The Great Diversity of Italian Landscapes and Landforms: Their Origin and Human Imprint

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Abstract

An outstanding variety of landscapes and landforms are present in Italy due to its complex geological history, repeated climate changes and increasing human impact through time. This chapter highlights the reasons for the geological and geomorphological diversity of the country by illustrating its geological evolution since the Mesozoic, outlining the paleogeographic changes that occurred as a consequence of Quaternary climate variations, and tracing the unique human civilization history that has so strongly influenced landscape evolution since the Neolithic. Special attention is devoted to the complex history of the country, where peoples coming from different geographical areas met each other contributing to make Italy a compendium of cultural diversity capable of attracting travellers from all over the world. Landscape conservation and protection are finally taken into account.

Keywords

Landscape • Climatic change • Paleogeography • History • Italy

2.1 Introduction

Italy is characterized by extraordinary diversity of landscapes due to its complex long-term geological and climatic evolution, and its unique human civilization history.

From a geological viewpoint, the shape and physical configuration of Italy originates from the collision between the African and Eurasian plates that occurred during the Cenozoic. This geological event caused the closure of the Tethys Sea, and was accompanied by the compression and piling up of its sediments which determined the formation of the two mountain chains that now characterize the Italian territory: the Alps and the Apennines. This tectonic evolution is still ongoing, causing remarkable seismic and volcanic activity, which threaten human settlements and activities. The diversity of Italian landscapes is also due to the wide variety of lithotypes, including the pre-orogenic basement and the successive sedimentary cover.

Dramatic climate changes affected Italy in the last 25,000 years leading to relevant geographical and morpho-climatic changes, including remarkable coastline variations. At present, diverse climatic conditions characterize the country influencing landform evolution. This is principally due to the wide latitudinal extent of Italy, and to the altitudinal range from over 4800 m to sea level, and locally below. In addition, the presence of the Alps and Apennines significantly influences the general air circulation; the fact that the country is enveloped by the sea along *ca.* 7500 km determines also a significant variety of regional and local morphoclimatic conditions.

The human presence since prehistoric times has itself profoundly contributed to the shaping of Italian landscapes. Numerous and different communities who alternatively ruled and lived in the Italian territory have left a clear imprint in

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the land use and management (such as terracing, land reclamation, management of water courses, land division, farming), providing the means to make Italy a compendium of environmental diversity where, through time, a melting-pot of different cultures developed thanks to Mediterranean, Slavic and German influxes. This has also provided the ground for the development of Italian "cultural landscape" which has attracted travellers and visitors for a long time.

2.2 Physiography of Italy

Italy consists of a peninsula elongated in a N–S direction into the central Mediterranean Sea and of two major islands, Sardinia and Sicily (Fig. 2.1). The peninsula and Sicily show a peculiar boot shape delimited in the north by the Alps. The Mediterranean Sea enveloping Italy locally takes different names, such as the Tyrrhenian Sea to the west, the Adriatic Sea to the east, and the Ionian Sea to the southeast of the mainland.

From an administrative viewpoint, Italy borders France to the west, Switzerland and Austria to the north and Slovenia to the east. It is worth noting that within the Italian peninsula two foreign states are included: San Marino (61.2 km^2) and Vatican City (0.44 km^2).

Coasts represent an important geographic feature of Italy, since they extend for 7375 km (ISTAT 2015) offering a great diversity of coastal landscapes and landforms (Fredi and Lupia Palmieri 2017). Mountainous and hilly areas prevail over lowlands (Table 2.1) due to the presence of the Alps and the Apennines which dominate the country from a physiographic viewpoint due to their continuity and significant average altitude (Federici 2000). The Alps, as well as the seas encircling the peninsula, protected Italy from invasions; in historic times, the Apennines constituted the backbone of the country and also a geographical and cultural divide.

The two mountain chains heavily influence the climate of the country since they control wind circulation and precipitation patterns. The Alps protect the Po Plain from the cold currents from Central Europe, while the Apennines restrain the influence of maritime humid air to the west-facing Tyrrhenian side (Fratianni and Acquaotta 2017). The Alps also host a number of glaciers, especially in its western side (Giardino et al. 2017).

The distribution and regime of rivers are strongly influenced by the presence of the Alps and Apennines, with the

