of *Concrete Island*, Baldini e Castoldi, Milano, 1993.



PRIN 2007-2010, survey of infrastructures in Trentino Alto Adige.
Junction Civezzano - Torchio (TN), fishing area.

disciplines. The French case (Lassus and the policy of “1% Paysage et developpement”), the Dutch (government programs and pilot projects on major infrastructures), the Swiss (the architecture of the road by Rino Tami), the American (the Greenways), the Spanish (infrastructures that cross the cities of Madrid, Barcelona and more recently in the Canary Islands) are examples of integration of various disciplines, that aim to seize the *opportunities* offered by the passage of a road, rather than to limit its damages². Whoever is about to carry out researches on the subject is faced with a large choice of case studies available for research, studied, catalogued, mentioned in various interpretations.

Today it is necessary to look toward more specific investigations³: specific tools for specific types of landscapes. In a more general perspective, specific studies are pieces of a complex mosaic, impossible to address in full in a single search. The general pattern of the mosaic is not unique but fragmented into overlapping planes: the interpretations are potentially infinite and intersect each other (divided by types of landscapes? By types of disciplines involved in the transformations? by types of infrastructures or a more specific road way?).

The choice made by this research is to investigate possible strategies to analyse and design mountain sites and landscapes affected by road crossings, from the point of view of the space, at all scales involved.



Some mountain locations affected by the presence of roads, recorded during the 2007-2010 PRIN research *Projects for landscaping in neglected areas*⁴, show a mingling of the total space of the street and the space outside it. This feature combined with others seems to be created by some specificity common to all mountain landscape (land morphology, topography, climate, features of the road artefacts), which don't exclude broader issues generally addressed by the research, such as the path, perception, scale, speed: it is indeed completely pervaded by them, that cross it transversely.

The quality of the space is central to the investigation because it is what mostly affects the perception of the places by those who pass through them and by those who live there. This does not mean that the landscape is the result of a complicated process distributed in time, but it establishes, albeit fragmented, the margins of Architecture in this process: the places crossed by roads that *physically support the body*, creating spaces characterized by size (distance, length, height, thickness, roughness...) which are abstract architectural tools for the control of the quality of the space. The road itself is a space influenced by distances, heights, slopes, views.

There are many cases in which the road is designed as an architectural space⁵, and if these cases were to become part of common practice, if the devices that regulate them had been reproduced as a policy, if the procedures by which they came into being had been copied, today we would live the ideal condition in which the road is seen even by those who support it with their territory as a developmental opportunity. We know that is not so in most cases: the common feeling, while approaching a road is still an unpleasant experience, unappealing, to be avoided if possible: who would want a road to pass a few meters from their home? And how many people now live sharing their space with the roads?

In Italy, for example, those who promote the roads are committed in a systematic practice of *mitigation*, a concept which, according to the terms, seems more related to environmental parameters than architectural or landscape aspects. This practice is dominant not only in the great achievements, but especially in *common* cases, that are all those daily situations without media exposure and non-catalogued, which appear as small sections of roads, adjustments, junctions to old or new roads that affect the landscape not so much for the extension, but for the frequency of their occurrence and spreading. *Mitigation* and

Compensation are useful tools, but not sufficient: we must think of the road as an attended space, inside and beyond its kerbside, in which noise and smog reduction and water purification are just some of the rules for the quality of the spaces created, a quality that now appears to be left to the adaptability of the places it crosses.

Roads are the image of a society that lives simultaneously two scales that are in conflict, the global and local one: the first is expressed by the flow (mobility, information, speed, competitiveness...) the second by the places it crosses through. The *space* generated by the roads is a land of conflict, but also, as Ballard would like, evidence of the individual's ability to confront with its contradictions.

INTRODUCTION	ANALYSIS	DESIGN 1	DESIGN 2
STRUCTURE	VERTICALITY	BOULEVARD	GROUND/ROAD
SCIENTIFIC CONTEST	OVERLAPPING	INTERFERENCES	POSITION
EXPERIMENTATIONS	SLOPE	PLANNING SECTIONS	OUTCROPS
	DIFFERENCE IN ALTITUDE	RAREFIED INTERSECTIONS	ROAD THICKNESS
	PERCEPTION	CONTINUITY/CONTIGUITY	
		OVERLAPPING	
		IN BETWEEN	

1.2 Structure, purposes and tools

The construction of roads always involves transformations of various nature and extent, no matter what kind of territory, place or landscape in which it occurs. In some of these places, landscapes or territories transformed by the presence of roads one can discover unutilized potential opportunities that go beyond the judgment of value.

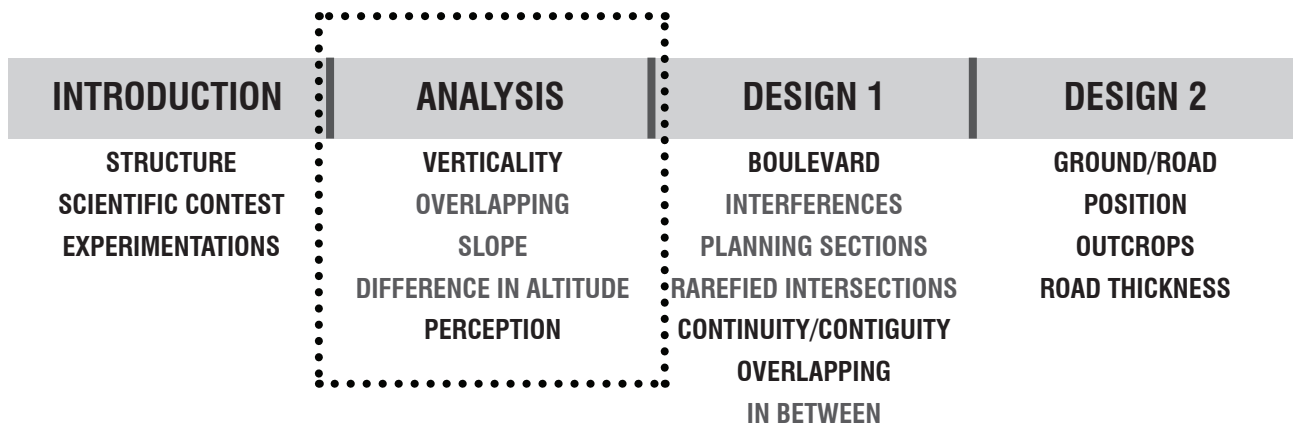
This Doctorate thesis provides analysis and design strategies to interpret and control the changes⁶ produced in mountainous places and landscapes following the road constructions. These strategies are based on the activation of unexploited potentials of the places, although compromised, characterized by the presence of the roads. The expression *unexploited potentials* refers to functions, attitudes, uses that during the construction process of the road are not or have not found an appropriate design solution. It's a topic of the thesis that these *project gaps* can be usefully addressed by using architectural devices, grouped into strategies, thus obtaining two results: creating a link between places, landscapes and roads and to strengthen the participation of the architectural discipline in a field in which today it is less integrated than others.

The thesis starts from the study of the specific nature of mountain landscapes. In road engineering the mountain orography is an important factor in the conditions that govern the road design. To face steep slopes, gorges, mountain passes etc. involves the creation of characteristic artefacts, but also a different attitude in establishing the minimum and maximum geometric parameters of the road. The Italian legislation on road geometry⁷, for example, defines the minimum and maximum parameters (radius of the curves, slopes) for roads designed in most of the orographic conditions. The decree specifies that the

curvature spans, slopes of the road and all the technical elements must be weighed in light of the topographical conditions and therefore may differ from the parameters given in the text of the rule. The Province of Bolzano has issued a regulation⁸ in which are addressed some specific situations typical of mountain territory situations: characterized by large differences in altitude, steep slopes or the need to reach places situated at high altitudes.

As in road engineering designs, also in the formation of spaces and their interpretation, in the mountain context provides specificities that this thesis has found.

The thesis is divided into two parts that reflect the goals that this research aims to obtain: to highlight strategies for interpretation of the mountain context of the road infrastructures (analysis) and design strategies (design).

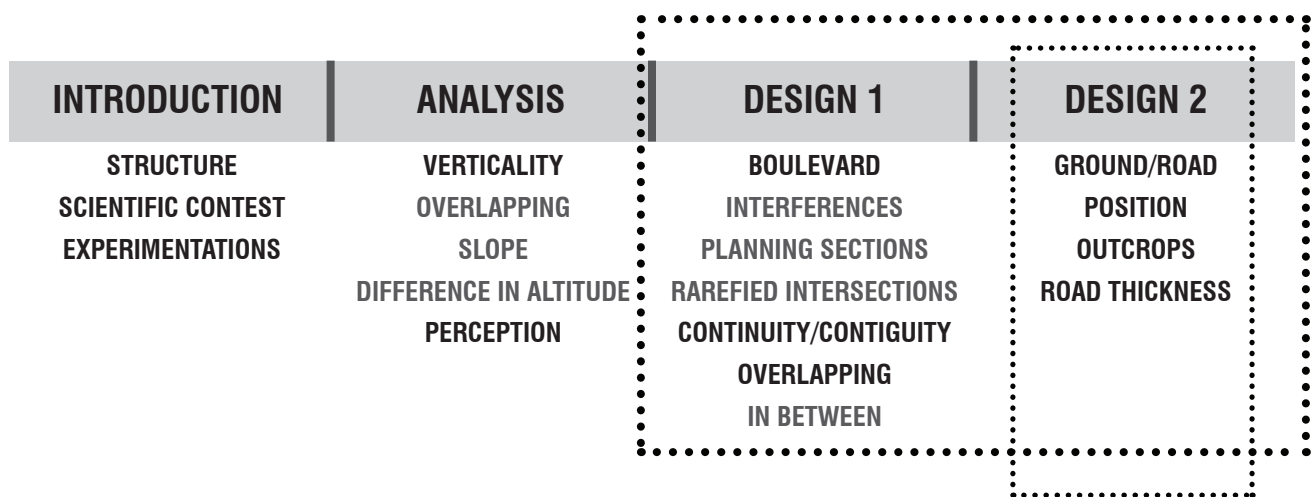


Chapter two of the thesis deals with the analysis strategies. Its purpose is to highlight the specific typology of mountain landscapes; the focus turns to morphology and topography as peculiar to each mountain landscape: they lead to interpretation or project attitudes categorized in different and characteristic situations. A factor connected to the topography and the morphology of the mountain contexts is the *verticality*, which is divided into separate components (*overlap, slope and gradient*) with specific characteristics but overlapping one another⁹.

This specificity is discussed through the analysis of stretches of road, infrastructure nodes or artefacts in the mountains, divided according to the topography in which there are: *steep slopes, slopes or valley floors*. Except in some cases, the majority of case studies belong to the geographical area of the Trentino Alto Adige, an Italian region characterized by mountainous landscapes. The geographical and

methodological starting point of the analysis is the 2007-2010 PRIN ministerial survey *Projects for neglected landscape areas* (Research Unit, University of Trento, coordinated by Prof. C. Lamanna), during which a survey was conducted on case studies in the mountain context of the region, characterized by the presence of roads¹⁰.

The design strategies offered in the second part of the thesis (chapters three and four) come from architectural projects whose devices interpret the verticality of the spaces and are repeatable in cases of mountain roads.



The strategies do not strictly reproduce the analysis pattern (overlay, slope, difference in altitude...), but separately address transversal subjects of the research, highlighting aspects that are potentially common themes described in the analytical part. Thus, for example, the theme of the *in between* or that of the *continuity and sequence of spaces* will be addressed according to the potential of the work focused on these strategies in the interpretation, for example, of the *gap or the overlap*.

A separate chapter is devoted to strategies that interpret the relationship between road and ground. This choice is made by interpreting the road as the only artificial element formed by continuous connections between the road strip and the ground it passes through, characterized in mountain contexts by continuous variations of vertical dimension: the mediation between the road and the ground is an opportunity for bonds based on the morphological *modelling* of the land, the *location* of the road compared to the ground (intersections, vicinities, separations), and the opportunities offered by spaces adjacent to the road, on the *vertical thickness* of the kerbside etc.

All strategies can be applied at any stage of the production of a road, from concept to design to construction. Furthermore, and supposedly this is the most frequent case, they can be applied when the road is built,

intervening to change the situations already in being: in this second case, the subject of the problem of an already *existing* road, a condition generated by a technical urgency, by the lack of integration during the procedures, by interdisciplinary diffidence, etc.

The interdependence of the tackled issues is large, because they are constantly crossed by more general themes that address both the analysis and design strategies. Particularly, the issues of a *scale* and *perception* appear to intersect with virtually all the provided strategies and interpretations.

Regarding the perception, a central issue to the debate and the European Landscape Convention¹¹, it has been highlighted which aspects of mountain contexts influence the individual in two conditions: during the drive on the road and while off the road. The verticality in mountain contexts is crucial in the way of perceiving the landscape crossed by the road and inhabited.

The scale in the road project is treated in its dual consistency: longitudinal and transversal. The road is in fact at the same time a large-scale and local scale or diminutive element. Starting from the graphic representation used by road engineering, which simultaneously uses different scales making them interact with each other (road profile and cross section), and that does not find correspondence in other disciplines,

It's possible to work on different scales, holding together both the global and the local significance of the road¹².

The need to deal with a piece of a large “mosaic” determines the need to specify larger themes and subjects already addressed by other researches (scale and perception are just an example: continuity, sequence, time, physical dimensions, but also *overlapping, in between, parasite architecture* etc. are issues that must be addressed according to many unilateral points of view). In this sense, we find that some researchers or future researchers need to start from the *fundamental figures* of the discipline, such as those of graphical representation (plan, elevation, section) in order to establish solid and specific operational bases.

The Doctorate research of C. Azzali (currently being written), which belongs to the Department of Environmental Engineering of this University, is responsible for the regeneration of areas created by neglected infrastructures, thus starting from the *surface*; the same way, A. Venudo developed in 2005 the PhD thesis *Thicknesses, Codes, Interfaces*, figures that to some extent are based on *section, plan and elevation* of the road; the Doctorate thesis of S. Daniele¹³ (Polytechnic

of Milan) also starts from a plan of the prospectus and section in order to investigate *The public space of Infrastructures*.

This thesis investigates in particular *elevation and section* of mountain roads, highlighting the characteristics of the verticality and the resulting choices in the interpretation and design of the spaces of the road. Thus in the conviction of entering a branch which is in a process of consolidation that thinking back to the basic principles and tools that control them, adds small specific pieces to a much larger and complex structure.

1.3 Scientific and Cultural Context: The European Landscape Convention and the Manifesto for the project of the European Landscape.

The introduction to the volume edited by Serena Maffioletti, *Paesaggi delle infrastrutture*⁴, significantly begins with five quotations of excerpts from the writings of some of the leading Architects, expressing a vision of the problem of infrastructure according to points of view related to the respective periods. The years of reference start from 1932 (Ludwig Mies Van Der Rohe), and continue through 1939 (Le Corbusier), 1964 (Kevin Lynch, Donald Appleyard and John Myer), 1989 (Vittorio Gregotti) and end in 2005 (Mario Virano), year of the publication of this volume. To date, it is nearly a century of debates on mobility infrastructures¹⁵. During the last decade, however, the debate over the landscape has intensified, and with it the discussion on the role that mobility infrastructures (specifically roads) play in the transformation of landscapes.

The cultural reference point is represented today by the *European Landscape Convention*¹⁶, which in 2000 opened the way for an extended research that is spread through different disciplines: Geographers, Anthropologists, Urban planners, Architects and other specialists still contribute to enrich a subject with very large layers¹⁷. The purpose of the Convention was to establish some universally recognized points and strategic goals in order to guide the approach toward the landscape of the European Union Member States. The theme of infrastructure seems to be particularly sensitive to two of the principles laid down by the Convention:

1) the new definition of the term “Landscape,” which “designates a

certain portion of territory, as perceived by people, whose character derives from the actions carried out by natural and/or human factors and by their interrelations”¹⁸;

2) That it “concerns landscapes that might be considered outstanding, common and neglected landscapes”¹⁹.

The first point expresses the belonging of the landscape to the culture of the people who inhabit it, to the way they understand it and make it theirs through the transformation actions that are culturally shared. Within this research, this leads almost naturally to the local/global conflict, which is often highlighted during the process leading to the creation of new roads²⁰.

When the landscape is influenced by collective interests of mobility, it increases the risk that the road

structure will be deposited on the land with dimensions that are out of scale and shapes that have no contact with the place.

The second approach extends the definition of landscape also to everyday life landscapes, by subtracting the exclusiveness from the territories hit by these exceptional values. The landscape of the infrastructures is often the landscape of everyday life, in part because mobility requirements make it increasingly populated, in part because it features more and more every place in which it is built.

But, it is through the commitment to “integrate landscape into the planning policies of the territory, following the city plan and its cultural, environmental, agricultural, social and economic and other policies that could have direct or indirect impact on the landscape”²¹, in which it seems possible to search the basis for most of theoretical studies and practical experiences, the relationship between infrastructures and landscapes: the road infrastructure should be considered an *opportunity* for the territory crossed by it, contributing to its development in a sustainable perspective.

More than ten years after the European Landscape Convention was drawn up, the three European Networks for the implementation of the Convention, *Uniscape*, *Recep-Enelc* and *Civilscape* prepared a document with the purpose of implementing the Convention through 18 program points for the project of the European landscape. The *Manifesto for the European Landscape Projects*²² is an open document, under development, which fuels and directs the debate towards the operational tools of the landscape projects and leads to turn the attention to *how* to deal with the landscape following the principles of the Convention.

With theme of perception as the starting point of the project, of the public dimension of the project, of the participation, of the different combination of knowledge, the Manifesto indirectly addresses issues related to the changes induced by the roads to the landscapes: however, it's particularly significant for the manner in which it addresses the points that affect the mobility of people and their perception of the landscapes²³ and the need to think of new spaces through new specific tools related to various disciplines²⁴. The first point introduces the *perception project*, the study of the path in motion, of perceptual references, of the images starting from the *vision* from the studies of Lynch in *The view from the road*; the second represents one of the starting points for this research that through the investigation of strategies based on devices for the design of spaces, intends to provide specific architectural tools, with a view of the participation of the discipline to the design of the most frequent and integrated road spaces.

1.3.1 Beyond mitigation: the road as opportunity for landscape development.

In order to get rid of the limits of the picturesque and conceptual and operational ambiguities of the term “environmental integration” we must reflect on the features of the area and the nature of ground as a structural metric of the landscape that we intend to transform. The ground should not be considered as a plane support or be paved in order to set the architectures on it, but we need to reinvent the relationship between the building and the ground to anchor the building project to the project of the area and that it involves and transforms²⁵.

Some experiences of foreign road achievements are the steps of a course of study begun earlier than in Italy and produces results to which today we look at with interest. The procedures that lead to the creation of infrastructures in the territory involve from the beginning professional figures and disciplines that are able to interpret the relationship with the landscape, as defined by the Convention (Landscape Architects, Architects, Anthropologists, Geographers...). The result of this cultural attitude is represented by infrastructure projects shared by the population, provided with a strong territorial relationship and with an

architectural independency.

If, during the last decade, in Italy the debate on infrastructure - landscape has definitely increased, and the most important and recent road achievements have been involved by it, it perceives the existence of a step between these and the European ones, in the continuity of the basic notion of the *infrastructure as a developmental opportunity for the land*.

While, for example in France, the opportunity provided by the intervention on the territory makes it possible to positively transform the process since the beginning through coordinated economic practical and technical means, in Italy it seems to be assumed that new roads inevitably produce damage to the territory: the two basic instruments, environmental mitigation and compensation, respectively, are designed as in a way to hide and restrict the local damage and as a way to pay back the territory for the damage suffered. The concept that emerges, even in the most recent road achievements, is that in the presence of an inevitable damage caused by the infrastructure, the landscape project should focus on how to minimize it. As for the ground, this difference causes different attitudes, that we want to highlight through two symbolic examples of road projects, one French and one Italian, in which the attention to the landscape has been a fundamental part in the involvement of different cultures and in the funding made available, and in which the attitude towards the ground refers to very different conditions: the A19 from Artenay to Courtenay, in France and the highway Passante di Mestre, in the Veneto²⁶ region.

The A19 highway from Artenay to Courtenay, whose construction has been advantaged by the advice of Bernard Lassus for the landscape, represents the last great French highway construction. It is part of political policy within the “1% Paysage et développement,” the newsletter that since 1995 requires that 1% of the total cost of the infrastructure should be allocated to projects that relate to the landscaping, in relation to local communities (although the latter may actively participate in the financed projects by paying the same sum). The consequence of this operation entails is that the new accommodations are not only closely adjacent to the infrastructure, but are extended to that portion of the landscape that is visually

in relation with the highway, involving the permanent population²⁷. Another regulatory tool is also the “Charte d’Itineraire”, a document signed in 2007 in accordance with the policy of the Newsletter 1%



Paysage et développement, which aims to highlight the main landscape aspects of the areas crossed by the A19, aiming to produce specific intervention actions to accompany on a quality level the transformations of the territory triggered by the new highway intervention, with the object of obtaining a good quality landscape. The guidelines resulting from the document are: to support the quality of the projects for the affected areas; to promote quality housing and urbanization and the enhancement of the built property; to contribute to the enhancement of the agricultural landscape; to promote the landscape quality of the accesses to territories, cities and towns through the A19; to create an important network of routes designed to discover the territory.

Of course the program resulting from the “Charte d’Itineraire” does not aim to build an organizer sign of the territory or even the creation of timely architectural projects as saving solutions, but rather the collective work of road aimed at the transformation of the landscape, from the earliest decisions made on the course of the track.

The design work of the ground operated by Lassus was carried out since the concept of the road as a means of perception, knowledge and promotion of the area: a principle that involved every aspect of the project, from the choices of the track to the smallest details. The ground was modelled to achieve visual points of the landscape otherwise hidden. For some stretches, the highway embankment was raised by a meter and a half in order to obtain a broader and deeper visual perspective, and put the road users in connection with the more distant surrounding areas. The green bridges, built in order to ensure a transverse continuity to the ecological corridors, appear as strips of land without solution of continuity that claim a morphological independence from the road track.

The Passante highway of Mestre is the highway infrastructure that joins



B.Lassus, landscape design for the A19 Artenay-Courtenay (FR, 2007). Landforming operations for the discovery of the landscape.



the Mestre bypass by linking the highway to the east and west of the urban area of Venice²⁸. Enormous sums have been allocated for works related to the inclusion of the link road in the territory through a special project called “Passante verde” which extends along the entire path of the structure. The purpose of the Passante verde is to “provide solutions to issues left unresolved by the mitigations project of the Passante”. The project, still under construction, takes place on an experimental ground that makes it potentially repeatable, in the methods and approaches to other future projects, and has unquestionable merits in the tools that it proposes to implement: the enhancement of the environmental system and reconstruction of the ecological networks; the redefinition of relations, routes and the creation of new centres, the development of perceptual sequences and identity of places and the quality of the landscape²⁹.

However, it has been chosen to separate the road construction from the landscape project, making them independent from the point of view of time: an offset due to the emergency condition in which it was built, a contingent condition, unfavourable to the control of the design choices: the Passante of Mestre, following

a debate which lasted twenty years, was a work of absolute necessity, practical and political, hence its implementation had to be prompt and certain, without any constraints that could slow or block the evolution of its construction. We must note, however that this situation, for reasons that are beyond the scope of this research, is common to many major road projects in Italy. The priority given to the implementation of the road has resulted in two separate projects: the technical road design

The Mestre bypass (Venice, IT, 2009). The track that was built runs for long stretches in the trenches, under the country level.

(path, artefacts, mitigation) with the exclusion, from the early design and strategic decisions, of professional and competent specialists in cultural transformation of the landscape and architectural quality of the products, and the landscape (Passante verde), with the involvement of Architects and Landscape Architects to produce a comprehensive and coordinated plan of compensation. The landscape project of the Passante verde is, in this sense, a project ex post, even though it was considered and developed simultaneously with the Passante di Mestre infrastructure project.

It's in the attitude towards the ground, in which the separation manifests itself prominently: the track that was built runs for long stretches in the trenches, under the country level, between retaining walls in concrete structures with a vertical progression. Expensive solutions, which have the advantage of hiding part of the road from the sight of the surrounding areas, extensively urbanized, but does not establish any relationship with them: from the road one doesn't perceive the outside and from outside the continuity is only visual, and the two parts into which the territory is divided communicate through passages that are difficult to reach.

1.3.2 From the project of artefacts to the project of artificial grounds

While there is clearly a need to refine the cultural framework in which to operate the transformations of the landscape through the construction of roads, it should be noted that the differences between towns, regions or between landscapes, establish restrictions, specific insurmountable parameters for each of them. In some parts of rural France the choices for the paths can be multiple, there is room for alternative design, the layout may be more fluid and the ground can be modelled very well beyond the foot of a hypothetical embankment in natural slope³⁰; in the Venetian plain, dotted with buildings, warehouses, roads, rivers and property boundaries, these margins are smaller because they restrict the possibilities to occupy the land by the road. This also happens in Trentino Alto Adige, where a variable topography and complex land orography forces to perform paths often without alternatives. In this case it is clear that the ground project, mediating element between the road and topography plays a crucial role and must be dealt with technical,

analytical, cultural tools that meet the purposes that the Convention, a reflection of contemporary cultural needs, establishes.

At present, the mediation with the ground is entrusted to individual artefacts that constitute the solid road (road embankments) and the elements that integrate it (underpasses, retaining walls for bridges, viaducts etc.). The design of the road is interpreted as a collection of artefacts distributed along a path measured with progressive figures: to each progressive relates an artefact, the design of which often ends in itself. Not only is the relationship with the context conflicting (the topography of the place is *dominated* by the passage of the road through technical solutions), but the same artefact can be designed without taking into account the characteristics of artefacts placed close to a progressive³¹.

Hence the need to draw on other sources for the techniques to search for projects, practices, researches to be imported and used in the field of road construction projects: new architectural attitudes towards the ground, not necessarily aimed at the road project, but imported when culturally related.

1.4 Architecture *strategies*

The strategies proposed in this thesis through the project actions, such as *modelling, overlapping, in between design*, etc. with the purpose of interpreting the verticality of the spaces in the following components: *overlays, slopes and altitudes*. These actions correspond to architectural devices and are illustrated by the projects that use them.

Some architectural experiences show potentially useful architectural devices in the planning of the spaces of the road while making use of these devices completely apart from the road design: these are architectural projects that develop between two or more elevations, levelling the gradient and at the same time implementing a program of functions and spaces that create relationships with the places in which they were established.

An example is the project of Alvaro Siza for the pools in Leca da Palmeira (Porto, 1966) where the difference in altitude between the ground and the road is fully used in order to transport people from one side to the other: up high are the road crossing flows of Matosinhos,



in below the ocean pools, passing through a theory of concrete walls, ramps and extended spaces built parallel with the road, which compress the spaces and force to take a sequence path, which ends on the rocks. Following a similar interpretation many projects can provide devices to interpret the topographic elevation of the places, redefining their meaning. Some, such as the one by Siza, although not road projects, are compared with their presence and incorporated into the composition; others are completely unrelated, but the device can be exported in road situations.

Among the surveyed projects appear some architectures in urban contexts (e.g. interventions on artery crossings in Barcelona or the redefinitions of the waterfront overlooking the ocean in some cities). These examples not only create landmarks in the panorama of the roads, but also show connection architectural devices or the use of elevation projects and cross-sectional studies repeatable in mountain contexts, including non-urbanized ones or are being investigated in the design strategy used (typological sequence of sections, relationship with the margins of the context using the elevation of the project, the sequence of intersections with the context along the road, etc.).

The parallelism between urban and mountainous areas involves several logical planes: from a morphological point of view, the mountain backdrops of the valleys crossed by roads resemble skyscrapers located along the streets of a big city: they visually channel the perspective along a predetermined direction. From the standpoint of land use, in the mountains or in the cities the available land is a valuable resource that has a high cost: this often forces to layer the infrastructures and makes

A. Siza Vieira, swimming pool
in Leca da Palmeira,
Porto, 1966



good use of the strategies that work, for example, on the elevation and on the interaction of overlapping items. In cities and in the mountains there is the need for “objects” (buildings, crops, roads, etc.) along the vertical dimension. In the city by elevating buildings or roads, in the mountains by using orographic mountainsides. At different scales, for example, the high line recovered from Corner to Manhattan creates a perceptual mechanism similar to the Fadalto (TV) viaducts or the Borgo Valsugana (TN) viaduct.



The landscape is dotted with elements that define the timetable³² by creating complex and lasting relationships with each other. New paths of roads have to deal with inhabited, cultivated, manufactured, crossed spaces which often leave little room for design alternatives. In mountain contexts, the road crossing has to deal with the problem of a complex morphology of the land, which forces the path to even more binding solutions. The architecture of the road often has no alternative paths, with no room for change: paths that appear in their stiffness very similar to those of existing roads. Because of this, finding strategies for roads yet to be built may be combined with finding strategies to transform existing roads.

In the project of a road being built from scratch, to set the path as a function of the potential quality of the surrounding area becomes a point of contact between the road engineering skills and architecture skills, an information exchange that takes place on the terrain of a cultural overlap, which is possible only in some virtuous cases. In the projects on already built roads, the road already occupies a defined space and the work is

SS12 near Ora, Adige Valley, (BZ): cultivations are developed up to the edge of the road. The land value is too high to be able to waste.

concentrated in the interpretation of the surrounding space. A middle course between the two conditions is given by the transformations of the road axis in order to adapt it to the new conditions that occurred over time (e.g. increase or decrease in traffic). In this case it is possible to work on slight horizontal shifts in the location³³ or on the shape of the supports that support the road strip (bridges, viaducts, embankments, etc.).

But the problem of the road-landscape relationship appears clearly in *ex post* situations: roads seen as purely technical since the establishment, supported by the places and landscapes crossed by it that are protected or reimbursed through *compensations and mitigations*. The suggested strategies are often applied in these situations, in which the research of the quality of the space adjacent to the road is a chance for recovery.

1.5 Experimentations

During the course of this research some studies, research and workshops have been carried out. The results obtained from these experiences have influenced this study and you may find quotations, examples and traces of them within this thesis.

Particularly, the surveys carried out during the 2007-2010 PRIN research *Landscape projects for neglected places* and the study carried out on SS47 Valsugana are often quoted in the analytical part (Ch. 2) and investigated through its vertical aspect. The workshop *Pettinissa. A long green line* is also quoted in the *design strategies* of the thesis, because it contains project results.

2007-2010 PRIN research Landscape projects for neglected places

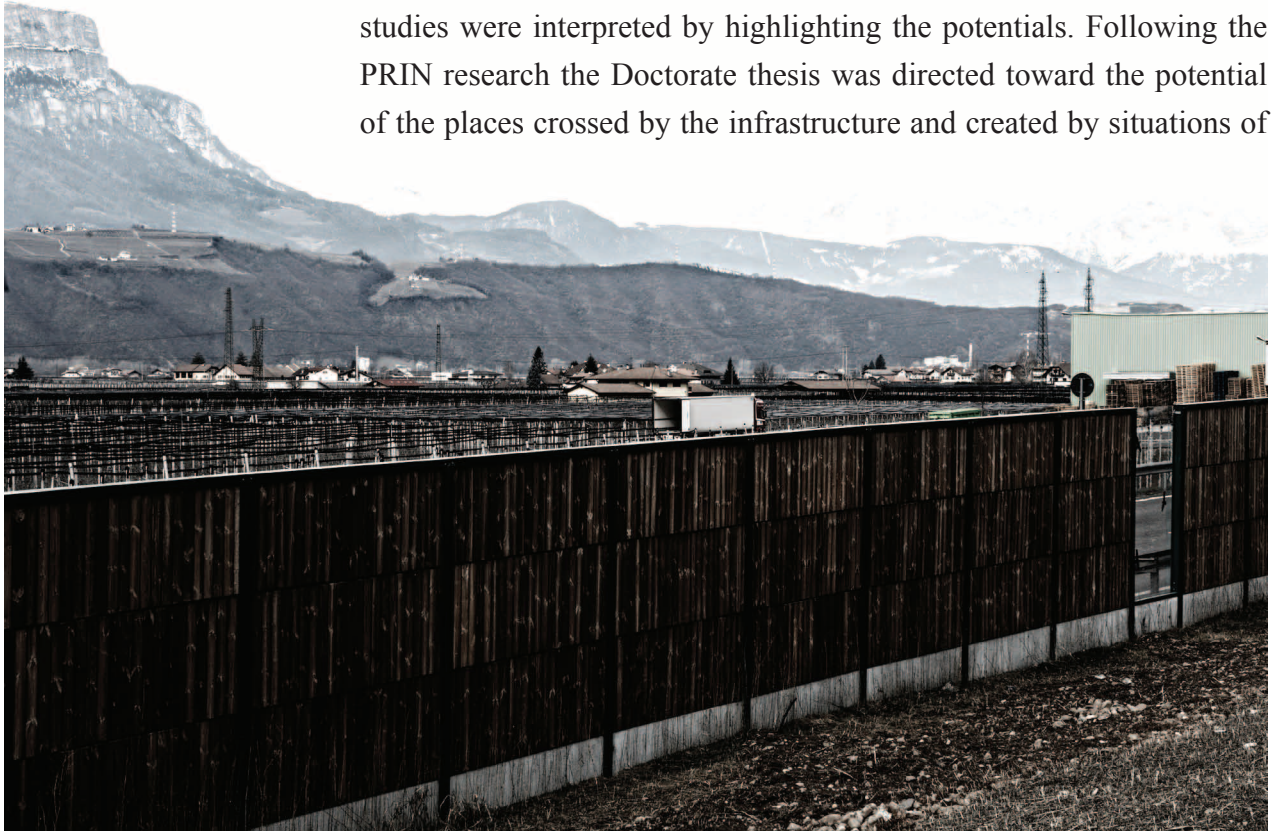
The ministerial Research PRIN 2007-2010³⁴, conducted for the Trento Unità by Professor C. Lamanna and nationally by Prof. A. Maniglio Calcagno, involving five research units of five different Italian universities on the theme of the *Landscape projects for wasted places*. The University of Trento developed the PRIN research by analysing the mountain landscapes of the Alps in the Trentino and Alto Atesino tract, including the landscape of mobility infrastructures. Some case studies were analysed by using a photographic survey along roads crossing, for example, the SS 12 in the stretch between Trento and Bolzano, or the SS 47 “Valsugana” in the Province of Trento. The purpose for which the survey was initially addressed was to detect critical points generated



PRIN 2007-2010.
 Photographic survey in
 Trentino Alto Adige.
 Photo by M. Lamanna.

from the roads in mountain areas. Right from the start it became imperative to reverse the investigation viewpoint, noting instead the *potentials* linked to the specificity of the Trentino region, opportunities waiting to be seized and the areas in which to eventually develop an architectural project.

The ministerial research PRIN 2007-2010 conducted by the Unit of Trento is considered the genesis of the analysis system, based on the photographic survey, used for case studies examined during the course of the thesis. Some of the case studies examined in the Trentino and Alto Atesino area were preserved according to the functional aspects offered by the thesis. Also preserved were the targets of the analysis: the case studies were interpreted by highlighting the potentials. Following the PRIN research the Doctorate thesis was directed toward the potential of the places crossed by the infrastructure and created by situations of

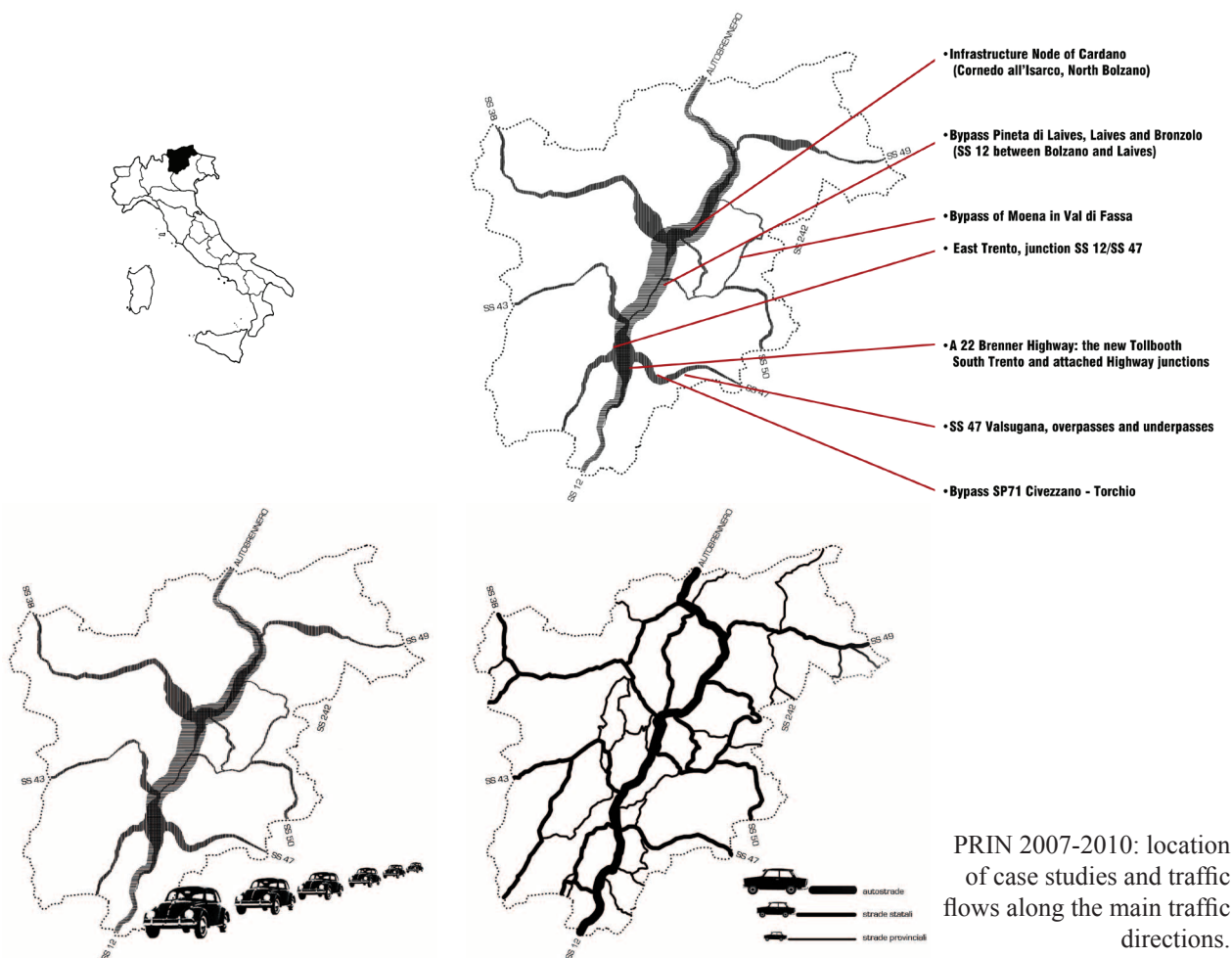


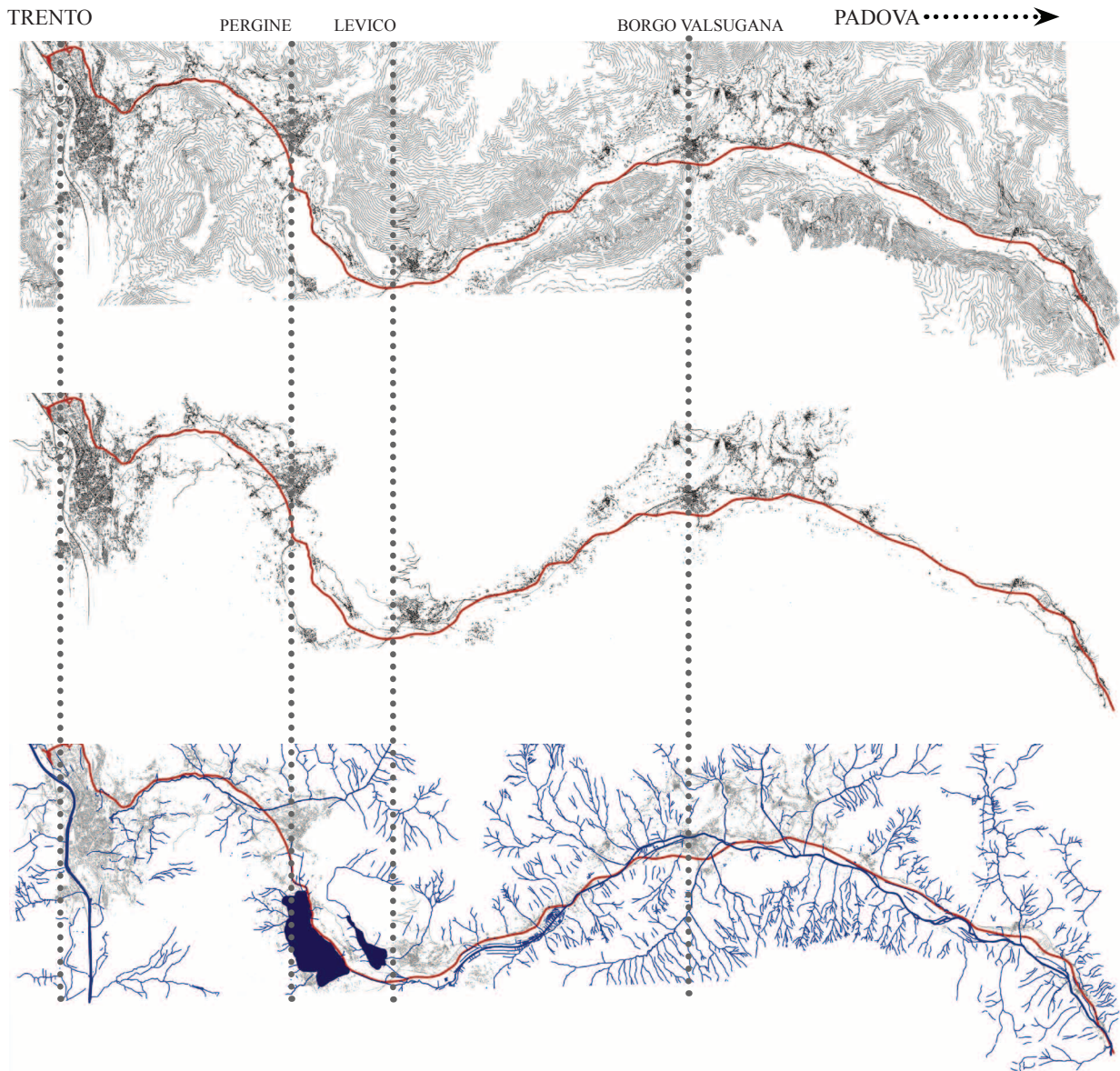
verticality, as they will be defined in the following chapter: situations in which there is a chance to read, interpret and take advantage of the verticality in some of its components (*overlaps, slopes gradients*).

The case studies of the PRIN research and those subsequently added using the same analysis parameters will be quoted at length: following is a list of them.

- The infrastructure Node of Cardano (Cornedo all'Isarco, North Bolzano)
- A 22 Brenner Highway: the new Tollbooth South Trento and attached Highway junctions
- East Trento, junction SS 12/SS 47
- The SS 47 Valsugana, overpasses and underpasses
- The Bypass S.P.71 Civezzano - Torchio
- The Bypass Pineta di Laives, Laives and Bronzolo (SS 12 between Bolzano and Laives)
- The Bypass of Moena in Val di Fassa

A study on the SS47 "Valsugana"





The case studies of the research PRIN 2007-2010, have been extended to a specific study carried out in this thesis, along the SS 47 “Valsugana” in the section between Martincelli and Trento. From Primolano, a few kilometres before the border region of Trentino Alto Adige and Veneto the section crosses, in the valley floor, a mountain landscape that lends itself to an analysis model.

The SS 47 “Valsugana” is a highway that connects the Pianura Padana starting from Padua (Veneto Region) and the Brenner line at the elevation of Trento (Trentino - Alto Adige), defining a low cost alternative to the Brenner infrastructure (railway and highway). From the basin of the Pianura Padana, in fact, the A22 highway reaches and passes through the Brenner more easily and quickly with the cost of a longer and costly path. The average daily traffic flow of 16,000 vehicles³⁵, consisting mostly of heavy vehicles, which take advantage of the economic profit deriving from the low speed and no tolls. The road section is variable:

SS 47 “Valsugana” (TN).
Analysis of mountain orography through the valley, bild and interceptions with catchment basins.

generally two-lanes, sometimes it narrows to one lane in each direction. On the side-lines of the SS 47 SS formed in time, residential areas, shopping centres, parking areas, production areas, which share space with the road. The edge of the crops in Trentino Alto Adige is an insurmountable barrier because of its costs and strategic opportunity: the space for other functions than agriculture must be sought elsewhere and in this case along the corridor of SS 47³⁶.

Today we seem to need a vast intervention that leads the road to accommodate increased traffic over the years: the problem is the focus of a local debate, some sections of the road present a critical flowing situation, because of the combination of different types of traffic, exceptions to the road safety standards and interferences between the road and urban areas. The suggestions are heterogeneous both in solutions and for decisive effects (improvement of the road and introduction of a tollbooth, upgrading of the *Valsugana railway* for freight traffic, and other timely solutions along the route). The private space adjacent to the road and the narrowness of the valleys is not sufficient to allow an enlargement intervention without affecting situations on the kerbside established over time.

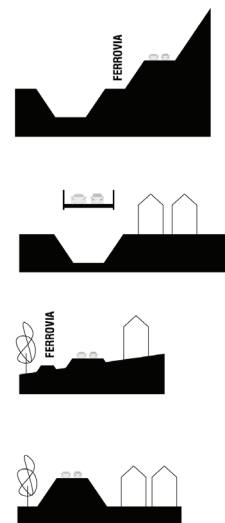
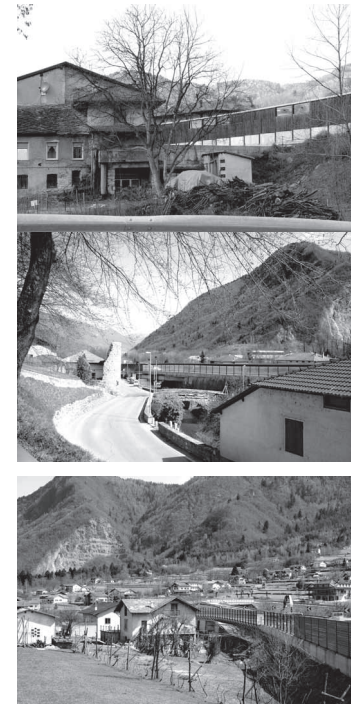
The study carried out during this research is justified by the need to transform, evolve and balance the SS 47 taking into account all possible evolutionary scenarios, while maintaining the goal of restoring a link between the road and landscape.

The survey is based on the verticality, a key that allows to interpret the Valsugana through possibilities at different scales: from the perspective of the mountains when crossing the valley from the spaces between the ground and road strip space available to the project because designed only in a technical road-sense.

