



Terraces & Drystone Walls in Machu Picchu – Peru



Terraces & Drystone Constructions in Selitsa - Kalamata

1. Mountainous Stone-built Paths and Settlements, Flora – Fauna and Sustainable Development

The mountainous drystone paved paths (Kalderimia) in Greece amount to thousands of kilometers. They connect mountainous settlements with each other, but also with other destinations, such as: coastal towns, ports, monasteries, churches, chapels, mountain refuges, bridges, mills, wells, springs, etc. The networks of those paths are a valuable **heritage from our ancestors**, not only of monumental nature, but functional and useful to this day. They are also a **"loan" from the next generations!** The value of these hiking routes, as an available investment for soft and sustainable development and revitalization of abandoned mountain settlements, is enormous.

Mountain paths and settlements are gaining additional value due to climate change, global warming and rising sea levels. Several beach resorts are predicted to be covered by the sea, while the tourism of the Mediterranean countries is gaining competitors in more northern latitudes, where the climate is becoming more temperate. After all, there is an increasing preference for mild tourism all year round, in areas of natural beauty, combined with physical exercise (hiking, mountaineering), healthy food and accommodation in mountain settlements (e.g., Taygetos in Mani or Pindos in Northern Greece). Drystone paths and walls and cultivation terraces are constructions compatible with the preservation of biodiversity in flora and fauna, as well as the protection of the environment and the landscape. They contribute to retaining fertile land, avoiding floods and landslides, enriching underground aquifers, reviving, and exploiting mountain settlements. They are essential for mild and sustainable agricultural production, housing, and tourism development and for dealing with the climate crisis. In contrast, carriage mountain roads fragment the forest environment, interrupting the communication and cooperation of forest trees and local flora as well as local fauna species. Dry stone constructions also serve as shelters and habitats for endemic small animals, insects, and reptiles.

It should be noted that several traditional drystone constructions in many regions of Greece have already been designated as tangible Monuments of the Cultural Heritage, by the Ministry of Culture. In addition to this, the drystone knowledge and techniques have been registered in the Representative List of UNESCO for the Intangible Cultural Heritage of Humanity.

Therefore, for all the above reasons, **traditional drystone constructions are technical works inseparable from the natural and cultural environment.**

Note: The term "kalderimi" (linguistic corruption of "kalos dromos" = good road), survives in other languages as a "loan" from the Greek language. Those paths are called kaldirim in Turkish, kaldrme, kalderma, kalldrem, kaldrima, or kaldirma in Croatia, Bosnia, Albania, Serbia, Montenegro, etc.



Drystone constructions – terraces – water supply in Peru



Drystone paved path (Kalderimi) in Selitsa - Kalamata

Drystone paved paths and hiking routes are prominently displayed in military and public aerial photographs (A/F) and maps in Greece, from 1945 onwards. Especially in A/F with good resolution (e.g., 1965, 1979), as well as in the topographic maps of GYS (Geographical Military Service). There, they are clearly marked with dotted lines as "**well- or badly passable mule roads**". These official A/F, the corresponding orthophoto-maps, and topographical maps, can be used for scientific documentation of the existence and the route of these old mountain roads. **They constitute an excellent database of paths and roads pre-existing in the year 1923** (according to the recent technical specifications of the Official Gazette 2671/B/2022). **Given that in Greece there is still no land registry, such documentation and database is essential for the official recognition of their existence, shared use, and public ownership.**

Additionally, these old roads and paths exist and have been used continuously for hundreds of years, as can be seen from historical reports, e.g., of foreign travelers, maps - inventories and contracts of the Byzantine - Frankish - Venetian - Ottoman period for ancient settlements (such as Selitsa). Therefore, the "Vetustas Doctrine" also applies **for an official recognition of their existence, shared use, and public ownership.**

However, **due to the complicated and outdated rural and urban planning legislation in Greece, such recognition automatically creates a "right to build houses" in agricultural – forest properties on both sides of the "recognized road", transforming agricultural - forest & cultivated land in residential, without any rural and urban planning!** (See my presentation in the 17th SPS Congress in Chavtat, Konavle, Croatia: "[Restoration, promotion & utilization of mountainous traditional dry stone constructions. Confirmation of their existence, age, communal Use, public property and jurisprudence \(EN\)](#)").