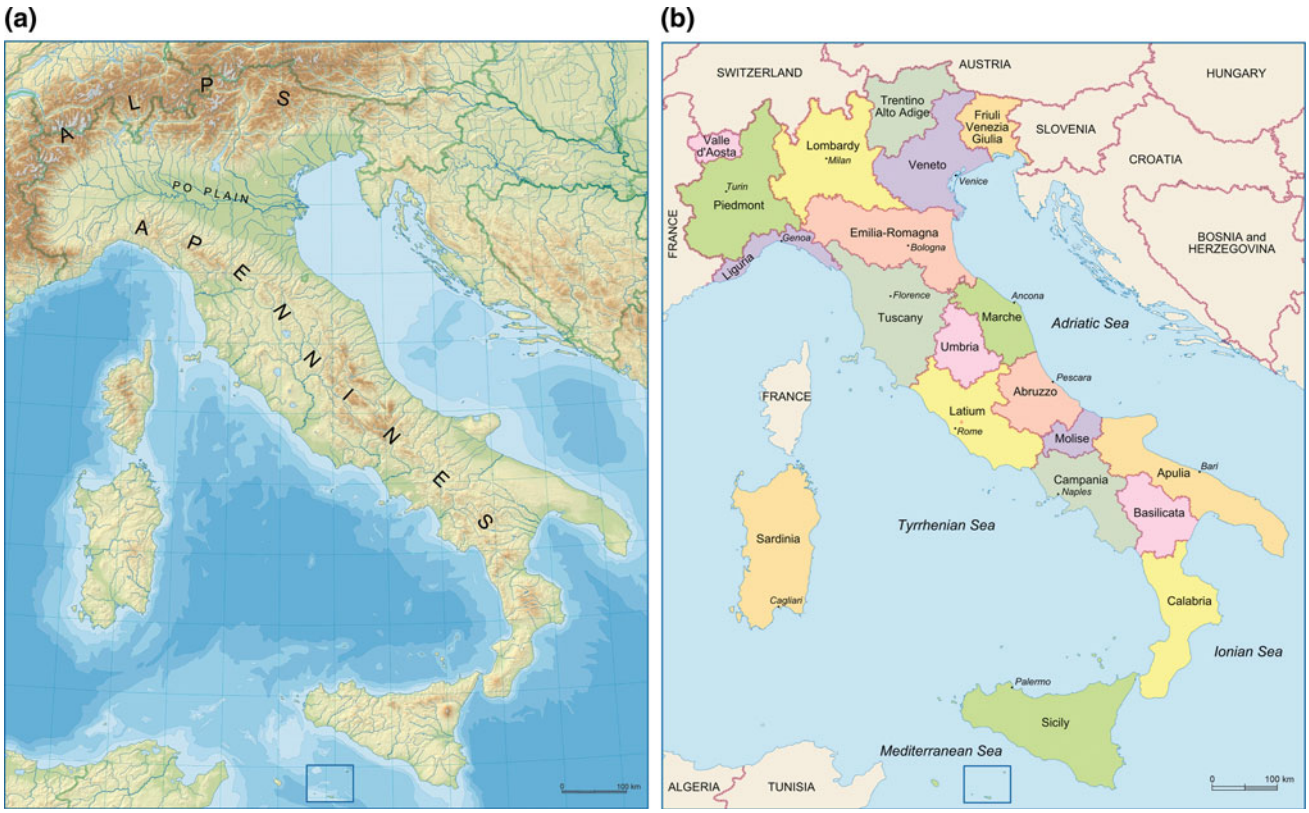
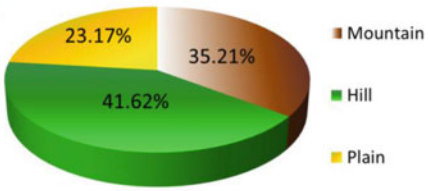


Fig. 2.1 Italy: physical and political setting. The latter displays the 20 administrative regions. The *blue* rectangles include the Lampedusa and Linosa islands which are located southward, outside the frame (base maps courtesy of Litografia Artistica Cartografica S.r.l., Firenze)

Table 2.1 Numbers of Italy

Extremes		
Northernmost point	47°05′30″ N	Testa Gemella Occidentale (Prettau, Trentino-Alto Adige)
Southernmost point	35°29′24″ N	Punta Pesce Spada (Lampedusa Island, Sicily)
Westernmost point	6°37′32″ E	Valle Stretta (Bardonecchia, Piedmont)
Easternmost point	18°31′18″ E	Capo d'Otranto (Apulia)
Maximum length	1,291 km	From Testa Gemella Occidentale to Punta Pesce Spada
Maximum distance from the sea	294 km	Madesimo (Lombardy)
Highest point	4,810	Mt. Blanc /Mt. Bianco (Valle d'Aosta)
Lowest point	-3.44 m	Contane, Jolanda di Savoia (Ferrara, Emilia-Romagna)

Mountains and plains (1)	Area (km²)
Mountain	106,110
Hill	125,419
Plain	69,807
Total surface of Italy	301,336



Major mounts	Altitude (m a.s.l.)
Mt. Blanc	4,810
Mt. Rosa	4,634
Mt. Cervino	4,478

Major plains	Area (km²)
Po and Venetian plains (Piedmont, Lombardy, Emilia-Romagna, Veneto)	46,000
Tavoliere delle Puglie (Apulia)	4,810
Salento Plain (Apulia)	2,000

Main islands	Area (km²)
Sicily	25,707
Sardinia	24,090
Elba Island	223

Main volcanoes	Altitude (m a.s.l.)
Etna	3,350
Vesuvius	1,281

Rivers (2)	Length (km)	Spring (altitude m a.s.l.)
Po	652	Monviso (2,020)
Adige	409	Reisa Lake (1,550)
Tiber	405	Mt. Fumaiolo (1,268)

Lakes (3)	Area (km²)	Maximum depth (m)
Garda	370	346
Maggiore	212	372
Como	146	410

Lagoons (4)	Area (ha)
Venetian Lagoon	55,000
Goro Lagoon	17,411
Comacchio Valley	15,742

Glaciers (5)	Area (km²)
Adamello	16.4
Forni (Ortles-Cevedale Group)	11.3
Miage (Mt. Blanc)	10.5

Number of glaciers
903

Glaciers' total area (km²)
369.90 km²

Climate (6)							
Maximum temperature (°C)	Weather station and altitude	Minimum temperature (°C)	Weather station and altitude	Driest locality	Mean annual rainfall	Rainiest locality	Mean annual rainfall
+47° (25 June 2007)	Amendola (Foggia, Apulia) 60 m a.s.l.	**-41°** (February 1929)	Regina Margherita hut (Valle d'Aosta) 4,554 m a.s.l.	**Capo Carbonara** (Sardinia)	< 300 mm	**Musi** (Friuli Venezia Giulia)	> 3,000 mm

Schematic description of main physiographic features of Italy according to: (1) ISTAT (2015); (2) Marchetti (2008); (3) Fredi and Pelfini (2008); (4) De Pippo and Valente (2008); (5) Smiraglia and Diolaiuti (2015); (6) Fratianni and Acquaotta (2017)

rivers flowing from the Alps being longer and having higher discharge. Plain areas are not frequent in Italy though the northern part of the country is dominated by the Po Plain (constituting 70% of level areas of Italy) which results from the accumulation of fluvial sediments deposited by the main Italian river during the last one million years. Lakes of different origin are present throughout Italy. The main lakes located at the southern margin of the Alps are related to both structural causes and action of ancient glaciers (Table 2.1). Central Italy is instead characterized by a series of volcanic lakes (Fredi and Ciccacci 2017).