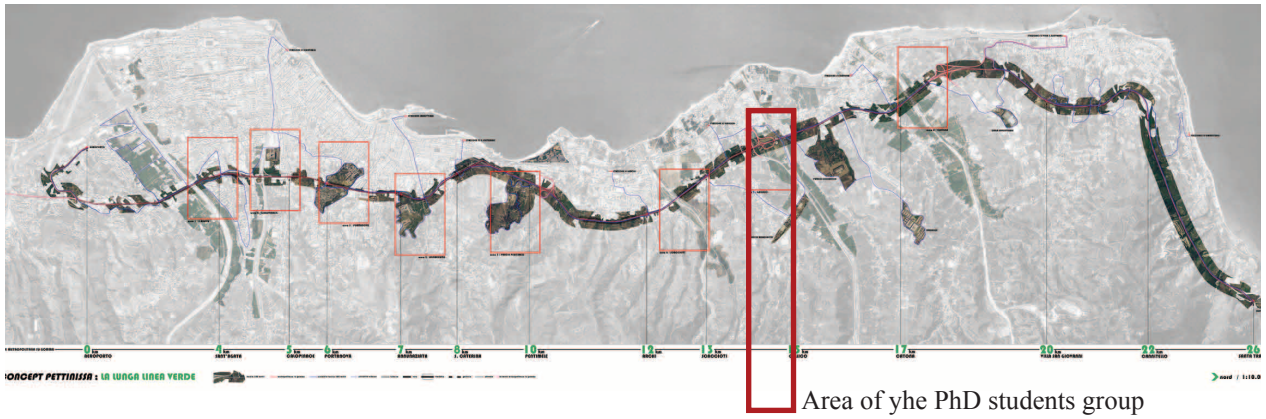
Through the graphical tool of the cross-sections have been highlighted the different elevations (the road, buildings, mountains, etc.) and the relation of the materials of the landscape with the road.

The study was developed through a series of typological cross-sections carried out along the road: each section represents a different type of elevation. In addition to highlighting the great variety in the types of elevation situations along the road and the relationships that such a variety triggers between the elements of the context, the sections highlight from time to time the areas for a potential architectural design based on the interpretation of vertical dimensions.

Pettinissa, a long green line

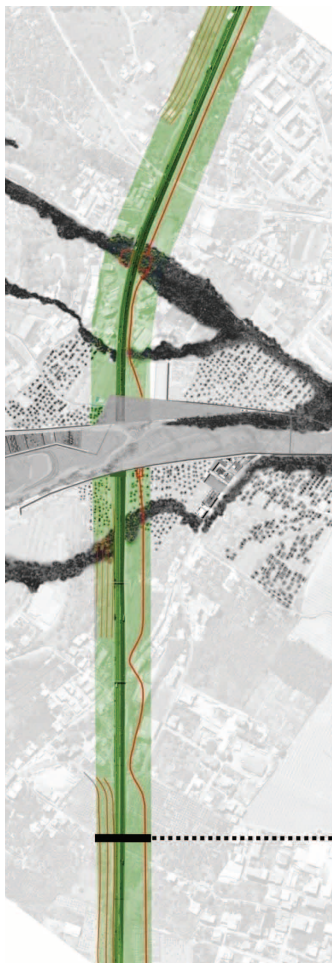


SS47 Valsugana. Photographic survey along the road and example of typical sections..



Pettinissa a long green line. Concept purposed by the workshop organization.

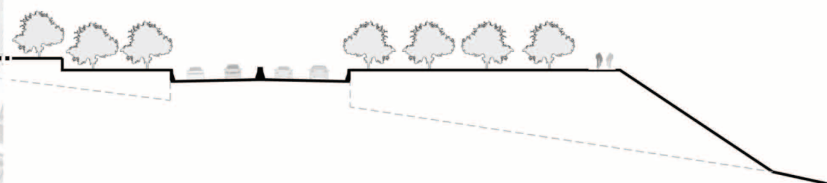
Design landscape along the section road attributed to the PhD students group.



The workshop *Pettinissa. A long green line*³⁷ is planning a survey carried out by different groups of students and Doctoral students on a stretch of 25 km of the highway-bypass parallel³⁸ to the coast between Villa S. Giovanni and Reggio Calabria. The groups of students were asked to provide project solutions in 12 sections of the route, within an area 300 m wide aligned with the path along the road. The overall master plan was based on the interaction of this *section of landscape* with the elements that cross it (mostly *rivers*, streams that flow down the slope to the coast), with the aim of triggering mutual benefits, interdependence, interlocking mechanisms from the margins of the project toward the city/country fragmented along the coast.

The ground plan, the connection of the road with the places it crosses, to determine what happens to the areas surrounding it, to assess its potential in a complex picture of factors are among the issues addressed by the group of PhD students³⁹ during the workshop. The design of the group includes an area characterized by the intersection with the stream named Scacciotti, which, through a hydraulic solution crosses the road by passing over it.

The project's purpose is to define a balance between landscape transformation and maintenance of the mechanisms that generate it: the maintenance of the stream involves the extraction of excess material that will be used to shape the edge of the road and in subsequent phases



may be sold; the active presence within the stream of excavators will automatically determine a control of the illegal deposit of waste.

The edge of the road is reshaped for 30 meters upstream and downstream through an embankment: the downstream edge of the embankment follows the trend of the slope, creating a line shaped macro prospect which cuts the side longitudinally. Along the edge of the track flows the pedestrian path, underlining the dynamic condition at different speeds.

In the coplanar space of the road will be re-planted citrus crops expropriated within thirty meters of the embankment: this to make the space between the pedestrian path and the active and productive.

The intersection stream-cycle path is resolved through an underpass, a solution that respects the continuity of the stream, and that will be addressed taking into account the risk of creating hidden spaces: the underpass will be large, bright and free of dark corners, a space capable of housing alternative functions in place of just traffic flow.

NOTES TO CHAPTER 1

¹ J.G. Ballard, *Concrete island*, Jonathan Cape, London, 1974 (I ed.). Between 1973 and 1975 the writer J.G. Ballard published a trilogy of novels with the purpose to investigate human behaviour and languages, assumed as a response to the variety of contemporary urban landscape and technology (V. Guglielmi, 2009). In *Concrete Island* Ballard develops the story within a median island, from where the leading actor is catapulted following an accident and from which he will no longer be able to leave because of the margins of the median, described in the previous step, steep and high elements that prevent him from reaching the street level and ask for help from passing motorists. In an attempt to survive within what he considers initially an uninhabitable place, Maitland discovers not only that the island that holds him captive is a visited place, even though by people at the margin of society, but within it behaviour rules are enforced, to which he soon gets used to and dominates.

² *Noting that the landscape has an important public interest role in the cultural, ecological, environmental and social fields, and constitutes a resource favourable to economic activity and whose protection, management and planning can contribute to job creation; (Landscape European Convention, Preamble)*. The European Landscape Convention emphasizes the need to consider the *value* of the landscape, prompting to abandon the idea that the road is only a tool at the service of global needs, and in this light are also interpreted the most recent of the quoted studies.

³ “The concept of contemporary landscape needs to rethink the “idea of space”, offering a new physical and conceptual dimension of landscape itself in consonance with our time. It therefore requires new urban planning, technological, architectural and legal tools which are able to renegotiate the idea of space and time, as well as place and site.” *Manifesto of the Canary Island for the European Landscape Project*, Uniscape, Recep-Enelc, Civilscape, Observatorio del Paisaje Bienal de Canarias, Gobierno de Canarias, March 2011. The Manifesto is a document sponsored by the Centre of Insular Landscape directed by the Architect J. M. Palerm and written in 18 points proposed and discussed by representatives of the three European Networks for the implementation of the Convention, Uniscape, Recep-ENELC and Civilscape, gathered in Gran Canary and Tenerife from March 23 to 25, 2011.

⁴ Research Unit of Trento, coordinated by Prof. C. Lamanna. for an in-depth examination cf. same chapter, paragraph *Experimentations*

⁵ The recent collection which constitutes the backbone of the Doctorate research of A. Venudo (cf. interview in this chapter) is a demonstration of how great is the number of best practices from which to draw repeatable architectural devices.

⁶ “What is needed is to restore the thickness and functional semantics to the road, to make it become a constitutive element of urban and planning design, a resistant material which, with its form, is opposed to the fragmented burst of events and interests, to the fluidity and mingling of ideas, to the annulment of any recognizable identity, of any distinction between alternative projects, of each of the criteria required to

establish their legitimacy.” (B. Secchi, “Lo spessore della strada” in *Casabella* 553-554, 1989). Already in 1989 B. Secchi recalled the foundational value of the road: the road brings transformations in the landscapes and these need to be controlled, prevented, designed, focusing not so much on the inevitable, but on the possible, on its potential.

⁷ Ministerial Decree November 5 2001, *Norme funzionali e geometriche per la costruzione delle strade*.

⁸ Presidential Decree June 27 2006, no. 28, *Norme funzionali e geometriche per la progettazione e la costruzione di strade nella Provincia Autonoma di Bolzano-Alto Adige*.

⁹ Overlay for example can be seen even in slope or gradient contexts and vice versa.

⁰ A paragraph in this chapter has been devoted to the 2007-2010 PRIN survey (1.5.1 PRIN 2007-2010. *Landscape projects for neglected places*)

¹ “Landscape” means an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors; In the definition given by the *European Landscape Convention* (art. 1/a), perception is expressly recalled in order to establish that the landscape corresponds to what the individual sees, remembers, feels. Thus, there is a correspondence between landscape and people, being the landscape created taking in consideration people’s feelings.

¹² In this respect, A. Venudo speaks of mapping as a strategy and of the section as a device: “The road project is the first ground organization of the flow function, which is expressed in two levels: the plan as layout and strategy, in the section as a form and a device. Levels found in the most significant types of roads such as the parkway and boulevard.” (Venudo, 2005)

¹³ Abstract in S. Daniele, “The public space of infrastructures” , in *PhD Yearbook* 2011, Politecnico of Milan.

¹⁴ S. Maffioletti, eds, *Paesaggio delle infrastrutture*, The Polygraph (quaderni IUAV), Venice, 2005.

¹⁵ An overview of the debate on infrastructures from the 20s until the past decade, with some thoughts on current trends can be found in the Essays by Valerio Paolo Mosco “L’architettura delle infrastrutture” published in Serena Maffioletti (ed.), *Paesaggio delle infrastrutture*, quaderni IUAV, Venice, 2005 and Niccolò Privileglio, “Città e Infrastrutture, nuovi spazi teorici” in *Forme Insediative, Ambiente, Infrastrutture*, Marsilio, Venice 2003.

¹⁶ *European Landscape Convention*, October 20, 2000, ratified by Italy on January 9, 2006.

¹⁷ The collection of definitions of the term Landscape, edited by Franco Zagari (F. Zagari, *Questo è paesaggio. 48 definizioni*, Mancosu, Rome, 2006) is a proof of how the landscape has, in the perception of each discipline, but also of each individual, different and overlapping features. 48 definitions?

¹⁸ *European Landscape Convention*, art.1, a.

¹⁹ *European Landscape Convention*, art.2.

²⁰ The census of the Volunteer Committees of Veneto, carried out by the Geographer from Padua, Mauro Varotto in 2008 (the results were anticipated during the conference at the Benetton Foundation, Treviso, in February 2009, (M. Varotto, LF Visentin “Comitati locali e criticità ambientali in Veneto” in *Ars* n. 116 - January/March 2008 eM. Varotto “Geografie del declino civico? Il fenomeno dei comitati spontanei in veneto” in *Bollettino della società geografica italiana*, Rome - series XIII, vol. IV, 2012, still in publication) has shown the presence of over 230 committees, one for every two municipalities in the area, created in order to contrast works that have a heavy impact on local contexts, promoted by entities unrelated to the

territory, but which use them to generate productions or services for a faraway development, and not only geographically. The census carried out in Veneto has no analogue in the Trentino Alto Adige: however, it is likely that this phenomenon will be extended to the whole country, with similar characteristics but different numbers.

²¹ *European Landscape Convention*, art. 5, d.

²² The representatives of the networks gathered in Gran Canaria in March 2011.

²³ “Landscape is a processual form. The forms of landscape are fused in movement, in the perception of movement. The factors of time and movement are consubstantial in the understanding and conception of the landscape. A landscape is also changing because it is experienced from within and it is literally moulded by the movement of the user, as happens in many works of contemporary art. We move within the landscape, but the very landscape itself is shifting, changing, growing and modifying. The architecture of the landscape is subject to temporality. Therefore, we wish to restore spaces to time, to give time to space, to look for spaces of relationship and a relationship between spaces rather than finished spaces in which to celebrate archaic or modern rituals.” Point 11 of *Manifesto For the European Landscape Project*.

²⁴ “The concept of contemporary landscape needs to rethink the “idea of space”, offering a new physical and conceptual dimension of landscape itself in consonance with our time. It therefore requires new urban planning, technological, architectural and legal tools which are able to renegotiate the idea of space and time, as well as place and site. This process of research requires a renegotiation of any code that would suppose a straitjacket in terms of thought, concepts, actions, obligations or participations and at once to revise the conceptions of representation of reality, the paradigm of our turbulent, ephemeral and dynamic times. The territory and city have become copies of their representations, of their maps and guides even of their own imaginary. Their reality is in cartographic representation as a regulatory legal bond that eludes the presence of man.” Point 14 of *Manifesto For the European Landscape Project*.

²⁵ C. Lamanna, *Archiluogo. La composizione del paesaggio*, Alinea, 2008, chapter 9, “Il suolo complesso. Progettare in pendio”

²⁶ The two projects are published in the journal *Architettura del paesaggio* No. 22 “Paesaggio e infrastrutture”, January-June 2010, pages 48-51 and pages 56-61. The project of the Passante verde is also documented in the website <http://www.passanteverde.it> and widely debated in conferences and seminars nationwide.

²⁷ A detailed explanation of the “Circulaire n° 96-19 du 12 décembre 1995” containing the evolution and content of the regulation, and the practical effects that it entails, is located in the Doctorate thesis *Disegnare linee nel paesaggio, metodologie di progettazione paesistica delle grandi infrastrutture viarie*, by Emanuela Morelli, tutor Prof. Giulio G. Rizzo, co-tutor prof. Guido Ferrara, University of Florence - Faculty of Architecture, 2005

²⁸ Until last year along the Mestre bypass mingled the local traffic of the urban area and the highway from all over the country and directed towards Eastern Europe, creating congestion and unsustainable daily economic (increased travel time) and environmental (pollution of the adjacent urban areas) damage. The Passante di Mestre was inaugurated on February 8, 2009

²⁹ S. Steffinlongo, *Il Passante Verde. Un parco lineare attraverso il territorio veneto dal piano paesaggistico alla realizzazione: storia di un progetto*, Il Poligrafo, Padua, 2012 and www.passanteverde.it/.

- ³⁰ Generally, the ratio used for the cross slope of the embankments is 2/3. It depends on the consistency of the excavated land or landfills and can be smaller or greater. This rule is evidently technique: the slope can't be greater than the limits of safety and stability of the slope, depending, for example, of a better perception of the landscape. Solutions such as retaining walls or reinforced armed land or concrete walls are used to occupy less space when there was little available, with the result of allowing an improper adjacency of the road to living spaces
- ³¹ In addition to the French experiences, which have been under development since the 60's, in the European field the experience of Architect Rino Tami as an aesthetic consultant of the National Roads Office of Canton Ticino in the twenty years between 1963 and 1983 for the N2 highway Como - Gotthard: the Architect's work, in this case turned into a real "aesthetic direction" for the artefacts manufactured and is often cited as an example (a job description is contained in the articles "Rino Tami, uno sguardo *estetico* sulle autostrade" by Letizia Tedeschi and in the interview with Flora Rauchat Roncati "An architecture called Highway" in No. 2 of the magazine *Trasporti e Cultura*) in Italy achievements such as the Italian section of the Brenner highway, which has seen the collaboration of the Landscape Architect Pietro Porcinai and of the Engineer Riccardo Morandi, occur as isolated cases, in which the presence of a Landscape Architect and of a structural Designer for the works, are a rare opportunity on these occasions, however, it does not seem to have been fully exploited.
- ³² Cf. also Renato Bocchi (by Emanuela Schir) *Il paesaggio come palinsesto. Progetti per l'area fluviale di Trento*, Nicolodi and University of Trento, 2006.
- ³³ Slight horizontal shifts are those allowed under the most binding situations, frequently faced by designers of road layouts. The margins within which the roadway can develop are often restricted: a study that fully uses the possibilities given by the position of the road in relation to the ground is very useful.
- ³⁴ A. Calcagno Maniglio, *Progetti di paesaggio per i luoghi rifiutati*, Gangemi, Firenze, 2010.
- ³⁵ Given distance from the plane of the mobility of the Province of Trento expressed in TGM (average daily traffic). The figure is an approximate average of the surveys carried out in stations along the SS47. The average for the type of vehicle is about 13,000 vehicles for light traffic and 4,000 vehicles for heavy traffic.
- ³⁶ The land of the valley floor has a cost of 114 €/sqm along the Valsugana (in the plain near Padua it barely reaches about the 60 €/sqm). Average Agricultural Value. Data 2010 (Trento) and 2011 (Padua) of the Territory Office, acquired by the resolutions of the Provincial Expropriation Commissions, published on the provincial bulletins.
- ³⁷ University "Mediterranea" of Reggio Calabria - Department Oasis/Master in Extraordinary Landscapes Politecnico of Milano - NABA Nuova Accademia di Belle Arti of Milan. The study is being published by M. Lorusso (University "Mediterranea" of Reggio Calabria).
- ³⁸ Main road system connecting the north to the south that consists of the A3 in the section of Villa San Giovanni-Reggio Calabria in continuation of the SS 106 Taranto-Reggio until the Tito Minniti Airport for a total length of about 25 km.
- ³⁹ A.W. Bonanno, B. M. Farinato, P.Mina, V. Leto, C. Luci, R. Lorusso, E. Genovese, G. Porretti, V Tirella (University "Mediterranea" of Reggio Calabria) C. Azzali, L. Siviero (University of Trento), A. Stocco (University of Nova Gorica).

INTERVIEWS

INTERVIEW WITH ADRIANO VENUDO

Adriano Venudo holds a doctorate in Architectural and Urban design. Since 2007 he is a professor of Infrastructure and Landscape and Urban Planning at the Faculty of Architecture of Trieste and of Urban Design at the University IUAV of Venice. He participated in the Venice Architecture Biennial (2001), in the Milan Triennial (2004) and at the Triennial of Zagreb (2004). He has received awards and mentions in several national and international design competitions. He brings his research into the professional study Stradivarie, in which he develops the themes of open spaces, infrastructures and landscapes.

*Adriano Venudo developed his PhD research at the University of Trieste, with the thesis *Thicknesses, codes and interfaces. Architecture of the road*. The thesis, besides being an extraordinary repertoire of examples on the architectural design for the road, turns the spotlight of the debate on the concept of space-road, “A support provided with its own specific thickness suitable for the multiple functions associated with the movement.”*

Some recent PhD theses on the relationship between infrastructure/landscape are inspired by the fundamental figures of the operational representation (section of the layout or of the elevation) to organize an interpretive classification. I refer to the thesis of: Sarah Danieli *The public space of infrastructure*, Milan Polytechnic, who divides her comments on road infrastructure in layout, section and elevation; the two theses of the research group at the University of Trento, the one of my colleague Chiara Azzali and mine, which deal respectively with the vertical measurement (section and elevation) and with the areas (layout) produced by the roads; to some extent her thesis *Thicknesses codes and interfaces*, in which thicknesses and codes in particular seem concepts related to the Cartesian dimensions of the infrastructure. Is it fair to say that, despite the road research produced in recent years and the large international case studies, there still is the need to begin from the basics to achieve innovative results?

Regarding this point, I would say a resounding yes.

The margins reserved for the architectural profession in the field of roads affect bridges, pedestrian trails, pavements, lighting and equipment. The assignments on designing spaces derive primarily from other jobs (e.g. architectures of roadsides or parks). The Architect in Italy is not involved in the design of the track. Why is this so and how can we overcome this step?

On this point I disagree: I finished the thesis in 2007 and since then I have continued to gather material, thanks to my teaching experience (Infrastructure and Landscape studies at the University of Trieste), opportunities for study and research, professional commissions and actually I can say that it is a false problem. Let me explain: for Architects, the “leeway” to draw the entire infrastructure, particularly roads, are certainly few, but there are some, and should be taken advantage of to the maximum. Maybe I go against the flow, but I mean that today the Architect has the tools to coordinate the infrastructural project, to outline the guidelines into a more “sustainable” relationship with the crossed contexts, and to address specific issues such as the insertion or the definition of landscapes generated by the infrastructure itself.

Could you quantify them geometrically? According to you, do the margins for manoeuvres diminish in small but significant shifts of the road axis that could rearrange the spaces at the side of the infrastructure or does the Architect join immediately the decision making process?

We need to consider 2 operational levels.

1) It's recognized (e.g. by public authorities) that the layouts relating “to the edges” are the jobs carried out by Architects, and I find that today there is a widespread sentiment that the road project finds a “free play” in the design of the roadside: a project that is both functional and perceptual, subsequently with a form of technical, service and aesthetic importance. We can debate whether the results are positive or not, but I find that today we're already working within this framework. The project of the *Passante Verde* of Mestre is one example, but there are many others, smaller and less known, because they are not exceptional but absolutely normal events. I find that there are areas or regions that are working very hard and that sparked an honourable phenomenon by encouraging a widespread sensitivity for the infrastructure project, such as Veneto and Emilia Romagna in particular.

2) As for the geometrical redesign of the dimensions of the infrastructure, it is a fact that the audit reports of curves, roundabouts, axes, slopes, etc. (Cf. that are legally required by the regulation 2001-2006) have always been carried out by engineers. This happens because in the faculties of Architecture there isn't a sufficient technical training: I think, however that it is not a matter of practice, but a disciplinary one: we need to strengthen the instruments of cultural education on the topic of infrastructures and offer this specialization to the Architects that want to have this possibility. As part of the infrastructure project and in relation to the short-term economic status, there is much to be done, particularly in the field of *landscape integration*. This work must be done in cooperation with other specific skills and other disciplines (e.g. Engineers, Environmentalists, Agronomists and Geologists). From my personal experience, I happened to work a lot with transportation Engineers and Doctors of Forestry, and this has always produced good exchanges and good results. We can, and must, learn to manage the space of the road and understand of what *nature and consistency* it is made: the rest is a work in coordination with other professionals (Engineers, Geologists, etc.).

Which Architect knows how to calculate the clothoid of a curve, or a simple curve, that follows the

technical regulations on road geometry? We Architects do not have this knowledge, in our DNA, nor in our study curriculum: but we have other complementary and equally necessary ones. It's only natural that there are overlapping disciplines, but always with respect to different cultural perspectives.

I am also convinced that it is important to “establish” a theory of road project, oriented according to the Architects' point of view. No one has ever written a systematic theory in which the theme of sequences, colours, materials, sizes, openings, closings, views, etc. (the first and most important text is *Man Made America*, by B. Pushkarev and C. Tunnar, 1964). A particular attention should be paid to the space and *space-road*.

Let's go back to the first question, why we should start from the basics.

Of this theory there are only a few scattered pieces (our theses are an example). What parts do you think are missing in order to have an organic framework?

One, two, three.... anthologies, handbooks, design, systematic and series theories, that divide the project of the infrastructure for example, based on the contexts it crosses. First the extra urban context, then the one that “shapes the landscape”, and then the city context: in this case a lot has been written (Lynch, Cullen, and the entire Chicago school), but not from this point of view.

According to you, is it appropriate to set the *theory* in a specific landscape (in order to have as many theories as there are landscapes to which we refer), or should there be a unique theory of context?

I think that the context can help a lot to build a theory of the project, but surely there are some structural issues; I believe for example that the ones I discussed in my thesis could perhaps be reformulated. If I were to rewrite it today I would like to start with the *types of contexts or landscapes in order to speak of roads*, discussing, for example, of the European Landscape Convention.

What do you mean by types of landscape? Orographic landscape (lowland, mountain or hill)?

Yes, for example. And maybe I would concentrate on the concept of “inclusion”. Architects know how to “watch” the territory and have the tools to understand the city, the phenomena and the features that define the landscape: I would start from this feature and from how the road builds the landscape.

I would focus on the concept of “inclusion” for two reasons:

- 1) The inclusion is required by any European legislation, also by the *Eurocodes*.
- 2) The inclusion is a real need. All the major projects that over time got stuck are a proof of it. Today I am still looking for a text that in a simple, direct and clear manner (with examples) shows the principles, strategies and devices needed to address the inclusion of infrastructures for the mobility of the landscape.

A manual...

Yes, but from the Architect's point of view, one that explores the definition of the space of the road.

That's very demanding, but also useful to other disciplines: for road Engineers, for example.

I don't think it should contain all disciplines, it would be just for Architects: it could, consider a part, or at least one aspect of the issue, but in a specific way.

A work of synthesis of all the subjects that we talked about: such as the *Manual of garden design* by Franco Zagari.

Yes. For example, before he started the work on the project for the A22, Pietro Porcinai wrote a text, a work report, which is actually a kind of study on methods for road design and inclusion of the highway (which resulted largely from his direct studies in the field of American parkways, and from theories of the Landscape of the road of S. Crowe and G. A. Jellicoe). This report should be recovered and turned into a "live-text"; in it Porcinai speaks in first person, records details, solutions, materials and colours, landscapes, issues that need to be solved, views that need to be recovered with the tools he had invented (the "prospectograph"), tactics that need to be remembered; it should be recovered and distributed because it would help to spread among scholars and designers a new sensitivity toward the infrastructure project, bringing new ideas other than the usual Lassus and Simon (although they are always good teachers). It's a text of that sets rules, according to a strict design and operational point of view.

Much more recently, and of considerable interest, is the publication on the Passante Verde, the park and inclusion project of the Mestre Passante Highway.

INTERVIEW WITH COSTANZA PERA

The Architect Costanza Pera is currently Chairman of the II Section of the Higher Council of Public Works.

Previously, she held several ministerial positions including, for the Infrastructure Ministry, the following positions: Chief of Cabinet of the Minister, General Director of Soil Protection, Ministerial Adviser with responsibility for developing and promoting the infrastructure and culture program and Assistant-Chairman of the Infrastructure and Culture Commission.

And for the Ministry for the Environment and Protection of Land and Sea the following positions: General Director of the Environmental Impact Assessment Service, Public Information and for the state of the Environment, President of the Commission for the Evaluation of Environmental Impact and Coordinator for the development of technical standards that govern the evaluation of Environmental Impact.

The Architect Costanza Pera has answered to a question regarding several subjects. The consideration that results not only provides a broad overview of the landscape design for mobility infrastructures in Italy and focuses on the strengths and weaknesses of the latest infrastructure constructions, but also gives us a glimpse of less known aspects of the intense and passionate work behind the scenes of the institutions.

As President of Section II of the Higher Council of Public Works, with dedicated functions particularly regarding the landscape, could you give me a definition of what should be the requirements of a landscape project for major infrastructure accomplishments? From your experience, how frequent are the cases of landscape projects integrated with infrastructure projects in the concept phase, in the past ten years?

It's very difficult to answer your question.

And it is difficult not because the questions are wrong or badly put, but because the institutional elaboration on the issues that you are studying is very outdated. So it's doubly useful to develop studies like the one you're carrying out and I consider your questions to be the right way in which we need to study the issues.

Before giving you my answer I consulted several experts in the Ministry of Public Works, University Professors and Officials, because I was afraid to forget something important, or that I had missed something. Of course, it's always possible that it will happen, however, I think that the most important aspect that we need to confess is this: when we speak of "infrastructure and landscape," we must refer to projects carried out abroad.

In Italy, over the past twenty years, some steps forward have been made in terms of regulation, preparatory studies and ambitions.

The preparatory studies were fairly profuse on linear infrastructures, as a result of the regulation of Environmental Impact Assessment and increased regulatory attention to landscape and landscape

planning. But it seems difficult to claim that the results are obvious.

There is the example of Reggio Emilia (The bridges designed by Calatrava on the S. Milan-Bologna highway axis, editor's note), of the bridges built because of the decision of a large town such as Reggio Emilia to claim compensation because of the passage of high speed trains and because of the works on the highway network with an investment on the landscape identity of those places. I think it was the only town in Italy to carry out such an operation.

Something positive has been done by ENEL on the power plants, but I would stick to the infrastructures managed by the Minister of Infrastructures.

The regulation of Environmental Impact Assessment has led Anas and the Railway Company to pay more attention to their actions, but in terms of landscape it is difficult to list significant typical or innovative results. There are some works that are carried out on time – such as some individual bridges or viaducts – that express uncommon qualities, but they are the result of a professional and a very focused creativity. The most difficult operation is perhaps the doubling the Grosseto-Siena, whose project (really endless...) started in the early 90s, is being carried out with average results.

The work carried out on the high-speed railway line Turin-Novara certainly hasn't achieved appreciable results. The highway Salerno-Reggio Calabria, which underwent a procedure that lasted many years, does not seem to shine for landscape solutions.

The focus during the preliminary study has broadened the range of subjects, and this is a very positive factor. Anas has entrusted territorial and landscape studies to the University of Rome for the on-ramp of the western Roman section, intended to affect areas of high landscape value to connect the highway Roma - Civitavecchia to the South-West quadrant. A similar operation is going on for the new Pontina and I'm aware that in Veneto there is a co-operation between Anas and IUAV. We'll see if these studies will turn into actual high quality designs and construction. It's my opinion that in order to obtain this result the support of many circumstances is required, including a strong public attention. You ask me in synthesis what are "the requirements of a landscape project for major infrastructure work." I begin by distinguishing what is necessary in the design stage and in the evaluation of the project by an administration. Could I ask you to tell me if by "landscape project" you mean:

- a) the new landscape that is generated with the introduction of an infrastructure the territory;
- b) what will be done *around* the infrastructure to try to recreate a new landscape;
- c) if we are talking about an infrastructure planned for the landscape to which follows a new landscape.

The concept of "protection" was at the centre of all discussions that took place regarding legal aspects and of the instrument terminology (Italy had just overcome the extraordinarily important Galasso Decree and subsequent legislation, that assigned to landscape planning its current role), but the evaluation of a project remained exclusively entrusted to the attention of the superintendent and his staff. To my knowledge there was no written statement, except maybe some generic newsletter within the Ministry. Since we had to regulate the mutual field of environment and cultural heritage I entrusted to the Graduate School of Genoa of the Professor Maniglio Calcagno, a study to define the landscape contents of the environmental impact and finally the Ministry for Cultural Heritage agreed to put into writing the Prime Minister's Decree on the technical rules relating to the Environmental

Assessment in what could be to the landscape component of an environmental impact study, it was the end of 1988. Since then there has been a slow and gruelling march of landscape plans and finally the Presidential Decree on landscape relations.

But in a certain sense, what I really want to tell you is that, all these rules, that I can't tell if positive or not because they provide an excuse for bad consciences, in terms of project quality are pretty useless. The problem is primarily cultural and it lies in the culture of contracting authorities and of designers. Again: I could ask you if your question refers to formal or material requirements. From the formal point of view, the paradox is the following fact: what should be done is written to the Ministerial Decree governing the preparation of the landscape relationships. I read an interesting report on these issues written by an expert, Marinella Del Buono of the Regional Directorate for Cultural and Landscape Heritage of Tuscany:

...”The landscape relationship must finally compare the outcome of the intervention and the prescriptive contents of the Landscape Plan and demonstrate the project’s consistency with the goals of conservation, enhancement and re-qualification indicated in the Landscape Plan for the particular context in question.”

In the Presidential Decree of December 12, 2005 there is a frequent use of terms such as “*insertion*” “*adequacy*,” “*continuity*”. It’s really very difficult to comment on, and it seems to bring out the hope of reducing risks.

It seems to me that in order to design the landscape, designers need a great culture: a general culture and a specific one, on history, locations, materials, technologies, and the specific qualities of the designer and his ability to turn these projects into achievements. I think it’s important to have the humility to dialogue with those interested in an area of land. I happened to study the process of planning and design of the viaduct of Millau, and the process was anything but short, with a very long procedure in the territorial planning and the five design teams that have competed for the award.

I preside over the Second Chamber of the Superior Council of Public Works since March of 2009, therefore for about 18 months, and I would say that for the projects that the Board considers, the attention to the landscape is entirely accidental.

Among all the projects that we examined one showed an explicit focus on landscape aspects: the project for the so-called Western Door of Salerno. This is the connection between the highway A3 and the commercial port of Salerno. Tenders were invited to take part in a competition of ideas in 2006, and apart from the evaluation that the Assembly of the Higher Council gave in relation to the aspects of road safety (which had not been solved appropriately), we can say that the contracting was at least aware of the major problems related to landscape design.

Among the positive examples in Italy we can include the so-called Chilometro rosso and the beautiful Minimetron of Perugia.

The highway mountain pass between Bologna and Florence comes came to us after a long process of local bargaining, started in 1986, and that certainly has encouraged attention to detail and funding of parks and peripheral measures of reforestation. This was the way of interpreting the relationship with the landscape at the time.

I would mention the initiatives of the marine cities for the redesign of the historic docks and waterfronts. I don't remember many other examples.

For the waterfronts, it is known, Genoa was the first, but it was a predominantly urban renewal operation, although involving the ancient port infrastructure. Other operations, such as Civitavecchia and Savona, are more directly related to the competition on the cruise terminals and related industries. Salerno is a special case, more complex. The case of Savona is emblematic in this sense, because it involves an important change in landscape and identity that took place a little by chance, without a proper initial awareness. The largest terminal building of Costa Crociere, which certainly changed the landscape of the city and the harbour and its connections with the rest of the world even, was built in a city that at first pretended to ignore it. Waves of two thousand tourists at a time transiting to and from cruise ships in a small provincial town (where I was born, incidentally) that find nothing waiting for them, because the light infrastructures of the city, shops, bars, restaurants were closed also in the evenings. Today they tell me that the cruise terminal is integrated into the city, which has changed in a dynamic sense.

The case of the waterfront would seem more suited for a specific study on the economics of landscape projects (apart from the Millau Viaduct).

To conclude briefly: I think we can say that the regulations regarding the landscape industry have not made a decisive contribution to improving the quality of the projects, if only marginally. It probably increased the attention to detail, but it is obvious that in the mid-90s it had reached a dramatically low point.

The dynamics that trigger a good design and a good construction seem to be others, and reside in the culture, sensitivity and local pride and next to these sensitivities, the contracting authorities and designers.

CHAPTER 2: ANALYSIS

2.1 Vertical elements. Interpretation

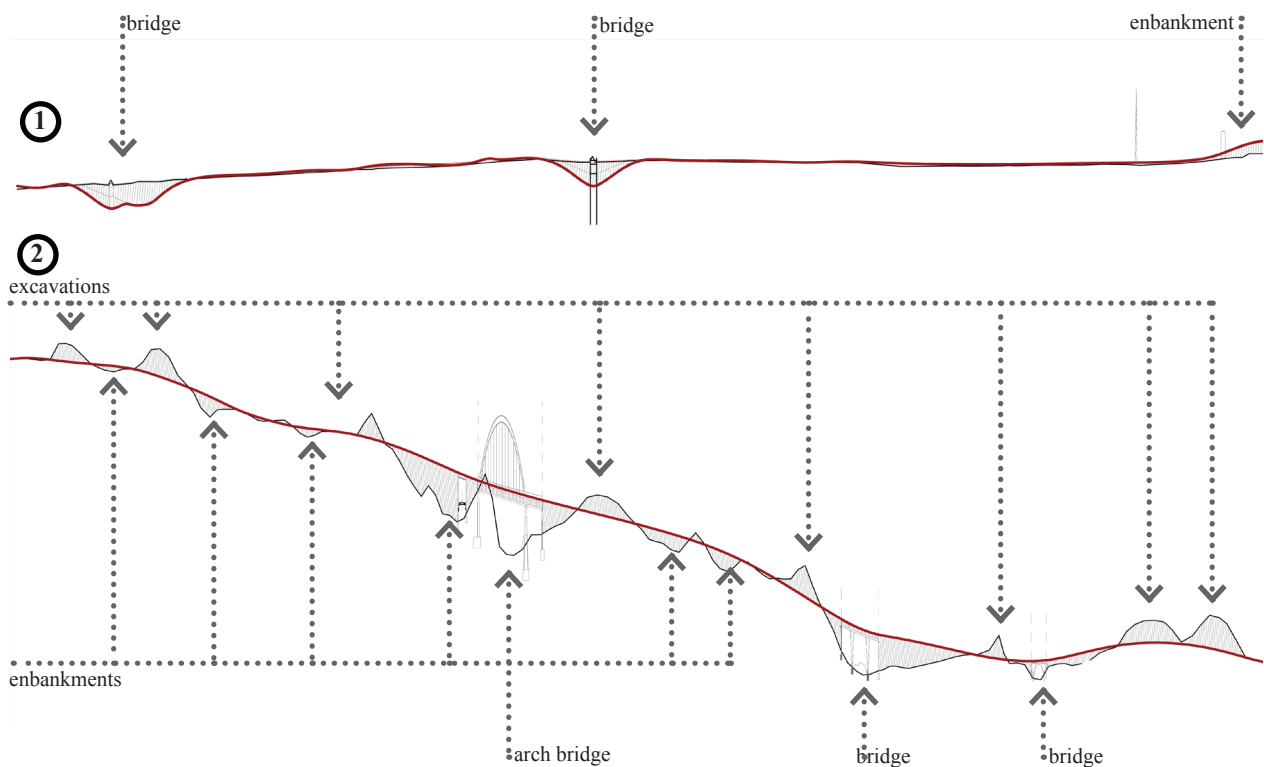
The vertical elements are an important feature in the landscapes of mountains, reflected in every element, be it natural or artificial: in regards to the roads they take on many forms and meanings connected to landscape and architecture disciplines.

The importance of verticality in mountain contexts is demonstrated in many ways: it is impossible to establish a comprehensive and definite classification that includes all of the aspects involved in this interpretation. *Overlays, slopes and difference in altitude* are the subdivisions that are suggested below, and are based on characteristics found in the appraisal carried out during this research: in many of the case studies examined, the alterations brought by roads to places and landscapes are effects resulting in part from these three conditions. Overlays, slopes and difference in altitude, in fact, are *components* of the vertical elements found in all mountainous contexts. They influence the interaction between roads and the materials of the landscape through recurrent and typical mechanisms that are already known to the research: perception from the road and of the road, the hierarchical relationship between point elements or crossing points, use of the spaces *in between*, scale and speed, position and perception, images and shared communal values etc.

The following are descriptions of case studies that highlight the functional aspects of verticality divided in this interpretation.

The verticality is the component of the space that best symbolizes the mountainous context and that most affects the project elements that define some of the landscape's characteristics. From a morphological point of view, mountainous landscapes, compared to planes, are characterized by a *disproportion* of the vertical component of orography: mountains, valleys, gorges are elements that establish the rules of the organization of space, they delineate, separate and set out the proportions on which the materials of the landscape are formulated: roads do not escape the constraints (or opportunities) of orography.

The road is an elongated element which, in a mountainous context, crosses spaces with variable altitudes. During this crossing, morphological or perceptive mechanisms take place in which the vertical dimension is the decisive factor: from a morphological point of view, in a mountainous road there is a much greater presence of road artefacts, for example, in



Images of profiles in comparison:

1) a road in the plain context: preliminary design of SS 47 "Valsugana" (Bassano del Grappa – Cassola) Connection works to variant of Bassano del Grappa Road section from Italian standard C1: suburban secondary length of road segment: about 3300 m

2) a road in mountain context: functional adaptation of SS 52 "Carnica" (variant of Socchieve). Road section from Italian standard C1: suburban secondary length of road segment: about 3700 m

order to support the land or for the overpass of watersheds, and the earth movements are greater than those of the plains; from the perceptive point of view, the great orographic elements catalyze and steer the attention of those who cross the landscapes along the mountain roads. The suggested interpretation in itself does not exhaust the possibilities (or difficulties) inherent to the designing, developing or transformation of the locations or mountainous landscapes characterized by the presence of roads. Furthermore, even though it is specifically discernible in mountainous landscapes, the vertical component of the space belongs to all spaces, including those of the infrastructures in the plains. However, the issue of verticality, as part of a broader analytical schedule, must be addressed before each design, technical, environmental, engineering, and therefore also architectural, choice is taken.

Road engineering in Italy has addressed the problem with specific¹ regulations for road designing in mountainous contexts. From a technical point of view, it is acknowledged that a mountainous context has specific features related to orography (e.g. the extensive use of hairpin bends or slopes often beyond the limits imposed by common technical standards). The study of the role that verticality has in the transformation of the infrastructure of the landscapes in mountainous contexts is a first step to recognize and extend this important peculiarity to other fields, in this case to the architectural field.

Through international experiences, we can find practices, built architectures or projects that utilize the vertical dimension occasionally: we cannot affirm that there is a common practice that interprets the vertical design as a project opportunity; in fact, the opposite can be said, particularly in Italy. Many of these practices are not implemented in mountainous contexts, but are akin to them because they provide devices which, abstracted from the specific case, can be easily applied anywhere.

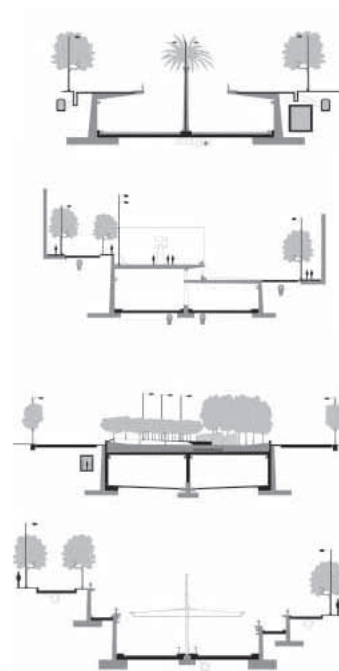
In other architectures in which there is a specific interpretation of verticality, the context, although it is not mountainous, compared to the latter presents morphological similarities, of perception or use of the soil: consequently, the devices of these architectures are also recommended in mountainous contexts.

Many examples of architectures that approach the subject of verticality, in the cases shown below, are used in urban contexts.

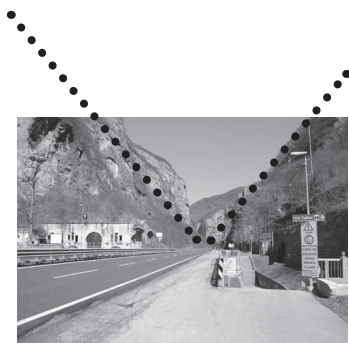
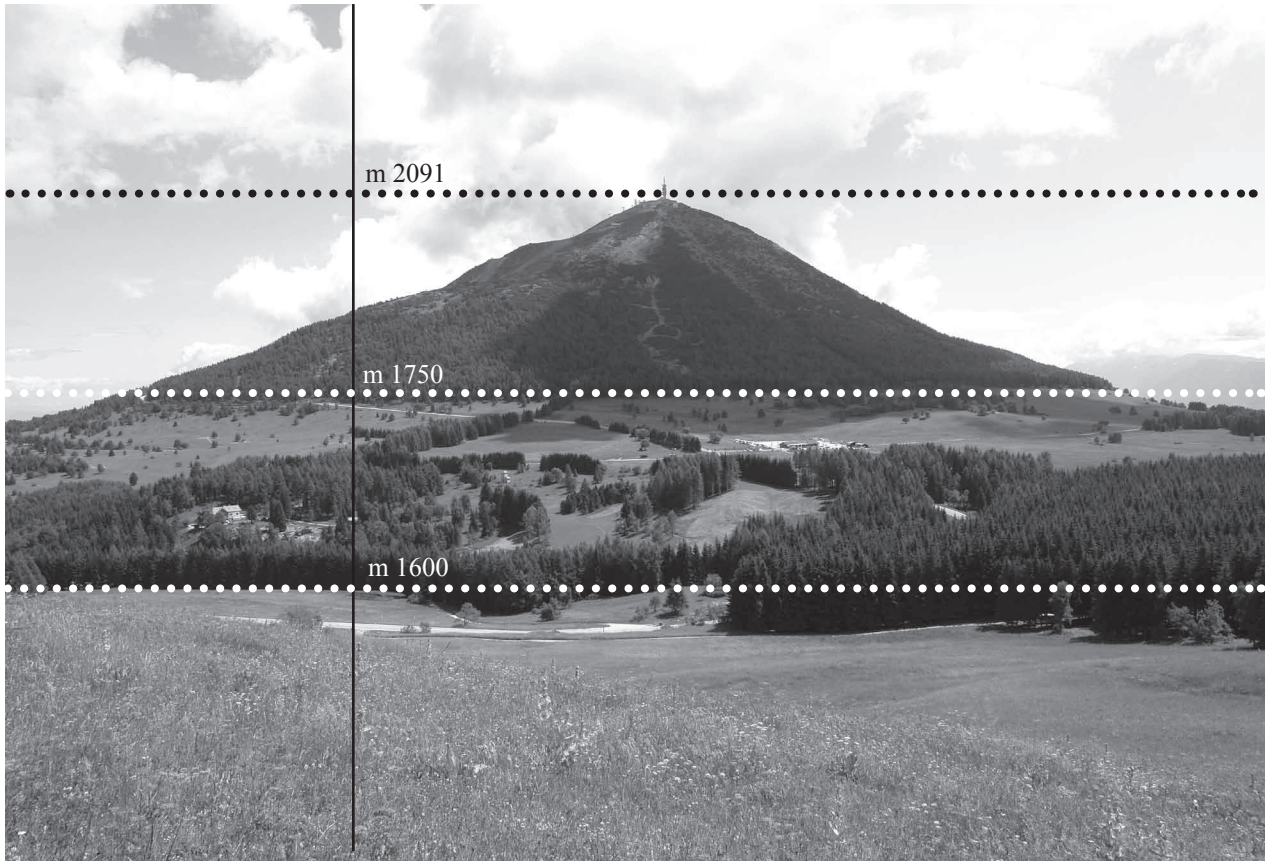
Usually, in architecture the subject of verticality is used for tall buildings, in densely urbanized cities where the cost of residential zoning justifies major investments in innovative technologies and architectural procedures of highly effective communication. While observing the mountainous landscape, the doubt arises that verticality can also be addressed in a radically different landscape, but with the same analytical structure: in both cases there is the opportunity to develop activities, routes, locations at different elevations, to consider the perception as a function of the latitude, to decide that, if the plane area is scarce, expensive and full of obstacles, the height becomes a strategic option on which to rely.

For example, certain constructions of roads in densely urbanized settings address this issue in their full extent. The project B. de Sola for the Ronda de Dalt of Barcelona, or the project of J. M. Palerm and T. de Nava for the Barranco de Santos in S. Cruz de Tenerife use unconventional solutions in order to solve problems of lack of space by utilizing the vertical space. The sections of the project are flexible: they are reduced depending on the available lateral space, overlapping the levels of the flow of traffic and finding other spaces for community facilities (plazas, walkways, public buildings or gardens).