Therefore, citizen associations (hiking, mountaineering, cultural, environmental, etc.) asked the Greek "Ministry of Environment and Development" for an immediate **legislation about registering old roads** (e.g., displayed in official topographic maps of 1965 – 1979) **in the cadastral charts of the National Land Registry** with a "Special Code of Public Land" according to specifications in the Official Gazette FEK 2671/B/2022. **This law should not automatically give any "right to build houses" in properties on both sides of the registered roads**, avoiding the conversion of agricultural - forest & cultivated land into residential areas without spatial and urban planning, and at the same time protecting the traditional old roads from damages - encroachments and private claims. **The extension of existing settlement boundaries or the establishment of new settlements for residential properties, should be exclusively an issue of state's spatial and urban planning legislation.**

Now is a positive occasion for such a regulation, given the recent activation of the permanent positions of the “**Council of State**” (StE) about “building houses outside settlement boundaries”, according to which, among other provisions:

- **The natural and cultural environment are considered as independently protected goods** (par. 1 and 6 of article 24 of the Constitution). The competent bodies of the State must take positive actions and take the required legislative and administrative, preventive, and repressive measures for their effective preservation.
- **A rational spatial restructuring of the country is required** (par. 2 of article 24 of the Constitution), based on the rules of science, to ensure the proper development of settlements, the protection of the environment, the best possible living conditions, and economic development in the context of the principle of sustainability (sustainable development), an essential condition of which are spatial plans.
- **In areas without urban planning**, which, in principle, are not intended for building or tourist exploitation, but for agricultural, livestock and forestry exploitation and public recreation, **residential exploitation is only exceptionally permitted**, and may be prohibited in whole or in part or permitted under particularly strict conditions and restrictions.
- **Crucial provisions of the (relevant) 1985 decree essentially reproduce provisions of the (similar) 1978 decree, which was enacted before the reform of legislation** on spatial planning, environment, and antiquities (laws: 2742/1999, 1650/1986, 3028/2002) **and is not coordinated with it.**
- **The imposition of restrictions on building in non-planned areas does not concern only the areas with particularities** (NATURA 2000, natural beauty, etc.) **but all the areas without urban planning of the country**, even those that have already been burdened (due to the change in principle of their destination) with legal (based on building permits) or arbitrary construction.

Unfortunately, **the Government** – once again captive to self-interested voters – **is promoting biased legislation "bypassing" the Council's jurisprudence, ignoring the unconstitutionality of this legislation!** This attitude finds support from the financial interests of guilds (engineers, lawyers, notaries), building cooperatives, tourist accommodation "investors", landowners, squatters, etc. It is also supported by government-controlled media through "subsidies". **Since 1923 and for the 100 consecutive years, this has been the permanent policy of the so-called "Greek client State", where ministers – members of parliament - regional governors and mayors act as "real estate brokers" and the "beneficiary" citizens "pay as customers with their votes"!** Unfortunately, **Greece does not have a Constitutional Court**, where appeals could be made directly against unconstitutional provisions. This is left to the judges in the courts of first instance and the courts of appeal on a case-by-case basis. **The “Council of State” reacts** (depending on its composition and the political-social situation) **with a delay of many years** when a case reaches the third instance at this Supreme Cassation Court! **Even today, in the age of the climate crisis and the recent biblical destruction of 300,000 hectares of land by forest fires – storms – floods - landslides, the destruction continues unabated.** Most of the "investments" in areas without urban planning are subsidized by national and European Community resources or "development programs" of the European Union!

2. Forest Ecosystems – Biodiversity – Global Warming – Climate Crisis

Photosynthesis, the effective mechanism discovered by Nature, **creates plant vegetation and forests**, which are considered as **"light, condensed with carbon and hydrogen atoms"**! All forms of life are sustained by the above types of **"condensed solar energy into carbon compounds"**, created by the photosynthetic mechanism.

According to recent findings in forest ecology, **underground networks of symbiotic fungi** (mycorrhiza) connect individual trees in forests with **a system of mutual communication and cooperation, in addition to** the emission of gaseous compounds (aromatic hydrocarbons) as **messages from the foliage**, something like an **"underground wired and aerial wireless internet of plants"**!