The main geographic features of the country are reported in Table 2.1.

2.3 Long-Term Geological History and Paleogeography of Italy

Italy is characterized by considerable geological diversity which is largely related to its long-term geological history (Bosellini 2005, 2017). The topical geological events which have made Italy such a complex land from a tectonic and lithologic viewpoint will be briefly described below, as well as the main climatic phases which profoundly changed the geography of Italy through time due to remarkable sea-level variations.

At the beginning of the Mesozoic (*ca.* 250 Ma BP), when all continents were joined into one (Pangea supercontinent) and surrounded by a single ocean (Panthalassa) most of the Italian peninsula was submerged by the relatively shallow and warm waters of the Tethys Gulf (Fig. 2.2). The Triassic Italian landscape was substantially different from the present-day one: most of the contemporary lands were covered by a shallow, epi-continental sea. Locally there were groups of white sandy atolls surrounded by deep sea branches and protected by huge coral reefs. The latter, due to mountain building processes, have been uplifted more than 3000 m and nowadays constitute some of the most spectacular landforms of the Dolomites (Soldati 2010). Coastal areas hosted tidal flats, lagoons and small evaporitic basins where fine calcareous sediments were rhythmically deposited constituting today's thick layered dolomitic rocks. At that time only part of Sardinia and Tuscany were emerged within the arid paleo-European continent. The Triassic landscape did not last more than *ca.* 50 Ma years; in fact, with the Jurassic opening of the Piedmont-Liguria Ocean all previous emerged lands were covered by an extensive oceanic basin.

In the Paleogene (from *ca.* 66 to 23 Ma BP), in effect of Piedmont-Liguria Ocean closure and the consequent continental collision, uplift of the Alpine and Apennine chains occurred. During the Tortonian (from 11.6 to 7.2 Ma BP) most of the Italian peninsula was still under the sea level:

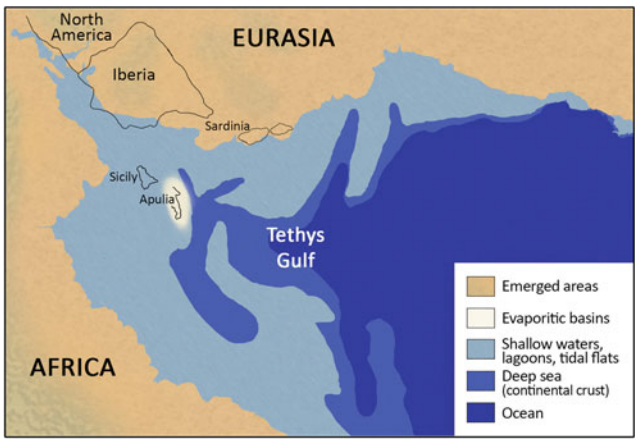


Fig. 2.2 Southern Europe at the beginning of Mesozoic (*ca.* 250 Ma BP)

Apulia, most of the Alps and Apennines, Corsica and Sardinia were the only emerged areas. Between the Corsica-Sardinia block and the Apennine chain, the youngest of the Italian seas was born: the Tyrrhenian Sea. The latter at present reaches depths of 3800 m and is characterized by a series of volcanic islands and submerged volcanoes; among the latter noteworthy is Marsili which is considered the largest European volcano. Thanks to the opening of the Tyrrhenian Sea the Apennine chain migrated towards the east and progressively emerged above sea level.

During the Messinian (from 7.2 to 5.3 Ma BP), evaporation was dominant in the Mediterranean Sea and, like today, the inflows coming from the Atlantic Ocean played a fundamental role in sustaining the sea level. At that time the communication with the Atlantic Ocean was drastically interrupted—the reasons for which are still debated—leading to almost complete desiccation of the Mediterranean basin and to huge precipitation of evaporites (e.g. gypsum and halite). At the same time, during the drying up of the Mediterranean Sea, the Apennine uplift continued. As a consequence, today it is possible to find outcrops of evaporites along the entire Apennine chain, from Piedmont to Sicily, such as the spectacular Vein of Gypsum of Romagna Apennines. At the time of the Messinian salinity crisis, the Tyrrhenian Sea was reduced to a brackish basin delimited by a steep arid slope, the Messina Strait was an emerged plateau and all along the peninsula spectacular canyon systems developed in correspondence with former rivers.

Once the communication with the Atlantic Ocean was re-established (early Pliocene; about 5 Ma BP), the sea quite rapidly invaded the Mediterranean basin reaching a level higher than today. At the same time the Apennines almost reached their present position and the Tyrrhenian Sea increased in its depth. Next to the Apennine chain new volcanic centres were formed such as Colli Albani and Campi Flegrei (Aucelli et al. 2017; Fredi and Ciccacci 2017).