The mountainous landscape is characterized and influenced in its transformations by verticality. The mountain backdrops join the perspective, that in turn is always different if the observation point is higher or lower; the slope, in function of the different levels, creates



Ronda de Dalt, Barcelona,
cross-sections: the fee is
used from time to time to
find relationships
with the city



distinctive landscapes (the terraces are a challenge for the slopes), as well as accessibility to valleys or passes, though improved by the bonus of a visual, perceptual and recreational experience of places held in people's memory, that often happens only by overcoming great differences in latitudes; the environmental conditions vary with the different altitudes and the natural and anthropogenic landscape changes accordingly; the natural elements of the landscape tend to conform to the differences in latitudes (landslides, waterfalls, gravel, ravines, that highlight the geological stratigraphy).

It is essential to consider carefully the meaning of the term vertical and its importance in mountainous landscapes crossed by mobility infrastructures, taking into account that some of these concepts, although closely related to the mountainous landscapes, could open new interpretive rationalities also to other landscape contexts.

Monte Bondone (TN): diversity in the vegetation and use of soil depending on height.

Cultivated terraces with vines in Val di Cembra (TN)

SS47 "Valsugana" (TN), near S. Nazario.

Vertical: directed from top to bottom; perpendicular to a horizontal reference level; oriented in the direction of the force of gravity².

Therefore, whatever is disposed from top to bottom is vertical: a series of significant levels, objects that do not find enough space in a flat and horizontal area (prized in mountains as in cities), materials that

deposit because of gravity, eyes forced to look up, that dwell on all that meets their journey at various levels. The vertical arrangement of the materials of the landscape is done by different means and with different effects, which we shall call below the *components* of the *vertical* subject: in fact, they represent some specific aspects that come together, in reference to the landscape of mobility infrastructures, to define its global significance.

The components of the *vertical* subject are the *overlapping*, *slope* and *difference in altitude*. Each of these topics generates typical and recognizable road situations.

The ridge

The church

The guard rail

The road

The village

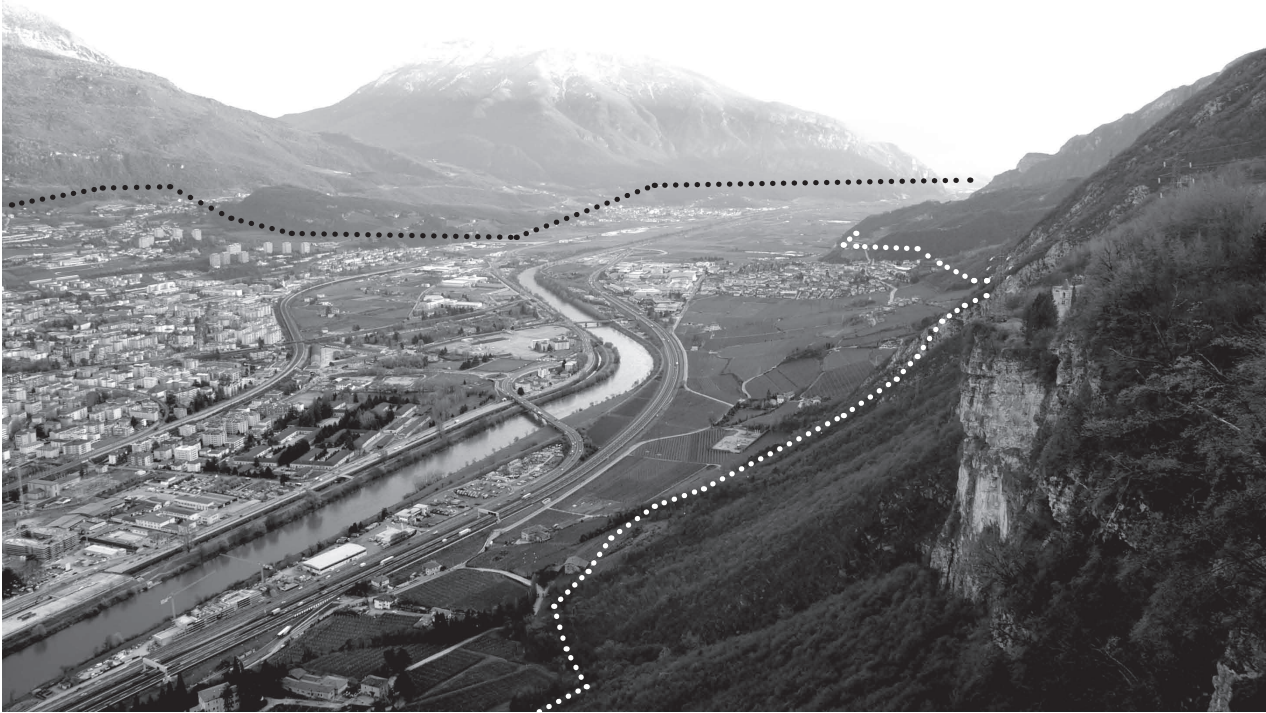


2.2 Overlapping: the hierarchy of the elements

To put, place one thing over another; to add, impose; to prevail, to place before; add to another; to happen; to be added by surpassing while making others disappear³.

The concept of overlapping is perhaps the most complex of the verticality components that we have specified because, unlike the others, it involves the simultaneous involvement of different dimensions: the space between overlapping objects, the settling time and the relationship that develops between them. However, overlapping is also the most frequent situation encountered during the surveys, because every road, no matter how careful the procedure that lead to its creation (particularly the choice of the route), overlaps with what lies beneath it.

SS 12 near Bolzano.
Overlapping of different
landscape elements in
Cornedo all'Isarco - Cardano
Case (BZ).



The roads, constrained by a geometry that does not allow great variations are uncomfortable settlements, especially when local morphological constraints reduce the route alternatives. They frequently overlap both with what they find in their path, and with each other. In mountainous orography, it is common to come by stacks of roads and other elements involved in contending confined spaces. The overlapping in this case generates critical situations in which the road makes its way between elements, taking away a portion of their space. Some examples are a few case studies in mountainous contexts found in the course of this research. However, overlapping also means the opportunity to establish new internal hierarchies to overlapping elements by experimental patterns.



The slopes of the mountains limit the flat bottom of the mountain valleys, wide in some sections of the Val d'Adige, and narrow in some sections of the Valsugana; the area available for crops, industrial areas, public facilities, residential areas, mobility infrastructure is scarce, limited, constrained within the boundaries that run parallel to the foot of the mountains. Anything added interferes with what is already present: it is necessary to find space between the elements, otherwise there is an *overlapping*.

Val d'Adige from "Doss", over Trento city. Most of the anthropic elements arise within the boundaries made by the foot of the mountains.

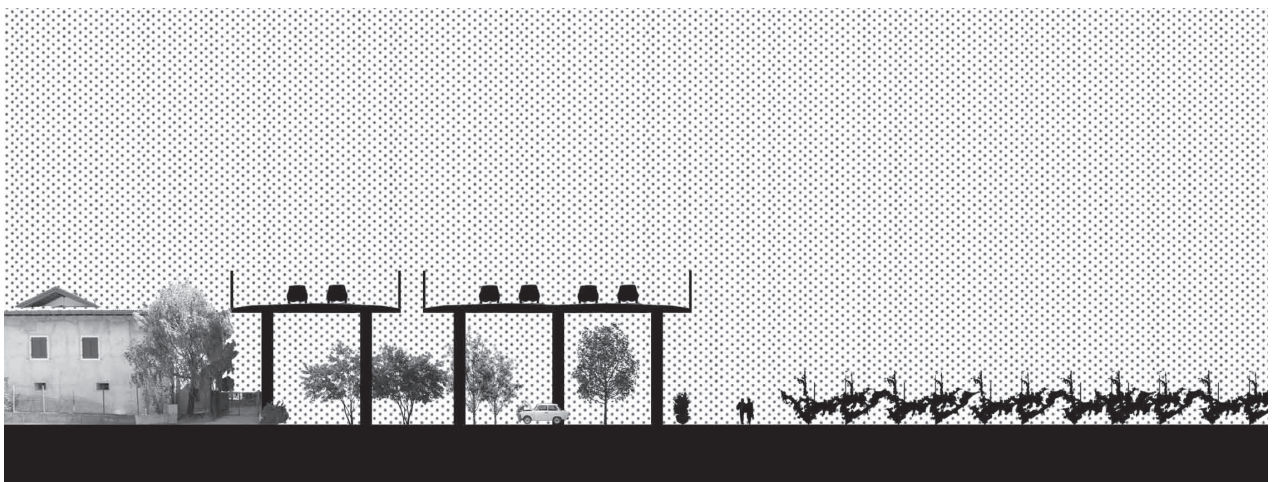
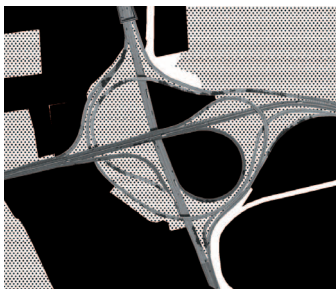
Overlaps of roads to Motorway A22, near Bolzano

Each object has a more or less wide-ranging area of relevance depending on the logical or functional level to which is dedicated. The mountain roads, especially in the valleys, often overlap with other elements and with their areas of relevance. Thus, there are two levels of overlapping: physical, material overlapping between the elements (roads over canals, railways, fields or other roads) and logical overlapping, Stratification between physical elements and pertinent spaces of other elements. Based on the experience made during the Ministerial PRIN 2007-2010 research, it was found that these stratigraphic stacking of spaces and objects generate spontaneous and unplanned situations of use of the spaces.

2.2.1 Plans and overlapping spaces: Northern Trento and Cornedo all'Isarco

PRIN 2007-2010, survey of infrastructures in Trentino Alto Adige.
Infrastructure junction of Northern Trento (SS47 - SS12). Diagram of plan and cross section.

The infrastructure junction of Northern Trento is the ramp that connects the State Route 47 “Valsugana” to the road 12, north towards Bolzano and the countries along the Val d’Adige and south to the Trento bypass and the junction to the highway A22 “Autobrennero” . The junction is located at the northern edge of city, surrounded by industrial areas and by a disorganized and fragmented residential development. The junction is a fundamental event in time compared to the other presences that can be noticed here: the areas adjacent to the junction, appealing because of the accessibility offered by their position, have gone through a commercial and industrial development that took place after its construction, while among the existing residential buildings, some of which have been demolished and others, very close to the junction, are still inhabited, reflect their previous condition and have lost part of the freedom they enjoyed prior to the completion of the junction.





The infrastructural construction of Northern Trento has changed the stability of the area immediately adjacent to the new junction. As evidenced by the images in the photographic survey, through the years there has been established a new precarious balance, totally lacking in planning, coordination, order or planning. The elements formed over time are proof of this ambiguity, expressed through new connections between the materials involved: hedges, precarious fences, use of the spaces as deposits or gravel access areas.

With its wide closed twists, the junction defines areas that otherwise have no purposes: they are unplanned areas absorbed in the background of the outer junction, which is commercially desirable.

The overlap occurs with the loss of the logical boundary between public and private spaces: the spaces merge, the area under the viaduct used from time to time as a garden or as a storage area. The viaduct at the entrance of the junction becomes part of the garden of the house next door; the space under the viaduct exit used as a warehouse, surrounded by fences and hedges. These situations are devoid of stable organization or projects, and show the need for a planning scheme.

The uncritical overlapping of the junction with the existing situation has led to a reorganization of the hierarchy between the elements, acting as a support for unplanned activities and uses.



PRIN 2007-2010,
photographic survey of
infrastructures in Trentino Alto
Adige. Infrastructure junction
of Northern Trento
(SS47 - SS12).

PRIN 2007-2010, photographic survey of infrastructures in Trentino Alto Adige. Infrastructure junction of Northern Trento (SS47 - SS12). Embankment as porphyry storage.



Car place Doghouse

In the infrastructure junction of Cornedo all’Isarco there has been an effective staging of the overlapping characterized by the symbolic representation of stacked layers.

Infrastructure junction of Northern Trento (SS47 - SS12). Elements of private garden under the viaduct

The town of Cornedo all’Isarco, inhabited by about 3300⁴ inhabitants and situated at the entrance of the Val d’Ega, along the Brenner, north of Bolzano, at a height of about 390 m above sea level. It occupies a part



of the south slope of the valley of Isarco, which relates to an orographic narrowing of the valley: this narrowing is a strategic crossway for the infrastructures that run along the Brenner, and that have accumulated over time, making this passage a mandatory one.

A bundle of infrastructural routes overlaps the town by crossing it at various altitude levels. The Brenner highway and railway, the SS12 (Bolzano - Brenner), some local roads, a cycle path and the Isarco River are forced to overlap and twist around houses and public spaces.

In every part of the town can be seen a mixture of urban scale road elements (noise barriers, guard rails, lighting poles) and inhabited spaces (squares, playgrounds, walking areas along the river). The streets, bordered by colourful noise barriers, appear as screened, but loud prospects the middle of the town.

The stratigraphy of the overlapping elements is visible everywhere. Elements of the landscape that are dissimilar in origin and logical context were grouped into the same image from top to bottom: church, gallery, square; fields, streets, city hall, river; mountain, noise barrier, parking area and playground, all discernible at different levels.

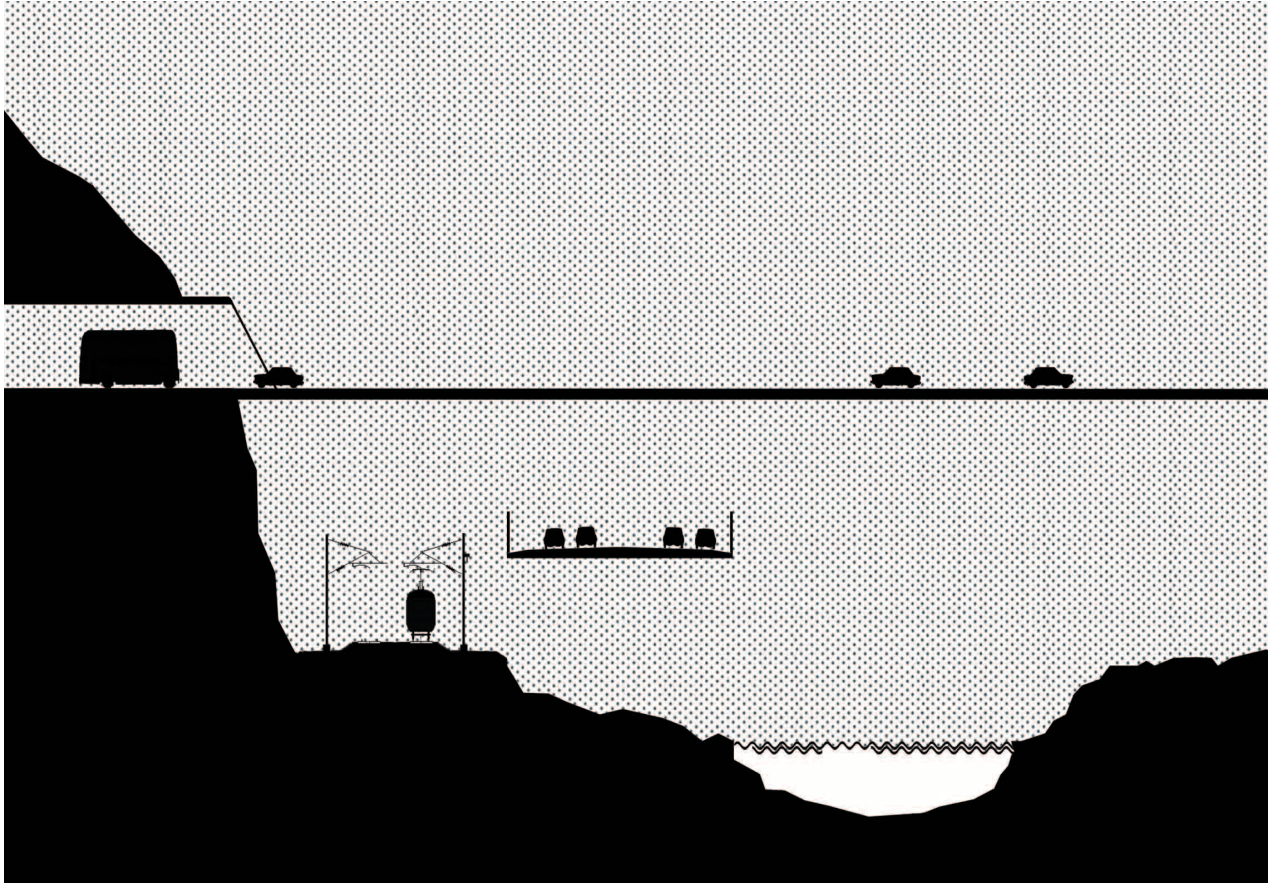
Again, the overlapping areas generate ambiguity, lack of organization, in which one recognizes the absence of a plan, a device that establishes



PRIN 2007-2010,
photographic survey of
infrastructures in
Trentino Alto Adige

Infrastructure junction
of Bolzano North (Cornedo
all'Isarco))

Overlaps of road and
landscape



PRIN 2007-2010, survey of infrastructures in Trentino Alto Adige. Infrastructure junction of Cornedo all'Isarco. Diagram of plan and cross section.

Overlaps of spaces: a bicycle path between road and railway

values and purposes of things and spaces. In the stratification of elements we can recognize the hybridization of the spaces: the space of the road transects with the space of the town, the hierarchies that normally regulate the relations between elements are broken. The gap is visible in the ambiguity of the use attributed, sometimes spontaneously, to such spaces; generally, we tend to criticize the aspects of the transformation brought by road constructions to local contexts.

The overlapping evolves into fragmentation: crossed by infrastructure flows, the town is split into separate parts. The viaducts between them determine the relations between the separate parts. To move from one part to another (from one area to another of the town) you have to cross the space beneath the viaduct that cuts through it, which thus becomes a connection space. At the extremes of this sequence, the side of the mountain and the Brenner railway surrounds the town.

In this case, the elevated position of the viaducts is the only way to cross the town and areas divided by the viaduct are perceived as independent and isolated parts of the town. This perception is accentuated by the different levels of altitude of each part: each time you cross a viaduct you perceive a change in altitude. The noise barriers appear as alien prospects of the town: sets beyond which flows a world apart from

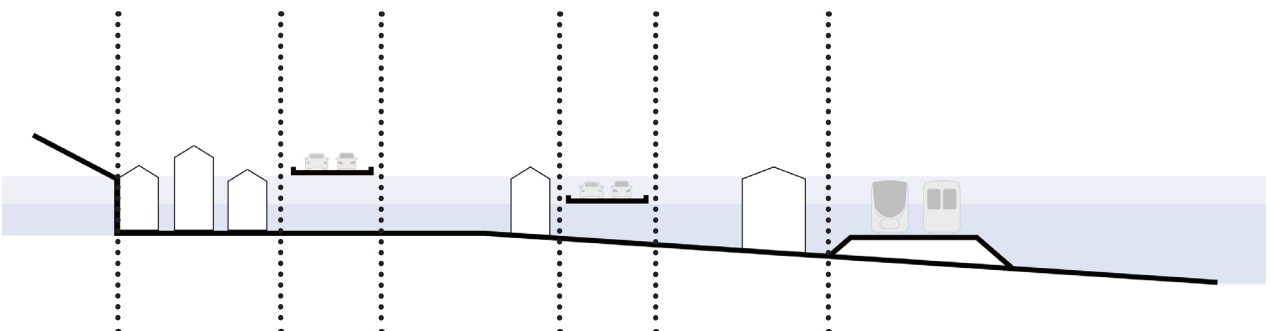


the life lived locally. The space under the viaduct is exclusively for crossing: it is not adjusted in height by the road rules and is used only to go from one point in the town to another: yet it is undoubtedly a public space.

PRIN 2007-2010,
 photographic survey of
 infrastructures in Trentino Alto
 Adige.
 Infrastructure junction
 Cornedo all'Isarco

Noise barrier as alien perspectives
 in the town

Sequence of spaces cross the
 town: viaducts and relation
 between separate parts
 of the town





2.3 Slope: land and perception

Designing architecture sites with natural slopes is a radical form of urbanization of the territory, a forced reduction of the natural surface, but at the same time one of the oldest forms of occupation of the territory. It is the continuous intervention of humans on the land that, through the years has characterized the current morphology of the landscape of agricultural and housing settlements⁵.

A slope is the ratio, expressed as a percentage, between two points at different levels of vertical altitude and the length of the horizontal projection of the section in question.

The orographic nature of mountain contexts often forces to operate under sloping conditions of the terrain. Compared to the conditions offered by a flat context, in a sloping area it is necessary to increase the amount of work in order to create the conditions essential for human presence: it's compulsory, more than in other morphological contexts, to provide *mediation* between construction work and land.

Slope on plateau of "Pale di S. Martino" (TN), 2010, dec.

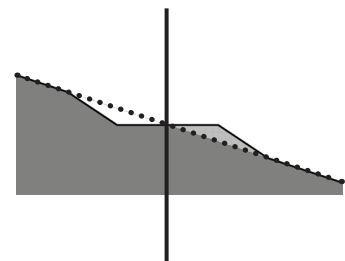
The sloping agricultural sites require works of terracing which vary depending on the ratio base/height of the land, the soil quality, the

amount of rainfall, the type of cultivation etc. Basically, they vary in terms of the location and the of land's peculiarities.

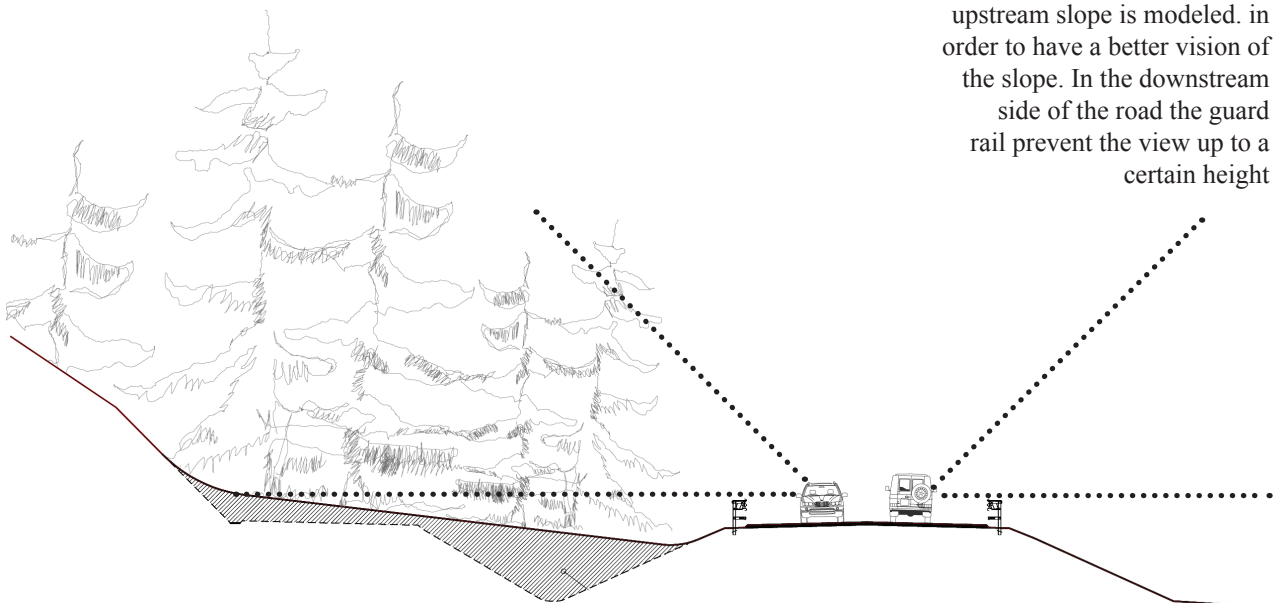
The changes operated on the land have the function of supporting the road strip, creating a surface on which it can be set and at the same time solving technical problems, which vary from case to case or from section to section: stability of the slope, the flow of water from the slope etc.

Traditionally it was possible to build roads along a slope starting from the figures indicated by basic road engineering. Most of the sloping roads are built outside the ground (with land fillings or containment walls in the downstream side), interconnected to the ground (by means of an excavation in the upstream side and refilling or containment in the downstream side) or entirely within the ground: it is essentially a modification of the terrain.

As in the case of terraced agricultural landscapes, the constructive possibilities offered for the construction of a sloping road vary according to the slope ratio (base/height), land quality (particle size, weight, compactness), the presence of water courses or moving slopes in the terrain on which the construction is taking place. Also variable is the range of materials and construction techniques: the containment of an upstream or downstream road is carried out artificially (walls in conditions of instability, slopes, poor soil cohesion, etc., or road embankments).



Typical cross section of a road in mountain, where the upstream slope is modeled. In order to have a better vision of the slope. In the downstream side of the road the guard rail prevent the view up to a certain height





2.3.1 Slope and perception: case studies of Pineta di Laives and Moena.

From an architectural point of view, a sloping road, offers the possibility to address at least two issues that go beyond the technical factor. The view *from the road* and *of the road*.

A sloping road offers a view divided in half: the downstream part is presented free of obstacles (except for those imposed by road restraint barriers), the upstream portion offers a close view of the mountainside. While the former is characterized by a long range and by the scale overview, in the second we can see the details of construction, excavation, coatings or, in the case of milder slopes, the sides of the Mountain.

Any perceptual interpretation of a road on a slope should take into account the peculiarity of this aspect and the elements that influence it.

In the perception of the landscape of a valley road, for example, the role of the guardrail is determining. The Italian technical standards impose in some stretches of highway guardrails over five feet high. With a similar visual impediment, the perception of the landscape of a valley loses the bottom half. It would be crucial to have elements that are as

SS 42 to Mendola pass (BZ),
mar. 2008.

In the top: the road is visible
from village of Caldaro as a
long clear line on the prospect
of the mountain

In the bottom: competition
“Strada Passo Mendola”
(Province of Bolzano), group
headed by prof. E.Siviero and
prof. C.Lamanna.
study for the frontal view.



continuous and fluid as possible on the roadside, to avoid attracting the attention of the eyes toward emergencies such as net connections between guardrails of different sizes and types, road signs etc.

Upstream of the road, the nearness of the surfaces of the containment of the excavation works should be considered. The possibility to use materials with the intent to highlight the continuity of the surfaces should be studied even in retrospect.

The scenic road that goes from the town of Caldaro (province of Bolzano), to the Mendola⁶ Pass, is an example of a pattern with a slope that, given the elevated position above the valley, affects the landscape perceived both externally, and when crossed. The road, at about 1200 m on the east slope of the mountain range of the Mendola is visible from

On the left: SS 42 to Mendola pass (BZ), mar. 2008. only one side of the road allows the view of the landscape.

On the right: study for typical sections: competition "Strada Passo Mendola" (Province of Bolzano), group headed by prof. E.Siviero and prof. C.Lamanna the sections leaves the view of the landscape from the road completely free



the town of Caldaro (425 m above sea level) and from the road, there is an embossed view of the entire valley.

The road has been subject to a bid for tender held by the province of Bolzano in 2008. The notice required the adherence to safety norms for the road with the adjustment of the layout and the planning of an artificial tunnel to block out the rock falls and a new bridge. The bid represented a moment of debate on the perception of the historical route from the valley below and the valley from the road. It was requested that the rock fall tunnel and the bridge should affect as little as possible the two patterns of perception: in fact the road represents a shared cultural value for the local communities, because it represents the historical trail that leads to the Mendola, the border between the territories of Trentino and Alto Atesine, therefore, between communities with profoundly different traditions, cultures and languages.

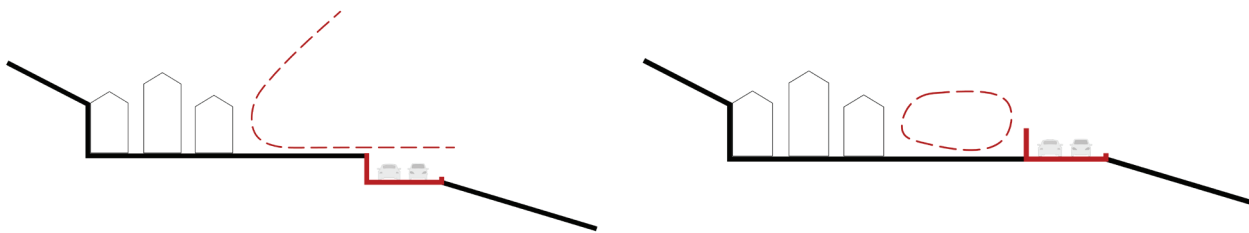
The adherence to safety norms for the road was a strategic choice for the provincial administration: the alternative of a natural tunnel dug into the mountain would cut off the main road and the pass, and in fact would have caused the abandonment of the historic route. Once known as a resort for wealthy people (late nineteenth century), today is a popular cycling route.

SS 42 to Mendola pass (BZ),
mar. 2008.

Competition “Strada Passo Mendola” (Province of Bolzano), group headed by prof. E.Siviero and prof. C.Lamanna.
Study image for the view from the road.

The case study perceives the role of architecture in the road and in the transformation of the landscape.

To maintain intact the perceived value of the historical route, it is necessary to work simultaneously on the road as a space (internal path) and object (cutting the side of the mountain). The slope is the link between the two dimensions of perception and the physical elements on which to intervene are architectural elements: the road edge and the



roof of the tunnel, the pillars that support the structures, the bridge, the retention barriers, etc.

The vision of the sloping road is variable depending on the position of the road and of the observer. If the road is downstream of the observer, one can determine the condition with which it is possible, with little construction work, to hide the path completely from eyesight. If the road is above us, the prospect of cuts, embankments, retaining walls is crucial, because a long and extensive moulding may change the landscape on a large scale extending visual effects that can affect entire valleys.

In the first case, a representative example has been detected along the SS 12 between Bolzano and Trento, in the location of the Pineta di Laives, during the PRIN 2007-2010 research.

The case study consists of a stretch of track planned for the beltway of the Pineta di Laives, Laives and Bronzolo, in the Province of Bolzano, a bypassing of the SS 12 constructed to divert the passing traffic from residential areas⁷.

The new route of SS 12 in Pineta di Laives is a sloping road perceived prevalently from the urban centre in a higher position than the path.

The profile of the track has an upward inclination: tucked away in the south, near the newly built gallery, it gradually rises to appear in the

PRIN 2007-2010,
photographic survey of
infrastructures in Trentino Alto
Adige.
SS12, Bypass of Pineta di
Laives (BZ), position of the
new road and possibility of
differenced spaces



residential area.

The images show the two viewing conditions: in the first in the road plane is lower than the ground on which the activities of the town develop. In the second the road emerges above the level of the town, the noise barriers preclude creating a closed space between itself and the fronts of the houses, whose view towards the landscape of the valley below.

The intervention in its whole earns useful areas, to be used for parking and public green spaces, without having, though, a visual contact with the valley landscape, a panoramic reference point of the place.

In the bypass of the town of Moena, in Val di Fassa (province of Trento), the observer's viewpoint is also directed outside the road: the bypass develops in an elevated position compared to the village, from which you can see all the features that do not flow in the natural tunnel. The road, embanked into the side of the mountain with a slope of about $\frac{1}{2}$ and the retaining walls reach heights of great visual impact. The walls have the upper profile cut at the intersection wall – ground: a curved line that shows the trend of the mountain altitude. The prospect of the road characterizes the entire tract of the valley found in the town, suspended half way up to highlight the relocated through flow.

SS 346, "Somedà" Tunnel,
Moena in Val di Fassa, (TN).
The cut produced by the
road in the mountain is is
a prospect visible from all
places in the town.



2.4 Difference in altitude: artefacts, orography and landscape

Height of a plane or a flat surface (or even of a point, a place) compared to another plane (or point or place) used as reference point⁸

In this thesis, the subject of difference in altitude in mountainous contexts is addressed by two distinct interpretations for size scale: orographic scale gradients and difference in latitude in an urban scale. In the first case, we analyse specific road artefacts (bridges, viaducts, tunnels, etc.) generated by specific areas of orographic mountainous contexts. For this purpose, a classification is made with three types of orographic gradients (highly variable difference, slope and valley floor), which describes the characteristics of road artefacts that normally appear in each of them. The artefacts are examined as objects, architectural or engineering works present in mountainous contexts, to become essential features.

In the second case the road is seen as a single and elongated element with continuous differences in altitude, resulting from of the local difference in altitude encountered during the crossing of the mountainous terrain:

M. Linsi, photograph
of artifact in mountain
landscape, national pavilion
of Switzerland, XXII
International Architecture
Exhibition (Biennale di
Venezia)

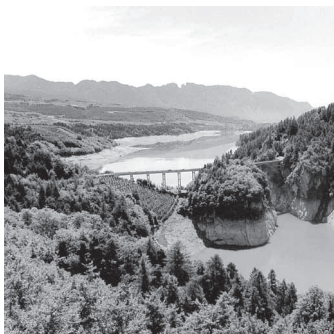
Valle di Non: photo by G. Basilio (Photographic survey in Trentino)

the vertical dimension of the spaces or of the elements that make up the road comes into direct relation with the urban scale of living spaces, improperly absorbing the supporting features for various kinds of activities; the longitudinal dimension of the entire *road structure* is in correlation with the regional scale, representing the continuity of a foreign element, but at the same time rooted to the places it passes through.

In both interpretations suggested, the difference in altitude is strongly connected with the road artefacts. In the mountains may be found typical road artefacts, such as natural or artificial tunnels, or bends. Even within a single type of artefact, such as the bridges, there are typical morphological - constructive characteristics (e.g. construction types or dimensions).

2.4.1 Orographic gradients: a classification

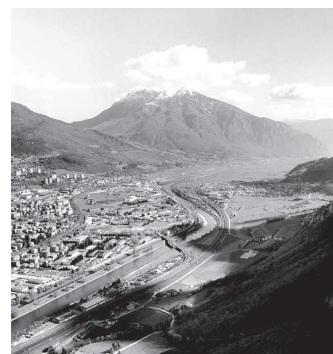
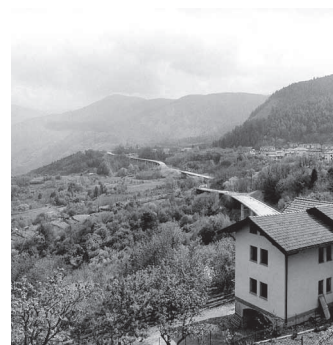
A classification based on the *difference in altitude* aims to order the specific characteristics of the road artefacts in mountainous contexts characterized by different level drops. Road projects in steep topography (e.g. slope) face different technical, functional or architectural problems compared to roads in a flat topography (e.g. the bottom of a mountain valley). The level drops are typical of complex orography: while great differences in altitude generate characteristic road artefacts and solutions, the overlapping of other infrastructural lines on the bottom of a narrow valley between two mountain ranges, creates others, morphologically different, in which it is always the difference in latitude that affects the choice of the solutions. In this chapter, we propose a classification according to orographic conditions: to different terrains correspond different conditions in which the difference in latitude has a conditioning role.



- *Strong drops, or orographic gradients:* are complex orography areas where the planning terrain has a steep geometry, full of ravines, slopes, landslides, etc. In these places are mostly used long span bridges or natural tunnels: the former can use the height of the gorges to be crossed by finding a better support for the abutments; the latter have the advantage of limiting the visual impact of the road only to the intersection of the tunnel with the surface of the mountain (the portal).

Both design solutions have their disadvantages (access to the site, waste disposal etc.), but often remain the only possible solutions for paths in the mountains.

- *Slopes*: On the slopes, the roads can be totally or partially integrated or, less frequently, altogether detached from the ground. Practically, there is the possibility of modelling the ground so that the road flows there.
- *Valley lowlands*: In some mountain valleys, the plane ground surrounded by the mountainsides is a scarce and precious. The road infrastructures must find space between the concentration of other infrastructure routes, which entails overlapping of the road surfaces with variations in height and considerable artificial development through excavations or embankments.



This classification brings the issue of the relationship road/landscape to the question of the role of the artefact road. The form and structure of the road artefacts (or architectures) affect the landscape because they personalize it by widely repeating their peculiarities in the area: these are all the more powerful in composing an image of landscape if they are particular to that landscape. Reinforced concrete arch bridges, built with centrings have typical shapes of mountainous landscapes, as well as artificial tunnels or wooden pedestrian bridges with pitched roofs. The intention is not to forget the idea that the road should also be analysed as a whole, arguing that, even if not belonging to a single road axis, the artefacts represent a landscape through a consistency in form or technique. What we intend to say is that that the artefact has both roles in characterizing the landscape.

Just look at a dozen bridges and viaducts to see that the plans were carried out randomly, of course with different and unsteady results. Next to some fine examples, we find a series of mediocre facilities: the Viaduct Quercia-Setta, on the Rio della Serra, the viaduct Castellare, the bridge over the river Lora. Also very ugly are Case Olmi, Corzanello, la Cassina, Formicaio and Podere Vicchio that, because of the inert sequences of arches, seem to belong to a remote civilization of engineers, of fifty or a hundred years ago. No one bothered to ensure some consistency among the various technical and figurative works of art. The tunnels are, almost without exception, hideous, with badly designed heads or rather not designed at all. Roadways, bridges, viaducts, run into these tunnels with no formal or structural connection. All

Valle di cembra and Valle di Non : photo by G. Basilico (Photographic survey in Trentino)

this reveals a method both architecturally and economically deplorable.

With these words, Bruno Zevi greeted the inauguration of the Autostrada del Sole in '56, stating the need for a design *figuratively* and *technically* coherent that could be acceptable for the entire highway. However, the road artefact is also the result of morphological and environmental conditions, in which, in the case of mountainous contexts, difference in altitude plays a significant role (see following paragraphs).

Road artefacts as reference for mountain landscapes is the subject of three recent publications, referred geographically to the Alps. Two of these publications are by J. Conzett: *Structure as Space. Engineering and Architecture in the Works of Jürg Conzett and His Partners* and *Landschaft und Kunstbauten/Landscape and Structures*⁹. The first is a collection of Conzett's works, a Swiss engineer who oversaw the national pavilion at the XXII International Architecture Exhibition (Venice Biennial), whose second publication is the catalogue.



With the title “Landscape and structures,” Jürg Conzett traces, along with the photographer Martin Linsi of Einsiedeln, different routes through Switzerland. Jürg Conzett focuses on this subject, making use of interventions applied to the landscape by builders and engineers. He analyses the conditions under which these interventions were made: the technical, economic, architectural and touristic requirements; he also examines the current importance of these interventions for humanity. Jürg Conzett seeks to provide an answer about the ways in which we are currently dealing with our architectural heritage and how this heritage influences contemporary architecture¹⁰.

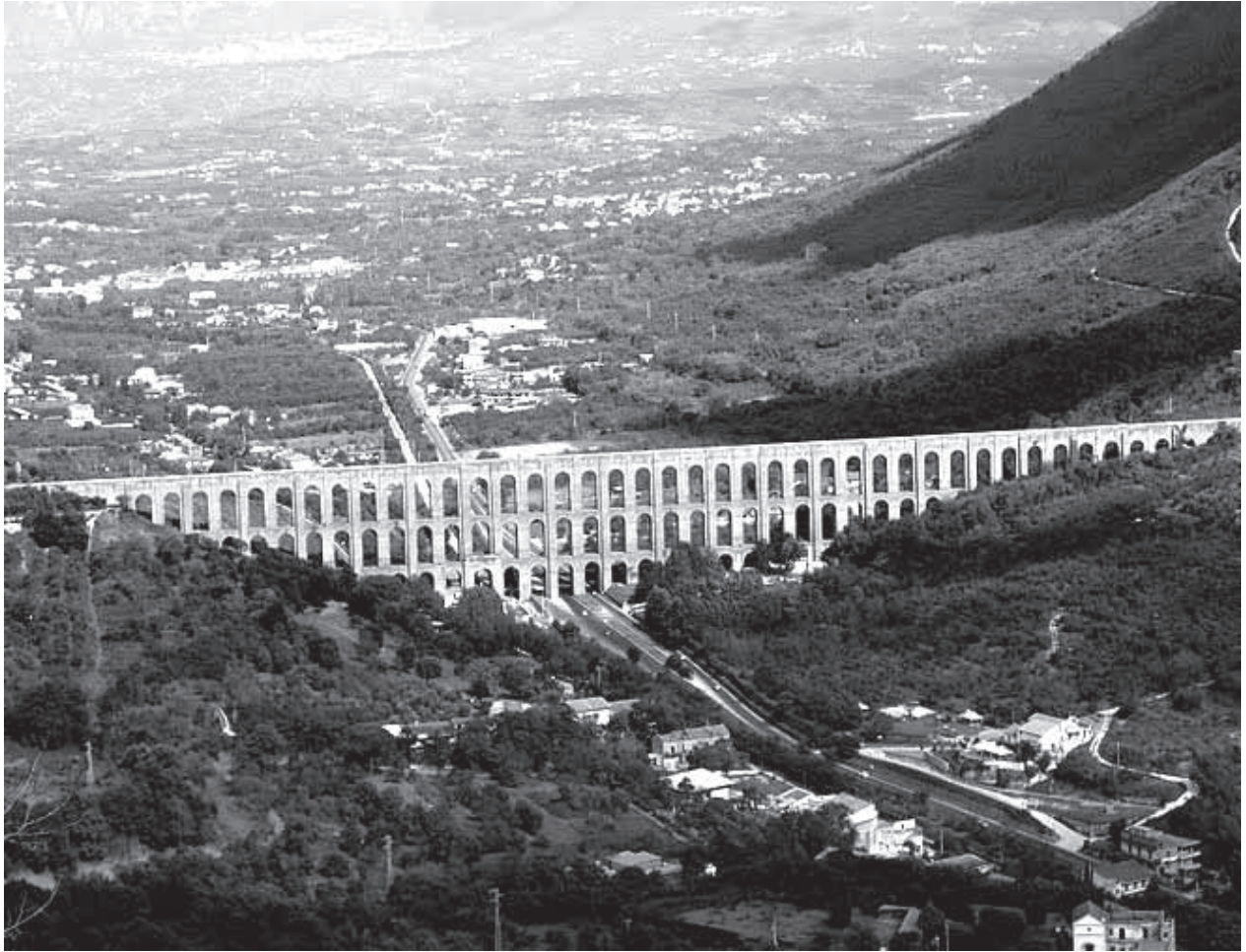
By specifying the economic and touristic aspects and their relationship with individuals, the subject approached by Conzett, is generally, that of the role of the road artefacts in the landscape.

The third publication is *Brücken in Tirol*¹¹, a collection of photographs, layout diagrams and information on a selected series of bridges in the geographic area of the Tyrol.



The three publications are, in our opinion, an inspiration to complete a survey on road artefacts in the Alps as a key to interpret the landscape. A research whose aim is to address this issue should extend the survey to geographical areas not covered by existing publications (e.g. the area of the Italian Alps, with the differences of each region) and highlight the differences between the various geographical areas.





2.4.2 The difference in altitude in mountain roads: hairpin bends, tunnels and bypasses

In the previous page: artifacts in mountain landscape exposed during the Swiss national pavilion at the XXII International Architecture Exhibition (Biennale di Venezia).
Photo by M. Linsi.

In this page: L. Vanvitelli, aqueduct Carolino, (CS, 1762) and Pont du Gard (Cassagnoles, FR, 19 a.c.) Difference in altitude as a design issue.

The difference in altitude as a design issue for the development of infrastructure projects was also an issue for the Romans when building aqueducts. The technique to bring water from the point of collection to the city, without the use of hydraulic pumps, was solely based on gravity. The problem was to ensure that the path of the channel from the source was almost completely straight with a slope that could guarantee at least the water flow (on average 2.5% but in some cases less: the slope of the Pont du Gard is 0.4%). Given the constraints, the path was, apart from exceptional cases, indifferent to the orography of the places it encountered during its passage. This situation was similar to that of the roads (steady altimetric gradient overlaid on free soil) in which in order to cover the vertical gradient the Romans built the imposing structures we know and protect today that characterizes some landscapes in Italy

and abroad¹².

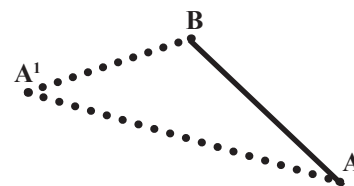
In mountainous contexts, in order reach a fixed point at a certain altitude (a pass, a town, a lookout...) from a starting point with a different elevation, without exceeding a slope determined in advance, you need a path of a length contained within a minimum standard. Longer distances than this parameter (thus establishing the shortest path) cannot contain the slope at the established level (e.g. levels set by technical standards or by the ability of vehicles to move along roads with a bigger slope).

Natural tunnels and bends are technical solutions required to solve problems of track sections in the mountains characterized by strong orographic gradients. In the first case, sections of the road in the tunnel are designed as alternative routes that otherwise would face slopes that are technically and economically challenging in terms of construction (steep slopes, landslide slopes, inaccessible gorges etc.).

In the second case, the difference in altitude is addressed in its entirety using only the resources offered by the geometric road discipline.

From the point of view to the inclusion in the landscape, the natural tunnel is an effective tool: the presence of the road occurs exclusively within the limits of the intersection of the tunnel (the main one, the secondary one and the aeration vents) and the “drilled”¹³ surface of the slope. This intersection takes on itself the task of determining the appearance of the gallery: in the most precise cases, the portal of the tunnel is built into a more global picture of the road through the artefacts that encompass it. The attempts to attribute a *character* to the road, that will invest it globally, through a single coordinated architectural design of all the road artefacts, find in the portals of the tunnels suitable features for this purpose. The case of architectural design for the N2 highway Chiasso S. Gottardo is the best-known example in the architectural infrastructure landscape. The portals of the tunnels, designed by the Architect R. Tami use the same compositional system for partitions and flat sheets used for the other artefacts along the rest of the track, thus defining a recognizable path.

More recent and thus less known is the case study of the Bressanone bypass: as during the construction of the highway N2, the administration of the province of Bolzano appointed a single designer to study architectural solutions for the many portals of the tunnels in the project. The choice of the administration pursues the strategy of providing a way to avoid stylistic fragmentation and give the project a visual continuity. The project involved the subdivision in two hierarchical



R. Tami, portals of tunnels for the highway N2, Switzerland.



levels of the foreseen road segments by establishing a different system of composition for the two levels: curved and fluid lines for the main section and broken lines for the second one.

As you can see from the pictures, the portals of the tunnels mark a sequence that accompanies the solid-void, inside-out rhythms of the entire tract.