Global warming, climate crisis and biodiversity loss are escalating and intensifying. In fact, "**positive feedback**" conditions accelerate the phenomena, e.g.:

- Ocean warming accelerates the melting of ice caps at the poles. Reduced white ice surfaces reflect less solar radiation, while the enlarged dark surface of the oceans absorbs more solar radiation.
- In the mountain glaciers and on the snow-covered land surfaces, the ice melts from both their upper and lower surfaces. Water from melted ice under the lower glacier surface acts as a "lubricant" and accelerates the movement of glaciers towards the sea.
- The reduction of forest areas (fires, photovoltaic & wind turbine parks, deforestation, logging, forest roads) reduces the absorption of greenhouse gases, as well as the transpiration of water vapor and oxygen from the forests. This implies a decrease in clouds and precipitation, drought, water scarcity and desertification of arable land, as well as further strengthening of warming.
- Extensive monocultures, combined with massive use of pesticides in agriculture, especially the "industrial" type with mechanical plowing - fertilizing - sowing - watering - harvesting, gradually lead to a loss of the fertile organic soil, as well as of the microorganisms - earthworms - beetles that maintain the surface porous, wet, and nutritious. In combination with water scarcity (reduced rainfall, depletion of underground water) it gradually leads to desertification of cultivated lands, contributing to the overheating of soil and atmosphere.
- The reduction of wetlands, either due to a decrease in rainfall and surface water, or to intentional drying for agricultural crops, has similar effects, especially in soils with a thick layer of peat. While wetlands store and retain large amounts of CO₂, their drying out leads to peat decomposition and emissions of methane as well as CO₂.
- Huge amounts of methane are also released during the melting of subsoil ice (permafrost), or frozen surface water (tundra) in vast treeless areas of arctic - antarctic - alpine ecosystems. The effects of released methane on global warming are predicted to be nightmarish.
- The increased acidity of ocean waters due to CO₂ absorption, combined with the increase in their temperature, results in "bleaching" and the death of corals and underwater vegetation, and the reduction in the ability of crustaceans to form calcium-carbonate shells. At the same time areas with toxic algae are rapidly developing. This in turn deprives endemic species of their usual habitats (corals, seaweed) and causes them to "migrate" to colder northern and southern waters. This is accompanied by chaotic conditions in the underwater food chain and gradual disappearances of marine species.
- Existing and new mining and extraction of fossil fuels (on land and underwater), as well as mining of metals and rare earths for "green technologies" cause a rapid increase in greenhouse gases (mainly carbon dioxide and methane), in all phases: extraction, beneficiation, transportation, combustion, manufacturing. In parallel, they cause environmental disasters and widespread pollution, and are usually accompanied by the oppression of indigenous populations and humanitarian disasters.
- Special importance in the reduction of biodiversity and its more general consequences is attributed to the rapid reduction of the bee population, and of other pollinators, as it implies the gradual and massive disappearance of species of flora, therefore also of fauna. The prospects for the collapse of the terrestrial food chain are becoming dire.
- All the above phenomena are more intense in the Mediterranean Basin, which is a "semi-enclosed" sea! Especially the warming of the Mediterranean waters and the retreat of the undersea meadows of the endemic super-plant "Posidonia Oceanica".

Greek Ministry of Environment and Development (Interview on 24.11.2021)

- "**Forests are an organized biosphere and should not be fragmented by the opening of roads** and development interventions, which prevent the communication and cooperation of trees and other

plants. Climate change is leading to a biodiversity crisis, large pieces of ecosystems, natural habitats, and consequently individuals of the flora, and thus also of the fauna, are being lost.

- **When mountains are fragmented by roads, this development leads to habitat loss and isolation of species.** The various species of fauna cannot then communicate with their natural habitats, go to places where they will look for food, or a mate for reproduction. This results in population declines and local extinctions of species. Ecosystems are discredited and mountains are aesthetically degraded."
- "The institutionalization of **areas without roads (pristine mountains)** helps biodiversity, prevents the entry of foreign species, enables movement, either for migration, or for a stopover for the individuals of the fauna. At the same time, carbon is absorbed from these areas and the effects of greenhouse gas emissions are reduced, which is an environmental priority. Among other things, intact ecosystems are preserved, which offer recreation, education and have scientific value."