During the Pliocene (from 5.3 to 2.5 Ma BP), Italy still showed landscape configuration very different from that of today. The sea enveloped the Alps and the Apennines, the latter displaying a multitude of archipelagos (Fig. 2.3). The Po Plain did not exist yet and the coastline was shifted up to a few hundred kilometres inland. Many species characteristic of tropical seas such as sharks, marine mammals, shells of different shape and colours—of which outstanding remnants

Fig. 2.3 Italy during the Pliocene (from 5.3 to 2.5 Ma BP) (base map courtesy of Litografia Artistica Cartografica S.r.l., Firenze)

are preserved as fossil records—populated the Pliocene sea which was much warmer than today. In correspondence to the present Po Plain there was a wide and deep gulf where Pliocene rivers flowed into and built fan-deltas. At that time the shoreline was adjacent to the foothills of the Apennines (Pede-Apennines). This gulf would have been filled by debris if it had not been for the contemporary basin subsidence. The transition from marine to continental environments was due to the prevailing sediment supply outpacing subsidence, and also to incipient glacial phases during which a considerable increase in sediment production took place in mountain areas. In fact, during the glaciation a great quantity of water was stored within continental glaciers and thus the sea level was lower than today and large amounts of sediment reached the plain (Marchetti 2002; Fontana et al. 2014).

During the Quaternary, that is during the last 2.5 Ma, the Italian peninsula experienced well-documented cyclic alternations of sea-level highstands and lowstands. The three principal contributions to sea-level changes along the Italian coasts are eustatic variation, glacio-hydro isostasy and vertical tectonic movements, such as the uplift of Calabria and Sicily and subsidence of the northern Adriatic area (Lambeck et al. 2011).

The last glaciation, which commenced *ca.* 110,000 years BP, has profoundly influenced landscape evolution and its traces are still clearly visible, especially in northern Italy. The shift of morphoclimatic belts determined different distribution of flora and fauna, the latter being drastically reduced and forced to migrate southward. During the Last Glacial Maximum (LGM, 24,000–18,000 years BP) the Alps were almost completely covered by glaciers as a nearly continuous thick ice sheet (it is estimated that in some areas the ice sheet reached 1800 m in thickness) that extended over an area of about 30,000 km^2 (Fig. 2.4) while the present glaciers' area is only of 500 km^2 (Antonioli and Vai 2004). Glaciers occupied large tracts of the Alpine foothills in northern Italy, since they expanded along the valleys and merged with each other to form typical piedmont glaciers. Glaciers also developed in some Apennine valleys, especially in those with northern aspect. During the LGM sea level was 130 m lower than today and a widespread alluvial plain developed over the entire northern Adriatic basin. The Po River Delta was located between Ancona and Pescara, in correspondence of the northern scarp of the Meso-Adriatic depression, and the Po River flowed in a slightly southern position from its present path. The Maltese archipelago and Sicily were linked by a bridge 105 km long and 38 km wide (Furlani et al. 2013) and Corsica and Sardinia were joined together, too. The landscape during the LGM was typically glacial and arid, with arctic tundra and grassy steppe covering the foothills of the Alps and Apennines and irregular deciduous and coniferous forest along the Mediterranean coast. Present-day Alpine glacial lakes and valleys testify to the erosive power of LGM glaciers whose maximum extension is revealed by majestic moraine amphitheatres.

After the LGM the global climate shifted towards warmer and wetter conditions through alternation between cool and mild periods. It is during the transition from glacial to interglacial conditions that Italy, as well as many parts of the Earth, underwent the most outstanding climatic and environmental changes during the last 20,000 years (Orombelli and Ravazzi 1996). Finally, during the early Holocene post-glacial Climatic Optimum—the warmest climate of the post-glacial period—the average surface temperature was *ca.* 2 °C higher than today (Vai and Cantelli 2004). Alpine and Apennine glaciers progressively diminished in size or even disappeared, whilst flora and fauna gradually recolonized mountain areas. The Adriatic Sea inundated once more the Po Plain and the Italian shoreline approached in stages its present arrangement.

Minor climate changes occurred in historical times, among which noteworthy are the warmer climate phase in correspondence of the Roman period and the so-called Medieval Climatic Optimum (between 800 and 1150 AD). The coldest period of the Holocene was the Little Ice Age that occurred between *ca.* 1550 and 1850 and has left remarkable traces within many Alpine valleys. During this period the Italian glaciers advanced significantly; for example the Rutor Glacier (Valle d'Aosta) was 1 km longer than now.

2.4 History and Civilization

Until the early Holocene the shaping of Italian landscape was exclusively driven by natural processes. Starting from about 7000 years ago—in correspondence with the spreading of agriculture in Italy—Man has progressively become the principal actor of landscape modelling in many regions of the country.

The first hominin traces discovered in the Italian peninsula date back to 850,000 years ago thanks to the dating of layers including lithic tools at Mt. Poggiolo, in the Pede-Apennines of Emilia-Romagna (Muttoni et al. 2011). However, the most ancient human remains found so far is a child's tooth collected at the Palaeolithic archaeological site of La Pineta, near Isernia (Molise, Central Italy), which is *ca.* 600,000 years old (Peretto et al. 2015).

In the second millennium BC, an Indo-European population moved towards the Po Plain and the Terramara culture developed in correspondence to a climatic period characterized by a decrease in temperature and by an increase of rainfall (Pinna 1996). These climate conditions could have forced the Terramara civilization to live in stilt houses to protect themselves from recurring floods; in this context they tried to modify the landscape to manage water resources through canalizations, deforestation for building, agricultural

and grazing purposes. The deforestation of the Po Plain, which already started during the Neolithic period, dramatically increased during the Terramara civilization. At the start of the Iron Age, between ninth and eighth century BC, the Villanovan civilization characterized a large area between Emilia-Romagna and Campania.