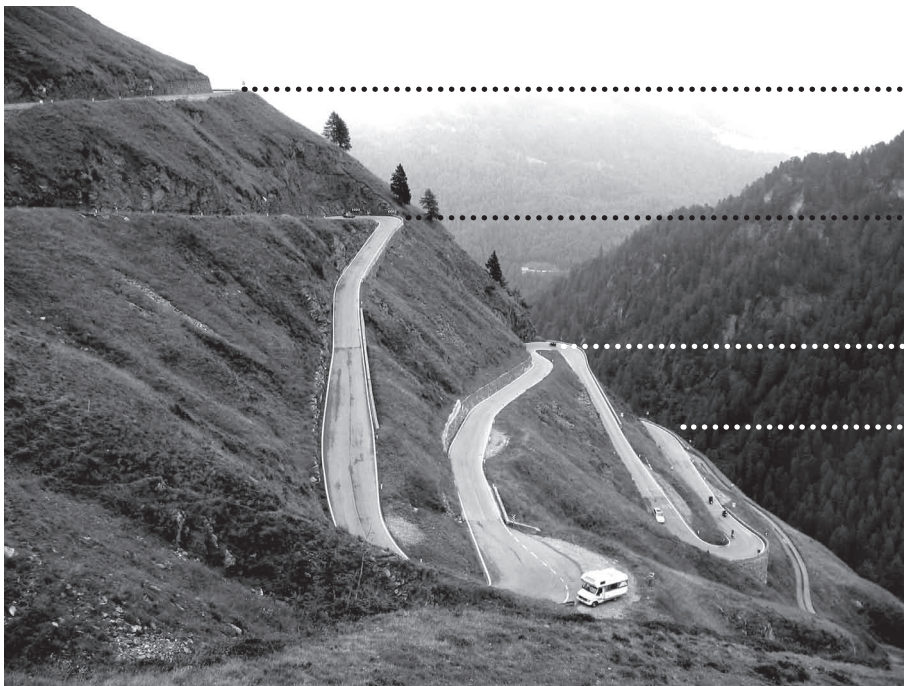
The bypass of Bressanone is one of many junctions built in the last ten years in Trentino Alto Adige. The towns along the valleys of the region experiencing an increase in seasonal traffic headed upstream have gradually shifted the traffic from the centres outward. Given the lack of available space on the edge of the cities on the valley floor, the junctions have preferred to adopt solutions in galleries. This is the model to which the case studies surveyed relate to, such as Bressanone, the towns of S. Cristina and Selva in Val Gardena and Moena in Val di Fassa: common solutions that suggest a trend in which we can consolidate repeatable design principles.

Alternative to the tunnels, road sections that deal with high gradients developed *in the open* are characterized by curves: the curved part of the track of the road or railway, whose horizontal projection has a central angle close to 180° , with an average performance similar to a semicircle.

Bypass of Bressanone (BZ): hierarchical subdivision in different composition systems: fluid and broken lines for main and secondary straight of the road.

The bends are built in the presence of steep slopes and conditions of limited space for changing direction¹⁴.

During the surveys and studies discussed in this research were not



..... altitude: m 2028

..... altitude: m 2012

..... altitude: m 1958

..... altitude: m 1935

**Total length of the road in the picture: about 1,16 km.
Slope: 70%**

encountered significant cases or best practices that worked on the road element of the bend to interpret the landscape through architectural tools. A road characterized by curves can be interpreted as a path in which the viewpoint changes its direction quickly, providing continuous reverses of perspective: while crossing it one may see the two different sides of the same landscape, at a different elevation at every curve (gradually higher or lower).

Usually, the roads characterized by hairpin bends are built in impervious situations, under developed or cultivated, not easily reached by a constant flow of individuals: places that are hidden from our perception. The roads with hairpin bends surveyed in this research are not considered critical elements: they are a perceptive device, often created unintentionally, in which the architectural design does not seem to be important in advance.

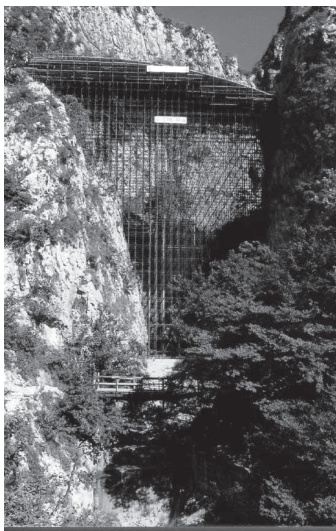


2.4.3 Bridges and viaducts: differences in height, shape and structure

Specific needs arise when dealing with high orographic gradients: these are situations that challenge the designer in regards to statics, construction techniques, and organization of the construction site. To a steep gradient corresponds a demanding solution regarding the spans (it's more convenient to lengthen the latter rather than to support the

Pass of "Rombo"
(BZ, 2509 m o.s.l.).
Bands as tool for landscape perception.

Bend as photographically described by Linsi and Conzett



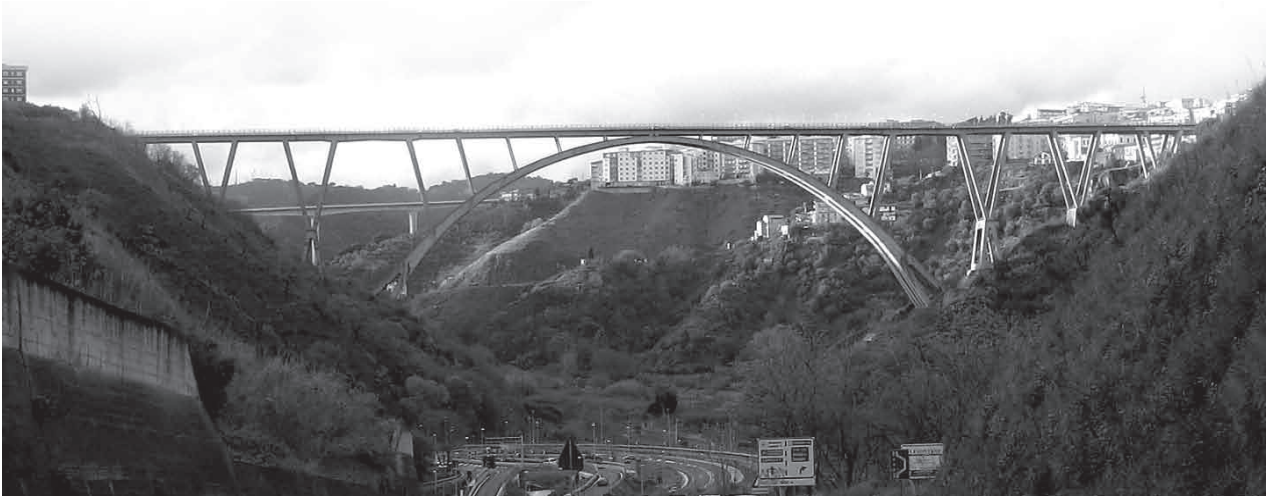
R. Maillart,
Salginatobelbrücke, Schiers,
canton of Grisons, 1930.
The bridge has typical static
scheme “Maillart”.

Centering during the
construction of an arch
bridge over a mountain
gorge.

road with high and expensive piers); furthermore, high gradients also often results in limited accessibility to the site areas, often narrow, with the risk having to change the morphology of the places and eventually restore it once the work is finished.

It’s interesting to note how the orographic difference in latitudes has influenced the evolution of the shapes of bridges in the history of structural engineering. The bridge “Maillart”, for example, (arched bridge plan designed by Robert Maillard, 1872-1840) is a model, which was very diffused¹⁵: the connection of the lower arch, very thin, with the overlying deck (thick enough to confer stiffness to the bridge) allowed a cheaper construction system and optimization of the materials. The centrings used for the construction of the lower arch were to carry a lighter structure, which, once established, was able to act in turn as a support for the construction of the deck, heavier and stiffer, connected to it by uprights. The use of the arch recalled the efficiency of the ancient building tradition, guiding the composition toward a natural proportion of the elements. However, the gradient between the deck and the supporting plane of possible temporary structures was a limit, and the problem of the centrings in the construction of bridges in difficult terrains was dominant until the invention and spread of the technique of prestressing of reinforced concrete (Eugène Freyssinet).

The spread of prestressing in the years following the war accompanied



the highpoint of the famous personalities who gave life to Italian *structuralism*¹⁶ (Pierluigi Nervi, Riccardo Morandi, Sergio Musmeci, Silvano Zorzi and others) who drew inspiration from innovative structural solutions to transform the static tensions in architectural language by experimenting with the expressive potential of structures and materials.

While Nervi had the opportunity to experience innovative architectural forms deriving from the need to overcome the big spans with lighter and more economical structures, highlighting the development of tensional forces and making the materials work in a stylistic rather than mass manner, within road projects in complex terrains, others were able to experience other innovative structures establishing an architectural dialogue with the height of the gorges. Particularly representative are Zorzi and Morandi: the first for the works accomplished during the first implementation of the highway Autosole¹⁷ A3 Naples – Reggio Calabria and the second for a series of roads and highway bridges that experiment the power of expression, composition and construction of concrete by applying it to different static structures.

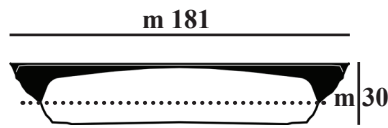
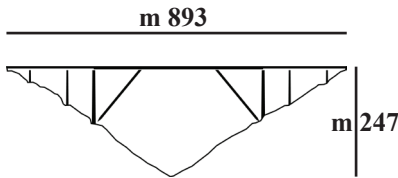


At this point, it's useful to compare the two works of Zorzi, the viaduct Sfalassà in Bagnara Calabria and the bridge over the Tagliamento in Pinzano to highlight the differences in the two design approaches based on two distinct orographic conditions, while maintaining both figures to highlight the balance of the tensional force and the slenderness of the architectural elements.

The viaduct Sfalassà, in Bagnara Calabria, with its squeezing portal-arch structure, utilizes the orographic gradient to find a better support and fully use the physical potential of materials and construction technology: it is 893 meters long (very large for that period), but its

R. Morandi, "Bisantis" viaduct,
(CZ, 1962)

S. Musmeci, bridge over the
Basento, (PZ, 1969)

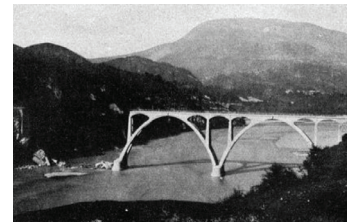


height from the valley to the road measures 247 meters. The Sfalassà¹⁸ won the European CECM prize in 1970, 1971 and 1972 and is still the tallest squeezing arch bridge of the world, while it is the third in Europe and sixth in the world as an ordinary road. Holding the deck are a series of large sized segments (piers in the sections on viaducts and two long and singular inclined steel rods to support the span in the middle) joined to one another as if they were leaning on each other: the composition, as in Bruno Zevi's description of Morandi's structures, seems "frozen just before the collapse,"¹⁹ almost as if it's unavoidable to convey the search for a static limit, prompted by extreme orographic conditions, to the general shape.

By the same author is the bridge over the Tagliamento in Pinzano²⁰: an orography characterized by a lower gradient for which a completely different choice of construction and composition is taken. The single element that connects the banks of the river has, as for the viaduct Sfalassà a figurative a state of tension, due to the large span and to the difference between the thickness of the abutments and of the centre line. The previous bridge, with parabolic arches set on the bed of the

S. Zorzi:
 On the top: Sfalassà bridge,
 Bagnara Calabra, (RC) 1967.
 On the bottom: bridge over the
 Tagliamento, Pinzano al T.,
 (PN) 1970.

Tagliamento was swept away and destroyed by the flood of 1966: the reasons to build a new single span bridge were mainly because of the water (i.e. the elevation of the abutments is higher than that of the level of the Tagliamento river flood) and the technique of prestressing encouraged the engineers to address a significant span (185 m). However, to determine a contrast ratio between the thickness of the deck and of the abutments was the lack of height between the elevation of the deck and that of the springer, determined by the flood.



Through the years, bridges and viaducts appear as works of architecture, isolated elements from the road on which the architect's activities flow. In them, we may find a concentration of continuity between separate places, symbols, metaphors, landmarks. The fundamental reason for the form is not only the structure (which, given the nature of the work, however, retains a significant importance) but what it represents.

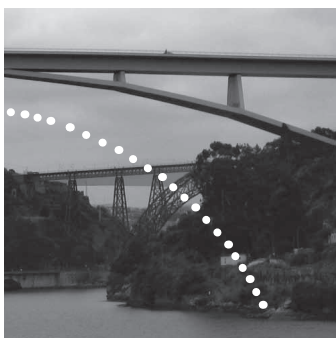


In the case of the viaduct over the River Tarn near Millau (France, 2004), clients and designers²¹ have accepted the challenge of crossing the valley at a height (maximum at the point of greatest difference in height between deck and ground) of 245 m. The structure is a proof of design and construction that has broken many records. Here it must be said that the flow of traffic at high altitude has involved the study of a curved path (a curve of 20 m radius) to counteract the feeling of floating²² with a slope of 3% to give drivers more visibility and control over the road. The speed, initially of 130 km/h was limited to 110 km/h to reduce the risks caused by the many motorists who stopped to photograph the valley below. The cable-stayed bridge highly affects in the visual field. In this case the plane that sits on the columns is so high that its disturbance slips over the line of sight of those on the ground. The piers, while impressive, are placed at a distance so extensive as to not create visual barriers.

Control of the visual field, perception, and shared memory are the topics addressed by Antonio Adão da Fonseca in the project he realized for the Infante Dom Henrique Bridge, over the Rio Douro in Porto (2003). The choice of an arch structure appears to interact with the two iron bridges of Eiffel and Seyrig respectively upstream and downstream of the new link. The choice to seek the minimum difference in height between the deck and the bottom of the arch (the extension of the arch is about 280m with a deflection of only 25m) is not that obvious, a solution that leaves intact the deep perspective along the Douro and the

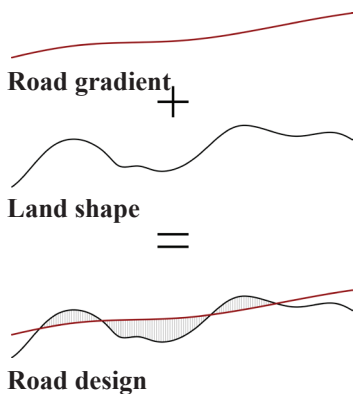
The old bridge over Tagliamento in Pinzano, before the collapse for the river flood (1966)

M. Virlogeaux, N. Forster:
Millau Viaduc,
Tarn valley, Millau, FR



visual integrity of the nineteenth-century landmark bridges. The desire to control the perspective is balanced by an unconventional static and constructive solution given the spans at stake: the arch structure typical of the Maillart Bridges is taken to extremes and built with a mixed solution of temporary piers/definite cantilevers.

2.4.4 The Space in “between”: an alternative reading of the road body based on the difference in altitude

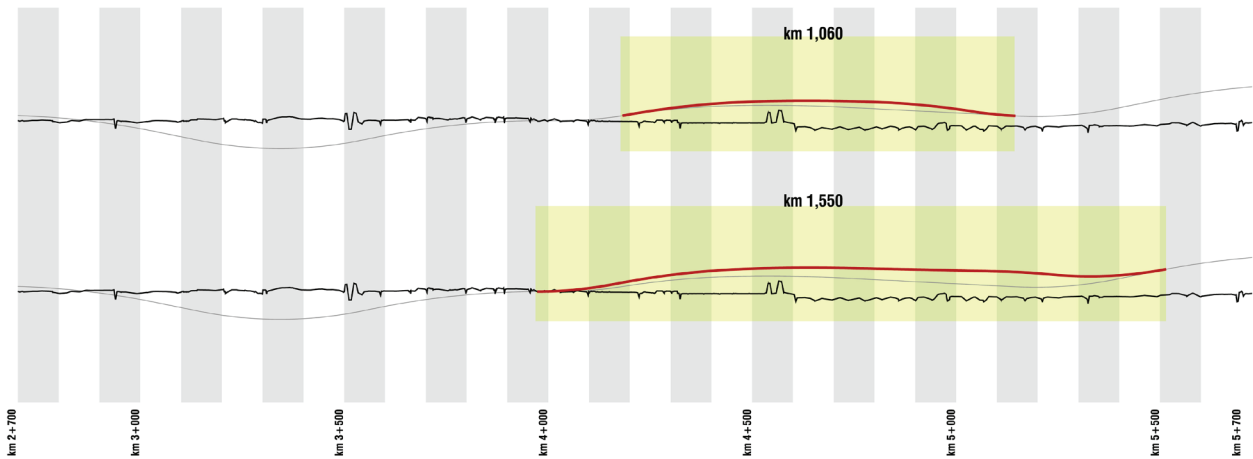


The design of a road is a morphological operation, whose purpose is to match, by overlapping, forms generated by different rules and free of logical contacts between them. The road gradient is generated by safety standards, standards of driving comfort, performance tables depending on the type of the road²³. The shape of the land is derived from natural and artificial factors entirely distinct, on which the designer usually has little opportunity to intervene: the more complex the shape of the ground, the harder it is to match the two figures, which maintain in turn a different stiffness.

A. Adao da Fonseca, bridge Infante Dom Enrique, Porto, 2003.

Comparison between the ideal arc (from the point of view of the static characteristics) and the arc realized in order to obtain a better visual of the old bridge.

The connection between the two figures constitutes the *body*²⁴ of the road project: in road engineering, an ordered set of artefacts which have the primary function of supporting the road strip unloading the weight on the ground; from a compositional point of view, a morphological connection between two distinct forms with different physical, semantic, functional properties: a gradient characterized by a continuous variation of the vertical dimension. Through these variations in height, the road



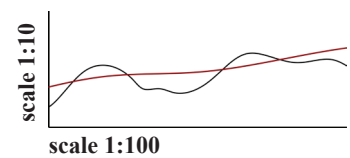
creates different morphological connections with the ground that sustains it, made of detachments, adhesions, excavations. The road is in this sense, a long fiber that grows, shrinks, and disappears and in this way clings to the ground to make up for it.

To represent the continuous variability of the height differences between road and ground, the representation used by the road designers is effective. The road profile has a different scale between the vertical longitudinal dimensions: the latter is increased by one decimal point, to highlight the differences in elevation in every point of the track. At every variation of a point in the road profile elevation, the variations are reflected along a substantial stretch of road upstream and downstream. The higher the traveling speed, the longer the stretch of variation. On the arterial roads, typical of the valley floor, an obstacle such as a road or a channel have effects beyond the intersection point, generating a detachment from the ground in order to create transverse barriers or the need of viaducts or road embankments.

The difference in scale used by road designers for representative purposes is also the image of two different possible ways to interpret the road, according to the size that is considered.

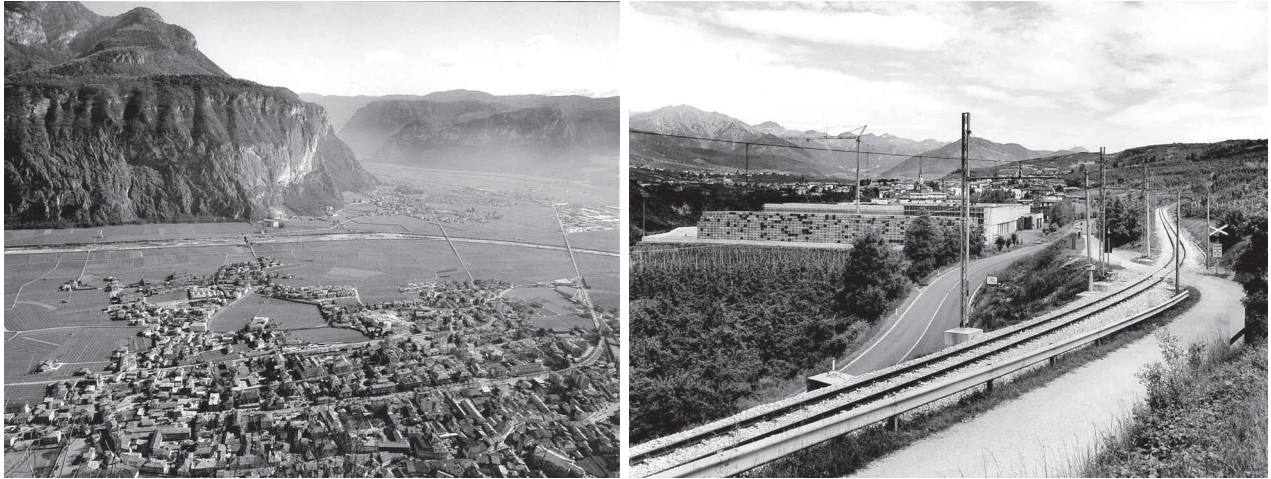
1) In the entire longitudinal axis, the road is a long element that determines a gradient that is continuously variable between its profile and the ground that sustains it. It shows, in its full integrity, the global aspect of its being and the needs of connection between far away poles in spite of the places that support their presence.

2) Locally, through the gradient that is present in every point of its path, the road represents the contact with the place and the relationship established with it, expressed through the physical separation from the ground.



Bypass of Mestre, road section of "Taglio" (VE).
Effects of the change in height of a point of the road.
Lifting up the road level by 1 meter we have variations along about 1 km. By 2 meter we have variations along about 1,5 km.

Civezzano (TN), hydraulic artifacts along the sp 71



The initial interpretation gives similar information to that found by Gabriele Basilio in some pictures taken during the photographic survey carried out for the Province of Trento²⁵, where the infrastructures appear, on the plane of the ground, intersecting elements to the context. In these images, the road has no beginning and no end, it simply passes, and winding among the objects it finds in its path, establishing intersecting, and approach and detachment relationships with them.

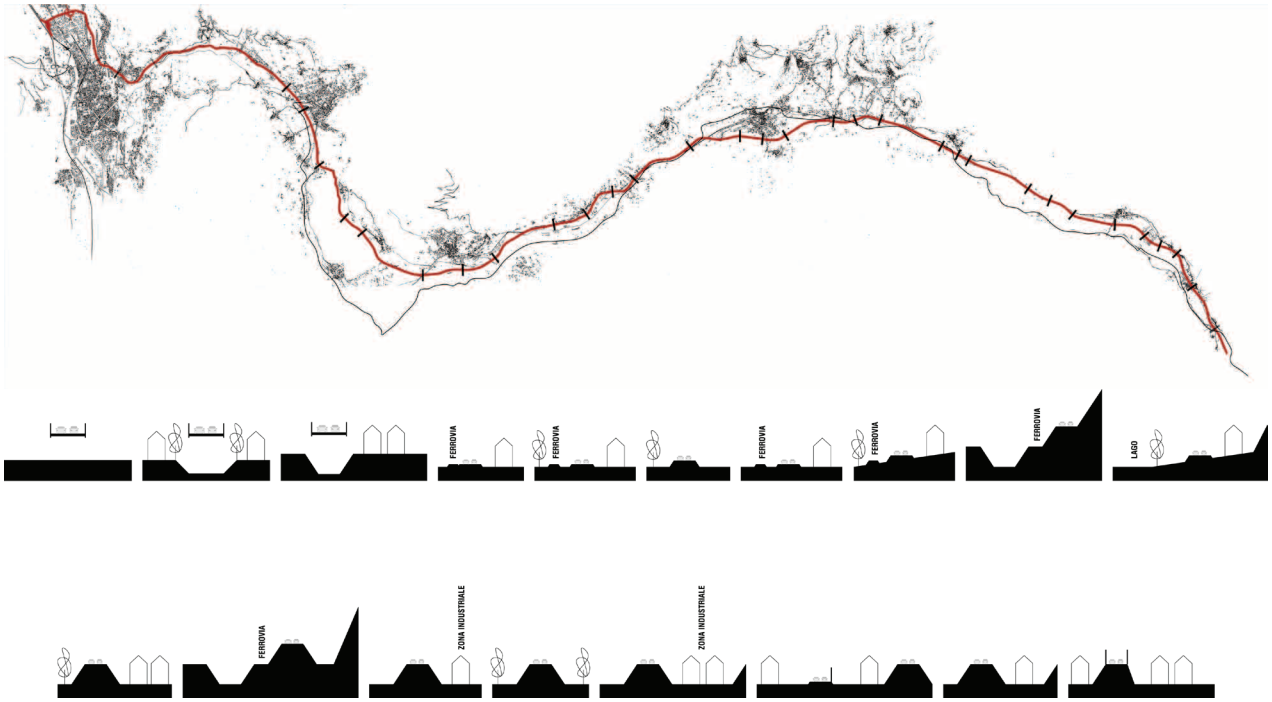
What is noted in the plan from Basilio is also in the prospectus or in section. The road enters into a relationship with the ground surface by detachment, intersection, approach, thus showing part of their belonging to requirements rooted elsewhere.

In the second interpretation, the road is a long element on which there are a series of timely events that connect it to the sites it crosses: in defining the nature of this connection, as well as different quantitative values, the difference between the road plane and the “country” plane assumes different roles from time to time. Detachment, intersection or approaching determine local effects that can be extended beyond the edge of the road, such as cutting paths, or preventing the transverse permeability of a place.

The sets of artefacts that constitute the road body show an *empty design*: except in some rare examples, they are not designed to mediate between two different two spatial dimensions (those of the road and those of the place) but to mediate morphologically (for example road embankments) statically (for example, bridges and viaducts) functionally (underpasses) hydraulically (hydraulic passages) etc. However, they are available for inappropriate uses (stacking of material, abusive acquaintances, meetings, etc.) only because they are in inhabited places.

Design strategies that would like to be compared to this two-way key

G. Basilio, Piana
rotaliana and Valle di Non
(Photographic survey in
Trentino).
Different way to represent the
double scale of the road



reading should begin with an analysis that considers the road as an element whose characteristics are similar to each other through unique devices (for example, the road that skirts a regular series of similar objects, towns, cultivated areas, etc.). On this basis, the strategy (or strategies) should follow a common logic in interpreting the differences in height globally addressed by roads.

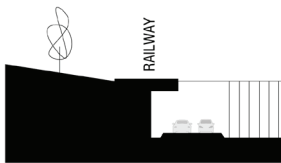
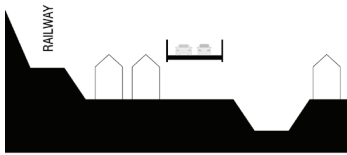
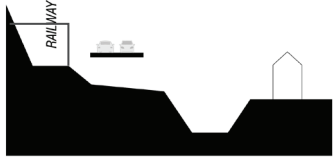
The study carried out on Highway 47 “Valsugana” during this research starts with an analysis that considers the road in its entirety. The section under investigation has common characteristics: it belongs to a single administrative territory (the province of Trento), which makes it subject to economic, technical and social strategies generated by a single political entity. Throughout its tract, it simultaneously has the function of traffic flow and local connection. It flows through the valley bottom through a landscape of a morphological and orographic type that does not change throughout the path; it crosses rhythmically through residential areas or industrial areas under the form of floating fragments in a sea of crops in a land whose value is very high; being it a distribution element on a large scale, it’s rhythmically characterized by infrastructure nodes that distribute traffic towards transverse directions, to serve the valleys that are parallel to the Valsugana.

The cross section of the road and its surroundings is considered as the main tool of analysis. There have been a series of typological progressive sections, identified by following the path of the road and entering,

SS 47 Valsugana (TN).

Survey of typological sections along the road.

In the next page:
Photographical survey and typological section



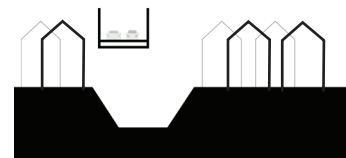


where possible, in the transvers paths. The information derived from the sections is: the type of difference in altitude (road embankments, bridges or viaducts, slopes, etc.); the type of landscape intersection materials (infrastructures, residential areas, cultivated areas, etc.), the type of spaces available to the project (mostly interstitial spaces).

The sections have variable distances, because they are built “at sight”, according to the variations in the type of gradient, and are at close range, because the difference in altitude is very variable. They can be grouped in different matrices according to the information they contain: thus they offer an overview of the relational conditions that the road has with its surroundings (break, barrier, overlapping, etc.).

Following the analysis, it was found that the gradient between the road strip and the ground helps to create discarded spaces, that were not designed, which usually generate problems to the natural functioning of the neighbouring areas. These critical issues are addressed and partly resolved environmentally (e.g. through noise barriers), neglecting other relationship aspects with the places (paths, view of areas that belong to houses, etc.)

The section at the centre of Marter, for example, based on the survey information, shows the following situation:



SS 47 Valsugana (TN).

Section on the village of Marter: photographic survey and typological sections

- Typological gradient occupied by a road embankment and a bridge in prestressed cement that passes over a stream and flanked by a slope.
- Materials of landscape consisting of a watercourse, building containing exhibition activities with local theme, a little detached the inhabited area of Marter, local roads adjacent to the watercourse.
- Interstitial spaces with difficult accesses and lack of maintenance and cleaning, but visible from the road embankment and buildings. These spaces are affected by the cutting of the road, overlying on the town and the related activities. It highlights the disproportion in scale between public spaces and road embankments, which are incumbent on them. The museum building located on the edge of the stream, could enjoy the presence of the latter, but the road embankment destroys the bucolic atmosphere that the setting suggests (the museum is an old mill).



Situations of this nature are found throughout the track. The study of the road SS Valsugana is therefore a possible model aimed at establishing a possible method of analysis based on the difference in latitude in its global and local aspects and announces design strategies that interpret the gradient of the road in the same two-way interpretation.

SS 47 Valsugana (TN).

Village of Marter: photographic survey. "Mulino degli angeli e casa degli spaventapasseri"

2.5 Perception: the leading role of orography

The European Landscape Convention expressly reiterates the issue of perception: it's the relationship between landscape and individuals, centrally located between the devices of the landscape project. In this section we only highlight some *specific perceptual features* typical of vertical landscapes: how does verticality affect the vision, the immediate understanding and the memory of individuals who cross mountainous contexts?

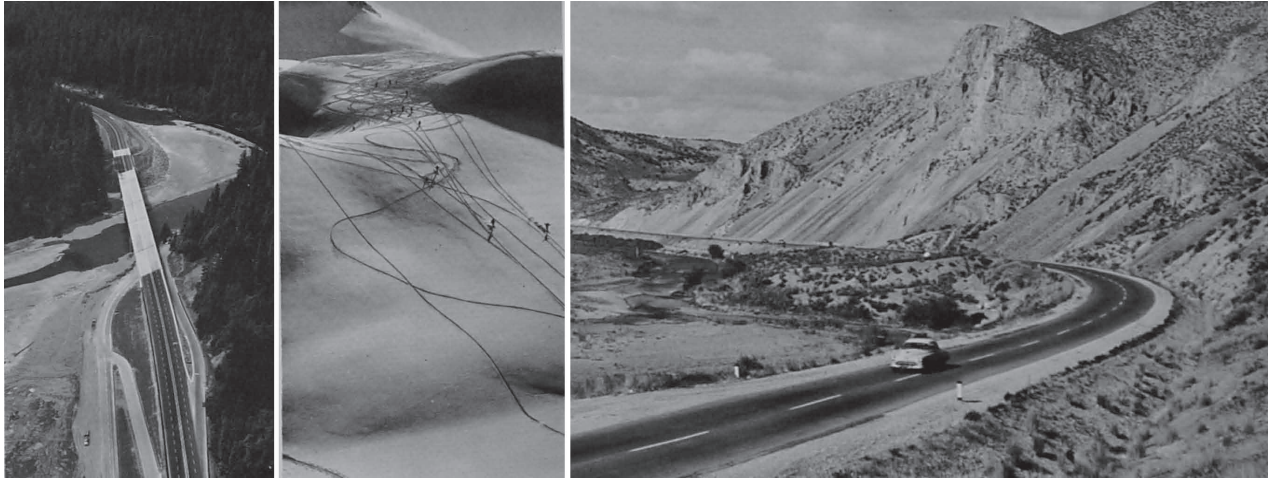
I sometimes think drivers don't know what grass is, or flowers, because they never see them slowly. If you showed a driver a green blur, Oh yes! he'd say, that's grass! A pink blur? That's a rose-garden! White blurs are houses. Brown blurs are cows. My uncle drove slowly on a highway once. He drove forty miles an hour and they jailed him for two days. Isn't that funny, and sad, too? [...] Have you seen the two-hundred-foot-long billboards in the country beyond town? Did you know that once billboards were only twenty feet long? But cars started rushing by so quickly they had to stretch the advertising out so it would last.

Ray Bradbury, *Fahrenheit 451*, 1953²⁶

Crossing a road through complex terrains characterized by differences in altitude, is a visual and perceptual experience.

“If the road unfolds effortlessly from one point of a pleasant and rather open natural landscape, it offers the same sense of rhythm and vital movement of the track of a skier. It represents, in fact, a well-developed artistic style”²⁷

With the lens of the Lynch experience of 1964, the vision of mountain roads is characterized by large and distant orographic elements, which dominate and channel the sight within natural prospects. The galleries, often in complex terrains, are sudden “pauses” in a sequence dominated by slow changes (the distance of the mountain backdrops slows the flow of the landscape), as well as the bridges and viaducts are sections that mark a sudden change in the path (the passage from one side of a valley or a gorge to another, sometimes so long as to allow a unusual view). The Lynciana sequence is characterized by high and low scale latitudes. It's a totally different experience to cross a sloping road, that leans against a macro orographic element that forces the gaze to the opposite side, or



to cross a road in the valley, dominated by a frontal prospective horizon, in which you continuously change altitude, because of the continuous intersections with streams, roads, residential areas that fill the precious space of the flat valley floor (as in the case of the great arterial speed roads of the Trentino, as the SS 47 “Valsugana” or SS 12 in the section between Trento and Bolzano).

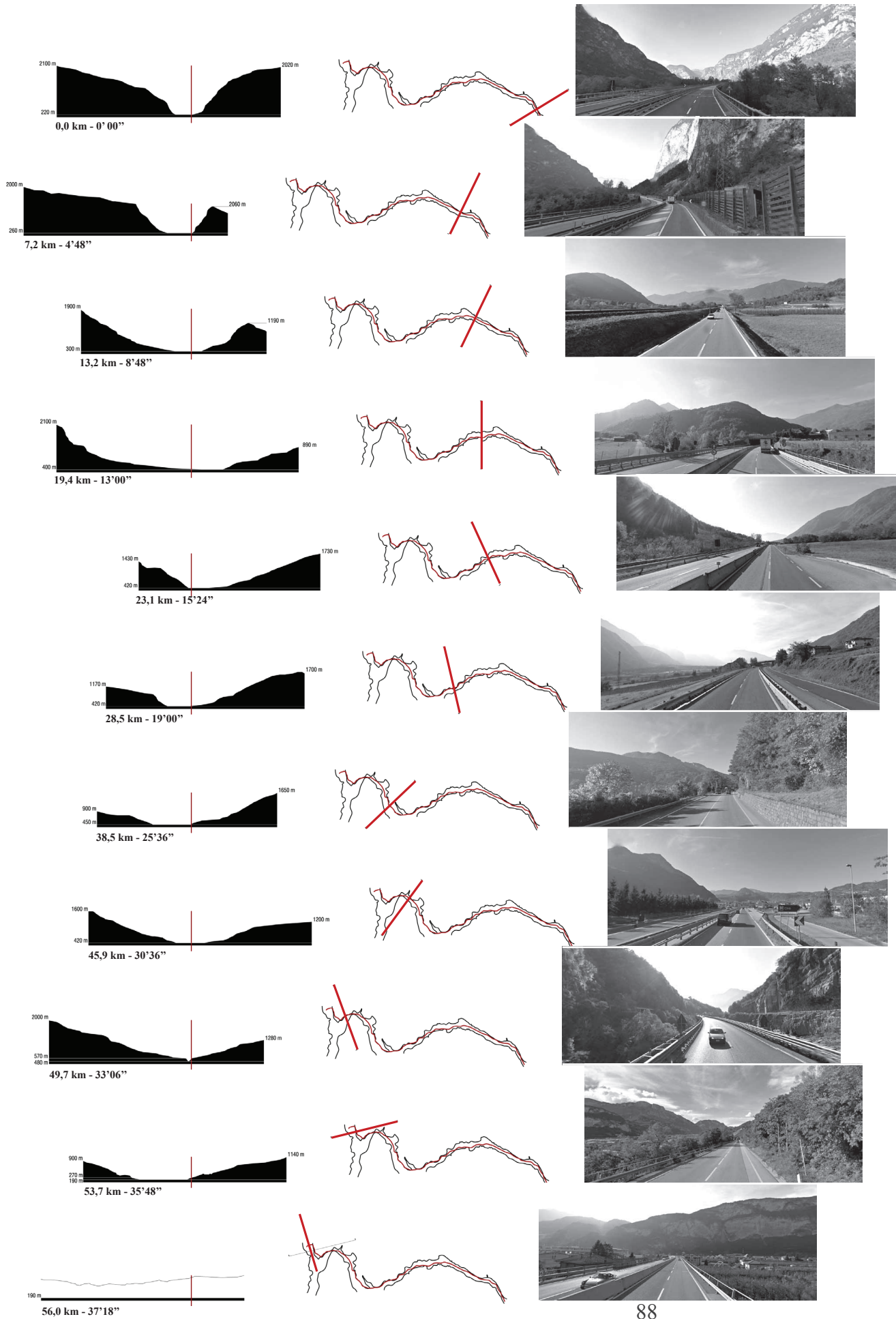
The road’s height, dominant in the flow of the mountainous landscape “from the road”, at a perceptual level involves other consequences.

The experience of driving a car is “a sequence projected before the eyes of a captive audience, quite frightened, but distracted, whose vision is filtered and directed forward²⁸”

Distraction is the mood of the driver: the landscape scrolls events happening around it as in a movie. D. Scully and P. Smith sustained this concept in 1972 to justify the abnormal size of advertising signs at the sides of the road, “about a third of the attention of the motorist is not focused on the immediate sides of the road²⁹.” The mountain backdrop is the large advertising sign that contends the scene to the events closest to the road edge.

The large scale dominates the sight as much as memory, more generally, the perception of the landscape, which is remembered, described, photographed and used starting from the images in which the horizon *catches* the eye and directs it upwards. This way you lose the details closest to you, already overshadowed by the speed of travel, that often disappear completely from the mind. A photographic survey of the roads in Trentino Alto Adige was carried out during the research PRIN 2007, conducted by the Research Unit of the University of Trento. It

K. Lynch, photos from *The view from the road*, 1964.



Previous page: SS47
 “Valsugana”: perception of the landscape along the path. Orographical elements in according to the speed (90 km/h.

In this page:
 Invisible Road elements.



has been demonstrated that, because of a diverted perception, filtered by the component in height of the scale of the horizon, in which the general scene dominates the attention, the photograph reveals details and contexts outside of the shared memory. They are situations in which are emphasized recurrent road elements that are out of range (the *road structure*, such as bridges, piers, arches, portals, road embankments or details often *alongside* roads, such as power lines, deposits of material, industrial areas). A sort of *perceptive confidence*³⁰, collaterally generated by the height of the horizon, by the large-scale orographic auditorium that the photograph, used here as a research tool³¹, crystallizes with objective evidence.

The study of the SS 47 “Valsugana” has revealed the size and position of the orographic elements that surround the valley. Through a series of sections, which detect the transections of the valley, considering the central position of the road, the progresses of the walls of the valley are represented as a function of the path. The road winds approaching or moving away from the slopes and the view of the valley varies from side to side. These movements occur very slowly and were surveyed according to the speed of the path along the road, assumed an average of 90 km/h.

Along the entire road, the perception of the surrounding landscape also varies depending on the precise location, the path already taken, the time it took to follow it. If the first stretch of road, for example, is squeezed between the sides of the mountains that delimit a narrow and shady area, the second section is wider and sunnier, and the road turns left and right with slow curves that are dilated in time.

NOTES TO CHAPTER 2

¹ Cf. chapter 1, p. 1.2

² (Devoto-Oli, *Dizionario della lingua italiana*, Le Monnier, 1990).

³ Ibidem.

⁴ Istat data, population on December 31, 2010.

⁵ C. Lamanna, *Archilogo. La composizione del Paesaggio*, Alinea, 2008, chapter 9, “Complex Land. Planning on a Slope”

⁶ The case study is the last stretch of the Highway of Tonale and Mendola, an important road of Northern Italy that connects the Pianura Padana to the Alto Adige crossing through four mountain valleys, the Val Cavallina, Valcamonica, Val di Sole and Val di Non, ranging from Bergamo to Bolzano. In accordance to the Legislative Decree No. 320 of Sept. 2, 1997, from July 1, 1998, the management of the tract in Trentino-Alto Adige passed from ANAS to the Independent Province of Trento and the Independent Province of Bolzano

⁷ At the time of the survey (August 2009) the construction was under way.

⁸ *Grande dizionario Garzanti della lingua italiana*, De Agostini, 2009

⁹ J. Conzett, *Structure as Space: Engineering and Architecture in the Works of Jürg Conzett and his Partners*, Architectural Association Publications, London 2006 and J. Conzett, *Landschaft Und Kunstbauten/Landscape and Structures*, Scheidegger & Spiess, Zurich, 2011.

¹⁰ J. Conzett, M. Linsi, *Landschaft und Kunstbauten/Landscape and Structures*, Op. Cit.

¹¹ M. Aschaber, G. Guglberger, K. Sporschill, *Brücken in Tirol*, Studienverlag GmbH, Innsbruck, 2011

¹² It is the case of the *aqueducts park*, near Rome.

¹³ The environmental problems that concern of tunnels are excluded from this interpretation: transportation of construction materials, the intersection of the ground water, noise pollution during construction, etc. Many of these aspects have a strong impact on the landscape and must be controlled through specific studies that go beyond the competence of an architect.

¹⁴ DPP June 27 2006, no. 28, “Geometric and Functional Standards for the Design and Construction of Roads in the Autonomous Province of Bolzano-Alto-Adige”

¹⁵ In Italy, for example, we may recall the bridges of Arturo Danusso at Villa Collemandina, Lucca (1932) or of Julius Krall on Biedano, Viterbo (1937)

¹⁶ Italian *Structuralism* should be considered especially in the light of ways of construction related to the monopoly of cement and iron: it is interesting to note that some of these professionals are related to construction companies as designers or contractors (e.g. Nervi and Zorzi). The possibilities provided by prestressed concrete (E. Freyssinet) were the basis of technical building solutions adopted at that time, however, Italian structuralism succeeded in achieving significant levels of formal suggestion (see Manfredo Tafuri, *History of Italian Architecture 1944-1985*, Einaudi, 1982).

¹⁷ The bridge over the Po, at Mortizza (1957-1958) and those over the Arno at Incisa and at Levene (1962-

- 1964), designed together with Giorgio Macchi.
- ¹⁸ Silvano Zorzi, Sfalassà Viaduct, 1967, designed at the IN CO-study of Milan together with Sabatino Procaccia and Luciano Lonardo.
- ¹⁹ Cf. Antonino Saggio, *Riccardo Morandi. Cemento d'autore*, in *Building, Abitare Segesta*, No. 102, November 1991, in *Domus*, no. 815, Editorial Domus, Milan, May 1999 and Arch'it, digital magazine on architecture (<http://architettura.it/>) in November 2000, under the title *I Nervi di Morandi o le reti di Musmeci*.
- ²⁰ Silvano Zorzi, new bridge between Pinzano and Ragogna, opened March 19, 1970
- ²¹ Michel Virlogeux structures, in collaboration with Norman Foster for the architectural aspects.
- ²² Road Traffic Technology, *Millau Viaduct, France*, (<http://www.roadtraffic-technology.com>)
- ²³ Italy the rules governing the road geometry are contained in the MD November 5, 2001, "Functional and Geometric Construction Rules of the Roads." However, the decree provides that the radius of curvature, slope of the road and all the technical elements must be weighed in light of the topographical conditions and therefore may differ from the parameters given in the text of the rule. The province of Bolzano has issued a regulation in which are addressed some specific situations typical of mountain lands, such as the frequent need to resort to the use of bends. (DPP no. 28, June 27, 2006, "Norme funzionali e geometriche per la costruzione delle strade").
- ²⁴ The term is used here to define the physical path as the only element of investigation. Body of the road is not a technical term of road discipline, nor an architectural one: in this context it connects the subject of investigation to specific characteristics of both disciplines.
- ²⁵ G. Basilico was called to detect photographically the landscape in the province of Trento during the revision of the Provincial Urban Planning. The work has been exhibited at the Museum of Contemporary Art of Rovereto between September and October 2003 and published in the volume edited by E. Ferrari and A. Turella, *Trentino. Viaggio fotografico di Gabriele Basilico*, Nicolodi, Rovereto, 2003.
- ²⁶ In Fahrenheit 451 Bradbury shows in the early 50's a world in which men are prevented from reading books or just store them and suffer the distraction of continuous elementary advertising messages, which force them to live with a hushed sense of reality. To represent this scenario, Bradbury uses the metaphor of motorists concentrate on driving. The speed forces them to see things in their complexity, without dwelling on details.
- ²⁷ D. Appleyard, K. Lynch, J.R. Myer, *The View from the Road*, Massachusetts Institute of Technology, Cambridge (Massachusetts), 1964, translation in P. Niccolin, A. Rocca, "The View from the Road. 1964-2003", *Lotus Navigator - The Landscape of the Freeways*, No. 7, January 2003.
- ²⁸ D. Appleyard, K. Lynch, J.R. Myer, *The View from the Road*, op. cit.
- ²⁹ D. Scully, P. Smith, "L'architettura della persuasione", in *Imparare da Las Vegas*, Italian translation published by Quodlibet (2010) by R. Venturi, D. Scott Brown, S. Izenour, *Learning from Las Vegas*, Massachusetts Institute of Technology, 1972.
- ³⁰ See C. Lamanna, G. Salgarello, C. Azzali, L. Siviero, "Photoscape. Invisible Atmospheres" in A. Calcagno Maniglio, *Progetti di Paesaggio per i luoghi rifiutati*, Gangemi, 2010. This volume contains the results of the MIUR - PRIN 2007-2010 research, "Landscape Projects for Refused Places", and the recalled study is part of the research carried out by l'Unità of Trento, coordinated by prof. C. Lamanna.
- ³¹ In the Trentino region photography has been used as a research tool by Gabriele Basilico, cf. note 23.

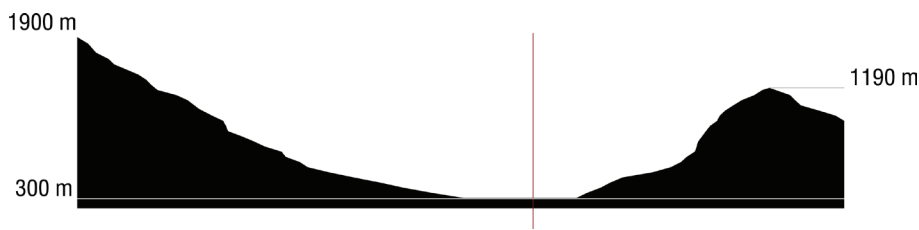
CHAPTER 3:
DESIGNING LANDSCAPE WITH ROADS



3.1 Boulevard in open spaces: the road crossing in mountain contexts

The fast speed crossroads in mountainous contexts are extended Boulevards, intersected with the context in some points at a distance, at times rare, at times in close sections. Arranged along the longitudinal axis, the interactions between road and morphological context combine to form a sequence of events at different distances between them. It is overlooked by urban centres, farm land, industrial areas, individual dwellings, touches and interacts with their edges, mediated by differences in height between the floor plan and traffic flow. From their location on higher altitudes, towns, roads on hillsides, cultivated terraces they overlook the crossroads from a privileged point of view. Recent achievements of urban boulevards, set on the axis of crossroads or local roads, share with mountain crossroads, not so much the nature of the landscape, densely urbanized in the first and rarefied and fragmented in the second, such as the chances of intercepting

Val Lagarina, photo by G. Basilio, photographic survey of the territory Province of Trento.



this context in localized and prearranged areas, on one side through perceptual paths that include the road in its entirety, on the other side through interspersed *intersection* strategies or concentrated in specific sections, which are conducted through the cross section or through a sequence of cross sections.