Therefore, an explicit legal guarantee is required, at least in the "pristine mountains", that wind (or photovoltaic) farms, artificial surfaces, or the opening of roads for motorized vehicles cannot be built, that any technical intervention, change or alteration of the natural environment is prohibited. This, of course, would be useful to extend to other mountains.

Unfortunately, however, **the distance between words and works of the Greek Governments is great.** The "**decapitation**" of many mountain tops and the **wide roads for vehicles through forests**, even within "Natura 2000" areas, for the installation of hundreds of enormous wind turbines, for foundations with thousands of tons of cement, installation of huge pylons of new electric power networks etc., without a contractual provision for their dismantling and retirement when their life span is completed, **is now a frequent daily practice.** This has justifiably provoked massive reactions, appeals and demonstrations by "Civil Society" organizations.

3. Mining of Metals and Rare Earths – "Green Technologies" – Climate Crisis

Mining, beneficiation, transport & processing of rare metals and rare earths for batteries, telephony, electric cars, wind turbines, photovoltaics, are still based on the use of coal - lignite - oil - natural gas for operation of thermal plants producing the needed electric power.

The production of electricity from renewable sources (hydroelectric, wind turbines, parabolic solar mirrors, photovoltaics, geothermal, "green" hydrogen, etc.) or from nuclear fusion reactors will take decades to gradually cover the needs. In the transition period, energy production from fossil fuels and renewals, thermal & electric vehicles, old and new technologies, will co-exist.

After the last ice age (beginning ~ 2.5 million years ago, ending about 12 thousand years ago), until the industrial revolution, the greenhouse gas content of the atmosphere, temperature and climate were maintained at sizes that allowed undisturbed habitation, cultivation, and exploitation of land, in coastal and non-coastal areas.

This is how agriculture and animal husbandry developed, as well as permanent settlements and the development of cities. More generally, forms of human civilization appeared and evolved on all the continents. But the carbon dioxide content of the atmosphere, from 280 ppm in 1800 reached 420 ppm in 2021, while it is expected to reach 1,000 ppm by 2100 (ppm = parts per million).

The technological - industrial - urban civilization was accompanied by a population explosion, and the corresponding needs for food, clothing, raw materials, infrastructure, which developed at a rapid rate in the last 300 years. This required consumption of energy in huge quantities. This need was multiplied due to the waste of resources (e.g., for production of weapons and ammunition, war machines and the conduct of wars), and a dramatic change in lifestyle (massive consumption of luxury goods and food) in the "developed" countries. A typical example is the addiction to beef (meat, cheese, milk, sausages, etc.), which – in addition to breeding grounds for millions of cattle – requires deforestation for mass production of animal feed. The greenhouse gases (carbon dioxide and methane) of the entire cattle sector exceed the total exhaust emissions from passenger - transport and military aircraft!

In the last 200 - 300 years, the produced quantities of technological materials (metals, plastics, cement, asphalt) exceed the mass of the planet's biosphere (e.g., forests, vegetation, corals, fish, elephants, termites, ...). Ancient alchemists tried to turn lead into expensive gold. Today's alchemists turn the "black gold" into cheap plastics. Plastics are so cheap and plentiful; they are often not recycled. They flood vast landfills in every corner of the planet, down to the Mariana Trench - the deepest point in the oceans and the lowest point on the surface of the Earth's crust, at 11,000 m deep. They are so resistant to wear and tear that they are preserved on a "geological time scale", as a **historical imprint of the "Anthropocene"**!

4. **Fossil Fuels – “Carbon Bombs” and “Methane Bombs” – Global Warming**

The short-term expansion plans of oil and gas companies, such as ExxonMobil and Gazprom, are colossal. A Guardian’s investigation has found that in the next seven or so years, they are likely to start producing oil and gas from projects that would ultimately deliver **192bn barrels**, the equivalent of a decade of today’s emissions from China. Burning this would produce 73bn tons of CO2. But methane routinely leaks from gas operations and is a powerful greenhouse gas, trapping 86 times more heat than CO2 over 20 years. Including this impact, at a standard supply-chain leak rate of 2.3%, means **the equivalent of 97bn tons of CO2 added to the atmosphere and driving us faster towards climate hell.**