Fig. 2.4 Italy during the LGM, 24,000–18,000 years BP; Alpine and Apennine glaciers are outlined in *turquoise*; *red dots* indicate glaciers of limited extension (base map courtesy of Litografia Artistica Cartografica S.r.l., Firenze)

In the eighth century BC, the Etruscan civilization developed first on hilly, fertile and water rich areas of Central Italy, the so-called Etruria region (mainly corresponding to the present Tuscany Region) and later they reached the Po Plain in the north, and Campania in the south. The Etruscans were expert farmers: they performed water canalizations for irrigation and modified river courses profoundly shaping the landscape. In the same period, Greek colonies widely developed in southern Italy. The Greeks also left a clear imprint on the landscape through the building of world famous cities and temples, such as at Agrigento and Siracusa (Sicily)—which implied the extraction of limestone from local quarries—and through the practice of intensive cultivations, especially of cereals, olive trees and grapevines.

However the most influential civilization which developed on the Italian territory in ancient times was the Roman one. Traditionally, the foundation of Rome is dated to 753 BC when the Etruscans in the north and the Greeks in the south were dominating over most of Italy. In 509 BC Rome became a republic. Starting from a small settlement of farmers and shepherds along the Tiber River (Del Monte 2017), the Romans soon conquered the whole Italian peninsula. As a result of the victory in the Punic Wars, fought against the Phoenicians between 244 and 146 BC, the Romans started their expansion and domination on the Mediterranean regions which in the following centuries resulted in a large empire (established by Emperor Augustus in 27 BC) stretching from northern Europe to the Middle East.

The Romans were responsible for a profound landscape transformation, whose traces remain visible nowadays in many parts of Italy. They created a dense, but extremely well organized network of urban centres characterized by extraordinary buildings and infrastructures, such as roads, bridges and aqueducts. Extraordinary roads were built to facilitate commercial activities and military actions (e.g. Via Appia from Rome to Apulia; Via Aurelia from Rome to France; Via Cassia from Rome to Tuscany). They all preserve their original path and are still in use. The most striking imprint on plain rural areas left by the Romans was the Centuriation, a regular square grid subdivision of cultivated lands outlined by orthogonal crossing roads and canals (Fig. 2.5). This practice started with its classical features in the third century BC and developed for about four centuries. The Po Plain was largely affected by this type of land management which followed intense deforestation (up to 60% of the Po Plain was deforested during Roman times). Deforestation caused a general increase in soil erosion which resulted in gully development in the hilly areas of the Northern Apennines and fluvial aggradation in the Emilia-Romagna plain due to the high availability of sediment. At that time there was also a substantial progradation of the Po Delta into the Adriatic Sea (Stefani 2017).

Since the Bronze Age attempts of land reclamation and drainage of marshy areas were several but almost all of them failed. The most famous land reclamation attempts during Roman times were the works on Pontine marshes ordered by Emperor Augustus and the implementation of a gallery (longer than 5 km) that linked the Fucino Lake to Liri Valley (Latium) by Emperor Claudius in the first century AD, to avoid the frequent lake floods.

After a period of prosperity (first and second century AD), characterized by warm climate conditions, starting from third century AD the Roman Empire fell into economic and political crises; in the fifth century AD repeated barbaric invasions—possibly related also to the search for more favourable quality of life during a cold and humid climate phase—progressively reduced the influence of the Western Roman Empire to Italy only (Fig. 2.6). Among those invasions, the most striking was probably that of Attila the king of the Huns (people coming from North Central Asia) which occurred in 452 AD. It seems that the birth of the city of Venice is related to these attacks when the inhabitants of villages of northeastern Italy moved to the Venetian Lagoon to protect themselves. In 476 AD Odoacre, coming from Pannonia (present western Hungary), deposed the last Roman Emperor of the Western Empire, Romulus Augustulus. The year 476 AD is conventionally attributed to the beginning of the Middle Ages.

During the Early Middle Ages, neglect in water and land management, accompanied by climate deterioration, resulted in frequent floods which periodically submerged plain areas causing the spread of malaria in former salubrious and dry areas. A famous catastrophic event is represented by the breach of Adige near Verona on 17 October 589 AD. As reported by Paul the Deacon, this flooding event partially destroyed the walls of the city of Verona. This period is characterized by economic and demographic crisis: barbaric invasions and epidemics, among which the terrible bubonic plague, reduced the Italian population to less than a half. As a consequence of the demographic crisis, agriculture activity drastically decreased; only some vegetable gardens and orchards remained around villages for local supply, and the forest expanded. Locally, clearings occurred carried out by monks and nobles devoted to agricultural practices.

During the Middle Ages attempts to restore the former Roman Empire failed under the advance of the Longobards, a people of Germanic origin that was ruling Italy between 568 and 774 AD. Only in the ninth century, Charles the Great (Charlemagne) once defeated the Longobards and added northern Italy to the Holy Roman

Fig. 2.5 Evidence of Roman Centuriation in the Emilia plain between Modena and Bologna (Northern Italy). *Red lines* outline the traces of the original land subdivision on satellite image (© 2016 Google) and topographic map (*Source* C.T.R. Emilia-Romagna, scale 1:25,000— licence at http://geoportale.regione.emilia-romagna.it/Projects/geoportale/get_license_view?tipo_licenza=CC-BY%202.5)

Empire of which he became the first Emperor on 25 December 800 AD. At the same time, central Italy was part of the Papal States and southern Italy and Sicily were contended by the Byzantine Empire and Arabs, until the progressive conquest (eleventh and twelfth century) by the Normans who were descendants of the Vikings. After the death of Charles the Great, the Holy Roman Empire progressively lost its original integrity due to power struggles and repeated invasions.