The plans for the Barcelona road (Ronda de Dalt, Ronda del Mig, Plaza Cerdà, il Nudo de la Trinitat), the Barranco de Santos in S.Cruz de Tenerife, the Avevida de Portugal in Madrid, the long series of waterfronts built in the last twenty years in many European cities, each of which sets specific problems with reference to the relationship between the road and the urban context, through the study of cross-sections, an instrument that represents an intersection point between the roads and cities. The cross section shows the jump of altitude, the permeability, the size of the vertical spaces, the boundary between the road space and the city space or the hybridization between the two, in correspondence of significant points identified in the plans. The sequence of cross sections indicates the amount of significant connections that the road has with the context: almost continuous, as in the case of the project for the seafront of Benidorm (Spain), carried out by C. Ferrater, sometimes intense, sometimes rarefied, as in the case of the Barranco de Santos, Palerm and Tbarez de Nava, or at times precise and rarefied, as along the streets of the Norwegian Atlantic coast, in the national program *National Tourist Routes in Norway*

The crossroad in mountainous contexts is an extended urban boulevard in which the possible interactions with the landscape are more distanced one side (town crossings, differences in altitude in overpasses of roads and rivers, paths from one side to the other of the valleys), on the other continuous, because dominated by orographic elements of large scale, which tend to vary slowly during the path, remaining perceptually almost constant.

The difference between urban and mountain boulevards in open spaces is in the longitudinal scale, which road engineering represents

Cross section of the Valsugana: the mountainside overlook the road.

Piana rotaliana (TN: photo by G.Basilico).



with the longitudinal profile of the gradient: a typical graphic system, which has no counterpart in the disciplines of architecture, if not in the analytic experiences of Lynch and Venturi in the seventies, that have become, not surprisingly, a reference point in the research of landscape infrastructures.

A longitudinal profile of a crossroad in a mountainous context, built with a road model, but whose aim is to represent the intersections between road and landscape, would seem like a long swinging thread, with lines, symbols, arrows indicating the location of the different significant points: interferences between road space and urban space, underground passages, bridges, green or cultivated passageways, would appear to get thicker or more at a distance along the route.

Unlike highways, arterial roads along the valleys have established more radical connections with the spaces that surround them: in this sense they are even more similar to cutting edge boulevards. Highways are also major roads that pass through open areas. There are examples of highways in which the perceptive factor and the interaction with the landscape has been studied, analysed and suggested, and which are taken as a case study in researches on the connection between landscapes and roads (e.g. the American greenways or French motorways), with results that are of interest even for this research. However, highways differ from the boulevards, and from toll-free crossroads, because they are a closed areas, bounded by fences, in which the hybridization only occurs visually, the intersections with the landscape do not generate attraction of materials along the axis as much as a toll-free crossroad does, being it open for use and to the continuous flow from the outside. Of course the passage of a highway generates intersections, overlaps, conflicts that some highway projects have addressed architecturally: the experiences of B. Lassus, Rino Tami or Porcinai bring to light model strategies that contrasts with the common practice of mitigation at all cost. But what really connects the crossroads in mountainous contexts to urban boulevards is the ability to generate activities, actions, and materials along the axis: sediments, equal to those generated by a water courses, which deposit along the flows in a continuous interaction between each other. As the flow of a river deposits its sediments in precise points of the riverbed, and these sediments affect the water flow of the river, so the flow of traffic on a toll-free highway crossing, open to continuous inputs and outputs, tends to generate urban materials along roadsides, which in turn attract traffic by influencing the performance of the road.

A22, highway of Brennero and SS47 Valsugana: margin of the first one are free. The second one has margin characterized by the condision of spaces and "intersections" with landscape or urban elements

The SS47 Valsugana or SS12 in the section between Trento and Bolzano are very different roads from the Brenner Highway 22, because the interactions established with the context that it crosses depend strongly on the flow, the traffic of the road that flows to a certain extent toward its boundaries and vice versa. They are roads that generate two-way interactions, internal and external.

The examples given below are for the most part road projects in urban contexts. They will be examined, not so much in the function that the intersections have within the project (the aim of this analysis is not in fact to determine the appropriateness of a linear park, a museum or a lookout along a mountain road) but from the point of view of the method of interpretation of the connection between the landscape and the road and of the architectural strategies used.

Architectural devices that intersect the city at close range can be reproduced in crossroads, at the point in which they intersect with the context.

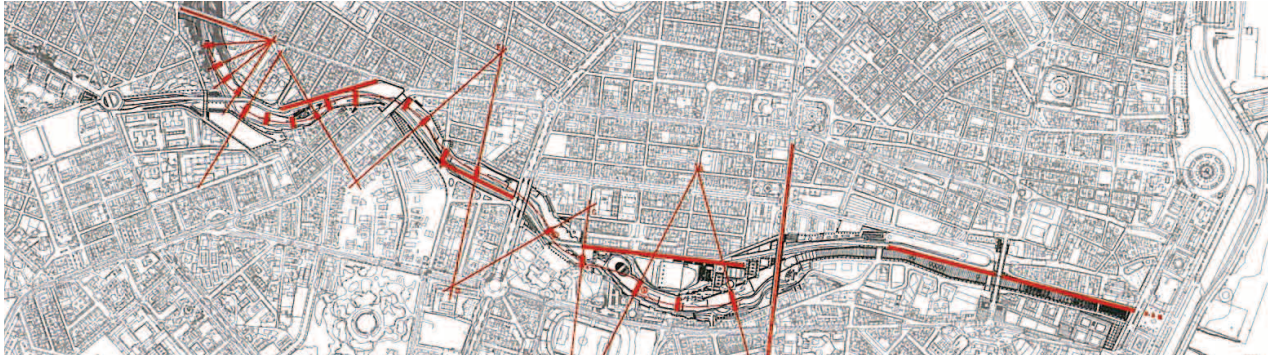
3.1.1 Interferences

Interference is the circumstance in which a street, while crossing a place, intersects with its area of influence other elements or areas of influence of elements, changing their original state. For example, when a road touches or cuts a town, interfering with grounds surrounding the buildings or the buildings themselves.

In this section we show some examples in which the interference is a strategy to create connections and transform places and interprets the possibilities offered by the differences in altitude.

The project by J. M. Palerm and T. de Nava within the Barranco, which crosses the city of Santa Cruz de Tenerife, (Barranco de Santos) is designed to intercept places and the city's emergencies forming a bond with them and from time to time interpreting and exploiting the possibilities offered by the complex morphology of the gorge within it is built, characterized by steep gradients.

The gorge, a conflicting historical element of the city, becomes a place of development of a continuity sought through the intersection of the linear park designed inside of the riverbed, and the emergencies of the adjacent urban context. The elevation is the dominant element of the project: through



the control of the spaces distributed at various altitudes along the vertical, the designers try to mediate between the different scales of the city and the places that represent it and the gorge.

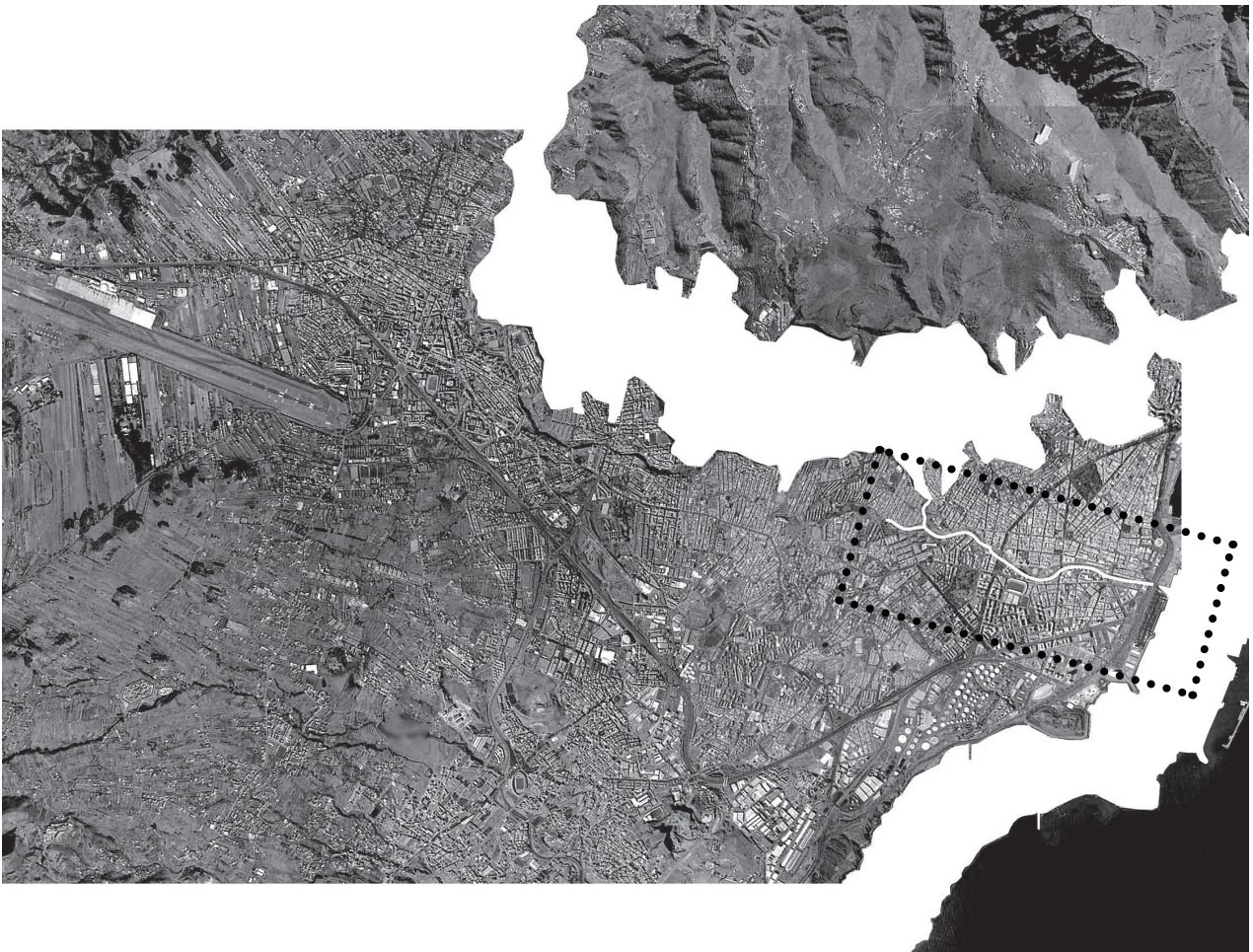
The project is developed within the Barranco, a natural gorge formed by water erosion over time and a place that gradually deteriorated because of the misuse that the population carried out. Born as a natural element created by flowing water, the barranco has had various uses, according to the convenience of the moment. At first it was used as an access to reach the sea or the inland, then as access for agricultural use, then again as an extensive dump for any kind of waste. Cola Benitez writes in *Barrancos Anazo* (1986)¹ “Not all the activities that were carried out in those places were so clean [...]. The gorges were uncomfortable places, generally difficult to reach, that people tried to avoid as much as possible when traveling. So it was a very big temptation, and a more comfortable solution to throw all that was not used in such strategic places.”

The barranco therefore presents some contradictions: as a linear element that enters the territory it is used as an access and distribution road. As a steep and rocky groove it is excluded from the paths and filled with waste.

It is anyhow tied to the use and to the inhabitants’ memory and perception (the popular expression *pull it to the Barranco* expresses an established custom in which the barranco has a central role even though it is perceived with indifference and annoyance, Mulazzani, 2010) also for the morphological role that it assumes in relation to the scale and to the difference in altitude of the orographic elements of the place: a deep groove that sits between the mountain range that lies on the north eastern edge of town and the platform of the sea at zero elevation.

Over time the city emerged in its development (numerous crossings of the Gorge, made through bridges and pedestrian walkways) and use

Barranco de Santos (Santa Cruz de Tenerife). Interferences, relations with the city.
Scheme of Palerm - Tabarez de Nava



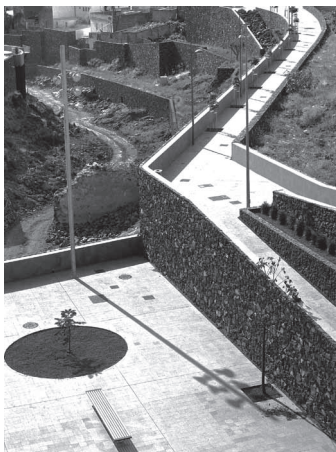
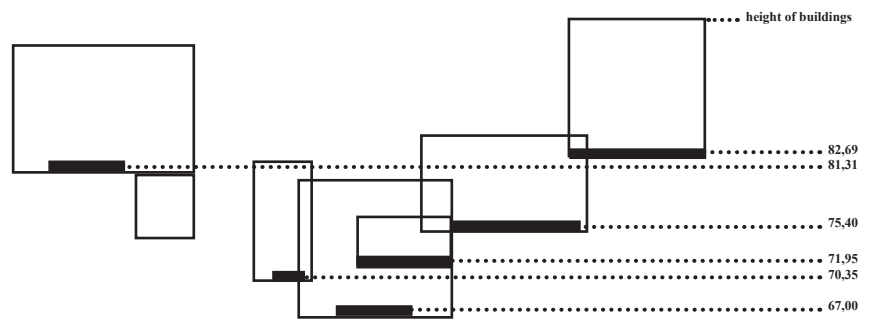
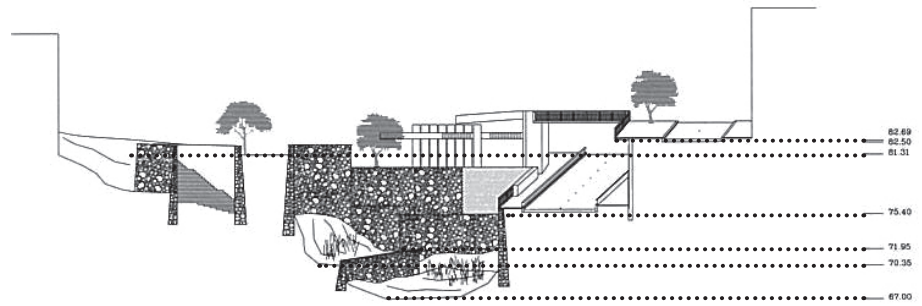
(the waste thrown in the bed of the gorge are an overlaying of the city's occurrences with hydraulic ones). The orographic picture is dominated by the difference in latitude: the large scale (mountain range and ocean horizons are present in the same view) and the local scale (the gradient in the groove of the gorge is an obstacle and the same time hides what people do not want to see). The project stems from technical requests, a new drainage system of the city water and a new road crossing along the gorge, which also correspond to the need to restore the barranco and return it to the city in terms of accessible spaces along the entire length of the groove.

The available space in which to develop the program consists of the walls, steep and complex, inside the gorge: so it is a vertically arranged space and the project serves primarily to connect multiple latitudes.

Interferences are interpreted as vibrations of a rope localized in some of its points, but that have an impact on the entire axis.

By using a metaphor, one could argue that the path of the Barranco is like a mathematical series that presents regular oscillations and other

Barranco de Santos
(Santa Cruz de Tenerife).
difference in altitude in a
large scale: the relation with
mountain and sea



irregularities, in which the variable of the imagined formula is represented by different interactions that the gorge determines when it crosses the city: the natural elements that have influenced and determined the morphology of urban development, and the artificial ones that men have determined by expanding their settlements. The Barranco, if we accept this condition, is like a violin string, that when pinched has some harmonic points and some others that are not. The challenge of our interpretation lies in identifying and locating these points.

J.M. Palerm, 2010

Barranco de Santos
(Santa Cruz de Tenerife).

On the right: continuity of the spaces obtained through relations between spaces in difference altitudes.

On the left: images of the road and the ramps.

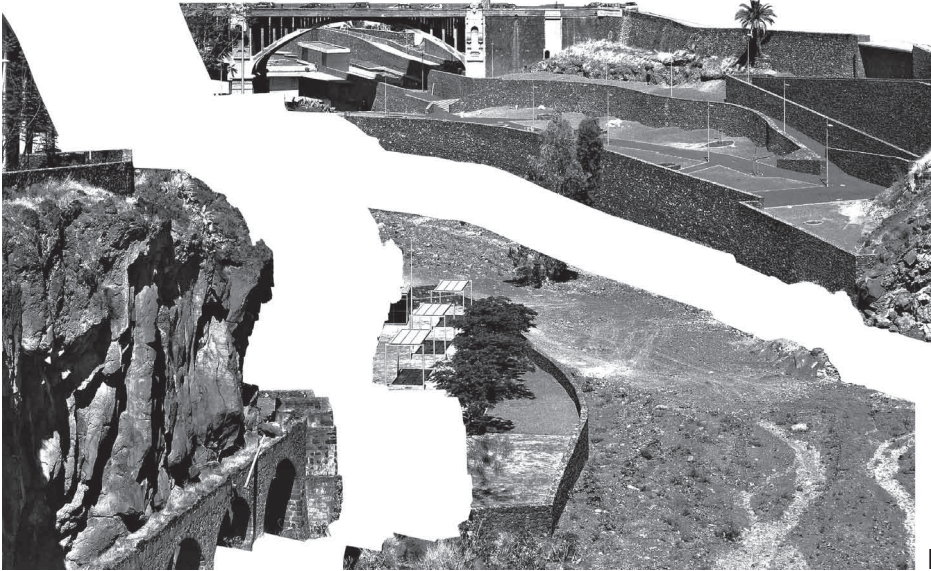
From the technical requirements (roads crossing the city, but also waste water and garbage disposal and maintaining a balance in the management of the gorge), the Palerm and Tabarez de Nava plan and seizes the opportunity to become an extended landmark within the city, creating mutual interactions along the city borders and within the gorge. These interactions are studied through the cross sections: the continuity of spaces happens through the passage between the elevations of the many places designed and distributed along the banks of the gorge.

The Barranco is an irregular line affected by numerous events along its path and, in turn, is intersected in the upper section by crossing lines - the bridges - which come from the perimeter areas and from the city limits. At this higher level it is joined by a central or middle area - formed by the edges of the gorge - and a third lower area, the riverbed².

URBAN PLANE



EDGE OF THE GORGE

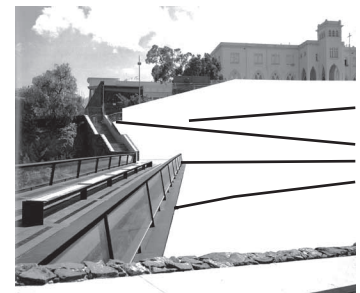


BASALT PLATFORM

The morphological interpretation of the Barranco starts from the subdivision of the elevation bands that characterize it. The first level is that of the city, superimposed over the Barranco through numerous crossings and overlooked by places that are considered strategic. The second intermediate is the edge of the gorge and third is the bottom of the gorge, a continuous sheet of basalt, which has been cleaned of the sediments and brought back to light.

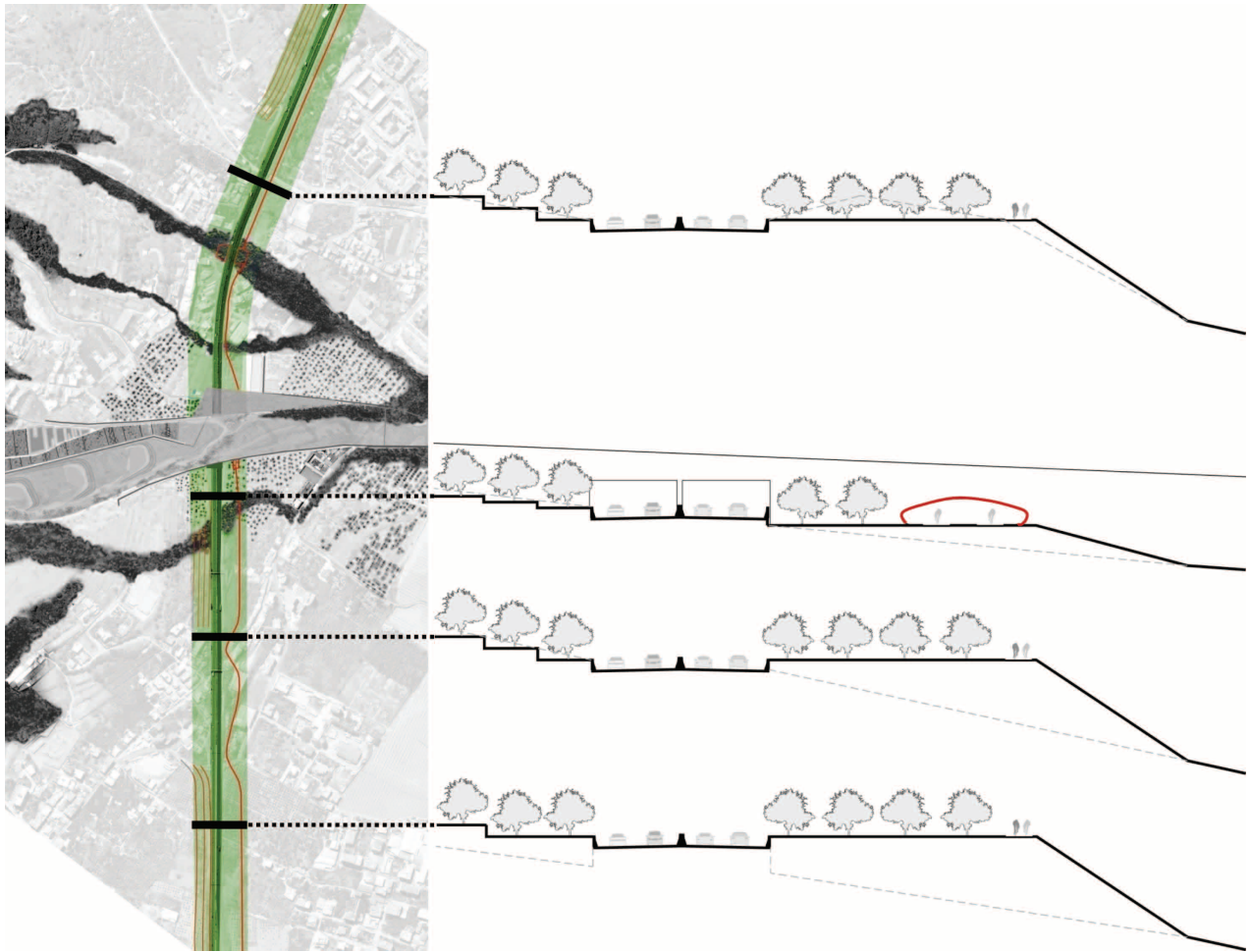
The plan shows, in the middle section, its ability to connect the city to the continuous line of the barranco. Along the wall of the gorge area is the new road crossing, eight kilometres of road with one lane in each direction at the intermediate elevation point, so that often it is hidden below the upper edge of the riverbed.

Pedestrian paths cross through the entire length of the gorge and bring to rest areas, plazas and public spaces rich in vegetation. The connections between the city level and the various levels of the linear park are made of ramps covered with stone that decorate some of the steep slopes of the gorge: the city seems literally bent under its paths, streets, public spaces and vegetation, in the wake of the gorge, attracted by its depth. The cross sections show the search for continuity in fragmented spaces on multiple levels through feeders, vegetation and uniform materials.



Barranco de Santos
(Santa Cruz de Tenerife).

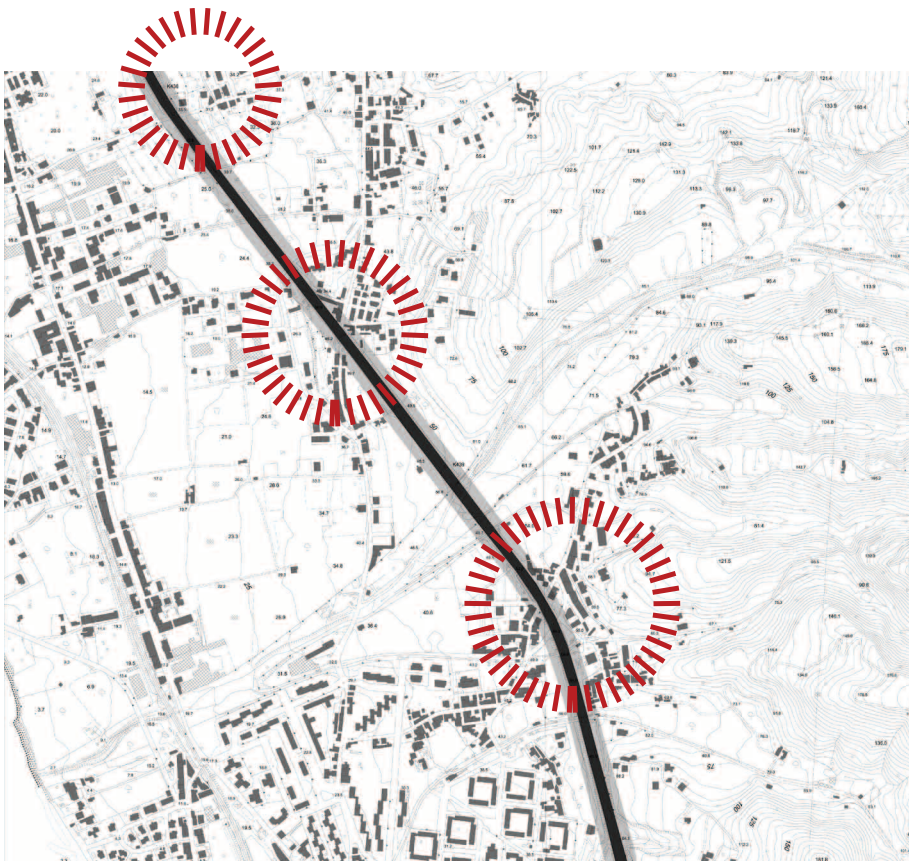
difference in altitude in the small scale (relation between grounds of barranco and city).



Subject of the workshop *Pettinissa. The big green line*, held in Reggio Calabria in July 2011³, the last section of the Salerno-Reggio Calabria highway, between Villa S. Giovanni and Reggio Calabria is focused on and offered to the study groups as a long element around which to design a transformation of the landscape. The study area is a span of three hundred meters in width aligned to the path of the road: the span therefore will have the chance to intersect/interfere with the elements that make up the urban landscape of the Strait of Messina: a fragmented landscape made of crops, roads, unauthorized residential buildings and many other elements arranged disorderly along the slope of the Calabrian orography. Further interference is caused by the crossing of long canals, the rivers: typical features of this landscape with a delicate hydraulic equilibrium although fundamental for the functioning of the territory.

As demonstrated by the study plan proposed by the group of the Scacciotti area, an element with defined morphological rules that follows the road crossing may help redefine, redevelop and substantially redesign buildings, fields, quarries and landfills, giving them new connections

Workshop *Pettinissa. The big green line*. PhD Group. Cross sections along the road.



through new accesses, new elevations and new services.

The project consists of an embankment/ridge one hundred feet wide, that redefines the ground and the edge of the road, enlarging it. The material of the embankment is retrieved from fiumara Scacciotti, which constantly carrying gravel from upstream to downstream, and whose bed is obstructed by large amounts of material. This green belt is equipped with a cycling path (which runs along the road) and is prepared for trial cultivations, to replace those expropriated for its construction.

Through a width of thirty feet, the embankment overcomes whatever it finds in its path: in the overlap with the other elements we try to define new hierarchies, new relationships between things, remixing an order established by the incident. The embankment changes the elevation imposed to houses and crops, linking it to an axis equipped with paths, networks: a new public crossing which leads in turn to other public spaces. The latter are constituted by a green system of walkable floor area that descends from the slope and crosses the road, interfering, in turn with the embankment and reorganizing the public spaces, now devoid of a logical hierarchy.

The project of the Scacciotti group simultaneously uses the potential of the road meant as an organizing element (through interferences) and the potential inherent in the readjustment of the imposed elevations of the



Workshop *Pettinissa*. *The big green line*. PhD Group.

Interference and difference in altitude are the occasions for redefine spaces of the fragmentation

elements placed on the ground. For example, unauthorized residential areas lacking in public spaces, entry paths, shared facilities, find in the interference with the embankment along the road the opportunity to redefine their settlement conditions, never really addressed by a design point of view. A new ground plan defines the ground attacks on the buildings, supporting connection routes with the new public spaces, gardens, local community facilities.

In this project the space of the road never comes in conjunction with new areas of the embankment. The two systems are separated in space: their only link is the proximity of the road, and consequently the embankment that defines the edge, and the constellation of fragmented elements that surround it and that are invested by it.



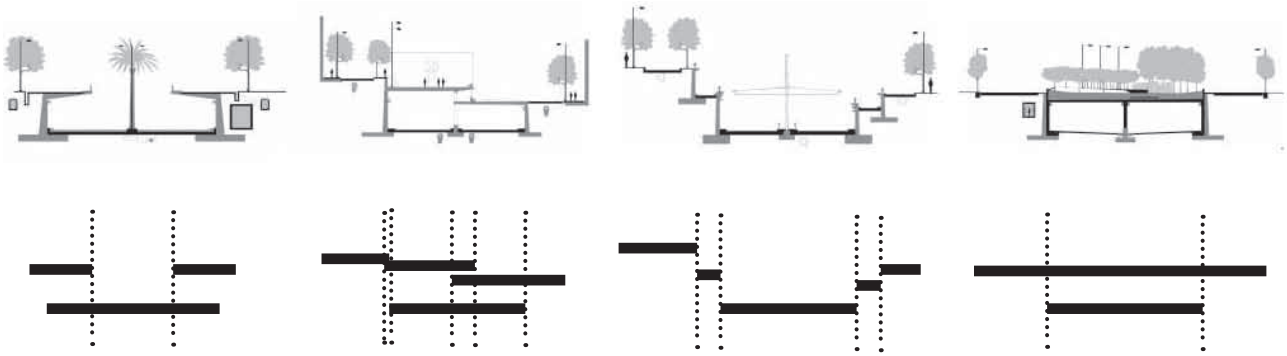
Similarly, the project of Bernardo de Sola for the Ronda de Dalt bypass of Barcelona, establishes a morphological link between the road and the town based on the imposed elevation of the road level and on the position with respect to the urban plan. Road and town, while influencing each other and interfering with one another, remain completely disjoint in the spaces, maintaining in this respect the feature of closed systems.

The bypass is designed as a double structure: the main section in the centre, consisting of isolated non-signalled roads (speed limit 80 km/h), that connects with the regional network and medium and long routes; at its sides, the signalized routes, non-specialized, are responsible for creating connections with the local network. The double structure, different in the different sections, separates these bypasses from similar ones created in other European contexts and solves, thanks to the multiplicity of the cross sections, the function of both infrastructure, connection and distribution.

The system used by De Sola consists of four typical sections.

- 1) Coplanar: the central section and the side streets move parallel to the surface, producing a high barrier effect. This solution is adopted only when the characteristics of the ground does not allow to lower the road level;
- 2) Trench: while the side streets are moving to urban level, the central trunk runs in the trenches and this reduces the visual impact of the infrastructure and the noise level of traffic;
- 3) Projection: when morphology can't be modified and/or the transverse dimension is reduced, the side roads surmount by an overhanging on the central section lowered in the trenches;

Ronda de Dalt (Barcellona).
Double structure in different
altitude level.



4) Full coverage: When possible, the central section of the underground bypass is covered by a concrete slab. The artificial ground, which is thus obtained, can be used for vehicular traffic (change in direction, connection to the local network, road junction, parking areas, etc.), or become an available area for the construction of new public spaces (parks, squares, sports and recreational areas) and new service facilities⁴. In particular, in this last typological solution the road provides the possibility of adding pieces to the city, new land, public spaces linked to existing borders that upgrade and give new meanings to them.

3.1.2 Planning sections: the waterfront of Anversa

The road is defined geometrically by a completely different scale of dimensions: longitudinally, the road is a territorial element; transversally it takes the scale of the place, and the cross section becomes the fundamental instrument of investigation and design⁵. We have already seen how, in road engineering, this dual geometry has its own representation instruments, on one hand the cross-section and on the other the longitudinal profile, and how these instruments of geometric representation have the specific characteristics of that discipline. In particular, the road's longitudinal profile is represented in dual scale, with the size in height multiplied compared to that of the length in order to highlight the difference in height between the ground and the traffic crossing level. The progression of the cross sections indicates the body of the road and its state of progress along the longitudinal profile: it indicates how the road is made.

Working on an existing road or planning a road ex novo involves both for the engineer and the architect to deal with the two fundamental scales of the road. As for the engineer, the road profile provides information on road sections with longitudinal slopes or on the amount of structural work, excavation and road embankments, the same



Ronda de Dalt (Barcelona).

Cross sections and different solutions based on the difference in altitude.

View of the square over the road

J. Nunes, project for the waterfront of Anversa, Belgium.

Simple “typical” keys. Each key interprets a specific situation in the waterfront.



happens for architect, even though he doesn't have typical graphical tools, specific for the profession or research, the territorial dimension of the road carries meanings and characteristics that need to be extracted, analysed and interpreted. To intervene on the totality of a road with kilometric longitudinal dimensions requires adequate representation tools and a method by which to proceed with order without neglecting the specificities of each crossing point and at the same time enhancing the overall characteristics, found in every section of the road.

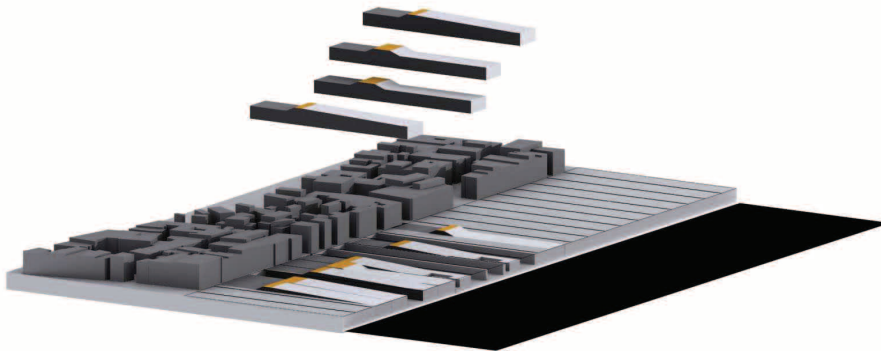
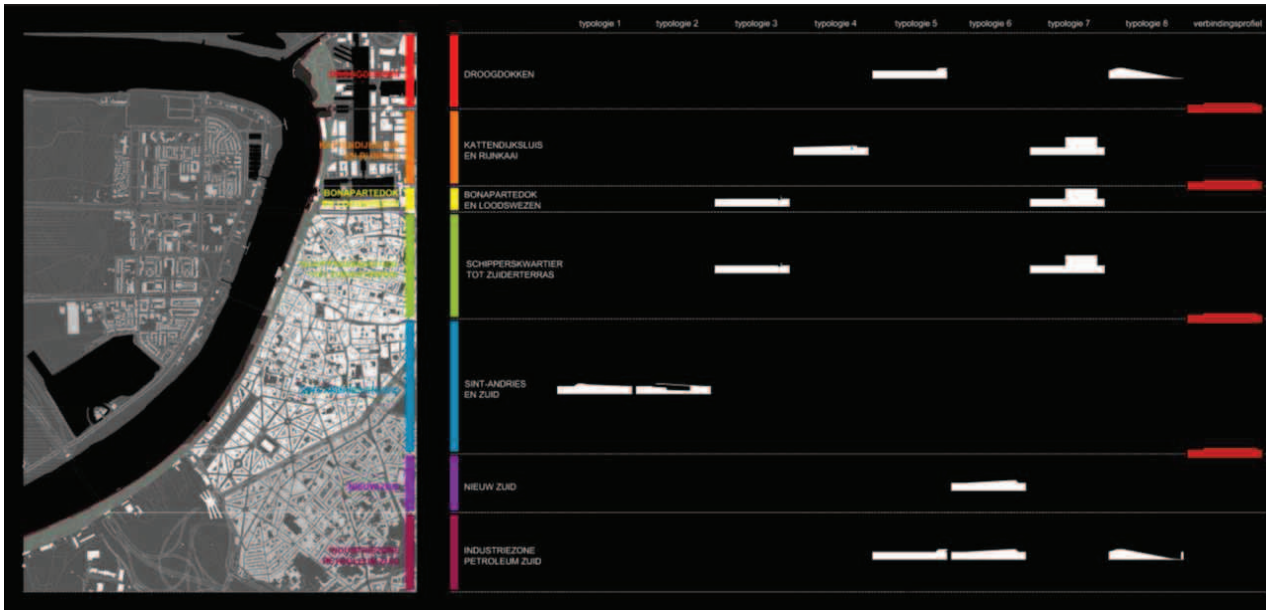
In the case of roads in the mountains, for example, the global features are the topography and the verticality, as suggested in this thesis, but may also be the climate, vegetation, buildings, systems of territorial control (dams, bridges, river regulations etc., hydraulic structures, networks and rock fall galleries, etc.): all these factors, individually or in groups, may be the central theme of a single road path.

By maintaining the overall characteristics of interpretation of a single road, locally there are many different intersections with the places they pass through, which may lead to interpretations that are distant from each other. The mountain roads, for example, can pass through crops, rivers, mountain passes, urban areas, industrial areas, individual emergencies. It may cross all these peculiarities at different heights and in different ways (in the trench or tunnel, on a viaduct or bridge, on an embankment, etc.). As part of a global action on a road, and in particular on a mountain road, there is the need to follow a plan that holds together the territorial and local aspects, without betraying the established principles of interpretation.

The project of the Proap (Joao Nunes) studio for the repairing of the front of the city of Antwerp (Belgium) holds together the two scales with a program of typological sections that provide longitudinal continuity, while effectively addressing the specificities of each intersection point between the project and the city.

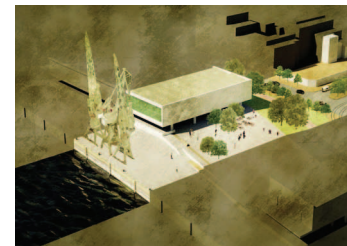
The design for the repairing of the front of the city of Antwerp shares with the road situations the need to start from a technical requirement. In this case, the need is a hydraulic one, such as defining the urban edge by establishing a diaphragm with the function of separating the land and the water of the river. A series of dams and levees is a diaphragm that separates the river from the city, from time to time moving back and forward depending on the needs and the link between the planned front and the spaces of the city.

To the contrary of other waterfront projects (Benidorm in Spain, Den



Haag in Holland, Reggio Calabria in Italy, etc.), that use a progressive scan between land and water through sections parallel to the coast in order to even out the gradients, in Antwerp, Nunes articulates the front of the project in cross-sections of equal thickness. Each section contains a typological solution divided by groups: wall, dam, trail, open space etc. are the types contained in each section and are a progression of spaces that connect the city to the water. The types are reduced to a limited number and are chosen according to the connections to be obtained with the city, point by point, giving each place a section that answers to its needs.

All contextual and formal solutions explored conveyed in the creation of a 'toolkit' containing instruments capable of adapting to the different requests and situations, and applicable in partial typological segments along the whole zone of intervention. Therefore different typological sections can be now incorporated, as a dynamical and flexible development process of the master plan. This is why the proposal is presented as a game - the



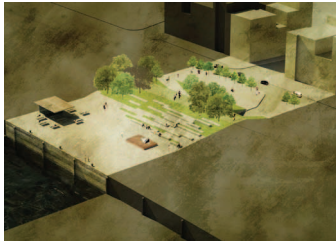
J. Nunes, project for the waterfront of Anversa, Belgium.

Synthetic chart of different intervention typologies and their possible application along the river waterfront.

Application example: all pieces are combined in order to dialogue with each section of the waterfront.

Rendering of typological interpretation of the guidelines

“kaaipian-spel”, or planning game – with pieces (which are typological sections from the toolbox) and rules (which are case studies of the single areas, defined by local intervention programs)⁶.



In this project, the method used by Nunes allows you to control both the longitudinal scale and the precise relationship with the city, while being consistent with the morphological, functional and principle aspects of the intervention. Each section contains in itself a part of the general program of intervention, applying in a local scale, the overall principle of the whole front. Like a road, local intersections explicated with cross sections deal promptly with diverse specificities.

3.1.3 Rarefied intersections: Detour, landscape road

Intersections of mountain roads in open areas with local elements can be drawn closer (e.g. when crossing the urban centres) or rarefied, as in the case of cultivated land dotted with villages, lookouts, natural areas, etc. Sequences of spaced sections set the variable rhythm of the intersection between the road and the place or between the road and the landscape, defining a logical path that involves entire roads and consequently entire territories. Longitudinal road crossings of the valleys or roads that are transversal to them, may have in themselves such sound logical characteristics to provide sense, recognisability and value to the entire path.

An individual can open and define a path in the wilderness: but, unless he is followed by others, his path will never become a street or road, as the road and the street are social institutions and it's their acceptance by the communities that gives them a name and a function⁷.

The SS 47 Valsugana highway, a fast speed road crossing on the valley floor, is a path marked by tourism, labour or transport commuters, as well as by locals when moving from one town to another. Every traveller remembers recurring places (stops, emergencies, deviations known to few), but overall it is possible to identify different sets of factors objectively or potentially perceived, arranged in a rare sequence along the road. Similarly, the SS42 in the stretch of the Trentino Alto Adige, a transversal cross road that runs across four alpine valleys (Val Cavallina, Valcamonica, Val di Sole and Val di Non), has recognizable

J. Nunes, project for the waterfront of Anversa, Belgium.

Rendering of typological interpretation of the guidelines stated by the master plan



places for which it is distinguished.

Strategies based on the rarefied intersections between road and places or landscapes crossed are designed to highlight the global nature of the route through specific elements, individual sections effective because of their sequence (longitudinal scale) and of the way in which they interpret the relationship with the place. On mountain roads, the latter aspect often is confronted with the issue of vertical dimension. The experience of the *National Tourist Routes in Norway*⁸ program, commissioned by the Parliament and the Norwegian Government to the Norwegian Public Roads Administration (NPRA), is the establishment of a tourist route through the road along the Norwegian Atlantic coast in which the intersections with particularly beautiful sections of landscape are rhythmically punctuated by punctual rarefied architectural elements, each designed to highlight specific features of the landscape.

The architectures created on the road side are planned from time to time by different parties, emphasizing the diversity of the specific interventions.

The program aims to promote tourism along the Norwegian Atlantic coast, and extends geographically throughout the State. The streets involved are eighteen, combined in a single path along which a series of small architectures are arranged, spaced from each other, with the role of tourist attractions. With their different functions from time to time (lookouts, parking areas, bridges, pedestrian paths ...) the architectures develop from the kerbside and spread deeply into the landscape: as perceptual devices (lookouts or pavilions that attract the view) or as devices of mediation that distract people from the speed and the road



National Tourist Routes in Norway

View of a typical bridge along the road

National map and example of local map of the touristical path along the roads.

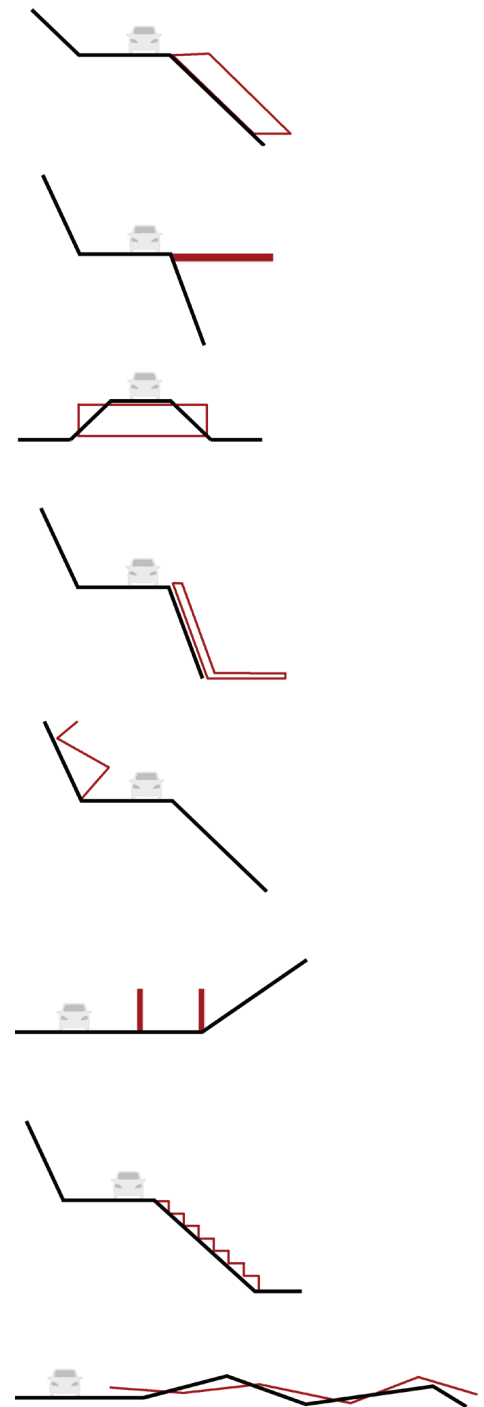


edge (transversal paths to the road, parking areas located at different heights from the road surface).

The Norwegian Atlantic coast, orographically rugged, has a complex morphology. The designers involved in *the National Tourist Routes in Norway* program, in most cases have integrated the gradients and the elevation as constituent elements of the project. The solutions are diverse and so numerous as to be able to obtain an ordered series of repeatable architectural devices, focused on the interpretation of the difference in altitude. The devices work on the double scale of minute detail and local orography. They refer to the lookouts that work on the orographic vertical, rest areas developed at different levels from the road, terraces that link kerbside and benches developing vertically down the slopes, ramps that gain height by suddenly changing direction.

Visitors of the Atlantic coast, in spite of the potential “slowness” of the Norwegian landscape, have the opportunity to experience continuous changes of scale: the longitudinal scale of the street, characterized by the speed with which the pass through the landscape, the small scale of the buildings at the roadside, characterized by spaces on a human scale and finally the orographic scale of the paths along the cliffs and slopes and overhanging lookouts that can be found on the Atlantic fjords.