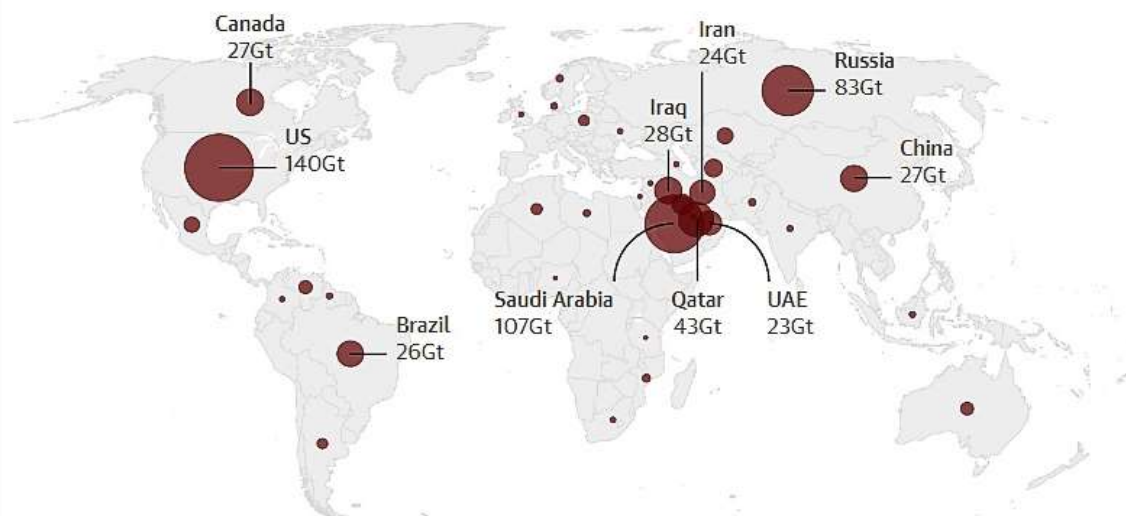
This includes **195 “carbon bombs”**, which – unless stopped – will drive catastrophic climate breakdown around the world. The term “carbon bomb” refers to a project capable of pumping at least 1bn tons of CO2 emissions over its lifetime and has been widely used in climate circles for the past decade to describe large fossil fuel projects or other big sources of carbon.

The proportion of **fossil fuel reserves that would need to stay in the ground for 1.5C** jumped to **60% for oil and gas** and **90% for coal**, while the UN warned that planned fossil fuel production “vastly exceeds” the limit needed for 1.5C.

Together these projects would produce **646bn tons of CO2** emissions, swallowing the world’s entire carbon budget. More than 60% of these schemes are already operating. The companies have developed further project options ... that would not even be compatible with a **devastating 2.7C of global heating.**

Twenty-two mega-projects in the US account for more than a fifth of potential emissions from global ‘carbon bombs’

Potential carbon emissions from carbon bombs by country, GtCO2



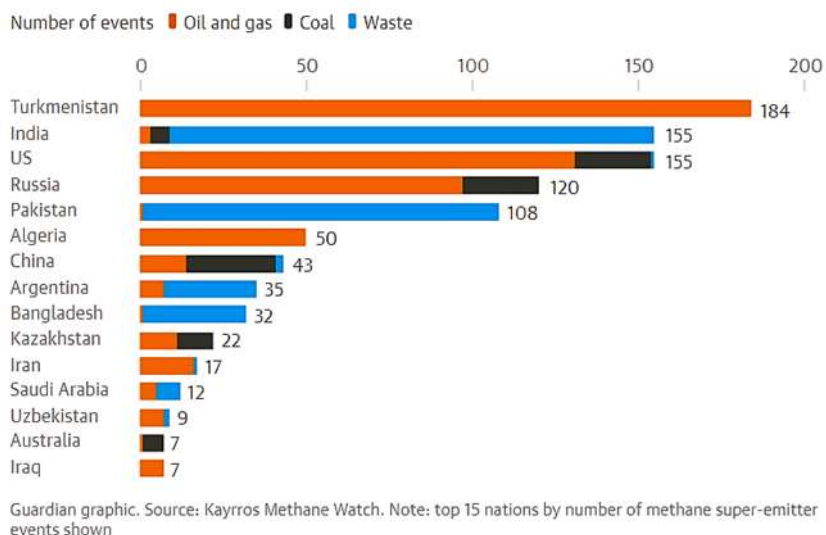
Guardian graphic. Source: Kühne, Energy Policy, 2022. MENA = Middle East and North Africa

<https://www.theguardian.com/environment/ng-interactive/2022/may/11/fossil-fuel-carbon-bombs-climate-breakdown-oil-gas> 11.05.2022).