A generalized climate warming and consequent partial ice-melting happened between 800 and 1150 AD—the so-called Medieval Climatic Optimum—causing sea-level rise, altering river dynamics and favouring wide development of marshes in plain areas. The spreading of forests and marshes together with Arab and Norman invasions forced populations to move from the coast to the hinterland and settle in fortified villages on hills. The Mesola Forest represents a remaining patch of the ancient planitial and thermophile forest that once ran along the Adriatic shoreline toward the north. It grows on sandbars probably formed between twelfth and fifteenth century AD.

The expansion of Medieval Communes which turned into powerful City States during the eleventh century, together with commercial activities, determined the modification of rural landscape, especially in northern and central Italy, by means of deforestation, quarrying and road building. The most influent City States evolved in several kingdoms and dukedoms.

The Italian Renaissance (fifteenth–sixteenth century) saw the flowering of arts and culture; the rural transformation left the most widespread imprint on the territory: plain areas underwent canalization, wide fields were used for farming and for sheep's grazing purposes, hillslopes were extensively terraced for olive tree and grapevine cultivation, deforestation and tillage were extended up to mountain areas. Towers and fortifications rose in strategic sites and around cities. During this period the belief that nature had to be under man's control developed, for both productive and aesthetic needs. However, between 1494 and 1559, Italy repeatedly became the battleground in a dispute mainly between France and Spain for the hegemony on Europe. The Peace of Cateau-Cambrésis (1559) ratified the supremacy of Spain on half of the Italian peninsula including the Dukedom of Milan, the Kingdom of Naples and the Kingdom of Sicily, which lasted until the beginning of the eighteenth century.

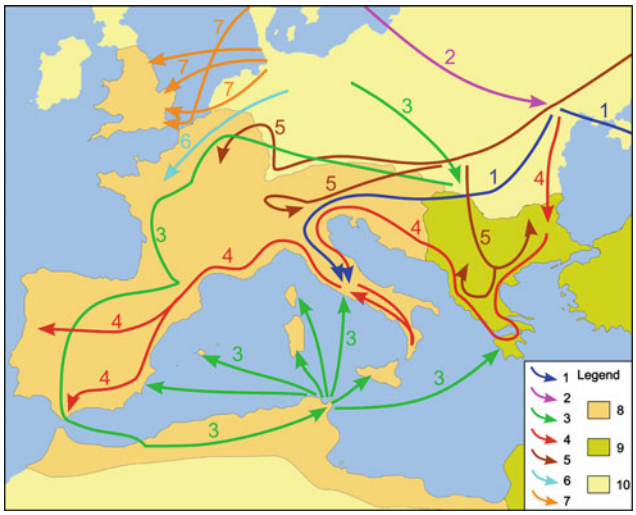


Fig. 2.6 Invasions of the Roman Empire between 100 and 500 AD. Legend: *1* Ostrogoths, *2* Goths, *3* Vandals, *4* Visigoths, *5* Huns, *6* Franks, *7* Jutes, Angles and Saxons, *8* Domain of Western Roman Empire, *9* Domain of Eastern Roman Empire, *10* Land outside the Roman empires

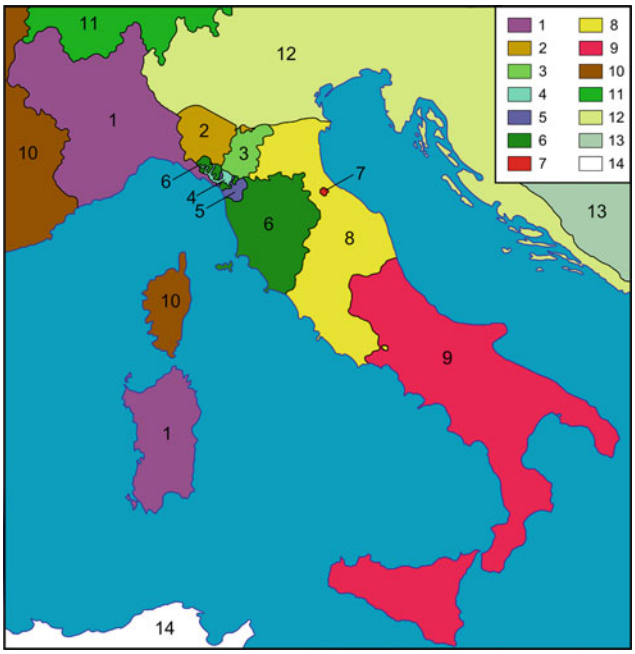


Fig. 2.7 Italy after the Vienna Congress (1815). Legend: *1* Reign of Sardinia; *2* Duchy of Parma, Piacenza and Guastalla; *3* Duchy of Modena and Reggio; *4* Duchy of Massa and Carrara; *5* Duchy of Lucca; *6* Grand Duchy of Tuscany; *7* Most Serene Republic of San Marino; *8* Papal States; *9* Reign of the Two Sicilies; *10* Reign of France; *11* Swiss Confederation; *12* Austrian Empire; *13* Ottoman Empire; *14* Other African States

As a consequence of the War of the Spanish Succession (1701–1714), the Spanish domain on the peninsula was replaced by Austrian Habsburgs domain with the Treaty of Utrecht (1713) according to which the Kingdom of Naples, the Kingdom of Sardinia and the Dukedom of Milan passed under Austria. Sicily instead became part of the Savoy domain.

Between 1802 and 1815, Napoleon Bonaparte conquered the peninsula: the northern part was named as the Reign of Italy and the southern as the Reign of Naples. After the Congress of Vienna (1814–1815), which was aimed at resetting the geography of Europe after the turbulent period of the French Revolution and the Napoleonic Wars, northern Italy came under the Habsburg control, southern Italy under the Bourbons and the Reign of Sardinia (including Piedmont) under Savoy. A large part of Italy was under the Papal States, while minor dukedoms survived (Fig. 2.7).