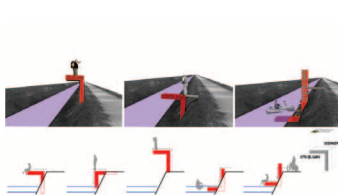
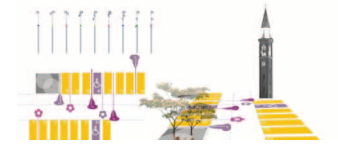
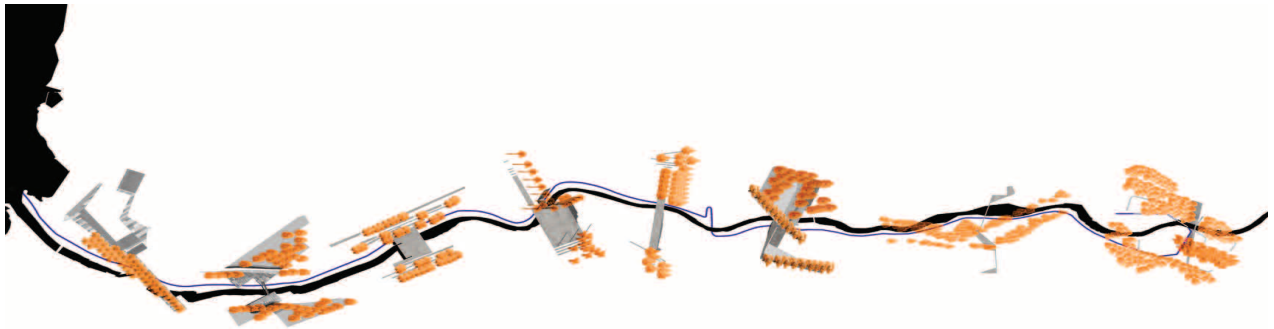
The *National Tourist Routes in Norway* program is a strategic government choice linked to tourism, an area in which the characterization and the highlighting of evocative features of the landscape (nature, trips, rests in beautiful places, etc.) are effective motivations for local marketing. The reproducibility of this strategy is possible even if not linked to tourism. The architectures proposed in the Norwegian program are small, have an insignificant cost when compared with the territorial extent. Yet, through a strategy of rarefying and timely distribution of architectural elements, they are able to establish a global link between road and landscape and simultaneously connect them to the places through architectural interpretation devices of the project sections. The interpretation of the elevation in the timely elements might seem like a side aspect of the strategy, however, it constitutes a fundamental characteristic: rooting them into the ground and into its geometrical features allows, in this case and potentially also elsewhere, the passage from road dimension to the local dimension, anticipating a deep connection with the landscape. Similarly, some experiments carried out by Franco Zagari, with his team from the Mediterranean University of Reggio Calabria⁹, intend to affect the semantic features of the landscape through timely interventions



National Tourist Routes in Norway

In the previous page: architectures along the road

In this page: schemes of architectural tools for difference in altitude.

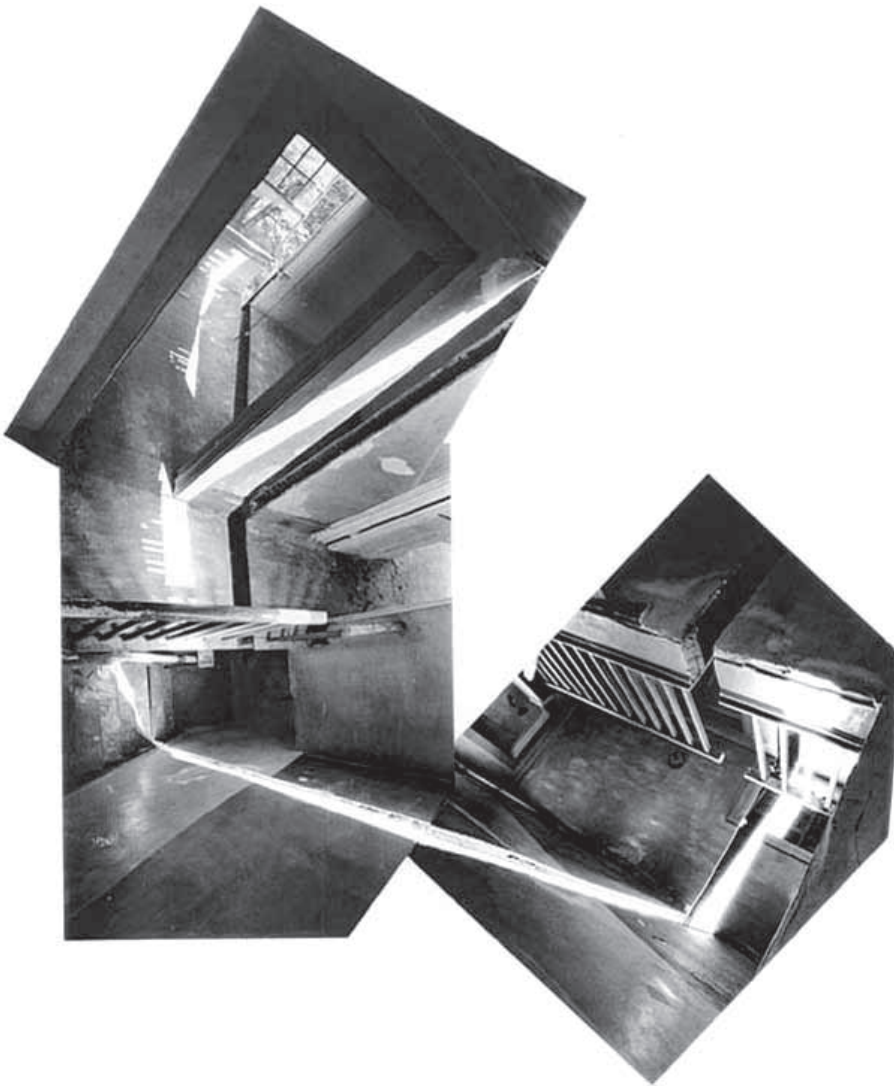


with a very low cost but repeated and widespread. The suggested actions intersect passage nodes that present peculiarities not so much in their individual dimension, but in the frequency with which they repeat themselves (parking lots, squares, hedges, nodes in the pedestrian paths, etc.). The feature of a *cloud* system of small interventions is related to the amount of repetitions, which must exceed a certain limit in order to be recognizable and distinctive.

The “acupuncture” interventions led by Franco Zagari are similar in approach to the *National Tourist Routes in Norway* program¹⁰: such as in the rarefactions, timely connections between architecture and landscape, and he demonstrates the possibility of extending these peculiarities to the landscapes of everyday life, such as those of some road sections in mountain contexts, a pattern that tends to embed the road to its context.

On the top: Franco Zagari, 8 bridges along the Sarca (Arco, Trento).

On the left: workshop in Camposampierese (PD). Projects diffused in the landscape.



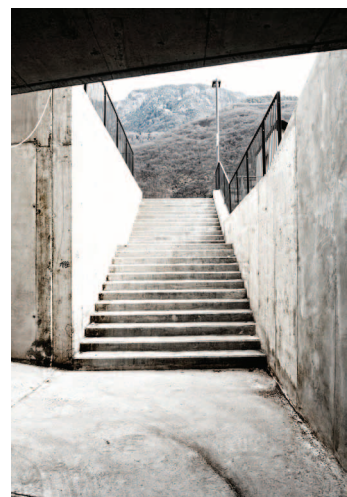
Gordon Matta Clark.
Splitting, 1974 - 1975

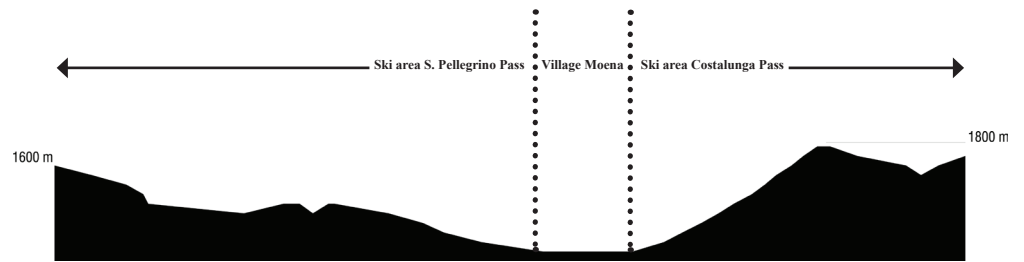
Paths and detours
in mountain landscape

3.2 Continuity/contiguity: the design of places and landscapes through sequences of spaces.

The difference in altitude in mountain contexts is a characteristic that produces discontinuities between spaces and places. Often, to connect different places at different levels are required uncommon routes that may appear misleading, or become perceptual experiences. We have seen how the roads with hairpin turns are, without any special interventions, perceptual devices of the landscape, articulating the views rhythmically along an extended path that gradually gains altitude and provides views in all different heights. Otherwise, roads with a variable vertical produce gradients which can create barriers when they overlap with the context in which they pass through, and the passage from one side of the road to the other happens through underpasses, pedestrian paths at high altitude or long detours from the main path.

In some study case surveys in mountain contexts, the pursuing of





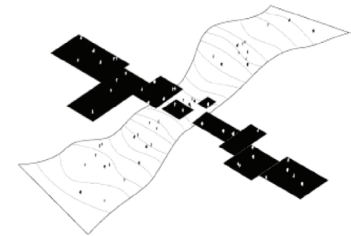
continuity of space with architectural tools becomes a development strategy for the place.

In the town of Moena, a tourist centre of mass compared to the Val di Fassa (TN), the transversal continuity of the space is the possible strategy for connecting the two sides that converge into the valley, historically divided by the highway that crosses through it. The strategic opportunity is born by carrying out the solution of a roadway problem: the construction of the junction, dug into the tunnel in the east side of the town: the new infrastructure eliminates the traffic that goes through the town centre, creating an important opportunity to transform the city's spaces. Moena, central to the Val di Fassa, is the starting point of some ski trails (winter) and natural trails (summer).

However, while offering a high capacity hotel accommodation, it isn't the final destination for tourists who travel a long distance from there to towns or ski slopes in higher altitudes on both sides that surround the town at west and east. Today Moena, with its urban areas characterized by gradients and steps even within the town and by a disorganized suburban development, is a large element of discontinuity between the two sides, removing the access points to the ski lifts and forcing the tourists who stay there to use their cars. The program outlined by the City through a development plan called Project Moena, foresees a complete transformation of the transportation system along the valley and transversal to the town, integrated with interventions to link the morphological elevations. The purpose of the plan, now (2012) still under development, is that to bring the first access lines that bring to the mechanical connections that lead to the high altitude passes, to the axis of the town, since it is the real destination for tourists, and simultaneously connect the two touristic sides through the reorganization of the elevations in the town's spaces.

Village of Moena (TN).
Cross section of the Fassa valley: the village breaks the continuity of the ski area. Whith the new ring become possible to rejoin the edges of the village

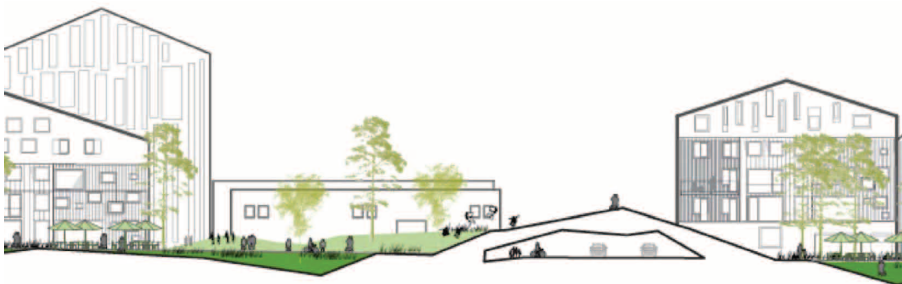
A similar problem, in a more advanced planning stage is offered by the project Oppdal +, of the Danish study Adept Architects¹¹, winner in 2011 of the first prize in the competition "Urban and landscape development" organized by the city of Oppdal (Norway).



The project stems from a situation equal to that of Moena: the town's junction frees the urban centre from traffic, creating an opportunity to reorganize urban spaces through a cross-reconnection. The Adept transform the main road in a continuous space that is spread smoothly across the town, and overcomes the infrastructure barriers that cross it longitudinally through a very wide bridge area.

The cases of Moena and Oppdal are comparable in the expectations with which they were created and in the strategies that were used: even though Moena is still in the makings, Oppdal is already in the preliminary phases. In both, the use of strategies aimed at creating continuous spaces is the tool for outlining future scenarios of development. In the case of Oppdal, in particular, the design provides for the connection of different elevations through a fluid element that flows without solution of continuity: a single place designed as a function of the movement, in which the city flows like a fixed backdrop to its sides.

The experience of the fluid space is comparable to the project by J. Corner for the reuse of the High Line in Manhattan: a unique opportunity in the recovery of abandoned infrastructures, because it allowed the use



Adept Architects and coll.
Project of urban landscape
developmet for Oppdal,
(Norway).
Global viewof the purpose

Concept of the spaces and
paths continuity.

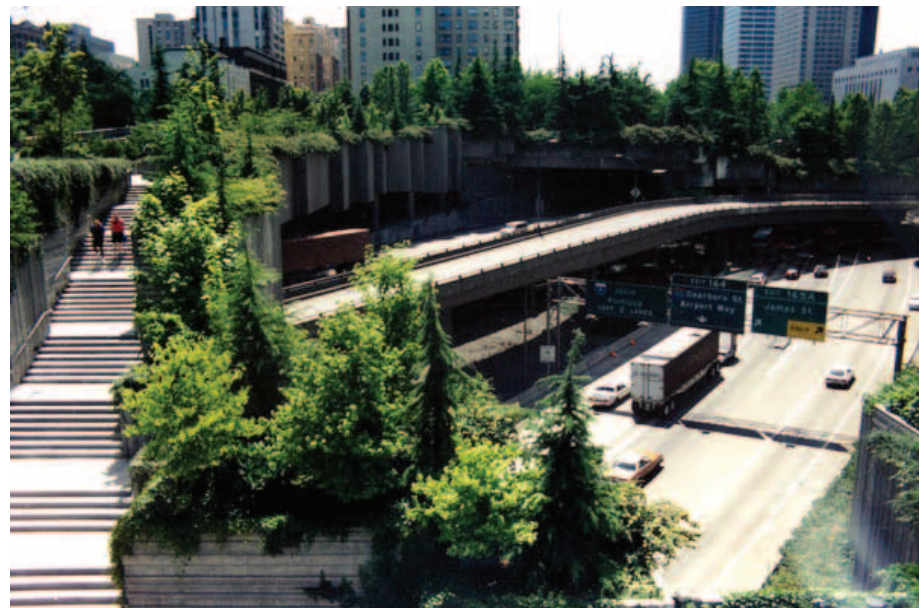
Cross sections of the
bridges - surfaces



of the height of the former railway line to cross the city at a level free of obstacles at a reduced speed¹². The High Line is now an elongated place in which the sequence and the variation is entrusted to the surrounding buildings, perceived from a new elevation. By maintaining the function of the viaduct, albeit at low speed, the high line becomes a device for crossing through the city streets and barriers through a continuous space.

The projects of L. Halprin and Weiss and Manfredi for the city of Seattle, respectively Park Freeway (1976) and the Olympic Sculpture Park (2010) are linked by the function of the infrastructural crossing beams that level the different heights of the city. Unlike the crossing projects in which the path is a single fluid space, the two Seattle projects are composed as following: one through sequences of close spaces that are levelled from time to time, the other through cutting operations performed on an ideal sloping surface.

In the first case, the Halprin project designs a series places next to each other at right angles at different elevations (progressively higher as you get closer to the ridge of the system) and connected by stairways. In the study of Halprin as Landscape Architect, J. Burns notes that the use of Halprin's three-dimensional work is a refined tool, not immediately noticeable. Even in Freeway Park, the three-dimensionality is split into two dimensional levels: an urban scale, the difference is an extrusion of the imposing castle of extruded volumes that show their verticality through the multiplication of vertical lines; human-scale spaces defined by lights and shadows and controlled perspectives that recall from time to time the next frame.



J. Corner, Field Operations,
High Line, New York
(USA, 2011)

L. Halprin, Freeway Park,
Seattle (USA, 1976).

When we experience Halprin's environmental facilities, the sense of the path and involvement that is basically provided to us by the three-dimensional effect, created by a complex layering that is sometimes easily visible and others is hidden to the visitor. High versus low, wide to narrow, shadowy planes combined with light planes, first floors or intermediate floors compared ground floors. One can perceive the three-dimensionality at the desired levels, simply by advancing or watching or plunging into the scene entering it with life and action. The three-dimensionality creates new possibilities for people, incorporates many elements of the environment and makes these places more than just the sum of their parts¹³.



In the design of Weiss and Manfredi, more recently, a slope with a gradient of 14 meters crossed from railway and infrastructural road bands is tackled through a sequence of sloping triangular and

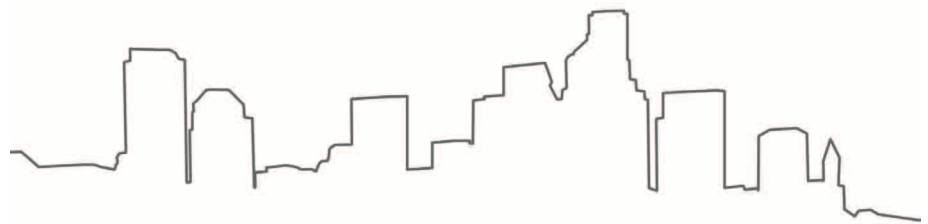


L. Halprin, Freeway Park, Seattle (USA, 1976). Perspectives recall from time to time the next frame.

Weiss e Manfredi, Olympic sculpture park, Seattle (USA, 2010)



trapezoidal surfaces, linked through the combination of adjacent and differently oriented sides. The surfaces are obtained by carrying out a logic cut into an ideal surface, located approximately to link the elevations of the project: the cuts match the passage of infrastructural lines, but also define by separating four different areas of the project. The passage from one area to another happens by the turning of the path in the opposite direction, with a device similar to a winding road. The Olympic Sculpture Park is an architecture landform project, in which the operator (the cut surface) is the device to connect different heights and simultaneously insert within the composition infrastructural elements. Consistent with the characteristics of landform architectures¹⁴, the system defines with the same morphology all the elements (buildings, bleachers, pedestrian walkways, etc.) arranged in space, regardless of the function attributed to them, generating an appearance of an artificial topography that mimics the geometry of natural forms¹⁵.

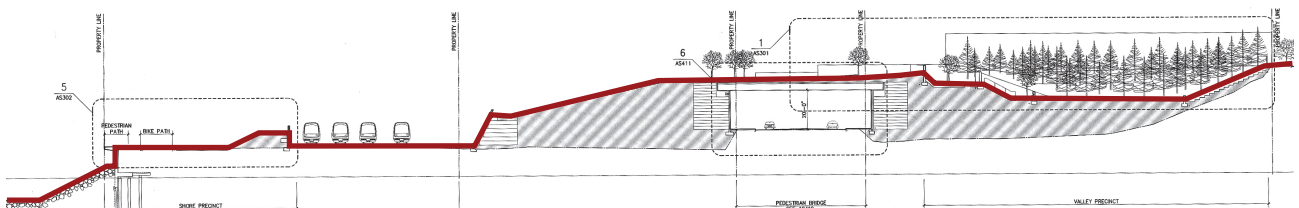
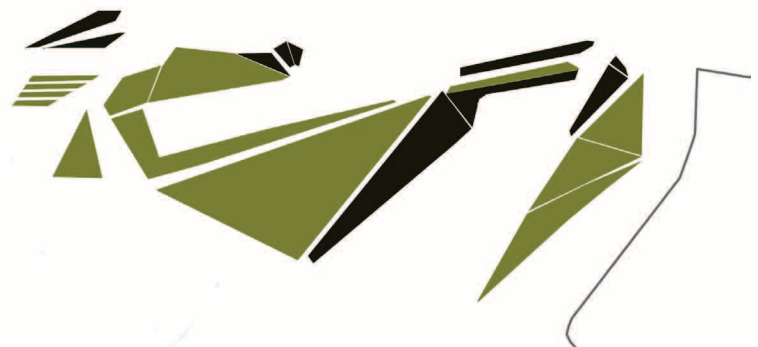


Weiss e Manfredi, Olympic sculpture park, Seattle (USA, 2010)

Concept.

Composition with sequence of triangular spaces

Cross section



In the same city, the two projects can be considered to be quotations of each other¹⁶ not so much in form, as in the site theme of the articulated place that in its development connects gradients created by the infrastructures. The composition of the sequence presents, however, differences: in the first case, the spaces, fragmented and recomposed through joints that constantly recall one another, appear as a continuous sequence, in the second passage from one to the other happens in fixed points, in the curves and the surfaces that define the triangular forms and compose more fluid spaces.

The gradient caused by a *fault in the land* can be used as an occasion for the development of an architectural path. The Portuguese experience of A. Siza shows the search for morphological features of the place to create paths set on the sequence of spaces. In the path towards the house of Cha to Boa Nova in Leca da Palmeira (Porto, 1963), the difference in height between the floor of the parking lot and the building is an integral part of the composition, which develops through a series of ascending planes, delimited by partitions with the function, as well as of containment, of distribution.

I do not think that the mechanism is very different than the required access manner to the Acropolis of Athens through the Propylaea, in which you suddenly discover when close, thanks to the viewpoint from below,



A. Siza Vieira, Casa da Chà, Matosinhos (Oporto, 1963)
The course designed by Siza gradually reveals the building.
From the floor above the building hides the mechanism approach.

the pronaos of the Parthenon, which seemed far away when seen from the city and then, disappeared from view while climbing. [...] The outer arrangement establishes with the slope of the land a different topological relationship: the geometry of straight lines becomes a revelation of the countryside. The path is the element that directs the use of a micro geography that Architecture rediscovers and reinvents.¹⁷



The sequenced path is a hallmark of Siza's work, and is also available in other architectures: but, unlike the house of tea in which there is a lack of elevation, the composition happens in a more complex manner, by using more elaborate architectural elements. In the School of Superior Education in Setubal (Lisbon), or in the Museum of the Serralves park (Porto), Siza, while maintaining the simplicity of the figures, use planes, partitions, colours and floorings to define the sequences approaching the building, in a more dense way than in Matosinhos, where the gradient itself contains the germ of the articulation of the path. Road architectures in places with topographies of variable elevations face the path through the composition of a fluid space, or of sequences of road elements.

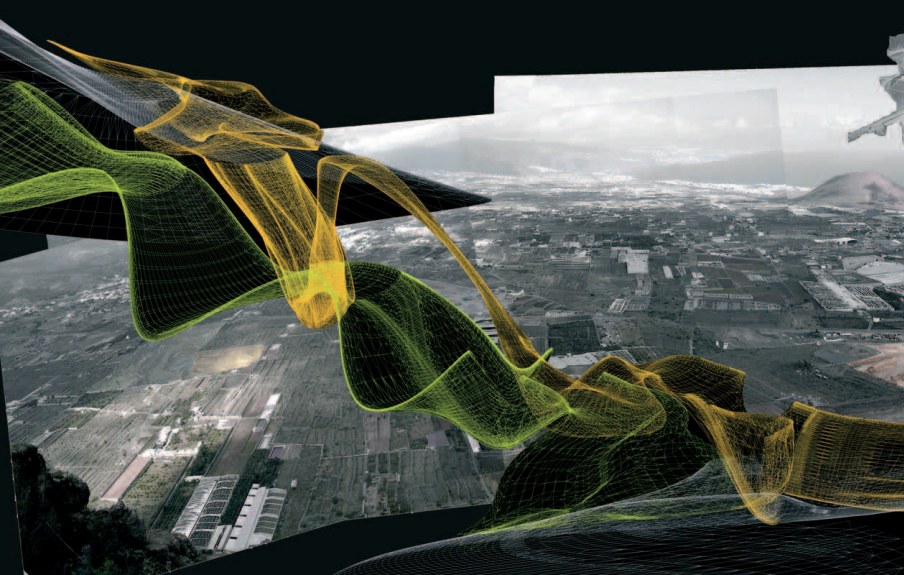
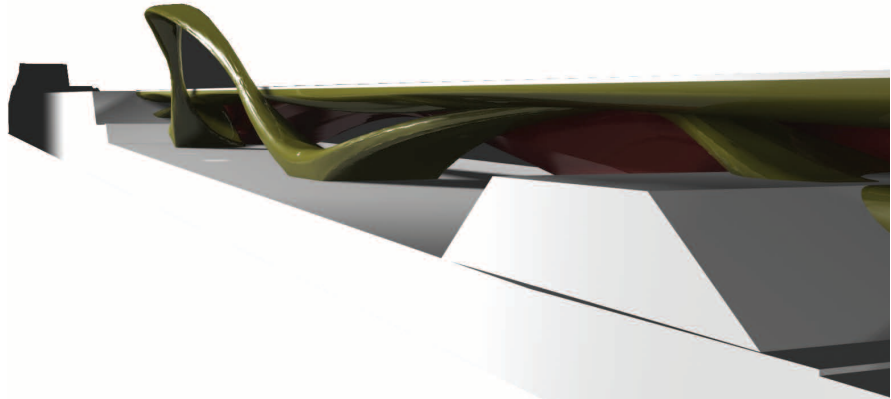


The theme of the route can be addressed through the project of road elements or of the edge of the road marked by continuity by establishing a principle or sequence, in the first case working on continuous elements that interact with the topography of the place, in the second case on timely elements as recurring road artefacts.



For example, two design experiences that share the theme of infrastructures in complex orographic contexts are the researches addressed by the group led by C. Lamanna for the SS42 between the section of Caldaro and the Mendola pass, and for the Barranco de Badajoz de Guimar, during the International Seminar *Proyectar el Paisaje, Territorios en Transformaciòn*, held in the Canary Islands from December 2005 to July 2006¹⁸: In the first case all the elements of the road are designed to define a space without solution of continuity, in which the rocky morphology is the matrix of architectural form; in the second it is the same viaduct which merges with the ground generating a unique shape.

A. Siza Vieira, sequences of entrance in the Museum of Serralves Park and School of Superior Education in Setubal.



International seminar Proyectar el paisaje Tenerife, project for a bridge across the Barranco de Badajoz prof, Claudio Lamanna (2007)



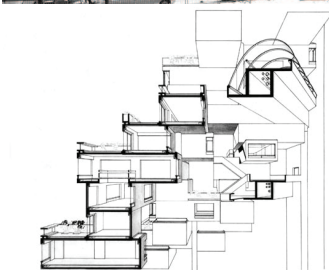
Design competition for SS42 del Tonale e della Mendola, BZ, prof, Claudio Lamanna, (2008)

3.3 Architecture and overlapping

In some cases it is a project such as a layer or a superimposed connection structure, i.e. a project which undertakes the task of defining a new layer and new forms of relationship in respect to the existing layer of the landscape, be it natural or urban, a project that works, in short, by superimposition and establishes vertical relationships, in section, with the existing layers¹⁹.



The overlap of mountain roads offers the possibility to analyse situations in which different layers of objects, intervened to affect the area at different times, coexist by positioning vertically on each other, adapting in time to the stacking condition. During the process of adaptation new spaces are born, interstitial spaces in particular, the result of the interaction between overlapping objects. In the composition of several similar architectural objects, the overlay is a strategy that exploits this capability to trigger contradictions: highly variable and unusual spaces through conventional objects or repeated endlessly. It's the case of the residential complex planned for Expo '67 in Montreal (Canada) by the Architect Moshe Safdie or the project for Vitra House by Herzog and De Meuron in Weil am Rhein (Germany, 2004)



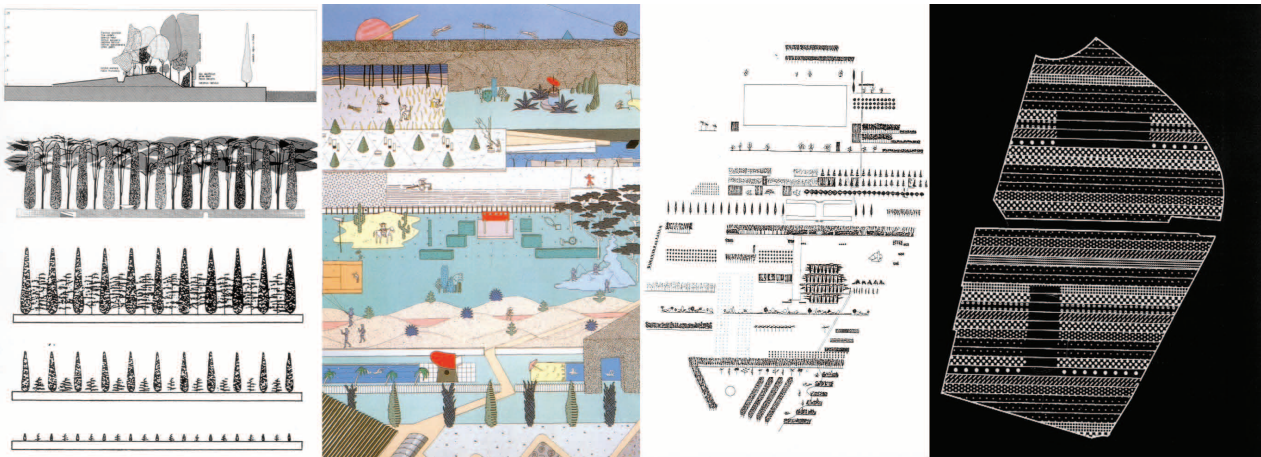
If the first overlap triggers a process of a creation of external spaces that are devoid of shape, starting from similar cells repeated indefinitely, in the second the designers choose a system of identical objects repeated endlessly superimposed with different planning rotations to generate through their intersection communicating and fluid interior spaces. The duplicated object is an abstraction of the prototype house in the collective imagination: a standard profile consisting of walls and layers, extruded in depth. The indifference of the research to the superimposed object enhances the research on the space possibilities inside the building: the spaces penetrate and smoothly enter into communication with each other and with the outside, creating sudden fractures to the conventionality of the interior spaces.

In architecture overlapping can generate new relational interactions between objects belonging to different layers. The relationship between objects is given by their relative positions (one over the other) but also by the *overwriting* that an order of elements opposes to another order.

In the 1982 competition for the park of La Villette in Paris, for example, overlapping (overlapping layers project²⁰) emerges as an alternative to traditional patterns of hierarchy between objects or systems. The plans

Herzog and De Meuron,
Vitra House, Weil am Rhein
(Germany, 2004).

Moshe Safdie, residential
complex for Expo 1967,
Montreal (Canada).



of B. Tschumi, R. Koolhaas and subsequently that of P. Eisenman for the garden Choral Works integrated with the park (1986), work through the overlay to deconstruct the design elements on various floors and then rebuild them when they are crushed into a new hierarch order.

Tschumi uses lines, points and surfaces as orders that preserve their independence even after they overlap, because they consist of thematic systems with independent rules²¹.

Koolhaas, also, works by overlapping five independent systems that can vary within them to meet the needs of the program, but creates a syntactic project, which gives priority to the independence of the local layers and the local connection between the overlapping parties rather than the celebration of a program with symbolic forms.

In Eisenman's project for the garden Choral Works at La Villette Park he experiences with overlaps in different scales, time and space, by introducing the garden plants at various times and layering the design and the plan of the project of Cannaregio.

The garden will be a contemporary place but will also contain within itself another time, another scale, and another place. The place will contain both its presence and the absence of its presence in the overlay²².

The overlay device tested by Eisenman refers to time: overlapping layers fall rhythmically over time and each layer maintains its own internal rules, in their appearance and the traces of the age to which they belong. What enters in the overlap is not a clean slate, but an accumulation of systems with its own rules of composition and internal relationships, generated as a function of the time in which they were produced.

A reflection on the meaning of time in the stratification was carried

R.Koolhaas, competition for Park La Villette.

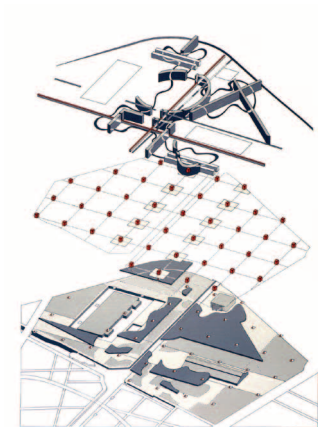
P.Eisenman, Garden Choral Works in the Park La Villette and design competition for Cannaregio area (VE).



out by Eisenman at the competition held in 1978 by the City of Venice for the area of Cannaregio. Founder and conceptual designer of the project Le Villette, Eisenman's presentation is a new text superimposed over the city context, in which the interpretation of the city context made by Le Corbusier with the project for the hospital of Venice (1940) became a cornerstone for the reinterpretation of the Venetian context, expanding and overlapping to the area of Cannaregio. The project consists of few overlapping systems. The grid of the cornerstones helps to define an order of empty spaces superimposed on the existing tissue. It's a research on the available empty spaces²³. "The grid is actually emphasized as an absence, a succession of gaps that act as metaphors for the gradual estrangement of man from his role as a measure unit of the universe. In this project Architecture becomes a measurement of itself."²⁴"

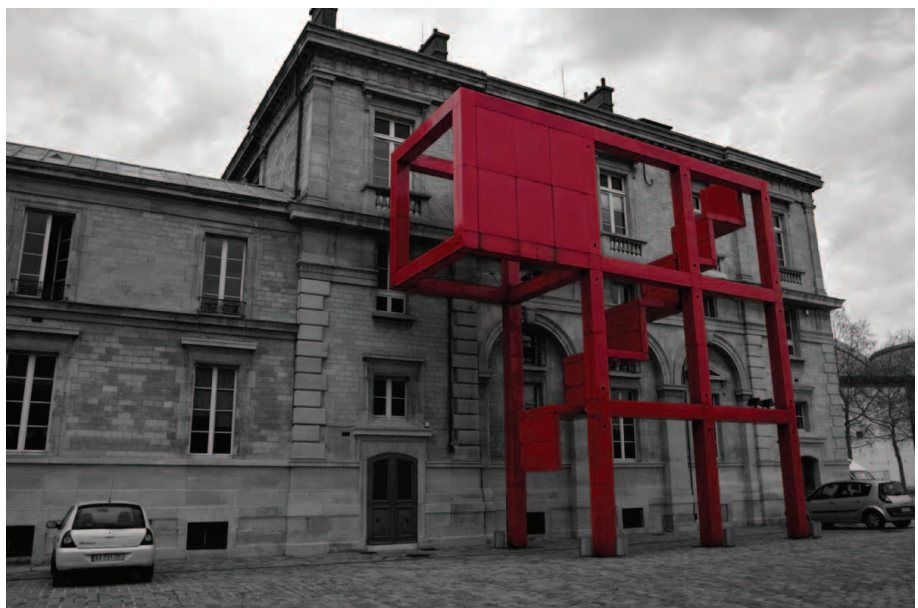
The overlapping opens to possible interpretations of space, especially in the local portions of the systems to which it relates. It's possible to still have the internal rules of each system (e.g. a street will retain its elevation and planning geometry, ordered by logics that are unrelated to the system to which it overlaps), and to establish local relationships between objects belonging to different systems.

In the case of the project carried out by Tschumi for the Villette, the landmarks crumble depending on what they encounter: they maintain their own rules, the measure of the grid, the required dimensions, the colour, materials, but they assume, for example, different functions and compromise their integrity locally when they collide with buildings or paths.

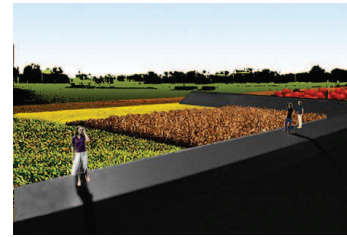


B.Tschumi, Park La Villette, Paris.

Overlaps of different layers and results in the place of the overlapping (in the picture, for example, condivision of spaces by an old building and the "folie" of the designed grid).



In the Villette projects the overlap is based on the interaction of planes that are not necessarily placed at different levels. The altitude of the position of the different floor plans characterizes the project of J. Nunes and G. Byrne for the Forlanini park in Milan. The system of artificial levees designed by Nunes and Byrne can raise the level of pedestrian paths, merging the project in the interstitial spaces between urban and agricultural areas that characterize the fragmented and undefined edge of the project area. This structure, which has an independent orthogonal design, by overlapping, sets the conditions that organize the space and the function of an otherwise fragmented context.



The introduction of a high altitude multiplies the possible interpretations of the park, enriching the physical perceptual dimension with a surprise factor²⁵.



The overlapping layers of infrastructures added to the context often create refused, rejected and excluded places. Roads uncritically overlapping to urban, agricultural, mountain, natural or artificial systems appear as parasites: organisms that live depending and relying on other organisms, drawing from these all they need to stay alive, stealing their resources, leading them to degradation. In *Parasite Architecture. Strategie di riciclaggio per la città*²⁶, Sara Marini studies architectural overwriting systems based on architectural organisms that overlap with other existing ones, giving them a new meaning, function and value: architectures capable of recycling the existing ones. The strategies indicated by S. Marini, starting from the projects and their carrying out reverses the common idea of a parasite as a harmful organism, recognizing the aspect of mutual dependence between host and parasite as the basis for a coexistence that is useful to both. S. Marini's strategy is suitable as an *ex post* practice in degraded infrastructural contexts, refused because they can't derive a benefit from the overlap and from the re-elaboration of the existing context.



The parasite strategy [...] appears in this context as a perfect device to direct the research very close to the heart of contemporary reality, made of layers, grafting and transplantation, complex relationships, bodies that do not die entirely and new bodies and that can't live alone²⁷.

G. Byrne, J. Nunes, design for the Forlanini park, (MI) organization of the space through a system of embankments

Korteknie Stuhlmacher architecten, Parasite Las Palmas, Wilhelminakade, Rotterdam , 2001.

Some infrastructural examples that may be considered as parasites are



recycled infrastructures through completely different functions, such as the High Line in Manhattan or the promenade Plantee in Paris or even the viaduct Spittelau by Z. Hadid. But all these achievements are less convincing on a daily practice, compared to the repertoire offered in other functional contexts by S. Marini, because they are based on the uniqueness of the occasion. Parasite strategies are most effective in the spaces of everyday infrastructures, which in mountain contexts are often characterized by the interstitial condition of elements arranged in vertical: these are *in between* spaces.

3.3.1 Between: vertical space and road support

New opportunities of connections between layers, overlapping orders of elements occurring at different times (roads brought down from above that interfere with existing elements of the landscape by creating vertical cavities) develop interstitial spaces with the scale of the structures (bridges or viaducts). The vertical boundaries of these interstices are the ground and the road; the horizontal ones from time to time are urban materials or of different landscapes, placed at variable distances from the road axis.

The interstitial space of the roads in mountain contexts is not intended as an intervention localized in one point or in an isolated stretch: it is a phenomenon which affects the entire path, continuously varying its height, and contributes to the organization and quality of the spaces adjacent to the road, conveying a foundational role to them²⁸.

A bare image of how the road interacts with the ground in the mountains and how continuous spaces and interactions based on the variability of the vertical dimension are generated, is provided by the project carried out by Shlomo Aronson for the conveyor belt that transports the debris derived from dirt digging in the Negev desert: in this project, similarly to what happens to a road, they address the issue of the elevations

Z. Hadid, Spittelau viaduct,
(Wien, 1994 – 2005).

J. Vergely, P. Mathieux,
Promenade Plantee, (Paris,
1988 - 1994).

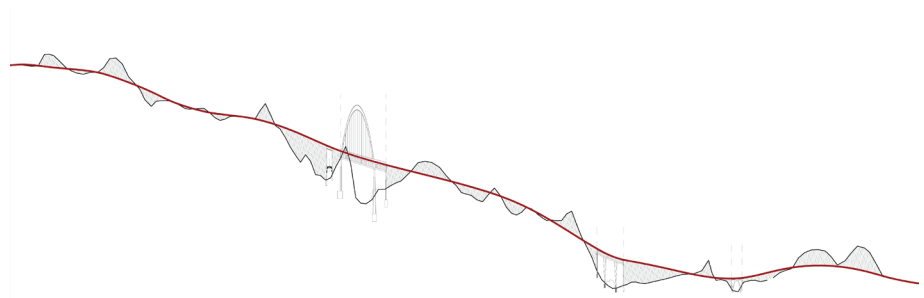


and the relationship between artificial figures and ground. Aronson's work is particularly representative because it figuratively expresses the relationship and the contradiction between the technical form, expression of a global need for a natural form that is found, met and set by the place it crosses through. A strip which is eighty kilometres long crosses an area with a complex orography. When it can't lean on it, it's supported by reticulated metal lattices, a more literal expression of the support function which they must fulfil. In Aronson's project, the differences between the behaviour of the conveyor belt and the flow of the ground highlight by contrast the morphology of the latter²⁹.

What makes Aronson's project representative of the specific case of the mountain is the characteristic to create continuous morphological cavities that need a connection with the ground and that in their complexity and extension are able to establish syntactic links, hierarchies and morphological relations with them. Both in Aronson's project and in a mountain road, the layout plan has no effect in the genesis of these bonds.

It's irrelevant that the line that crosses the territory fulfils certain evolutions: it can of course follow its own planning reasons (technical reason, in this case). It seems more important that this line keep,

S. Aronson, Conveyor belt,
Negev desert (Israel, 1986)



compared to the ground it passes through, its own independent elevation, its own stiffness, which can be compared to that of the mountain being crossed. This allows the creation of an offset, a gap and a margin: how to interpret this gap by defining the syntax rules of the road and the ground is the Architect's job.

It's necessary to return the functional thickness and semantics to the road, let it still become a constitutive element of urban and territorial design, resistant materials which, with their shape, are opposed to the fragmented burst of events and interests, and to the mixing of fluid ideas, to the annulment of any recognizable identity, of any distinction between alternative projects, of any criteria required to establish their legitimacy³⁰.



Bernardo Secchi recognizes the road as a fundamental asset for the city organization. The *thickness* of the road is a support, a project of the land that highlights the nature of the places starting from their topographic elevation performance. Highlighting the variability of the elevation in the city's topography is the starting point to construct a support within which to develop the contemporary city. In the project for Kortrijk cemetery in Belgium, Secchi and Viganò enhance the condition of the sloping of the project area through a series of partitions-borders, thus establishing a stable relationship with the morphological nature of the land, which will be suitable for all the present works and for the future expansions³¹.

Thickness is a term used by A. Venudo in the *Spessori, codici interfacce. Architetture della strada*³² to indicate the "depth, or emanation area related to the space-road (below, above, beside and in between), and not always used by cars." Among the purposes of Venudo's thesis there is the will to:

Conveyor belt of S. Aronson and road mountain profile.

B. Secchi, P. Viganò, Kortrijk cemetery (Belgium)

overcome the current debate polarized between two irreconcilable

positions: the first related to an idea of the road as a factor for development at all costs, regardless of the reasons of the territory, the latter expressed by someone who sees every infrastructure development as an intolerable threat to the environment. It was therefore decided to restart from the primary issue, namely the one related to the space, where the privileged field of observation is that of the traffic channel and the ability to transform it into space-road, or into a support provided with its own specific thickness available to the multiple functions associated to the movement.

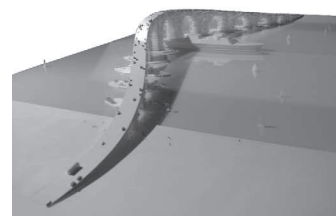
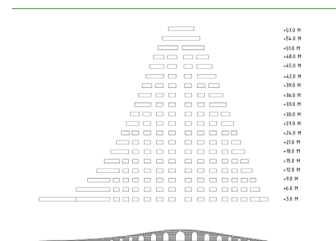
Again we find the use of the word *support*: the road as an available and partially organized space, a basis on which to establish activities, relationships, places.

The space between the ground and the road strip, as a basic element of the city, is approached by Le Corbusier in the Algeri Project of twenty-nine. A megalopolis of one hundred and eighty thousand inhabitants concentrated in a space *in between*, where the road is the main compositional element, the thistle along which the complexity of modern life is organized. The concentration of the city in a limited area, in order to preserve the open spaces from the view are part of Le Corbusier’s vision, as well as the contemporary need to preserve what has not yet been invaded by the fragments of the city scattered in the territory. The development of the city happens both below the road and from the beginning of the road, which thus assumes a founding role.

In common practice, the space between the ground and the road strip is designed in a technical sense: the only existing support is that of the road in a physical sense, through technical solutions at the intersections with roads, rivers and streams, towns etc. Bridges, underpasses, viaducts, road embankments are the materials that constitute the *body* of the road. Other than technical elements that build the road, they are also seen, perceived, inhabited, used as spaces, places, signs and landscape elements. They often carry traces of improper secondary uses and are adapted to the prevailing situation.

The survey of the case study of the area of the Trentino Alto Adige, during the 2007-2010 PRIN³³ research has highlighted the improper use of the spaces adjacent roads. Particularly, it was established that the variability of the vertical dimension affects the formation of uses, functions and characteristic relationships of these spaces.

The PRIN research is a practical test of how the road may be, even in mountainous contexts, a key element of the functional organization



Le Corbusier, megalopolis of one hundred and eighty thousand inhabitants, (Algeri)

Big Architects, “The bridge”



of the territory. Temporary or permanent deposits, pedestrian trails, service areas for productive activities, resting areas, entire sections of towns: the activities that develop under viaducts or hidden by the vertical thickness of road embankments are of various types. They are perceived or used as private property (e.g. gardens, or deposits) or public (such as car parks or crossing areas); they are acknowledged and planned, or spontaneous and at the limits of legality, because hidden from the height of the road or immersed in the cavity between the ground and the road.



In urban areas, bridges and viaducts overlap the context of the inhabited city: the spaces around them interact with the existing context, incorporating functions, uses and activities not specifically programmed. The study carried out by Margherita Vanore in *Suoli urbani all'ombra dei viadotti*³⁴ reveals how the spaces under the viaduct get animated with a “remarkable vitality” because taken away from the rigidity of a functional programming, often absent. The survey is carried out “in order to go beyond the technical needs of a construction service to consider its architectural potential in the context of the contemporary city.” The transfiguration of the road, according M. Vanore, is a repeated formula, frequent and widespread enough to be considered a *technical* form: the viaduct then becomes the *infrastructural container*, a work available for uses, delimited in the bottom part from the ground and in the upper part from bottom of the deck: a *space in between*, open to

PRIN 2007-2010,
photographic survey of
infrastructures in Trentino Alto
Adige.

interpretations.

The spaces examined by M. Vanore are often interstitial spaces, forced into the folds of the city, delimited by buildings, streets and squares and are subject to uses, intensifications, transversal crossings, commercial demands that characterize the dense urban context. Similar devices can be used to contain different functions, even in open spaces, more typical of crossing infrastructures in mountain and valley bottom contexts, where the soil has a high value (for example when used for prized and highly profitable crops) when the plane plots are scarce, when the crossing takes place in urban areas.