In a newer Guardian article, it is stated that: new research from the same scientists has identified 55 “methane bombs”: gas fields where leakage alone from the full exploitation of the resources would result in emissions equivalent to at least a billion tons of CO₂.

More than **1,000 “super-emitter”** sites gushed the potent greenhouse gas **methane** into the global atmosphere in 2022, mostly from oil and gas facilities. The worst single leak spewed the pollution at a rate equivalent to 67 million running cars.

Turkmenistan, US and Russia had the highest number of methane super-emitter events from fossil fuels in 2022



Separate data also reveals **55 “methane bombs” around the world** – fossil fuel extraction sites where gas leaks alone from future production would release levels of methane equivalent to 30 years of all US greenhouse gas emissions.

Gas fields also produce methane, which is sold to customers and burned, pumping carbon dioxide into the atmosphere. **When these emissions are combined** with the leaked methane, **the list** (of bombs that would result in global heating equivalent to 1bn tons of CO₂ each) **swells to 112**.

The **total emissions from these 112 methane bombs would be equivalent to 463bn tons of CO₂** – more than a decade of current global emissions from all fossil fuels. The methane bomb emissions are also significantly higher than the emissions **limit of 380bn tons** of CO₂ from all sources needed to **keep global heating below 1.5C**, according to the Global Carbon Budget’s recent estimate.

Methane emissions cause 25% of global heating today and there has been a “scary” surge since 2007, according to scientists. This acceleration may be the biggest threat to keeping below 1.5C of global heating ... researchers say.

About **40%** of human-caused methane emissions come from leaks **from fossil fuel** exploration, production, and transportation. These rose by almost 50% between 2000 and 2019. Another **40%** comes **from agriculture**, dominated by burping cattle, and **20% from rotting waste** sites. All are forecast to rise.

The recent surge in methane is largely being driven by **increased activity by microbes** that decompose organic matter, such as those **in wetlands and the stomachs of livestock**. It looks like rising global temperatures enable microbes to produce more methane, which then causes more global heating, creating a vicious circle. **Draining wetlands is unthinkable** for most scientists, as that could produce large CO₂ emissions and destroy precious habitat for wildlife.

A **50% methane cut from fossil fuel sites** could be achieved essentially for free, according to a study. ... In contrast, cutting methane from other human sources is significantly harder. Options that incur no net cost represent just **16%** of emissions **from waste** sites and **30%** of those **from cattle**.

(<https://www.theguardian.com/environment/2023/mar/06/revealed-1000-super-emitting-methane-leaks-risk-triggering-climate-tipping-points> 6.03.2023)

5. **UN secretary general, António Guterres, about world leaders and big companies:**

- “Simply put, they are lying, and the results will be catastrophic”, he said. “Investing in new fossil fuels infrastructure is moral and economic madness”.
- “Climate activists are sometimes depicted as dangerous radicals. But the truly dangerous radicals are the countries that are increasing the production of fossil fuels”.
- The failure of countries to “build back greener” after the Covid-19 pandemic or the 2008 financial crash was not a good omen, and Guterres said: “Fossil fuel interests are now cynically using the war in Ukraine to lock in a high-carbon future”.
- “The world is in a race against time”, said Guterres. “It is time to end fossil fuel subsidies and stop the expansion of oil and gas exploration”.
- Reflecting on the war in Ukraine, he said: “Countries could become so consumed by the immediate fossil fuel supply gap that they neglect or knee-cap policies to cut fossil fuel use. This is madness. Addiction to fossil fuels is mutually assured destruction.”
- “We are on a highway headed for climate hell and (instead of a brake) we have our foot on the gas”.
- “Our addiction to fossil fuels is killing us.”
- Recently, during the heatwaves in July 2023, he said: “We have passed the global heating phase! We are now in the boiling phase”!

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