The nineteenth century was a period of further landscape changes due to urban development and the beginning of industrialization. In northern Italy, innovative cultivation techniques and irrigation works developed, and a new railway system was emplaced that increased deforestation rate. It is estimated that between the end of the nineteenth century and the beginning of the twentieth, forested areas diminished by 30% (Corona 2015).

The generalized discontent, provoked by the provisions established by the Congress of Vienna, animated new nationalistic inspirations that led to popular rebellion against foreign powers. In this context, the movement of Italian "Risorgimento" (literally Resurgence)—a period which eventually resulted in the unification of the Italian peninsula under a unique national state—developed. Initially, revolutionary popular uprising developed, successively after the First (1848–49) and the Second (1859) War of Independence and the crucial expedition of Giuseppe Garibaldi in the southern part of the peninsula, Italy was almost completely unified under a unique reign governed by King Vittorio Emanuele II (1861). After the Third Independence War (1866) Veneto was annexed to Italy while Rome—after the defeat of Papal States and the so-called Capture of Rome (20 September 1870)—became the capital city. Trentino and Alto Adige (South Tyrol) became however part of the Italian Reign only after the First World War (1915–1918, in Italy). During the latter, several areas of the present northeastern Italy were sites of hard battles which left evident traces. Noteworthy are mountain areas at the former boundary between the present regions of Trentino-Alto Adige to the north and Lombardy, Veneto and Friuli Venezia Giulia to the south.

A few years after the First World War, which determined severe social-economic conditions in Italy, Fascism (1922–1943) developed and lasted until the Second World War (1940–1945, in Italy). Beyond any political judgment, it must be emphasized that during this period the Italian urban

landscape in particular underwent important transformations, including the emergence of considerable architectural works and redesign of many Italian cities. However, some rural landscapes still show the effects of relevant works carried out especially in suburban areas and in marshy and insalubrious lands (e.g. Agro Pontino) which were reclaimed. Noteworthy are the extensive works carried out in the Agro Pontino (Latium), Campidano (Sardinia), and coastal areas of Emilia-Romagna and Veneto (Federici 2008). It should be noted that 40% of the present agricultural areas consist of reclaimed lands which need constant maintenance.

During the Second World War the whole Italian territory was a battleground and as a result it was severely impacted and suffered from deep economic crisis for some years. However, on 2 June 1946 a referendum sanctioned the end of the monarchy and the birth of the Italian Republic, and two years later the Italian Constitution was proclaimed. Since then the present partition of Italy in 20 regions (and further subdivisions) was effective (Fig. 2.1). Since the Second World War the population increased by more than 30% from 45,910,000 (1946) up to 60,795,600 (2015) inhabitants following a constant growth trend which determined an increase of almost 300% since 1861 (Fig. 2.8). At present the population is mainly concentrated in urban and plain areas, also as a result of quite recent progressive migrations of people, especially from mountain areas to productive and urbanized areas. The most densely inhabited regions are Campania, Lombardy and Latium (Table 2.2). The abandonment of rural areas in the last decades locally resulted in enhanced slope instability and land degradation, as happened in some formerly cultivated terraced areas in Liguria (Brandolini 2017). Nevertheless, reforestation took place both naturally, on abandoned lands, and artificially. At present, forested areas more than double those present at the beginning of the twentieth century (Corona 2015).

2.5 Landscape Conservation and Protection

The reconstruction following the Second World War progressively led to an inexorable, widespread and sometimes disordered overbuilding of the territory. Starting from the end of the 1950s, the years of the second industrial revolution, in correspondence of the so-called Italian economic miracle, there was an over-exploitation of rural and coastal areas which implied disruption of pristine landscapes through deforestation, development of industrial settlements, enlargement of urban areas, colonization of coastal areas for tourism purposes, quarrying activities also within riverbeds (gravel and sand extraction) and so on.

The twentieth century is definitely the period during which human impact had the greatest influence on the Italian landscape. During the first half of the twentieth century, only cultural and political aristocracies and upper classes were well aware of the value of landscape, but the latter was appreciated and started to be protected mainly due to its aesthetic quality. However, during this period landscape protection issues were recognized also at the central governmental level. In this context, one of the first actions was the promulgation of law n. 1497 in 1939 which introduced land planning and restrictions as landscape protection tools. Subsequently, article 9 of the Italian Constitution (1948) included landscape as a matter under State protection.

A turning point in landscape protection is related to law n. 431 of 1985 (the so-called Galasso Law) according to which landscape assets had to be protected not only for their aesthetic and cultural significance but also for their physical features, both natural or human-related ones. This has led to the perception of landscape as part of cultural heritage. Currently, landscape protection is regulated by the Legislative Decree n. 42 promulgated in 2004 known as the "Code of Cultural Heritage and Landscape" which has collected and expanded the previously mentioned rules.

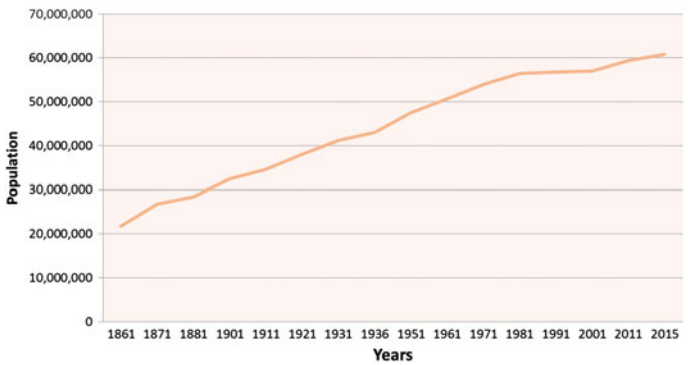


Fig. 2.8 Italian population growth from 1861 to 2015 (*source*: ISTAT database)