3.3.2 Use of the between: vertical interstitial space

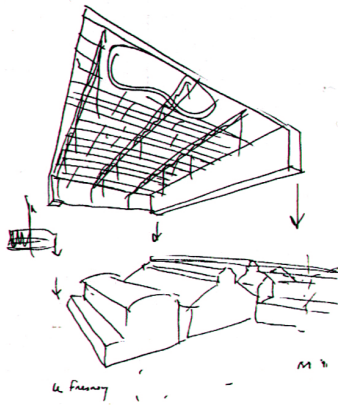
The design of the *in between space* is considered in the M. Zambelli's recent essay as an innovative technique in architecture, and expresses the being in between things, as to occupy a state of interstice³⁵. The definition of Tshumi Bernard, one of the first, together with Eisenman to highlight the features and capabilities offered by the interstitial spaces, provides of the *in-between* is:

The site of the unexpected, where unexpected events can occur, not provided by a conventional program. An area of waste, scrap, voids and margins³⁶.

The project carried out by B. Tschumi for the Le Fresnoy Arts Centre in Tourcoing (France, 1991) is an *in between* space developed on a



B. Tschumi, Contemporary arts center "Le Fresnoy", Tourcoing (France, 1987).

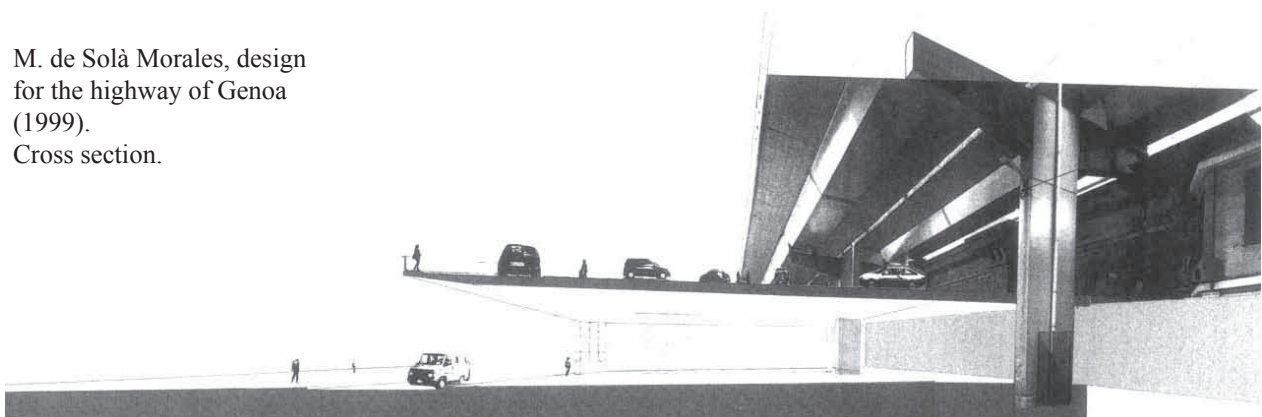


vertical dimension. The large overlapping coverage of the existing industrial buildings creates a cavity, an interstitial space, which is used by Tschumi for informal functions, trails and improvised meeting spaces. The hardware component of the project is the coverage, but the real project, excluding the restructuring of the existing buildings, is the gap between the two roofs and the organization that takes place within it. The Le Fresnoy, centre as the project for the Cannaregio is a study of the voids defined architectural pillars (in the first case the cover, in accordance with the grid). But if Eisenman thinks that the relationships appear to be not primarily directed toward a specific coordinate, the uniqueness of the Le Fresnoy Centre is to show the possibilities that the in between has a dominant vertical thickness, resulting from an overlaying of elements, one deriving from a project, the other already existing. The roofing of Le Fresnoy Center is also an overlaying parasite that can rewrite and reinterpret the industrial buildings now devoid of their original function rescuing them with new uses of the space³⁷.

The interstitial space under the viaducts is the theme of two projects of Manuel de Sola-Morales. In the project commissioned by the Port Authorities for the port area of Genoa (1999), the space under the flyover is intensified through pedestrian and traffic passages. The intervention involving the strengthening of the viaduct becomes an opportunity to completely redevelop the space below, now degraded. The viaduct is an element of fracture for the city of Genoa: De Morales' intervention aims to bring together the two parts of the city, providing additional services (sport functions, recreational, parking lots). The project involves the infrastructure and its elements, now out of scale if compared to the spaces of the city, are transformed from time to time into light fixtures or advertising surfaces: the viaduct is thus rescued from degradation and *recycled* with other functions.

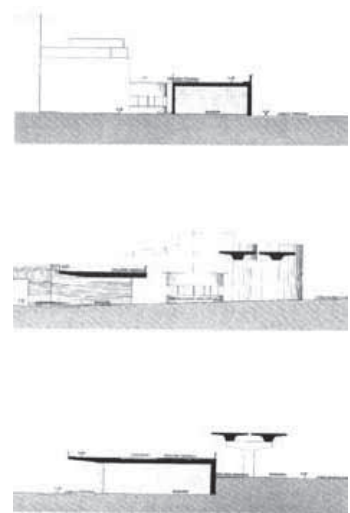
B. Tschumi, Contemporary arts center "Le Fresnoy", Tourcoing (France, 1987). Study sketch of the relation cover - building.

M. de Solà Morales, design for the highway of Genoa (1999). Cross section.

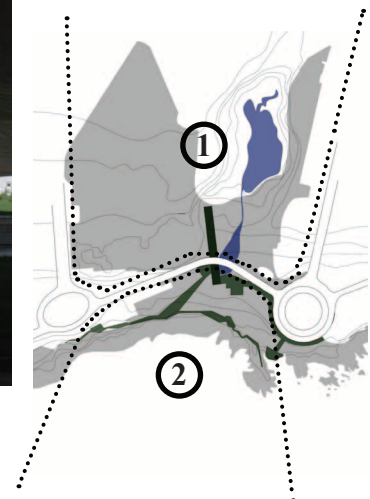


If in Genoa Morales faces an infrastructure with an engineering influence, thrown into the town only for road purposes and with which the city has developed over time conflicting relationships, in the project for the Parco de la Cidade do Porto (2000), the viaduct was built from scratch by replacing the existing road and in the between project is developed through a series of interventions that modify the geography of the place³⁸. The area of the park flows under the new infrastructure and adjusts itself to an open area on a slope. The pedestrian paths close to the viaduct are made of transversal pavements in order to compensate for the horizontality of the deck and to establish a smooth passage below it. Once the drop has been passed, the design of the routes (assigned to E. Souto de Moura) is more articulated and follows the morphology of the rocks. This way the viaduct scans a sequence of spaces set on an inclined plane and is treated figuratively in a different way, using the suspended body of the viaduct as a portal that transmits from one space to another.

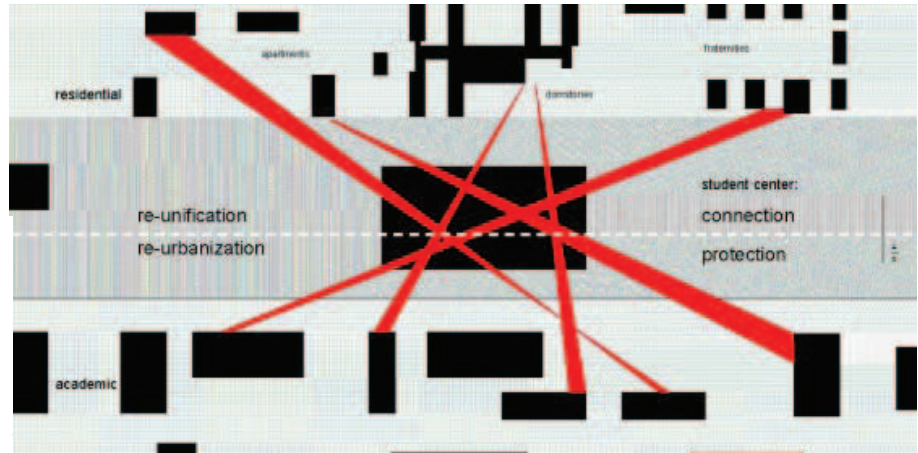
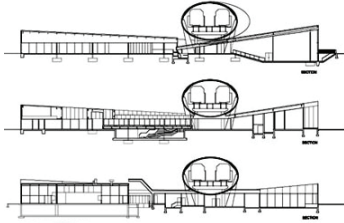
The two projects of Solà de Morales use the cavities of the *in between* to return spaces without volume but triggering relationships with the city by interacting and integrating the infrastructure to it.



M. de Solà Morales, design for the highway of Genoa (1999).
Cross sections.



M. de Solà Morales, Parque da cidade de Oporto, 1999 - 2001.
Sequence of spaces.

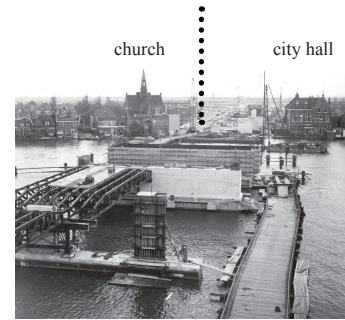


In OMA's project for the McCormick Tribune Campus Centre (Illinois Institute of Technology, Chicago, 2003), Rem Koolhaas implements an extension program of the campus searching for ties with the edge of the city that were interrupted by the subway train line. The space beneath the viaduct is saturated by a building, a closed box apparently unrelated to the context. Actually, the box contains fragments oriented according to the position of the buildings on the edge of the city that function as small urban districts with different programs, according to the function and the utilization time. The viaduct towers above the building, smashing it in the middle, wrapped in a steel tube that separates it acoustically and structurally from it, but keeping a compositional dependence between the two figures. The Koolhaas project is the addition of a piece or of pieces of the city to the viaduct, which is colonized by offering as a support its empty thickness, the only relationship between the two objects.

The three projects of Solà Morales and Koolhaas implement specific programs under viaducts, strategically involving the margins of the city. The viaduct, as also highlighted by M. Vanore is often the an indistinct place, undefined, in which no function has been established and therefore is open to improvised uses, often unplanned³⁹.

From a space devoid of a plan under a viaduct, the NL Architects group has developed a series of activities related to the urban edge of the town of Koog aan de Zaan (Amsterdam, 2003). A&ernA is the project for the reuse of the space under the viaduct that crosses the town by cutting it into two parts. The objective is that to unite the two folds of the city by considering the infrastructure and its spaces as an opportunity rather than a deprivation.

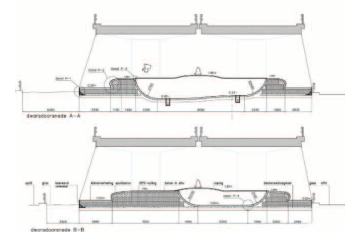
R. Koolhaas, McCormick Tribune Campus Center, Chicago (USA, 2003).



The passive attitude of the past decades was replaced with the quest for optimistic interventions. Finally there seemed to be a new mindset: instead of a disaster, the remarkable space under the road was now considered an opportunity. Maybe a new type of urban life could be accommodated here: from desolate parking lot to mixed use area, from wasteland to focal point, from ‘down town periphery’ to centre⁴⁰.

Under the viaduct are installed many different functions: a supermarket, a skate park, a swimming pool, rest areas with benches and a parking lot. The viaduct incorporates every function in a natural way, proving to be an ideal support. Among the pillars that support the bridge deck, the activities develop and become part of the city by interacting with it. A similar mechanism was applied spontaneously by the group of skaters in *Dreamland* an action of re-appropriation of the space under a viaduct, in a degraded industrial area in Portland. The group has made a skate park between the piers of the viaduct, in an area outside the control of the police, in order to occupy an unused public space for their activities. The creation of the skate park has been accepted favourably by the citizens, who saw the spontaneous project a way to generate a social control and tested the operation of this mechanism. The operation of *Dreamland* is part of the many squatting actions, a practice of appropriation of space in the disused and derelict buildings or areas with no apparent value or interest⁴¹.

The possibilities to colonize the space beneath a viaduct are in fact endless: the vertical dimensions between the roof-deck and the ground, despite the apparent unbearable situation generated by the road traffic,



NL Architects, A8ernA, Koog aan de Zaan, Amsterdam.

Picture of te spaces under viaduct, viaduct under construction (visible the cut of the urban spaces) and cross sections



as we have already seen, suggests many innovative strategies that can be used. To close this series of examples, a traveling object, designed to fit anywhere, that was installed under the deck of a bridge in Berlin reuses the space in a parasite manner. Not for social needs but for art, the installation of Raumlabor⁴², *küchenmonument* is a “generator of space and travel on four wheels”⁴³, inflatable and therefore adaptable to any type of space.

Dreamland team, skatepark under viaduct, Portland 1990.

Raumlabor, *küchenmonument*, generator of space and travel on four wheels, installation under viaduct in Berlin.

NOTES TO CHAPTER 3

¹ The book tells of the contrasts between the land and the development of the city of S. Cruz de Tenerife.

² J. Palerm, T. de Nava in M. Mulazzani (by), *Natura e artificio: il Barranco de Santos a Santa Cruz de Tenerife*, Electa, Milan, 2010.

³ For a general description of the workshop. Cf. Chapter 1, *Experimentations* paragraph.

⁴ Cf. Josep Anton Acebillo, *Una calle no es una carretera*, Quaderns, no. 193

⁵ Important is the assertion of A. Venudo in *Spessori, codici interfacce. Architetture della strada*, (2005) about the system of representation of the road width in road engineering. “It’s significant in this respect, the method, borrowed from transport engineering, to design the road through many sequences of sections, that as in an anastylosis process rebuild, the entire (floor) structure through the combination of significant parts (sections). It’s like a CT scan (CAT scan), the progression of the cross sections along the route identifies, analytically, the thickness of the road, otherwise undetectable, compared with complex topographies, especially compared to very practical reasons (not very considered), or to variations in height.” This consideration again raises the question of contemporary and effective representation in architecture of the two fundamental scales that define the road: the longitudinal and the transversal ones, profoundly different between them.

⁶ From the description of the project, website Proap: <http://www.proap.pt>

⁷ J. Rykwert, “La strada: utilità della sua storia”, in S. Anderson, *Strade*, Dedalo, Bari 1982, Italian translation by *On streets*, The MIT Press, Cambridge Mass, 1978. In Joseph Rykwert’s studies and published in several papers, the architectural historian tackles the individual’s assignment of culturally shared symbols to the urban materials with which he lives. The road studies are part of such a theoretical context.

⁸ The program has been represented in the exhibition *Detour* (2008) and was born in Norway through the initiatives of the Public Road Administration and the Cultural Foundation Norsk Form, and promoted in Italy by the Order of Architects of Bologna, in collaboration with the Urban Centre Bologna, AIAPP (Italian Association of landscape Architecture) and the Royal Norwegian Embassy. The exhibition catalogue is published in *Detour Architecture and Design Along 18 National Tourist Routes in Norway*, Statens Vegvesen, 2010.

⁹ Cf. in particular the design experience in the territories of Camposampierese (PD), a federation of 11 municipalities in whose territory Zagari led the workshop *Federazione come paesaggio* (15 to 20 November 2010). The study is published in G. Laganà (by), *Paesaggi di città non città. Franco Zagari, quattro progetti di ricerca*, Libria, Melfi, 2011.

⁰ The interaction between the themes of the paths and the “acupuncture” interventions in Franco Zagari’s researches, mentioned in the previous note, are addressed, in the Camposampierese study through interventions that aim to characterize the flows (water, roads, bicycle paths and pedestrian), and also in the landscape design for the area of Arco, a town on the shores of lake Garda in the province of Trento. Through the construction of eight pedestrian and cycling bridges, designed as slabs, crossing places, but also rest

stops, he intends to cause a short circuit in the mechanisms of generations of the landscaping techniques, starting with the perception: in the places in which one crosses or rests the landscape enters into the collective memory and becomes a value to be protected. The Arco experience was published in Sara Marini (by), *Dessiner sur l'herbe. Architetti per il paesaggio*, Il Poligrafo, Venice, 2006.

¹¹ Adept Architects, in collaboration with Various Architects and LaLaLand (landscape).

¹² As the promenade Plantee in Paris, The High Line project is the result of a decision process that has been able to grasp an uncommon opportunity, and probably unrepeatably. In this case it wasn't necessary to draw the edge or the path of a road (such as in the planning experiences of Lassus, of the American parkway or Porcinai for the A22), elementi intorno alla strada (come ad esempio il progetto di Jean Nouvel per il chilometro rosso o di Buro Lubbers per la A58 in Olanda), Not even the elements around the road (such as the project of Jean Nouvel for the red kilometre or of Buro Lubbers for the A58 in the Netherlands), but to design the interior of the road in response to the crossed landscape, at a bound height.

¹³ J. Burns, *Lawrence Halprin paesaggista*, Dedalo, Bari, 1982.

¹⁴ Other Landform Architecture projects are offered as artificial topographies, as in some works of Emilio Ambasz, Asymptote, FOA, Z. Hadid etc. The theme of Architecture as an artificial topography is explored by F. Fabbrizzi in *Topografie. Linguaggi di architettura ambientale*, Alinea, Florence, 2008.

¹⁵ Compared to the ambiguity between natural/artificial, the study of M. Zambelli (M. Zambelli, *Landform Architecture*, quote.) noted the morphological similarity of some naturally formed landform architectures commonly available. This ambiguity is present at a larger scale in mountain landscapes, where elements with a natural appearance and inhabited by people because of it, (pasture grazing or forest reforestation) are in fact completely artificial and programmed.

¹⁶ The fact that the system "bridge park" designed by Halprin in the seventies is now revived in a contemporary viewpoint makes one believe in the functionality and repeatability of the device

¹⁷ The gradual discovery is the theme that unites Siza's works for the Cha house and in Setubal. Cf. C. Lamanna, *Archiluogo*, quote.

¹⁸ Published respectively in C. Lamanna, *Archiluogo*, quote. and C. Lamanna, *Infrastrutture Canarie* Nicolodi, Rovereto, 2006.

¹⁹ R. Bocchi in relation to the project guide for the city of Trento, in E. Schir, eds, *Paesaggio come Palimpsesto. Progetti per l'area fluviale di Trento*, quote.

²⁰ Some projects delivered show a common trait: they are designed in layers. The use of layers is a distinctive feature of some graphic soft wares (in those years the use of CAD design and level design, as a form of alternative representation of manual design, was spreading), and has influenced the architectural production as today does the use of three-dimensional graphical models. One can say that even in the field of representation, which greatly influences the project, the overlap is a potential.

²¹ V. B. Tschumi, *Architettura e disgiunzione* "Each one represents a different and independent system, whose overlapping with another system makes it impossible for any composition because it preserves the differences and rejects the primacy of any other privileged system or organizing element", already quoted in S. Marini, *Architettura parassita. Strategie di riciclaggio per la città*, Quodlibet, Macerata, 2008.

²² P. Eisenman, Project Report for the garden at La Villette Park, 1986, archive Eisenman Architects.

- ²³ The concept of emptiness understood as an unplanned space is investigated by S. Marini in his essay “White spaces. Designing the scrap”, in F. Labella, S. Marini, eds, *L’architettura e le sue declinazioni*, Hypertext, Verona, 2008.
- ²⁴ Pippo Ciorra, in Peter Eisenman. *Opere e progetti*, Electa, 1996.
- ²⁵ Casabella no. 711, May 2003.
- ²⁶ S. Marini, *Architettura parassita. Strategie di riciclaggio per la città*, Quodlibet, Macerata, 2008.
- ²⁷ Pippo Ciorra, Preface to *Architettura parassita. Strategie di riciclaggio per la città*, quote.
- ²⁸ See above, concerning the position of the road and the ground, and the road as a *support*.
- ²⁹ A recurring theme in the land art works created in the Nevada desert during the 1960’s, for ex. by Micael Heizer
- ³⁰ B. Secchi, The Thickness of the Road, in Casabella 553-554, 1989.
- ³¹ The use of a ground plan as a support for future buildings is also interesting. The support derives from the studies of John Habraken in the 70s on the housing systems, in which he theorized the possibility of realizing a structural support and installation at a first stage, for living cells to be built at a later time. The designer would have the task of establishing the support, the individual citizen the opportunity to choose and design the cell to suit his personal needs. Also cf. J. Habraken, *Supports: An Alternative to Mass Housing*, The Architectural Press, London, 1972.
- ³² PhD thesis, coordinated by Prof. Arch. G. Corbellini of the Faculty of Architecture, University of Trieste, XIX cycle, academic year 2005 – 2006.
- ³³ Cf. Chapter 1, Par. *Experimentations*
- ³⁴ M. Vanore, *Suoli urbani all’ombra dei viadotti*, Clean, Naples, 2002
- ³⁵ M. Zambelli, *Tecniche di invenzione in architettura*, Marsilio, Venice, 2007. Zambelli differences the in between into two cases: the project within existing materials and the project within elements designed at the same time. Likewise, the in between strategy can be adopted both for already existing roads, and for designing roads with a vision that they should be settled in later or by already installing in the interstices of their bodies projects that interact with the existing.
- ³⁶ B. Tschumi, “National Centre of Contemporary Arts Le Fresnoy, Tourcoing” in Zodiac No. 15
- ³⁷ Cf in this sense also S. Marini, *Architettura parassita*. quote
- ³⁸ *Lotus Navigator* no. 8, “Controlled speed”, June 2003
- ³⁹ The indefinite in the in between is detected by Zambelli in the essay quoted at the beginning of the paragraph. The research carried out in recent years by S. Marini on recycling opportunities in architecture often considers the indefinite as a possible way for recycling. “White spaces assimilate buildings and ‘voids’, areas of the city or of the territory represented without information on the maps, white because they are unused, excluded from the design or poorly represented wastelands. Unstable islands awaiting a transformation, or simply some attention, that can’t be found in the encoding of the signs. White surfaces as a result of an accumulation of situations, not directly decipherable or driven out of the communication process, waiting to be re-integrated into a productive situation. Ignored spaces, omitted or forgotten, suspended.” S. Marini, *Spazi bianchi. Progettare lo scarto* in *L’architettura e le sue declinazioni*, quote
- ⁴⁰ From the website of the NL Architects office: <http://www.nlarchitects.nl/>.

⁴¹ Squatting is defined in the broadest sense as occupation and transformation of land and buildings that are unused or underused. It is based on the assumption that occupation and its use constitutes a right in itself above and beyond legal ownership. In architecture squatting has played an important role, spanning grassroots neighbourhood initiatives, responses by architectural professionals, or writers and activists. (cfr. Spatial Agency, <http://www.spatialagency.net/>).

⁴² Established in Berlin, Raumlabor is a group of architects who work on issues such as transformation and urban renewal.

⁴³ *Küchenmonument* was recently shown at the XII International Architecture Exhibition at the Biennale in Venice, offering possibilities as a venue for meetings, sessions and presentations. The images here are of the installation in Berlin.

CHAPTER 4:
DESIGNING ROADS WITH GROUND AND LAND

4.1 Ground and mountain roads

The close relationship between the road and the ground in the road infrastructures in mountainous contexts is often the background of each intervention, be it a creation from scratch or a modification of the existing. This ratio is expressed in three different situations, sometimes overlapping: the *position* of the road in relation to the ground, the road as an *artificial ground*, or the road elements that *mediate* the detachment of the road from the ground. The three categories refer to and stem from three ways of interpreting the more general theme of the architecture of the ground: the ground as opposed to the building, as a mediator and as the building itself.

The connection between ground and architecture determines the link of the building with the ground (e.g. in the access path or in the transition between different conditions in space, the connection between the ground and the road is what morphologically ties the road to its context: the accuracy with which its design is interpreted expresses the desire to establish ties with the place, and, if they exist, the nature of these links. If we take for example the case study of the Civezzano – Torchio variant, a short stretch of newly constructed road in a small town in the province of Trento, surveyed during the 2007-2010 PRIN research, it is clear that the road was well planned before the intervention.

The case study is a timely solution to a recurring situation in the mountains. The road, along a stretch in mountain valley, connects two levels (upstream and downstream) reaching a roundabout connection to the main roads. The valley crossing is carried out for a long stretch at a higher altitude than the ground floor: thus determining a difference between ground and road strip, which is filled with a high embankments made out of on grassy sloped reinforced land. While the road makes room for areas whose use has long been settled (and accompanied by economic and social interests: in area below is established an artificial lake for fishing and a small residential nucleus), and through technical solutions tends to interfere as little as possible with the existing situation, on the other hand profoundly changes the site through visual and physical barriers. Civezzano's case shows how the first aspect (to make room) is programmed, while the second (to create the barrier) is the *price* to pay to ensure the crossing.

A thorough understanding of the architectural possibilities offered by the design of the land is the basis for establishing ties with the crossed



places and could suggest a planned way to decrease the *price* of the crossing, by using techniques previously prepared by the architectural culture.

Also in this case, the interpretation of the relationship road-to-ground is linked to the verticality more than to other dimensions: the mountain road generates elevation jumps greater than in other contexts, creating barriers, discontinuity, variations in the morphology of the ground which, addressed in a purely technical way, tend to generate critical situations both in urban places, and in open spaces. In addition, excavations, embankments and cuts change with the surroundings: the prospect of the road comes into a close relationship with the mountain slopes by dividing them into several floors or with the valleys, creating a *thickening* effect of the bottom level. The ground, therefore, affects in two ways in the construction or modification of a mountain road: it can affect spaces that are internal or external to the road and to the road as an object lodged into the landscape. Architectural tools are the key to interpreting both meanings.



PRIN 2007-2010,
 photographical survey in
 Trentino Alto Adige.
 Civezzano torchio and SS47
 Valsugana. (TN)

4.2 Ground/architecture - ground/road

If I were to say, in very summary form, what are the most common topics, the most widely shared views, vocabularies, grammars and syntax between the first two lines of research that I mentioned, I would put primary emphasis and a new and improved attention to some aspects of the ground plan: a conceptual and operational place in which the topographic contemporary design comes to life. Not so much its relying on the physical, social and symbolic topography, on the map of social practices without being violent, such as the discovery or invention of a new topography in which those practices are represented.¹

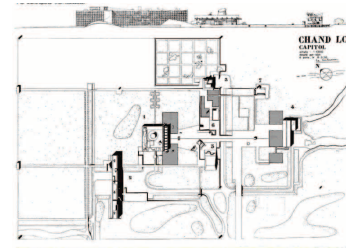
The change in the land upon which it stands is not only the premise of each architecture, but in general of any construction: before building, the relationship ground/construction must be decided (designed).

There are architectures that are detached from the ground, that are imbedded in it, and architectures that become ground themselves². The parameters that influence this decision are technical/economic (the weight of the structures, the bearing capacity of the ground, the ease to the excavation, etc.), distribution (for example, the various elevations of the paths to be connected), composition (the meaning that the land assumes in the choir of the elements of the project) etc.

In every project there is the requirement to make a choice, complex, innovative, functional, or dictated by the usual procedures. This requirement has made the theme of the connection ground/building and in general the ground plan as an issue that transcends time and disciplines.

In planning, the ground plan is a recurring theme in the writings of Bernardo Secchi, who dedicated his essays to it since the late '80s³. The design of the land, Secchi believes, creeps into, crosses and connects the different heterogeneous and fragmented parts of the contemporary city, taking appropriate forms and functions that define its aesthetic dimension⁴, a fluid space that passes through the thickness of land and buildings. Whether the ground is seen as shim, as a surface or as a ductile container, his plan avoids the danger of using these three individual potentials it offers in an isolated and uncoordinated manner, limiting the design possibilities to specific interventions. Secchi's extended vision, in which the land develops interstitial spaces, in our opinion is comparable to roads, major crossing elements of the landscape that

affect different places and transform them by crossing over them, sinking into their thickness or filling their empty spaces, continuously. In most recent architectures, we find conventional implant matrices that coexist with an innovative attitude toward the land. Full/empty, figure/background, inside/outside, are concepts inherited from the modern age that have generated and characterized for most of the last century architectures defined in space, with traceable boundaries and shapes cut out from a background. In them the project of the land has the function of a *device* to cross different scales, used as a mediation function between the natural surface and the artificiality of architecture (for example the ground plan on which Le Corbusier rests the volumes of Chandigarh).



The fracture of the above one to one oppositions, a trend that characterizes contemporary architecture, such as that produced between figure and background, is particularly significant in the evolution of the concept that governs the relationship between architecture and ground. In a recent essay by F. Repishti it is stated that the failure of the combination of figure/ground produces a “involvement of the topography of the places even in the absence of an identity connection to that particular place,” giving space to “situations that offer a seamless articulation of the land and architecture, generating a continuous, but not uniform, system able to represent an alternative to the traditional approach based on differences and contrasts”⁵.

The Venice Architecture Biennale in 2004, entitled “*Metamorph*”⁶ has collected many examples of architectures that show the effects of this crisis, marking a significant moment that we can now recognize more clearly. The last decade has flourished in a series of works involving topography searching for a continuum between architecture and territory. These architectures generate artificial land-forms that are able to carry out the functions to which they are subjected. The land is modelled using *operators*, which are actively involved in the composition of the architecture. Some of them are identified and catalogued by M. Zambelli in the book *Landform Architecture*⁷, or by L. Coccia in *L’architettura del suolo*⁸, essays that contribute to the definition of an operational methodology for landform architecture.

Grafts, metamorphosis, bends, hills, hedges, grooves, overlapping ... are recognizable actions in all modelling operations of the land, but targeted to the construction of architectures that are supports for human activities. Similar operators, moreover, are commonly used in anthropic

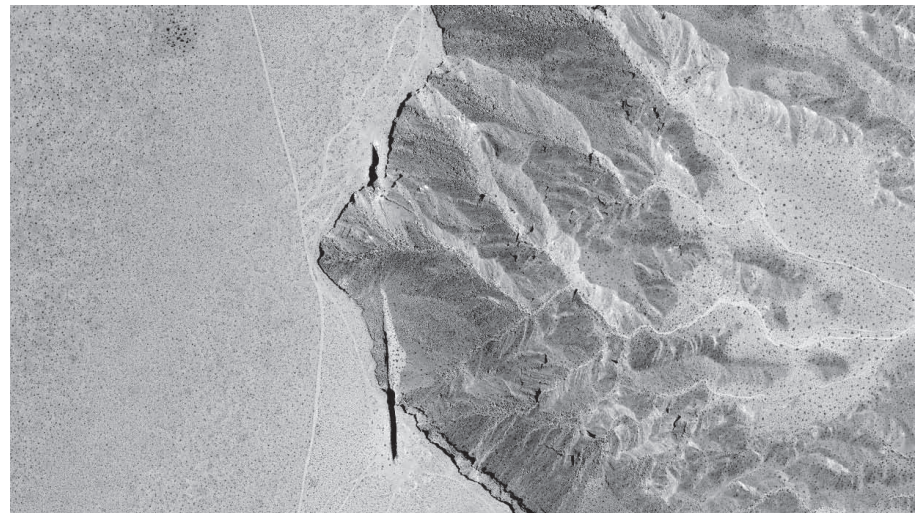
B. Lassus, rest area near the quarries of Crazannes, highway A837, Saintes-Rochefort, (France, 1993-97).

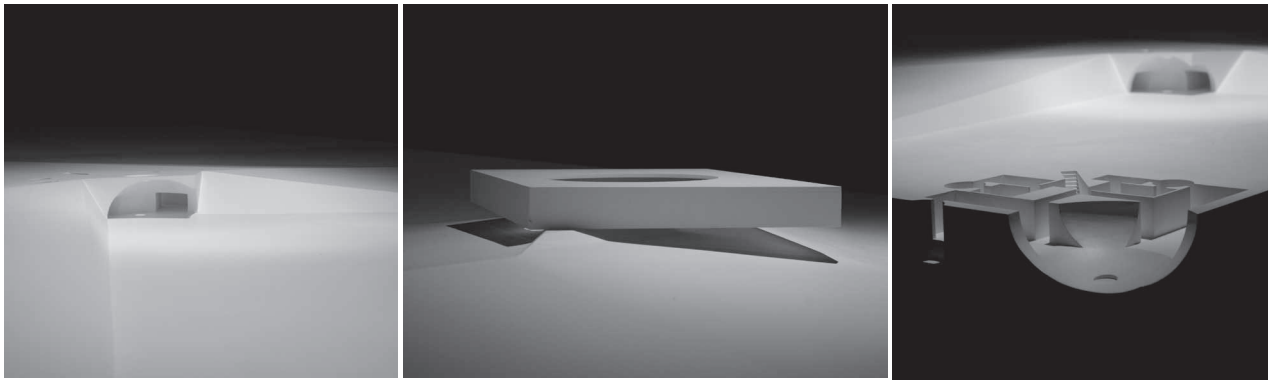
M. Heizer, Double negativ, Nevada desert (USA 1970).

changes and have effects in landscape construction. In Trentino Alto Adige, for example, *grafts* of buildings in the side of a valley are operators of changes in the ground; *bends* in the surface of a slope at the crossing a road on the hillside; *covering and overlapping* at the overlying of roads along the bottleneck of a too narrow gorge; the *groove* of the Adige deviated from its course to make room for the city of Trento or the road-*grooves* in the plains of the valley, pictured by Gabriele Basilico in the photographic survey of the Province of Trento⁹. These trends, this manner of interpreting the relationship with the ground, in most cases do not involve the construction of roads, even if the road, a construction with zero volume, consists mainly of movements of the earth. In the construction of roads it almost never happens that an architectural project of the land is taken into consideration, whether it is space between the elements in that place (buildings, other roads, crops, etc.) or whether the space is between bound and binding elements of the road (the track and the land it encounters). There are cases worthy of in depth examination, for example, those of Bernard Lassus or J. Simon¹⁰ for their great French motorway achievements, in which the modelling of the land contributes along with the choice of route to make the road become a knowledge instrument of the landscape. The modelling in Lassus' road design experience is often done through subtraction of material: as in the works landscape.



The road moves through the land removing some of its parts, interacting with the created voids, attracts some of the architectural studies recently exhibited at the of Land Art of Heizer in the Nevada desert¹¹, the excavation is a tool to showcase intangible features of the Biennale of Venice¹², in which the digging interacts with the construction, or





moulds it completely.

In projects, space and form become inseparable, not so much as a translation of one or the other, but as a highlighting of their coexisting. They are intelligible conformations and, as such, they are open to the different possibilities of life.¹³

The land becomes material to relocate when, for example due to the digging of a tunnel, it is necessary to bring great masses of land to different places than those of the excavation. An exemplary case is that of the gallery at the service of the bypass of the village of Moena, in Val di Fassa (TN). The resulting material of the gallery was at that time transferred to the close S. Pellegrino pass, and used to shape the bottom of a slope with land rock fall profiles.

The modelling of large masses of land designed to protect areas prone to landslides or rock falls are common in mountain contexts: a recent modelling of the landscape was carried out by Landslag and Reynir Vilhjálmsson for the structure of protection against avalanches in Siglufjordur (Iceland, 2003)

We detect an abnormality in the land of the mountain, like a big moustache, unnatural and large. This is a great device for the containment of avalanches, to protect the few houses at a low altitude, which in summer becomes a vantage point of the territory. “Protection Structures against snow avalanches in Iceland” is part of a national study on the risks of natural disasters after the tragic events of 1995, which involved different types of professionals.

The *best road practices*, such as those carried out by Lassus are isolated cases, however, produced by the exceptional sensitivity of the designers involved than that of a uniform road culture that recognizes the necessity to deepen organically the subject land/road.

In general, we can say that the theme of land/road is not recognized nor



M. Aires Mateus, Exposition pavillon in XXII international architectural exhibition (Biennale di Venezia), 2010.

Landslag and Reynir Vilhjálmsson structure of protection against avalanches in Siglufjordur (Iceland, 2003)

addressed in architecture as the theme land/building.

Particularly in Italy, the mediation between road and land is assigned to individual artefacts that combine to form the solid road (road embankments, subways, retaining walls of bridges, viaducts, etc.). The road project is a collection of artefacts distributed along a track measured with progressive figures: an artefact corresponds to a progressive, whose project addresses a point of contact with the place (a very steep slope, the proximity to an urban core, a stream that cuts across the track...) and ends within itself, it has a beginning and an end, not related to the next artefact, which in turn solves other problems. Not only is the relationship with the landscape a conflict (the topography is *dominated* by the passage of the road through technical solutions), but the same artefact can be designed without taking into account the characteristics of the artefacts adjacent to progressive places¹⁴. Every single artefact solves a technical problem and determines a relationship with the ground.

4.3 Making space: the position of the road relative to the ground

Thinking about the space that surrounds a road and therefore the role that the road takes in the organization of this space is the realization that it will be used, studied, or simply observed, that it will have a role in the lives of some individuals and of the landscape in which it falls.

[...] This means looking at the road [...] as a founding figure of the city, the sign of the conquest of new spaces, multiple and collective construction, as well as three-dimensional two-dimensional¹⁵

During a conference recently held at the Faculty of Architecture, IUAV University of Venice¹⁶, Pippo Ciorra defined the road as “one of the last basic elements of the contemporary city.” Ciorra was referring to the context of the territories west of the Italian coastline, characterized by widespread construction and urban fragmentation in which the roads provide immediate access to networks of mobility and become magnets for the continuous propagation of urban materials.

To date, the road attracts business everywhere: in whichever space it is built, the road has the ability to concentrate around itself activities, functions and the most various materials. On these functions in some cases one might try to have a planned control, to establish an organization,

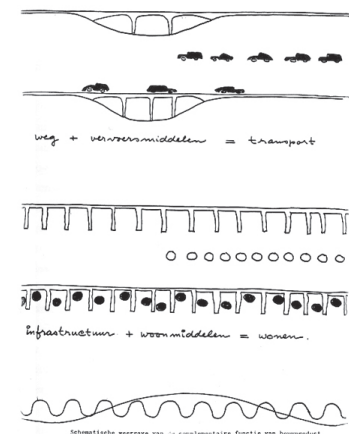
a hierarchy through planning instruments. A second method is not so much to establish the function that the spaces around the road will have, as to bring out their potential qualities and make them stable in time, waiting for them to be used at a later time.

The project of the space adjacent to roads is apart from the function that in time will settle within it: the latter will be decided or will be installed outside of specific programs, as observed during the PRIN 2007-2010¹⁷: to this day the spaces adjacent to roads in the mountainous context of the Trentino Alto Adige are colonized by many different functions. The design of the external space of the road, in the second case, can be targeted to bring out the potential qualities specific to each site: highlighting views, defining permeability and barriers, establishing covered and uncovered areas, balance the elevations in order to generate fluid spaces. From an extraordinary attractor element of urban materials, the road will become a tremendous support¹⁸ to establish functions in designed spaces.

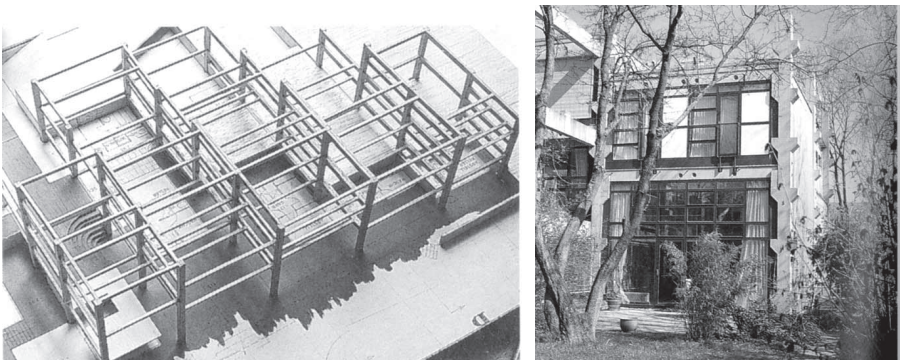
The concept of support used to indicate a space *halfway organized* is similar to that proposed in the 70s by J. Habraken for a new system of aggregated houses. In the theory offered by Habraken, the support was intended as a structure containing installations and common technical elements and was carried out at first, while the cell housing in itself at a later time¹⁹. This ensured compliance with the location of housing units in the space designed by the planner. The support this way uses the space and its organization as a foundation tool: an absolute space that governs and interprets the place and on which the individual can set his own specific activities. It's unique to find, between the diagrams of Habraken's study, a comparison between the support, as defined by him, and the viaduct: the support, according to Habraken is similar to a viaduct:

J. Habraken, comparison between supports and viaducts.

O. Uhl and J. P. Weber residential building in Genterstrasse, Wien, 1976.



Viaduct + cars = movement; support + homes = inhabitation



The design of the spaces adjacent to the road, in order to enhance the overall architectural value regardless of the function for which it will be used, is the reverse equivalent of the match suggested by Habraken: the road as a support for activities. The better is the space designed by the support, the better the quality of life of individuals who approach them in their activities will be.

To consider the road as an organized support consisting of attractive surrounding spaces, designed to the best of their abilities forces one to make the project interact with the plan and elevation of the road: it forces one to think of the road at the same time as a roadway project and as the bank of a potentially usable outdoor space, characterized not only by planning boundaries, even though from waste elevation, heights and vertical dimensions. The third dimension, emphasizing the physicality of the space on either side of the road, takes it back to the level of design material.

In mountainous contexts, the position occupied by the road compared to the ground decisively influences the quality of both the interior space of the street than the external one. In the first case, the elevation of the road surface establishes observation point of the surrounding objects (if in the trenches, for example, the portion of the outer horizon of the road is limited by the upper profile of the excavation, as well as from the top of a viaduct, the view will tend to be larger. In the second case, the road is an encumbering element that organizes the surrounding space, with an impact on its size, on the permeability of the transversal paths, on the views, etc.

In both cases it is useful to know the opportunities presented by the position of the road in offering quality alternatives to the surrounding spaces. Starting from the basic schematic figures offered from the road engineering, lets one have a picture of the operational options available to the architect, first in the dialogue with the more technical disciplines of the road (in the case of roads to be designed from scratch) secondly different morphological situations with which to interact (in the case of an architectural plan for an existing road).

Road engineering summarizes the possible positions of the road compared to the ground in three key figures: *in embankments, in trenches and on the hillside*²⁰. In addition to these there are other subcategories considered particular: roads *in elevation* provide for an artefact to hold up the road strip (for example a bridge or a viaduct).



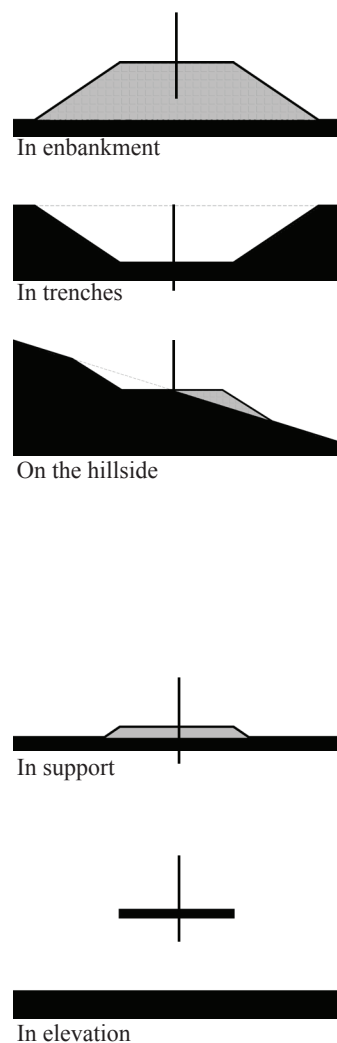
PRIN 2007-2010,
photographical survey in
Trentino Alto Adige.
Road in trenches near Pineta di
Laives (BZ).

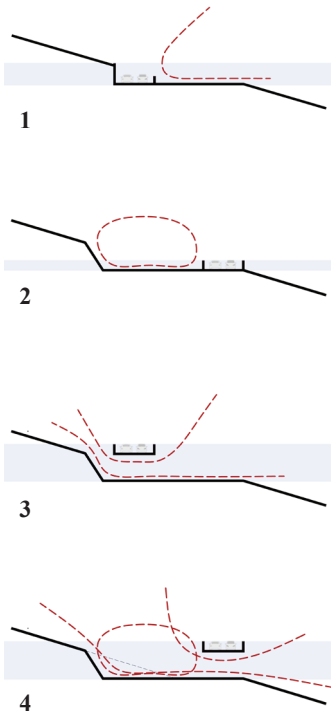
Streets *in support*, i.e. on the same level of the ground, are considered to be an ideal condition, since, from a technical point of view roads do not rest directly on the ground but need small embankments and other works for the retention of rain water.

As for the geometric representation, even in the typological subdivision, road engineering offers thoughts on the methods: for each typical road section are assigned specific repeatable elements: bumps, various types of walls, ditches, are elements that occur in one or the other type of section. In the architecture of the spaces around the road, a viaduct is equivalent to permeability, as well as the embankment is considered a barrier, but can also be a possible way to lean on an edge, while hillside roads offer the possibility, in a project, of a visual prospect along a slope. In addition, the hybridization of these figures with other elements offers the possibility of establishing a large number of spaces with different qualities, each of which establishes relationships (view, permeability, break, etc.) with the context. The intersection of these figures typically generates other more complex shapes, which are present in almost all road situations to which we refer to in road designing. But, more importantly, starting from these figures, one can establish a large number of spaces with different qualities, each of which establishes relationships (view, permeability, break, etc.) with the context.

It should be noted that, given a track that was constrained in the earlier stages of the project, making use of the technical advice of road engineers, in some cases, small changes can be made to the axis of the road, in the order of few meters, sometimes less. In our opinion, these changes may contribute to the transformation of places around the road, without changing the layout, but trying to understand the quality of the space that is created around it. If we consider this possibility not as a limitation but as an advantage, it will increase accordingly the ability to create the best possible spaces for that place.

Mountain contexts often require the design of roads on inclined slopes. In the four diagrams that follow, are represented four spaces defined by constant elements for each solution (the slope with some elementary modelling and the road), but with a variable position from time to time. In the first case, the road serves as the dividing line between the slope and the plane created downstream. The upstream part of the slope is obscured from view, the downstream portion is fully opened. The noise must be mitigated with sound barriers in order for the space adjacent to





the road to reach the right level of comfort.

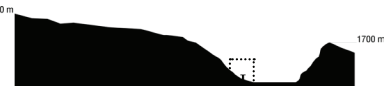
In the second case, the upstream slope is free to view, but is interrupted by the road on the valley. Compared to the previous situation, we have an enclosed space, confined, with no ways out.

The following situations (three and four) because of a gain in height elevation (a greater *vertical thickness* of the space between the ground and the road strip) determine more articulate and open spaces, in which the road serves as the organizer of the views and of the transverse flows in general. The situation no. three, while maintaining the road towards the mountain, is open to views and paths, which find an access, a beginning, under the road: the road becomes an entrance. The situation four is both an enclosed space, private, but open to views and routes towards the valley, with the same mechanism as above.

By working with the position one can reach solutions with different qualities. If other than the position one considers the possibilities offered by the modelling of embankments or artefacts, the possibilities to create different spaces increase.

Among the roads in elevation compared to the ground, the overlapping of viaducts in open areas, often present in mountain valley contexts (Trentino Alto Adige, for example, both the Adige Valley and the Valsugana are crossed for long stretches by viaducts), offers elements for thought: the road in this case is not just a perception device of the landscape, which has the advantage of flowing in a high position: it is also an element of distribution and organization of the spaces in an orographic scale.

From the outside, the viaduct in open spaces compares in size with the orographic elements of the context: crucial in the analysis are the orographic section and the longitudinal one, that highlight the proportions of the road compared to the major features of the landscape (slopes, orographic emergencies, planes and the great extension of cultivated areas). Case studies are the viaduct that serves the SS 47 “Valsugana”, located in the town of Borgo Valsugana that crosses the valley diagonally at high altitude, bisecting the open space of an agricultural park or the Fadalto viaducts that serve the A27 in Val Lapisina (Treviso). On the one hand, the interior space of the viaduct has a view of the valley, on the other its size is visible at long range, and is compared with the flat extension of the valley. In both cases, the viaduct is a support: not so much of accumulations of material to a reduced scale, as of extended



elements, capable of aligning, intersecting and contrasting to the two large infrastructures. The contexts of the valley are characterized by the flows (rivers and roads), and the arrangement and mutual relationship of spaces on a large scale is affected by them.

The issue is explored in the preliminary study framework for the new PRG assigned by the City Council of Trento to the research group led by Renato Bocchi between 2000 and 2001. The central idea of the plan is a city made up of flows, in which large infrastructures intertwine and define extended spaces from the far away horizon.



The concept of space that results is no longer the “finished” street or square, but the open countryside, the park, the “wide and panoramic views” of the movement and continuous flow. The horizon of these spaces is not that close to the buildings, but the much wider profile of the mountains that frame the valley or the local landmark formed by the rise of Doss Trento²¹.

[...] The substrate reference for the new “urban form” is no longer the formal establishment of the urban structure (urban morphology) but much more the formal establishment of a larger territorial system, which we call, with some approximation, “landscape”, a territorial system in which the predominance of large empty spaces (non-built) is just as important of the area of the built city²².

In the composition of the landscape, the infrastructure plays a morphological role in the orographic scale, establishing large-scale relationships between crops, forests, urban or yet to be developed areas.

Highway 27, Viaduct Fadalto, Lapisina valley (BL) .
Photographic view and orographical cross section.



In an elevated position compared to the ground, the traffic flow allows connections to large areas, becoming the territorial backbone that supports the large-scale organization of the spaces. This skeleton, that may appear to be flat on the plan, on the surface of the valley, actually works on many levels, weaving its way vertically through the spaces that thus also pass through it. The following roadways follow at a large-scale the orographic development of the Adige valley, and the spaces they intersected become long filaments sometimes wide and sometimes tight, that interact simultaneously with orography and territorial spaces: the rise and fall of major infrastructure elements is the tool that contributes to the definition of this large geographical backbone²³.



R Bocchi, diagram of “flows city”: river roads and margins of mountains in the Adige valley (from *Paesaggio come palinsesto*).

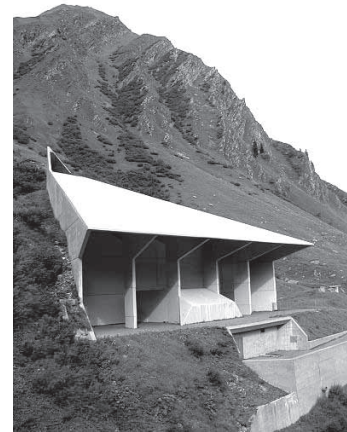
4.4 Outcrops: infrastructure traces

The use of tunnels is common in mountain contexts, be them natural or artificial, or generally the intersection of the road with the ground. While underground, the road often manifests its presence through technical elements, tunnel portals and short sections of road in the open: when left in the surface it evidences its presence as an *infrastructure trace*, an additional element of the road, not necessarily through its abutments, nor along its axis. Infrastructure *traces*, such as tunnel vents, portals, open stretches of road between two tunnels, are specific elements, infrequent, but that may be reflected in strategies involving the place, that protect it and constitute opportunities for its transformation or development. A famous is the ventilation well of the tunnel of N2, in Motto di Dentro, near Airolo (Canton Ticino) designed by Rino Tami during his assignment as aesthetic consultant of the Highway of S. Gotthard. The well is an element disjointed from the road axis only in its position: consistent with the work carried out globally for the N2, the technical artefact recalls in its figure, the other artefacts, showing its connection to a single logical path.

Similar in principle, the ventilation well of the galleries that serve of the bypass of Bressanone (architectural consultancy M. Scagnol) is detached from the normal technical artefacts, evolving in the final part in a split structure, which, instead of recalling the branches of the surrounding trees, becomes a steel sculptural element.

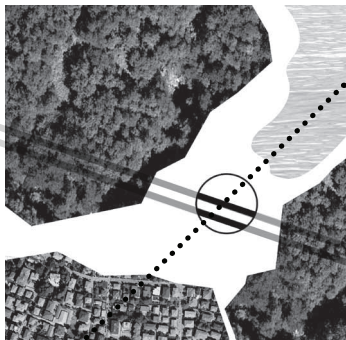
The project space Auguste Piccard, by Paolo Bürgi, for the Highway A9 of the Rhone, takes advantage of the tracks of the highway tunnel near the district G ronde, urban border of the town of Sierre, to organize a contemplation space involving the town centre and the surrounding landscape elements. The road space remains completely isolated from the surface context: the cars slide into the tunnel without entering in contact with the outside area. The space above the galleries is central, partially sunk into the ground, bordered by a cliff that isolates it from the surrounding context, ideal for fulfilling the function as a meditation area. As E. Morelli (2003) affirms, “At the same time there are two orders of time: a higher one out in the open, where people walk and meet, a lower one enclosed in highway tunnels, in which rushes the stream of traffic.”²⁴

The Auguste Piccard Space is strategically placed between the core and the town of G ronde and the nearby lake, a place of leisure and



R. Tami, ventilation well of the tunnel of N2, in Motto di Dentro, near Airolo Switzerland

M. Scagnol, ventilation well of the galleries of the Bressanone bypass, (BZ)

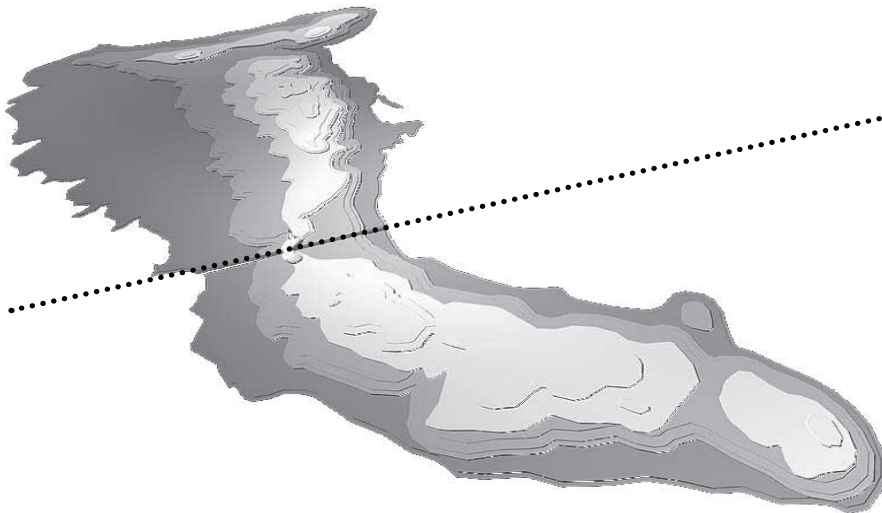


recreational activities, shortening the distance. Through an essential composition, it holds together elements that at times are different and at times opposing: the road, when surfacing, becomes part of a landscape composed from the edge of the town, the lake, the steep slopes of the mountains and the long lines of vines.

A contact between the moving speed of contemporary life and the stopping of thought.²⁵

Everything, in the composition of the elements of the project recalls the contrast between the two dimensions, one global and one local, represented respectively by the road and from space in the surface. The circle, a figure that refers to a single central point, is the antithesis of the two levels of the galleries, moved away from the centre of an apparently random distance. The selected function, a space in which to contemplate the landscape, meditate, rest, is the exact opposite of the road, a place of speed and distraction, of quick consumption of places and images. The verticality of the sixty-four italic poplars, monumental in height and in their circular arrangement is opposed to the horizontal line marked by the traces of the road below. The decision to bring out the road, otherwise hidden by the landfill, along with the singularity with which it is pursued is the proof of the refusal to hide what it supports by means of the place: in the form of a track, the road finds a role in the composition of the landscape enriching it with an element that under

P. Burgi, highway A9, espace August Piccard, Geronde, (Switzerland, 1994).

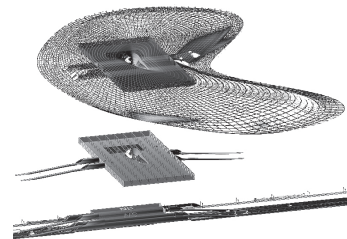
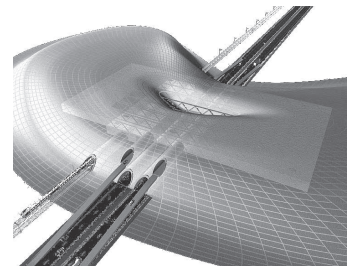


another form (as happens in most cases) would have had a different role: if it had emerged from the ground it would have been a powerful destabilizing factor, if kept underground it would have had no role.

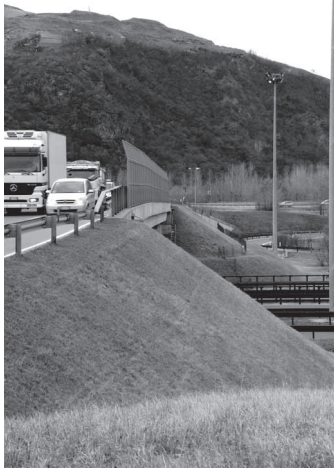
Although less detailed, the strategic theory *new Heuvelrug* of the Dutch study Monolab suggests the same architecture device: the intersection between the ground and the road creates a contact between the two elements in which the latter is a trace, evidence of the outdoor needs.

The suggestion is part of the study carried out under the project-guide operations concerning the A12 section between Deen Haag and the German border, one of ten “major projects” commissioned from the third architecture policy document “Shaping the Netherlands. Architectural Policy 2001-2004” (2000). A planning background of the study carried out by Monolab, fragmented into different plans on individual nodes or sections of the A12, it is the rejection of the principle that considers infrastructures as independent elements, and the adoption of new priorities aimed to sustain the intertwining and the contamination between road and landscape: interactions with ground, nature and landscape, and development of the road’s potential.

Interaction with the ground is a founding principle in the plan of Heuvelrug, a sand hill cloaked in forests, around which the A12 and the railway line alongside it is distributed, cutting its profile. Thus the integrity and continuity of the hill above the forest is lost. The Monolab plan is the variation of the roadway through the construction of two tunnels that cross the hill and the transformation of the hill into a natural park, whose access is possible only through a semi-underground visitor centre, located at the galleries: a void on top of the hill determines the surfacing of the access systems (railway stations), to the visitor centre and to the galleries.



Monolab, new Heuvelrug,
design for a road section of
highway A12
(Netherlands, 2000)



4.5 Gradient and edge: road thickness

We have seen that the roads in mountainous contexts have a variable altitude pattern, and that this variability often, does not match, although accentuated, with that of the ground that supports their path²⁶. The connection between the two forms is carried out by a border characterized by a variable height and thickness, which in common practice is achieved through technical elements of connection between the road surface and the ground. Road embankments, retaining walls or other catalogued solutions of road engineering determine typical situations regardless of the place they pass through. Every case reserves different details, perceived by a person with a skilled eye, but for most people, the kerbside is a recurring image in memory and subject to constant slopes, guardrails, ditches, concrete walls, overgrown grass and asphalt margins ...

The kerbside ceases to be a technical element once it has been assigned functions related to the definition of the spaces: the kerbside thus becomes a concept rich in contents, and operational capabilities.

In the survey of A. Venudo, the edge of the road is a strategic place, capable of receiving functions, uses and devices of the most diverse and various kinds. It is the interface between the road and its surroundings, between speed and stillness, between the crossing and the staying.

Compared to the infrastructure declinations of the border fundamentally affect the meanings of the device (open/close), of the space (volume and surface), of the connection (interface with the environment), of a technical and regulatory distance (buffer zones), of the function (Rest and service),

of the territory (land use), of a symbolic and communication representation (road markets), of a perceptual system (natural and urban landscape), and of ownership (public/private)²⁷.

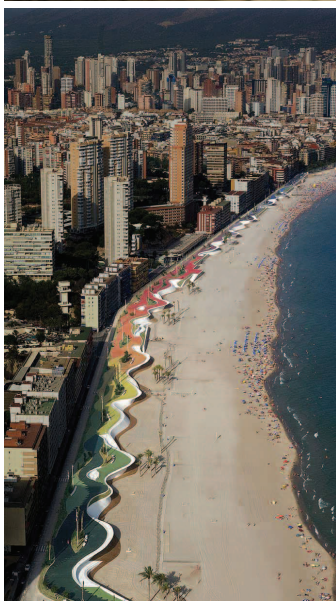
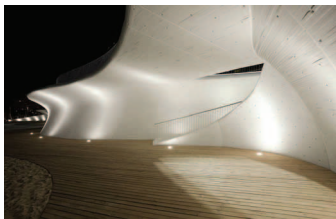
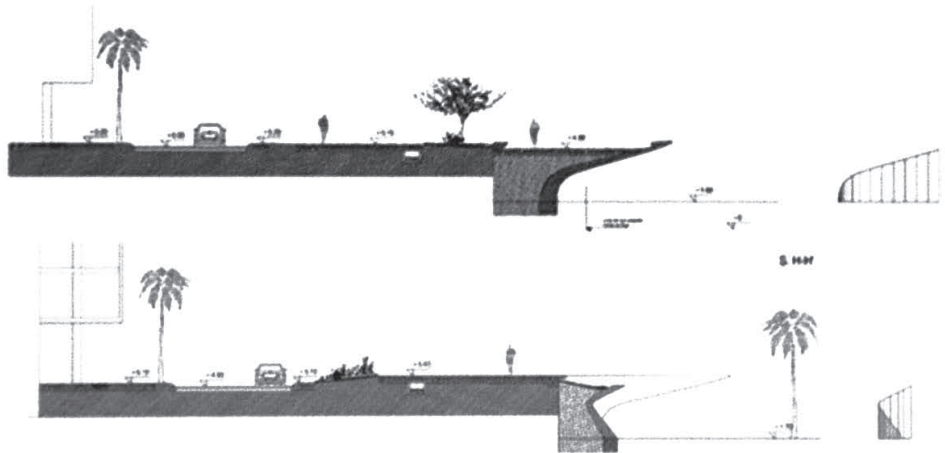
The roadside is the recipient of recurring elements in the infrastructure landscape: road signs or billboards, road restraint systems, noise barriers, cultivated and spontaneous vegetation, waste materials. It's the line of origin of the noise of traffic and at the same time represents the closest point, the door leading into the perceptual dimensions of mobility and to the network of visited places, different for everyone: an attractor for the settlement of all kinds of activities.

In mountain contexts, the road is a place characterized by height and variable widths and differently articulated, according to the technical, economic, functional, aesthetic, environmental, but mainly on the morphological basis of the land it crosses. The height is what determines the materials used for the supports (road embankments in the earth, retaining walls, concrete or steel, often coated), the physical and visual barrier and the separation between the extent of the speed and of the stillness.

In common practice road engineering plays a crucial part but often finds itself alone in front of issues that are foreign to the cultural peculiarities that it represents, the basic technical figures or their use appear to be insufficient or inappropriate to the architectural construction of the space adjacent to the road. The study carried out during the PRIN 2007-2010 and subsequent extensions to other case studies in mountainous contexts (see for example the SS47 Valsugana), highlight this weakness



PRIN 2007-2010,
photographical survey in
Trentino Alto Adige.
Study cases of Pineta di
Laives(TN) (on the top) and
Civezzano (TN)
(in the bottom).



with objectivity: road embankments used as deposits, invisible interstitial spaces between roads and houses, insufficient separation elements, retaining walls and road embankments that do not respect the human scale even though they are located in visited places.

Models suggested by architectural experiences in reference to work on the roadside that interpret the vertical thickness, a device which appears useful if repeated in mountain contexts, have effects on the prospectus and on the section: in the first case investing the longitudinal dimension of the road, producing effects on an extended scale, in the second case they effect the transversal dimension, that depending on the context involves stretches more or less extensive of the places.

The plan carried out by C. Ferrater for the waterfront promenade in Benidorm (Spain), involves both dimensions simultaneously: through the modelling of the road edge, shaping the gradient between the roadway and that of the ocean beach below, the two spaces are clearly separated, offering the possibility of two different dimensions (the road, tied to the flow of the movement and that of the ocean and a place in which people stand still).

The plan takes the form of a single elongated filament, a surface that bends on itself and conquers the third dimension, offering the possibility of hosting routes, creating continuous links between the vertical portion of the road and the beach and at the same time drawing a prospect along the entire front of the city. The project defines a unique place that accompanies both the car route and the path along the ocean beach. The modelling of the edge is always below the road level, so as to not lose the eye contact from the road to the ocean. With the intention of designing a shared place shaping equipment to deepen their association, to design the road which is a potentially degrading element in a recreational context in order to change the aspect of a long stretch of city on the

C. Ferrater, West beach promenade in Benidorm (Spain, 2004). Sections of the border and images.

ocean front, the plan for Benidorm is a landscape project focused on the three-dimensionality of the kerbside. It contains within itself access and exit devices from the two sites, placed at different heights and simultaneously draws an overview of lights and shadows that break on the grooved surface of the edge.

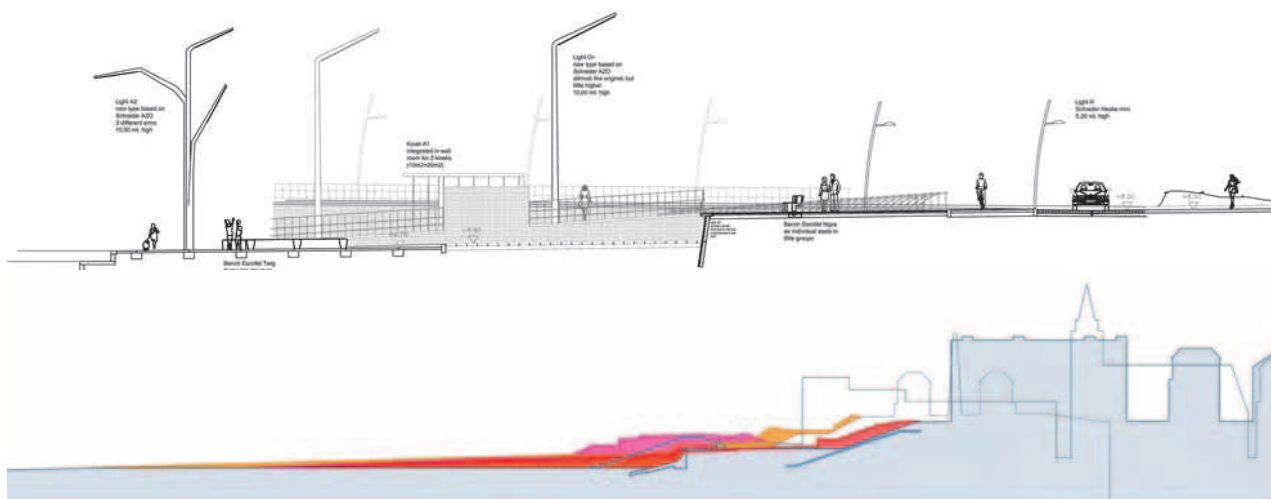
M. de Solà Morales, waterfront of Scheveningen Den Haag, (Holland, 2006-2012)

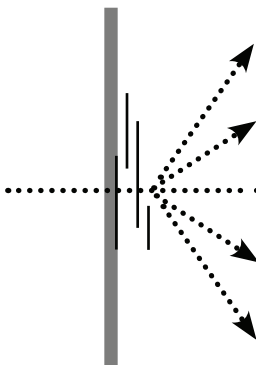
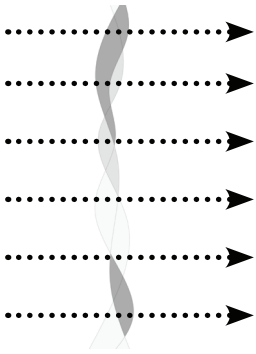
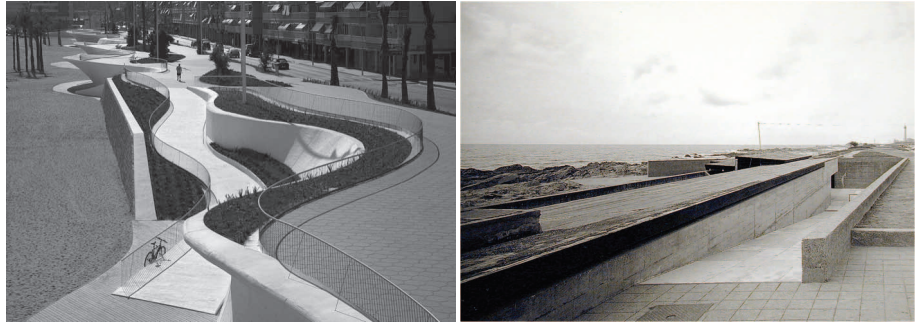
The Benidorm project addresses the subject of continuity through the thickness of the kerbside: it defines various paths, uninterrupted surfaces, creating continuous links between inhabited planes at different heights. The continuous use of the cross section is indicative and aims to control every step of the project: the sequence of sections defines precisely the consistency of the three-dimensional roadside, similarly to what happens in road engineering.

A Similar device, the project of M. De Sola Morales for Den Haag (Netherlands, 2006-2012) works for longitudinal bands, levelling out the different elevations of the sloping land that adjoins the edge of the city to the sea. The bands define a series of public spaces set on the flow of streams.



Unlike what is offered in Benidorm or Den Haag, the vertical thickness of the kerbside is the bank for some architecture schemes that address the issue containing the dimensions within narrow confines, without renouncing to the intent to define the prospect of the road, but amplifying the abilities to govern the long-range space through perceptive means. For example, the design of A. Siza for the ocean pools of Leça da Palmeira (Porto, 1966) solves the architectural transition in height between the road floor and the lower swimming area. The sequence of spaces that develop internally to the composition of concrete walls is an architectural device that picks the visitor up from a condition of flow and projects him into a static and contemplative place at a lower level.





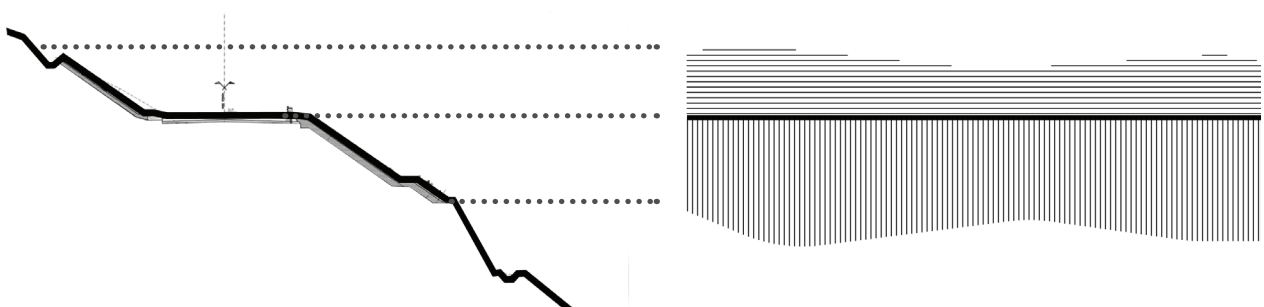
West beach promenade and swimming pool in Leca da Palmeira. Two different tools in order to have relations with landscape.

Roads on slopes create different geometrical effects on prospect

The two projects influence the landscape, interpret and modify it. Both approach the street as a secondary theme, in an accidental way, as accidentally as the theme of the elevation. They are antithetical in their methodological approach: if the former tends to fully invest the urban front, creating a morphological continuity that induces individuals to cross it in its entirety, the second tends to work in a timely manner, shaping the space around the person, wrapping and guiding the visual perception with the intent of obtaining, from a place that is concentrated in a point, perceptual effects at a long distance.

On sloping roads, the road edge is the result either of carryovers of land or of incisions in the land. Engravings and carryovers of land are artificial works that follow the elongated body of the road. Compared to the existing land, we determine the margins of artificial elements (supporting walls or road embankments) which prospectively are applied as lines or areas above or below the road, result of an artifice, highlighted or masked in practice with coatings and grassing.

Various lines or bands, the result of the morphological interaction between road and ground, determine the prospect of a sloping road, visible from opposing points of view or from the valley floor. Interacting with the thickness of the road, this system of artificial lines intersected with the trend of the slope highlight morphological characteristics otherwise invisible. If the common practice of cutting into the sloping road is a deteriorating element of the often untouched or natural looking landscape, in an artistic way it becomes an inclusion strategy. By

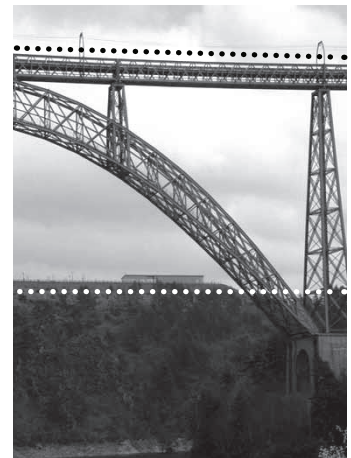




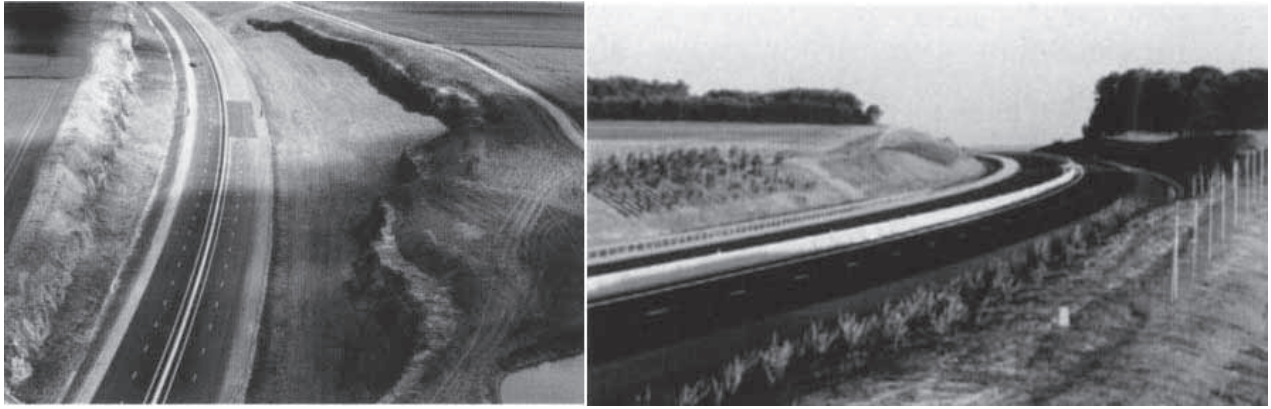
accepting the cut as an inevitable consequence of the passage of the infrastructure along a slope, it is possible to work both on the lines and on the intersecting surfaces.

As an element that is visible from the outside, the roadside can be modelled as a function of the external elements of the landscape, in order to establish perceptual connections with them. It's the case of the landscape project designed by the French study Latitude North (G. Vexlard and L. Vacherot) for the service area of Garabit (France, 2000) along the A75. The situation presented to the designers was to interact with the Garabit railway bridge, built (1884) by the Engineer G. Eiffell, historic sediment, today an engineering-monument of the landscape. In defining the outer edges of the rest area, the designers set the elevations according to the inclination of the deck of the great steel bridge: seen from outside, the edge of the area defines a slanted straight line that spreads out, on a plane of different depths, parallel to the structure, also defining at the same time the outer profile of the promontory in which the area settles. The parking area, dimensionally insignificant compared to the extension of the bridge, is capable this way, to establish a geometric dialogue with it.

The road as a long *shaped* element that is deposited on the landscape motivating its transformation, brings us to the road planning experience of B. Lassus, in which the road edge is processed and assimilated to the great works of land art, or to the *Responsibility* installations of the artist H.Siren for the Länsiväylä highway (Espoo, Finland, 1992-1995) In the highway A28 Le Mans-Alecon the edge is modelled with long stretches



Latitude Nord, (G. Vexlard, L. Vacherot) and B. Mader, rest area along the A75, near Garabit, (France, 1999).



of land excavations and different sized land carry overs in order to show glimpses of landscape and contributes to give the road the role of a perceptual instrument of the landscape. The road as geographical element²⁸, that interacts with the ground affecting its shape.

As a device, the transformation of the ground may be directed to highlight features of the landscape that are not immediately perceptible, of the landscape and orography. In this way, even the normal slope of the road embankment, used as a design standard, and extended in a continuous and invariable manner for long stretches of road, can assume an artistic value.



This is the direction, for example, in which the work was carried out in the project for the area Scacciotti in Reggio Calabria, in the Workshop *Pettinissa. A big green line.*



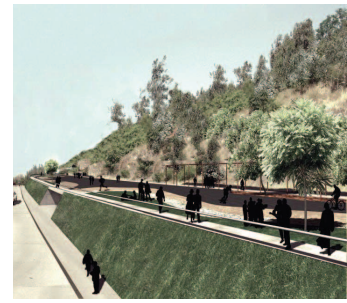
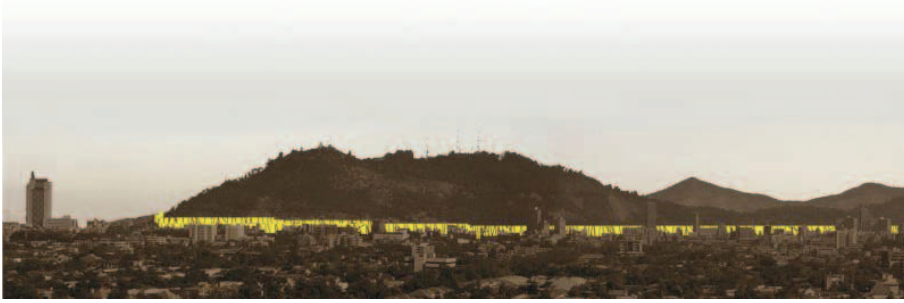
The road embankment modelled with a constant slope accompanying the entire stretch of road is a solid, three-dimensional and constant element that interacts with the ground on which it rests determining a variable geometric line, which highlights both the inflexible mark of the road, and the ups and downs of the ground. Like the works of land art on a territorial scale²⁹ the geometric solid highlights the characteristics of the site on which it rests, and leads us to acknowledge, through the simplicity of the forms, a relationship between device and nature.

A similar device is used in the project published by Aravena for a linear park on Cristoball Hill, (Santiago, Chile). The project uses the figure of the prospectus, created through the extension and modelling of the kerbside, to expose the band of the park from the city and yet still create a public space of a lengthy size enjoyable for walking and leisure activities, in a place that today have none.

The design approach that emphasizes the vertical dimension of the kerbside making it interact with the ground is the opposite of the

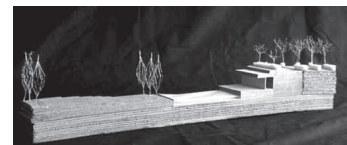
B. Lassus, landscape design for A28 Alecon-Le Mans-Tours (France, 1997)

H.Siren, Responsibility, Otawieimi, 1992-1995.



camouflage to which the common practice tends. The natural materials (grass restoration, wood, Corten steel) with which the retaining walls are commonly coated, embankments and other typical road elements found in the mitigation practice, are not able to conceal the shapes of the road: The incompatibility raises the need to find new tactics for integration and interaction between road and land, including the modelling of the edge that appears to be effective.

In a more spontaneous way, some designs use the position and the edge as a technique for separating places that require isolation from the road. Thus the outer edge in Nudo de la Trinitat is a separation device between the interior and the exterior of the great figure generated by the junction, or, in a smaller scale, the monument to the resistance of G. Valle in Udine (1959-1969) or that of A . Galfetti in Locarno (1988) that take advantage of the difference in latitude between interior and exterior and result in islands, places apart from the road stream in which, opposed to the external velocity, the gradient border stems traffic and provides a place to rest.



Project published by A. Aravena for a park of Cristobal hill in Santiago of Chile.

G. Valle, monument to the resistance, Udine (1959-1969)

A . Galfetti, roundabout in Locarno (1988).

E.Battle, J.Roig, Nudo de la Trinitat, Barcellona

NOTES TO CHAPTER 4

- ¹ Bernardo Secchi, “The form of the city” in *Planum / the european journal of planning*, September 2003, www.planum.net
- ² A proposito della relazione suolo/architettura, cfr. A. e I. Ruby, *Groundscapes: el reencuentro con el suelo en la arquitectura contemporanea*, Gili, Barcellona 2006
- ³ In addition to the already mentioned essay in the previous note, we should remember “Progetto di Suolo” in *Casabella* no 520-521, Electa, Milan, 1986, “Lo spessore della strada” in *Casabella* no 553-554, Electa, Milan, 1989, “Progetto di Suolo 2” in *Spazi pubblici contemporanei. Architettura a volume zero*, by Aldo Aymonino and Valerio Paolo Mosco, Skyra, Milan, 2006.
- ⁴ Bernardo Secchi, *Prima lezione di urbanistica*, Laterza, Milan, 2000
- ⁵ Francesco Repishti, “Excavation and overlaying” in *Lotus International* 139, 2009
- ⁶ K. W. Forster, by *Metamorph Trajectories*, *La Biennale di Venezia 9. Mostra Internazionale di Architettura*, Marsiglio, Venice, 2004.
- ⁷ The landform architecture imitates natural forms and becomes as smooth as the surface of land, rock or water. In this regard, Cf. Matteo Zambelli, *Landform Architecture*, EdilStampa, Rome, 2006.
- ⁸ L. Coccia, *L'architettura del suolo*, Alinea, Florence, 2005.
- ⁹ E. Ferrari and A. Turella (coordinated and by) *Trentino - viaggio fotografico di Gabriele Basilico*, Nicolodi, Rovereto, 2003. The publication contains the photographic experience made by Gabriele Basilico on behalf of the Province of Trento in the survey of the Urban Plan of the Province of Trento and of the legislation on the protection of the landscape. The study has been the subject of an exhibition titled “ Trentino - viaggio fotografico di Gabriele Basilico “, opened at the Museum of Contemporary Art in Rovereto (MART) from September 12 until October 23, 2003.
- ¹⁰ We refer for example to the rest area at Crazannes quarries, along the A837, Saintes-Rochefort (1993-97) or the modelling work of the kerbside along the A19 (2009) and along the A28 (1997) , for B. Lassus, and the rest area of Foucheres-Villeroy, highway A160, (1992) for J.Simon.
- ¹¹ We refer to works carried out in the Nevada desert between 1968 and 1970: *Dissipate, Displaced-Replaced Mass and Double Negativ*: are realizations of large excavations in desert context, where the individual is part of the work. Cuts and excavations reveal the morphological characteristics of the ground.
- ¹² Mateus’ scale models have been exhibited at the XXII Venice Biennale in the Italia Pavilion *People meet in architecture* (from August to November 2010), and appear in the exhibition catalogue (Kazuyo Sejima, eds, *The Venice Biennale. 12th International Architecture Exhibition*, Marsilio, Venice, 2010)
- ¹³ Subtitle to the installation of M. A. Mateus, XXII Architecture Exhibition, Venice Biennale, from August to November 2010.
- ¹⁴ In addition to the French experiences, which have been developing since the 60s, we must remember, in the European field experience of the aesthetic consultant of the National Roads Office of Canton Ticino,

Architect Rino Tami in the twenty years between 1963 and 1983 for the highway N2 Como – S. Gotthard: the architect's work, in this case turned into a real "aesthetic direction" because of the artefacts carried out and is often quoted as an example (a job description is contained in the articles "Rino Tami, uno sguardo estetico sulle autostrade" by Letizia Tedeschi and interview with Flora Rauchat Roncati "Un'architettura chiamata autostrada" in No. 2 of *Transportation and culture*). In Italy achievements such as the Italian section of the Brenner highway, to which the engineer and landscape Architect Pietro Porcinai and Riccardo Morandi participated, are presented as isolated cases, in which the presence of an only landscape and structural designer for the works, a rare opportunity on these occasions, however, does not seem to have been fully exploited.

¹⁵ S. Maffioletti, "La strada ci usa", in S. Maffioletti, S. Rocchetto (ed.), *Infrastrutture e paesaggi contemporanei*, Il Poligrafo, Padua, 2002.

¹⁶ Pippo Ciorra, *East Coast Urbanism*, Conference edited by S. Marini, December 6, 2010.

¹⁷ Cf. Ch. 1, Par. *Experimentations*

¹⁸ J. Habraken, *Supports: An Alternative to Mass Housing*, The Architectural press, London, 1972

¹⁹ Residential buildings based on Habraken's theory of support were carried out by O. Uhl e J. P. Weber in the houses on Genterstrasse, in Vienna, in 1976.

²⁰ It refers to the basic definitions contained in Road Engineering manuals, (e.g. R. Mauro, T. Esposito, *La geometria stradale*, Helvetius, Benevento, 2003) definitions that can vary from manual to manual, but which, in Road techniques show the specificity of construction details of each type of section considered.

²¹ Doss Trento is the local name of an orographic bank formation in the North West of the city of Trento, that emerges and rests on the plane of the Adige valley. The diagrams that accompany the Bocchi's study, the Doss is represented as an element that accompanies, is intertwined and defines the flows, contributing to the scanning of extended spaces and that can vary in size.

²² R. Bocchi, Plan-Guide for the band of the Adige river, published by Emanuela Shir (ed.), *Paesaggio come palinsesto. Progetti per l'area fluviale dell'Adige a Trento*, Nicolodi & University of Trento, 2006.

²³ The geographical term is quoted by Bocchi in E.Schir, eds., *Landscape as a palimpsest. Projects for the area in the Adige river in Trento*, Quot.

²⁴ E. Morelli, *Disegnare linee nel paesaggio, Trials*, tab 5, Ph.D. thesis, University of Florence, Florence University Press, 2005.

²⁵ P. Bürgi, "Perception", in L. Ponticelli, C. Micheletti, *Nuove infrastrutture per nuovi paesaggi*, Skira, Milan 2003.

²⁶ Cf. Chapter 2, *The space "between": an alternative reading of the road body based on the gradient*.

²⁷ A. Venudo in the introduction to the chapter "Border, margin limits... surfaces, ground, road... screens" in *Spessori codici interfacce. Architetture della strada*, (2005), quote. The roadside is investigated by Venudo as a hybrid space between the road and the city, for example, a place of transition between different speeds, or the sharing of spaces. For this reason Venudo refers to different the forms of the edge, such as screens, surfaces, buffer strips and their corruption through the colonization of the road margin.

²⁸ Land art is often recalled in studies regarding roads when they are given the meaning of *artificial geography*. (Venudo 2005). Particularly, some works of R. Long reflect on the traces left during a passage and result in

long geometric tracks on the surface of the ground made of ephemeral materials such as grass and stones, a metaphor of its temporariness.

²⁹ This refers in particular to the work of Michael Heizer, *Double Negativ*, in the Virgin River Mesa, Desert of Nevada, USA, in which the total size of the excavation work is never has felt in the place but, while passing through it, the individual is aware of being part of the work himself. The different perception of the geographical scale of the work is similar to the lines drawn from the population that inhabited the area of the desert of Nazca in southern Peru, between 300 B.C. and 500 A.D. The lines are drawn by removing the stones containing iron oxides from the surface of the desert, leaving a contrast with the underlying lighter gravel. In aerial views they manifest themselves as lines with an unquestionably artificial geometry, while on the ground they appear as individual and artificial imperfections of the land.

CONCLUSIONS

Architectural operating tools

Mountain contexts have been addressed in this research as a *type* and we have highlighted some of the general features that influence the formation of specific landscapes and places affected by the presence of roads. The analysis and project strategies that we pointed out and addressed aim to establish fixed points on the interpretation of any mountain context, and establish common characteristics between them. This study attempts to interpret the subjects already known to the research (perception, scale, continuity, etc.) through a unilateral point of view: given a *type of context*, the analysis and design strategies offered respond to the stimulus of the *Manifesto for the European landscape project*¹ to find *new tools* for the design of *new spaces*.

Architecture has established over the years a large number of strategies and devices suitable or adaptable to interpret the space of the roads: they are obtainable through a targeted survey of projects and constructions that contain them. The examples covered by this research are not always road architectures, nor are they specific of mountain contexts: they are architectures with a repeatable strategy or device, which face the problem of the relationship between the elements found in the landscape (in this case to interpret the vertical architectures, the differences in latitude, the slopes and the overlaps) and those of the new structure.

The *design projects* are a study tool: they provide information that, once removed from their context, are repeatable in different places or conditions. For example, it's possible to determine whether the studied architectural devices should be applied in the design of a new road or ex post, by intervening in situations already in place. This last feature highlights their adaptability, and makes them effective tools, able to change even the most rough and tricky situations, overturning the principle that interprets the road as an inevitable loss for the area it crosses through.

Yet it would be rash to say that a number of devices can provide a universal method for the design: the suggested strategies aim to define architectural projects, which in turn will refer to specific cases, increasing

the number of possible aspects and interpretations, by manipulating the logical integrity and breaking the inflexibility of the *method*.

A PhD research is directed mainly to the scientific community, hoping to add a branch to a specific knowledge and to bring attention to future researches.

In the perspective suggested by the *Manifesto*, the present study may provide operational tools for the project. The instrument here is interpreted as *what you use in order to obtain something*²: whoever is about to engage in designing spaces for roads in mountain contexts can read this research as a starting point and consider the strategies proposed as a possible way to interpret the design of the space. They are applicable in every point of every mountain road, because they are based on the determination, interpretation and design of the features of the *spaces* affected by their presence. Roads affect extensive territories and it is hard to imagine being able to continuously operate on an entire section of road: these strategies can be applied in a timely manner, where it is needed or in sections, resulting in a discontinuous path. This way we can control, prevent, or at least direct the transformation of landscapes crossed by roads, because they affect the location and the places, the *strategies* and the *tools*, by interpreting them through perception and the quality of the space, the ability to transform themselves over time and to extend their effects beyond the limits of the “project area”.

This research was also carried out to be referred to heterogeneous disciplinary professionals (Structural and Road Engineers, Architects, Politicians, Landscape Architects, etc.) that want to know the possibilities offered by the architecture of the spaces in the interpretation of the roads in mountain contexts, who are preparing to interact with architectural culture and its tools.

During the studies for the development of the Architecture thesis within the Faculty of Engineering has emerged the important aspect of the difficulty of language between the different disciplines: the terms, purposes and methods of the discipline are sometimes incomprehensible to others. The subject of the *dialogue* between different disciplines is not only important in the regulation of the infrastructure production, when it aims to implement a wider participation of cultures, but also in meeting and helping the need to understand and learn from different subject areas while maintaining their own cultural prerogatives³.

During this research, for example, we showed the opportunity to derive

from road engineering the operational strategies that are useful because of their *methods*. We proved that the specific case of the mountain context is recognized by the rules of road geometry, indicative of a singularity that affects not only the morphological features of the road artefacts, but also those of the spaces that they generate. But from an operational standpoint road engineering seems to have some extraordinary tools and methods: regarding the representation road engineering has developed a graphic system universally recognized and applied within the discipline, which allows to design simultaneously at different scales, with a global vision of the purposes, the specific peculiarities and of the entire structure. The system is specific and accurately controls the most unique feature of the roads, which is to generate effects at all scales. The road profile corresponds to a large-scale, scaled differently in the longitudinal axis and the vertical axis, in order to highlight the variability in elevation and the necessary artefacts in certain parts of the track. At the local scale corresponds the cross-section, which shows how the road relates to the ground. The studies of A. Venudo concerning the two representations, makes it clear how it would be helpful to approach this graphics system in order to evolve it, interpret it according to new requirements to control the *architectural* design of the road or of its spaces: the longitudinal profile corresponds to the *strategy*, the section to the *device*⁴.

A few days ago the news came out that the Italian Government intends to prepare a new decision-making system for the construction of major infrastructure projects based on the French participatory model⁵. Stimulated by recent setbacks in the implementation of the European railway corridor number five, a debate is taking place in Italy, a little late, compared to the *European Landscape Convention*⁶, on the need to interact with the local inhabitants before starting the design of an infrastructure. The French participatory process appears to be a functional model because it introduces culturally homogeneous professionals, some better suited to interpret the local needs and talk with the people, collecting information, requirements and incentives, compared to “pure” technicians, in charge of the technical design and the construction of roads under the law: a system that has shrunk considerably the local opposition to the construction of infrastructures. No matter which model we shall develop in the coming years, it is crucial to learn to know the limits of our subject area, to cross them

with curiosity and draw on other sources. It's hard to imagine that the dialogue with all the people involved in the construction of an infrastructure and with the inhabitants involved can be conducted in view of a single discipline, and without knowing the greatest number of operational tools available for the solution of tangible problems, such as for example, the conflict between road space and residential space, between the track and the landscape or the vision and the role of a viaduct along a mountain valley. Moreover, these possibilities must be effectively communicated to everyone.

The Italian delay compared to other countries is not easy to explain: political, social, economic and technical issues seem to have come between the introduction of more democratic and participatory decision-making models. If today it is also evident at a political level the need to reformulate the process, it is necessary that every discipline makes known the tools accumulated over the years, revises them in an operational sense, and makes them available to those who intend to embark in this road with their eyes open. However, given the delay and the damage already done, next to the new participatory models it is also necessary to establish tools to interact with already built roads, in order to solve already existing problems, and Architecture seems to have these capabilities.

NOTES TO CONCLUSIONS

¹ Particularly in section 14, cf. Chapter 1, par. *Scientific and Cultural Context: The European Landscape Convention and Manifesto for the European Landscape project*.

² *Grande dizionario Garzanti della lingua italiana*, De Agostini, 2009.

³ Cf. on this regard what Architect C. Pera says during the interview in Chapter 1: “It seems to me that in order to design the landscape designers need a great culture: a general culture and a specific one, in history, locations, materials, technologies, and the specific quality of the designer and the ability to transform all these into project actions. I think it’s important to have the humility to dialogue with those interested in a tract of land [...] The dynamics that trigger a good design and good construction [...] reside in the culture, sensitivity and pride of the locals, in the vicinity of these sensitivities are the contracting authorities and the designers.”

⁴ A. Venudo, *Spessori, codici, interfacce. Architetture della strada*, quote.

⁵ F. Sarzanini, *Il Corriere della Sera*, March 4, 2012.

⁶ Today in Italy the democratic participation of the population to the creation of the infrastructures takes place after the design is finished and only in order to advertise the intentions of the organizers.

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