Table 2.2 Regional population density and percentage of inhabitants

Region	Population density (inhabitants/km²)	Inhabitants (%)
Lombardy	419	16.45
Latium	341	9.69
Campania	429	9.65
Sicily	197	8.37
Veneto	267	8.11
Emilia-Romagna	198	7.32
Piedmont	174	7.28
Apulia	209	6.72
Tuscany	163	6.17
Calabria	130	3.25
Sardinia	69	2.73
Liguria	292	2.61
Marche	165	2.55
Abruzzo	123	2.19
Friuli Venezia Giulia	156	2.02
Trentino-Alto Adige	77	1.74
Umbria	105	1.47
Basilicata	57	0.95
Molise	70	0.52
Valle d'Aosta	39	0.21
ITALY	201	100

The first protected areas established in Italy—Abruzzo National Park and Gran Paradiso National Park—date back to the early 1920s. Many more have been added even recently; this underlines the growing awareness of landscape importance and the need of land conservation and protection. Toward a wider protection of the environment stands the framework law n. 394 of 1991 which ratifies the main principles for the institution and management of protected areas at different spatial scales. As a result, the Italian territory is now including nearly 3 million hectares of terrestrial and marine protected areas constituting almost 10% of the country. At present 24 national parks, 140 regional parks, 27 marine protected areas, two submarine parks, one sanctuary of marine mammals plus a large number of natural reserves are listed by the Italian Ministry of Environment.

With special reference to geological and geomorphological landscapes, although the concept of geological heritage has only recently found a proper legislative definition in Italy, the development of conservation awareness regarding the physical elements and non-renewable landforms had already been growing among scientists since the nineteenth century. The first Italian scientist who recognized the indispensable aid given by physical elements in understanding the history of the Earth and mankind was Antonio Stoppani (1824–1891). In 1875 he wrote the famous and conceptually modern book "Il Bel Paese" (The Beautiful Country) which makes him—thanks to the valuable overview of the Italian landscapes—a forerunner and appraiser of those features that would have been later on defined as Geosites. Apart from the work carried out by a few authors, only in the 1990s a scientific approach to geoconservation started to develop (e.g. Panizza and Piacente 1993). The recognition and assessment of geosites was functional to protection and conservation actions as well as to educational activities and tourist promotion (Miccadei et al. 2011; Bollati et al. 2012; Reynard and Coratza 2013; Pica et al. 2016).

The first systematic census of geosites at regional level in Italy was carried out in Lombardy between the end of the 1970s and the early 1980s, and at present most of the Italian regions have geosite inventories. At the national level, the "National Inventory Geosite" project was launched in 2002. The Inventory contains information on sites of geological, pedological and geoarchaeological interest, which have been collected by the Italian National Institute for Environmental Protection and Research (ISPRA).

Research activity in this field has produced a vast amount of literature and is being carried on by the co-ordinated collaboration between research boards, universities and public administrations, witnessing the increasing awareness for preservation of geological and geomorphological

features, as fundamental landscape components. The outstanding value of the Italian physical landscape favoured the inscription of a number of Italian areas within UNESCO natural World Heritage Sites (4) and the recognition of others as Geoparks (9). At present, the Italian natural World Heritage Sites are the Aeolian Islands, Monte San Giorgio, Dolomites and Mount Etna (Giovagnoli 2017).

2.6 Conclusions

The Italian territory is varied and fragmented into a multitude of regions having their own physical and cultural identity. This is also due to the rise of majestic mountain chains, locally covered by sparkling ice sheets, to massifs and sharp peaks located not far away from wide and populous plains crossed by a dense network of rivers, to limestone plateaus characterized by sinkholes, to gentle hills covered by vineyards and olive groves, to fertile volcanic areas, and to spectacular but desolate clayey slopes. To this variety of landscape features have contributed a long-term geological history, climate changes—which repeatedly modified the paleogeography of Italy—human activities since the Neolithic, and a complex history related to the strategic position of Italy in the Mediterranean region. Since ancient times, the elongated outline of Italy has favoured connections and exchanges with surrounding regions, but mountain chains have tended to separate and isolate people within specific geographic areas. This has led to an even higher variety of landscapes and landforms which are in many areas deeply connected with the human presence and different types of land use due to cultural and political diversity as well as to highly varied customs and traditions. This is still reflected in the extraordinary and valuable cultural heritage that characterizes and differentiates most of the Italian regions: architecture, literature, cultivation type and pattern, dialects, food, etc. Evidence of the complex evolution of Italian landscapes and landforms, which can be themselves considered as part of the national cultural heritage, is well preserved in many parts of the country despite the high density of population and industrial development that occurred in the last decades.

For the reasons mentioned above Italy has been a privileged destination for generations of well-educated travellers, intellectuals, poets and painters, for a long time attracted by the fascinating "Garden of Europe" where outstanding landscapes perfectly framed architecture and art masterpieces. Antonio Paolucci, art historian and the former Minister for Cultural and Environmental Heritage in the 1990s, stated that in the past "The Italian landscape was considered the emotional multiplier of the historic-artistic suggestion, meaning that the latter received from the landscape frame a sort of heroic and romantic amplification" (Paolucci 2000).

Nowadays Italy is a popular tourist destination. More than 50 million foreigners visited the country in 2015, making it the fifth in the world in terms of international visitations. The Italian tourist economy amounts to more than 10% of the national GDP and still with a large unexploited potential. Among the reasons to visit Italy is definitely the willingness to see extraordinary, often spectacular mountainous, volcanic and coastal landforms which make Italian landscape unique.

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